



# Henry Lawson Drive Upgrade Stage 1A

Review of Environmental Factors

Transport for NSW | July 2021





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Prepared by Aurecon Australasia and Transport for NSW  
Publication Number: 21.177

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# Executive summary

## Acknowledgment of Country

Transport for NSW acknowledges the Traditional Custodians of the land on which the Henry Lawson Drive Upgrade is proposed.

We pay our respects to Elders, past and present and celebrate the diversity of the Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW on which we build infrastructure, deliver projects and serve Transport's customers.

Transport for NSW (Transport) proposes to upgrade a 1.3 kilometre length of Henry Lawson Drive between Keys Parade, Milperra, and Tower Road, Bankstown Aerodrome (referred herein as "Henry Lawson Drive Upgrade Stage 1A" and/or "the overall proposal"). The overall proposal would create two lanes in each direction along Henry Lawson Drive, including the duplication of the Henry Lawson Drive road bridge to the south of Auld Avenue (referred to as the Auld Avenue Bridge). As part of the overall proposal, Henry Lawson Drive's intersections with Newbridge Road/Milperra Road and Tower Road would be upgraded to provide additional right turn lanes. The Auld Avenue intersection would also be upgraded to a left-in, left-out arrangement.

The overall proposal is subject to assessment under two planning pathways. A review of environmental factors (REF) under Part 5 of *Environmental Planning and Assessment Act 1979* (EP&A Act) is required for most of the proposal (the REF proposal) and an environmental impact statement (EIS) under Part 4 of the EP&A Act. There are small parts of the overall proposal that fall on land mapped under the State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP). This part of the overall proposal (referred to as the 'EIS proposal') is subject to approval under Part 4 of the EP&A Act. The EIS proposal is assessed separately in the EIS document.

Other stages of upgrading Henry Lawson Drive would be developed separately in the future and will be subject to a separate assessment process. The Henry Lawson Drive Upgrade Stage 1A is the first stage of the Henry Lawson Drive upgrade program.

Key features of the REF proposal include:

- Widening Henry Lawson Drive from two to four lanes
- Upgrading the signalised intersection of Henry Lawson Drive and Tower Road, including:
  - An additional right turn lane from Tower Road onto Henry Lawson Drive
  - A new channelised short left-turn lane from Henry Lawson Drive (southbound) onto Tower Road
  - An additional right turn lane from Henry Lawson Drive (northbound) onto Tower Road
  - Retaining the pedestrian crossing across Henry Lawson Drive on the southern side of the intersection.
- Upgrading the signalised intersection of Henry Lawson Drive and Milperra Road/Newbridge Road including:
  - Additional right turn lane on the Milperra Road and Newbridge Road approaches to Henry Lawson Drive
  - An additional through lane on Henry Lawson Drive's southbound approach
  - The removal of the bus only lane on Milperra Road, to provide an additional right turn lane on Henry Lawson Drive's northbound approach.
- Removing the dedicated left turn slip lane into the retail strip on Henry Lawson Drive with access being retained via a standard property driveway.

- Retaining the existing bus stop on Milperra Road (eastbound) and moving the westbound bus stop 20 metres to the west
- Altering access to Auld Avenue to a “left in/left out” only configuration
- Constructing a two-lane road bridge on Henry Lawson Drive (over Milperra Drain) (the Auld Avenue bridge) to carry northbound traffic, and retaining the existing bridge for southbound traffic
- Constructing new footpaths on the eastern side of Henry Lawson Drive, which will connect Tower Road with the existing Milperra Road eastbound bus stop, as well as a new footpath connecting Henry Lawson Drive with the Milperra Road westbound bus stop
- Widening the shared pathway between Flower Power (Keys Parade) and Newbridge Road to three metres and reconstructing footpaths along the western side of Henry Lawson Drive, where required.
- Adjusting existing drainage, including lengthening culverts, installing new drainage infrastructure and water quality controls
- Relocating utilities, including electrical, gas, water and telecommunications
- Final roadworks, including pavement, kerb and gutters, signs, lighting and line marking
- Ancillary work for the project including, but not limited, to road furniture, tie-in works, landscaping, and earthworks
- Temporary ancillary compounds, stockpile sites and associated facilities.

Construction of the overall proposal is expected to commence in early 2023 and would take about two years to complete.

## Need for the proposal

The overall proposal would provide:

- Increased capacity to alleviate congestion and address future traffic growth and development
- Improved road infrastructure to assist in reducing safety incidents including provision of a concrete median separating opposing traffic direction.

Without the development of the overall proposal, future road and traffic conditions within the overall proposal area would continue to decline into the future. Congestion would be expected to worsen, particularly during peak periods, and the number of crashes would increase due to poor driver behaviour in an unforgiving road environment.

The development of the overall proposal is consistent with the objectives, aims and strategic transport, land use and road safety planning documents. It would provide increased capacity to alleviate congestion and cater for development growth in the area.

## Proposal objectives

The objectives of the overall proposal are to:

- Improve travel times, journey time reliability and road safety outcomes for all road users.
- Improve freight efficiency and reduce vehicle operating costs on the road network.
- Support new developments in the precinct by improving traffic flow and connectivity to Bankstown Airport, Milperra Industrial Estate and proposed residential development in both the area and the surrounding road network.
- Improve connectivity and safety for pedestrians and cyclists.

The REF proposal would support these objectives. Increased intersection capacity would result in significant improvements in traffic capacity and traffic volume throughput at the Milperra/Newbridge Road and Tower Road intersections. In conjunction with other future stages of the Henry Lawson Drive upgrade program, the REF proposal would ease existing traffic congestion issues and improve freight access between the M5 Motorway and Hume Highway. Extension of pedestrian and shared paths would improve connectivity and safety for active transport users.

## Options considered

A range of strategic options were developed to response to the existing challenges on Henry Lawson Drive. Both non-infrastructure and infrastructure solutions were identified and assessed through an investment logic mapping (ILM) workshop conducted in November 2018. Of the strategic options, the option to increase the capacity of the road was selected as it would best address the identified challenges.

Further options were investigated to identify how best to increase the capacity of the road. These investigations identified that the site is highly constrained by considerations such as threatened ecological communities, residential and commercial/retail properties, properties identified as airport land under Commonwealth ownership, and properties subject to Aboriginal land claims. It was also found that it was not possible to avoid impacts to coastal wetlands. A series of workshops were held to consider and compare three alternatives for the Henry Lawson Drive upgrade program. These included:

- Alternative 1 – widening of Henry Lawson Drive to four lanes widening (two lanes each direction)
- Alternative 2 – widening Henry Lawson Drive to four lanes as well as a widened median to allow for future construction of an additional lane in each direction
- Alternative 3 – widening of Henry Lawson Drive six lanes (three lanes each direction).

The workshop concluded that Alternative 1 was the preferred option, as traffic modelling showed it would sufficiently address the congestion problem within the foreseeable future. The selection of the preferred option is justified for the following main reasons:

- Reduced acquisition impacts of residential properties compared to the other options.
- Reduced impacts on utilities along the western side of Henry Lawson Drive, south of Newbridge Road.
- Improved geometry along Henry Lawson Drive compared to the other options.
- The alignment would allow for future proofing of Henry Lawson Drive at the intersection with Milperra/Newbridge Roads.
- Allows for an additional through lane along Henry Lawson Drive northbound in the future with limited strip property acquisitions.

Biodiversity assessments and comparative analysis between the four lane and six lane strategic options also showed Alternative 1 (four lane widening) would have the least impact on threatened ecological communities and coastal wetlands.

The overall proposal layout for the preferred option has been optimised to achieve a balance between all the above-mentioned constraints while meeting the overall proposal objectives.

## Statutory and planning framework

The REF proposal is a road upgrade to be carried out by Transport for NSW and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

This REF has been prepared to meet the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A referral to the Commonwealth Department of Agriculture, Water and the Environment is not required. A Biodiversity Assessment Report has been prepared and the outcome of the tests of significance and EPBC Act assessments of significance indicated there is a high level of certainty the impacts to threatened biodiversity are unlikely to be significant. Given the REF proposal is not likely to lead to a significant impact on threatened species, populations, ecological communities or their habitats, a Species Impact Statement (SIS) is not required under the *Biodiversity Conservation Act 2016* to support this proposal.

The EIS proposal is deemed designated development under the Coastal Management SEPP and is assessed separately to this REF proposal. Details of the EIS proposal are described in the EIS.

## Community and stakeholder consultation

Transport has involved the community during the development of the overall proposal in early concept design, concept design planning phases, and in preparing the environmental impact assessment for the REF.

In February 2020, Transport for NSW undertook community consultation on the concept design for the overall proposal. This allowed Transport for NSW to understand community views and values so that feedback could be considered in further development of the concept design. Community consultation aimed to seek comments, feedback, ideas and suggestions on the proposed early concept design features. It also helped to identify and contact any potentially affected residents and stakeholders, and to build a database of any interested and concerned community members.

Throughout the early concept design consultation period, community updates occurred via a letterbox distribution (to 5500 local residents and businesses). 78 comments/submission were received. Aboriginal community consultation has been undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.

The key issues raised on the overall proposal related to the following:

- The scope of the Henry Lawson Drive Stage 1A upgrade and proposed widening
- Design alterations/options, including consideration of an underpass or overpass
- Changes to Auld Avenue
- Access to properties as well as other design suggestions for consideration.

## Environmental impacts

### ***Biodiversity issues***

The REF proposal has been designed to avoid and minimise the removal of native vegetation and threatened ecological communities (TECs) wherever practical. The REF proposal would result in impacts on biodiversity due to the removal of 1.69 hectares of vegetation which is classed as TECs. The vegetation clearing would result in impacts on 1.48 hectares of EPBC Act listed TECs, 11 hollow bearing trees, one threatened flora species and 1.69 hectares of threatened fauna habitat. There would be a direct loss of about 23 individuals of the threatened flora species - *Callistemon linearifolius* (Nettle Bottle Brush, listed as vulnerable under the BC Act) occurring on the southern side of Milperra Road. Potential impacts to the threatened fauna species could also occur to the Southern Myotis (listed as vulnerable under the BC Act) found in a culvert structure, when the stormwater drainage is extended.

The biodiversity assessment concluded the REF proposal is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats.

To reduce the impacts as far as practical, the REF proposal has proposed various environmental management measures. Some of these include further minimising; vegetation removal, loss of threatened flora and removal of hollow bearing trees through detailed design, further developing Landscaping Plans to revegetate the riparian corridor, undertaking pre-clearing surveys prior to construction and a Bat Management Plan for the Southern Myotis if it still occurs in the culvert structure before drainage works begin. Any residual impacts would be offset by retiring biodiversity credits in accordance with Transport's Biodiversity Offset Guideline (RMS 2016).

### ***Hydrology, flooding and coastal processes issues***

Transport for NSW assessed potential flooding and hydrology impacts that might occur during construction. These include potential flood risks in construction areas and potential impacts of construction activities on flood behaviour. Due to the constrained nature of the site, and nearby presence of the Georges River, identified ancillary sites may have the potential to be impacted by mid to large sized flood events. Detailed design refinements will continue for the temporary working platforms, which are required for bridge construction. The Construction Environmental Management Plan (CEMP) will include a Construction Flood Management Sub-Plan, to make sure appropriate mitigation measures are in place to minimise any impacts associated with flooding, particularly at the ancillary facilities.

In terms of operational impacts, the REF proposal would maintain the existing level of flood immunity of Henry Lawson Drive and result in flood conditions being no worse than existing conditions. The proposed new Auld Avenue bridge would provide 0.3 metres of freeboard for the one per cent Annual Exceedance Probability (AEP) flood level (a one per cent chance of occurring in any one year).

During Georges River flooding, the REF proposal would result in some localised increases in flood levels which could affect adjoining properties and a car wash facility. This is a result of raising new sections of road above existing levels. The level of impacts would range between 0.02 - 0.08 metres depending on location and the peak one per cent and two per cent AEP flood scenario.

During the Milperra catchment flooding, adjoining commercial properties south of Tower Road would experience increased depths of ponding of about 0.04 metres during a 10 per cent and one per cent AEP event.

During a combined one per cent AEP storm (Milperra catchment) and five per cent AEP flood in Georges River, there would be four residential properties that would experience increased depths of ponding in the front yard. This same scenario would result in peak flood levels in Milperra Drain to increase by 0.013 metres impacting on several industrial type properties along Ashford Avenue and Milperra Road.

Climate change impacts on flood behaviour has the potential to increase the frequency and flooding depth to the road and the surrounding area. This includes the potential to exacerbate impacts in adjoining properties and development as a result of the REF proposal.

Mitigation measures will be adopted during detailed design to further investigate and minimise flooding impacts. This will include investigating road levels, improving ground survey information and ongoing design of the Auld Avenue bridge. Implementing these mitigation measures would result in the REF proposal having a minor impact on peak one per cent AEP flood levels and being consistent with floodplain risk management plans, objectives of the Bankstown Local Environment Plans and the flood-related principles set out in the Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment (1999).



## **Surface water issues**

If not managed appropriately, key risks to surface water quality during construction could include increased sediment, nutrient loadings and potential mobilisation of contaminants. A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Construction Soil and Water Management Plan. In addition, construction water quality monitoring will be undertaken upstream and downstream of the REF proposal to ensure controls and site practices are effective at maintaining downstream water quality.

Operation of the REF proposal could have negative impacts on surface water quality, if left unmitigated. The pollutants from road runoff that are likely to impact surface water quality of Georges River and Milperra Drain include sediment, nutrients, heavy metals, hydrocarbons from oil and grease, and gross pollutants. To mitigate pollutants being discharged from the proposed upgrade, water quality treatments including bio-retention basins and vegetated swales will be implemented to reduce the net annual average weight of pollutants for both Georges River and Milperra Drain, with the exception of total nitrogen. Detailed design will further investigate these water quality treatments in consultation with Canterbury Bankstown Council, and identify additional opportunities to reduce total nitrogen loads to Georges River and Milperra Drain. Implementing these mitigation measures would result in the REF proposal being consistent with the Coastal Management SEPP and the Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment (1999).

## **Groundwater issues**

Potential construction impacts from the REF proposal relevant to groundwater and groundwater quality may include:

- Direct impacts to aquatic and terrestrial Groundwater Dependent Ecosystems (GDE) through clearing and grubbing activities during earthworks and leaching of potential acid sulfate soils into GDE habitats
- Indirect impacts to aquatic and terrestrial GDEs through transport of existing contaminant sources through preferential drainage paths (i.e. backfilled utilities trenches)
- Direct impacts to groundwater quality resulting from pavement seepage and stormwater leakage to groundwater
- Direct impacts to groundwater quality resulting from disturbance of acid sulfate soils and bridge piling having the potential to mobilise and intersect any existing contamination within the area.

To reduce and manage the potential impacts as far as practical, several environmental management measures will be implemented during detailed design and construction. During detailed design, further soil and water contamination investigations will be undertaken to identify existing groundwater quality conditions, groundwater levels and extent of acid sulfate soils. During construction, the construction contractor will be required to prevent impacts to GDEs outside of the required areas of disturbance by using measures such as physical barriers and demarcating boundaries and implementing a construction Site Contamination Management Plan and Acid Sulfate Soil Management Plan. The proposed surface water quality treatments are expected to also have a beneficial impact to groundwater recharge and quality. As a result, operational phase impacts to groundwater are expected to be minor.

## **Noise**

Construction noise levels are predicted to exceed Noise Management Levels for all noise catchment areas during standard hours and out-of-hours work for all proposed construction scenarios. Sensitive receivers that would be highly affected (above 75 dB(A)), include six receivers in noise catchment area 1 during bridge and drainage works and most receivers (about sixteen) in noise catchment area 2 during all construction scenarios. All receivers in both these catchments would also experience sleep disturbance during out-of-hours work for widening and pavement work. Mitigation measures will be implemented in accordance with the Construction Noise and Vibration Guideline (RMS 2016).

There is potential for structural damage and human discomfort from construction vibration on residential receivers when vibratory roller operations are conducted within 100 metres of structure. Receivers in noise catchment areas 2 and 4 would require vibration mitigation measures and these will be detailed in the contractor's Construction Noise and Vibration Management Plan.

During operation, the REF proposal would not increase noise levels by greater than 1 dB(A), which is not a perceptible change in noise levels. In some areas, the proposal achieves a 2 dB(A) reduction to some receivers. Several receivers, about nine properties, do exceed the noise mitigation guideline's acute criteria due to the proposal roads and are eligible for consideration for noise mitigation. At-property treatments are preferred due to the locality, space and residential property access constraints identified that quiet pavement surfaces and noise mounds/ barriers were not feasible.

### ***Traffic and transport issues***

During construction, the REF proposal would generate light and heavy vehicle movements on the road network surrounding the REF proposal area. The majority of construction works are being undertaken in the road reserve adjacent to and on the roads of Henry Lawson Drive, Milperra Road and Newbridge Road, outside roads, such as Tower Road and Auld Avenue, would also be affected by construction works. While these roads would remain operational during construction there may be a need for temporary lane closures which could result in localised congestion and delays, particularly if slower speeds are implemented around construction sites. Access to properties would be maintained during construction although access may need to be disturbed on a short term basis. To minimise impacts, landowners and occupiers would be consulted by the construction contractor about any potential access impacts prior to the commencement of construction.

During operation, the increased capacity of the REF proposal would result in significant reductions in traffic delay and increased traffic volume throughput at the Milperra/Newbridge Road and Tower Road intersections. Although the overall intersection performance level remains unchanged, it is expected that the REF proposal in conjunction with future stages of the Henry Lawson Drive upgrade program, would ease existing traffic congestion issues and improve freight access between the M5 Motorway and Hume Highway.

The proposed left-in, left-out only at Auld Avenue and the new centre median along Henry Lawson Drive would ban right-turn movements in and out of Auld Avenue and residential properties. This would require local traffic to detour and find alternative routes increasing travel times and causing an inconvenience. Widening of Henry Lawson Drive would result in some properties experiencing a reduction of setback space between their property fence/boundary and the main road. Properties which previously relied on this space to perform vehicle turnarounds to enter live traffic in a forward direction, would now be required to reverse into live traffic to access Henry Lawson Drive. Access to the commercial properties between Tower Road and Milperra Road would change from a left slip lane arrangement to a driveway access, but this would not affect access.

Transport is continuing to investigate the traffic and transport issues during detailed design and will also continue to consult the community. During construction, the contractor will implement a Traffic Management Plan and provide measures to maintain access to local roads, properties and pedestrian and cyclist access. The Plan will also outline the requirements and methods for the contractor to consult and inform the local community of proposed construction impacts on property access and the local road network.

## **Justification and conclusion**

Without the REF proposal, Henry Lawson Drive would remain in its current state, with increasing congestion at intersections, and increasing travel times during peak periods. By providing additional capacity at intersections, the REF proposal would help alleviate this congestion and support traffic-generating development in the surrounding area including the Bankstown Airport Redevelopment and the proposed Riverlands Development in Milperra.



The increased capacity at intersections would result in significant reductions in traffic delays and increased traffic volume throughput at the Milperra/Newbridge Road and Tower Road intersections. In conjunction with future stages of the Henry Lawson Drive upgrade program, this would ease existing traffic congestion issues and improve freight access between the M5 Motorway and Hume Highway.

The existing road environment also contributes to a high rate of casualty crashes. The increase in intersection capacity, the provision of appropriate shoulder widths, and an increased median width to separate opposing travel lanes, along with the smoother operation of the network will help reduce traffic incidents.

While there would be some environmental impacts from the REF proposal, they have been avoided or minimised wherever possible through attention in design and the use of site-specific environmental safeguards to be implemented during detailed design and construction. The beneficial effects of improving safety and freight efficiency are considered to outweigh the adverse impacts and risks associated with the REF proposal.

## Display of the review of environmental factors

This REF is on display for public comment between Wednesday 4 August 2021 and Friday 17 September 2021. You can access the REF documents in the following ways:

### Internet

The REF documents are available as pdf files on the Transport for NSW website at **[nswroads.work/henrylawsondrive](https://nswroads.work/henrylawsondrive)**

### Copies by request

Printed and electronic copies are available on request. Please note there may be a charge for hard copies, CD or USB. To obtain a printed or electronic copy, email [henrylawsondrive@transport.nsw.gov.au](mailto:henrylawsondrive@transport.nsw.gov.au).

## How can I make a submission?

To make a submission about this proposal, please send your written comments to:

Mail: Henry Lawson Drive upgrade team  
C/- Transport for NSW  
27-31 Argyle Street  
Parramatta NSW 2150

Email: **[henrylawsondrive@transport.nsw.gov.au](mailto:henrylawsondrive@transport.nsw.gov.au)**

Submissions must be received by Friday 17 September 2021. Submissions will be managed in accordance with the Transport for NSW Privacy Statement which can be found at **[transportnsw.info/about-us/privacy](https://transportnsw.info/about-us/privacy)**.

## What happens next?

Transport for NSW will collate and consider the submissions received during public display of the REF.

After this consideration, Transport for NSW will determine whether or not the REF proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the REF proposal is determined to proceed, Transport for NSW will continue to consult with the community and stakeholders prior to and during construction.

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# 1 Introduction

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This chapter introduces the proposal and provides the context of the environmental assessment, including the project development history and the purpose of the report.

## 1.1 Proposal identification

Transport for NSW (Transport) is proposing to upgrade Henry Lawson Drive between Keys Parade, Milperra, to Tower Road, Bankstown Aerodrome (known as the Henry Lawson Drive Upgrade Stage 1A) (the overall proposal). The overall proposal consists of upgrading a 1.3 kilometre length of Henry Lawson Drive including intersection upgrades and upgrade of 480 metres of Milperra Road. The location of the proposal is shown in Figure 1-1.

The proposal is expected to ease existing traffic issues between the M5 motorway and Hume Highway and increase travel efficiency for local road users by allowing for greater traffic capacity at key intersections. The upgrade is also anticipated to integrate with the neighbouring Bankstown Airport Masterplan, provide greater cycling options, improve upon existing pedestrian infrastructure, and enhance road safety in the area.

The proposal is subject to assessment under two planning pathways, a review of environmental factors (REF) under Part 5 of *Environmental Planning and Assessment Act 1979* (EP&A Act) and an environmental impact statement (EIS) under Part 4 of the EP&A Act.

A REF (this document) has been prepared for the proposal which is subject to Part 5 of the EP&A Act (referred to as the 'REF proposal'). However, parts of the proposal are located within areas mapped as coastal wetlands under the Coastal Management SEPP. Work within these mapped coastal wetlands is classified as designated development and therefore a separate EIS under Part 4 of the EP&A Act, has been prepared for this work. The work within mapped coastal wetlands is referred to as the 'EIS proposal'.

The relationship between the REF proposal and the EIS proposal is discussed in more detail in Section 1.3 and Section 4.1.

### 1.1.1 Proposal background

The overall proposal (encompassing the REF and EIS) forms the first stage (Stage 1A) of the progressive upgrade to 7.5 kilometres of Henry Lawson Drive between the intersections of the Hume Highway, Villawood, and the M5 South Western Motorway, Milperra.

The upgrade would help ease existing traffic issues and increase traffic capacity at key intersections to help meet growing demand, with residential, commercial and industrial development in the surrounding area expected to increase in the coming years.

Subject to approval, construction of the Stage 1A proposal may commence in early 2023 and would take about two years to complete. Other stages of upgrading Henry Lawson Drive would be developed and assessed separately in the future.

The Henry Lawson Drive Upgrade Project would be divided into four stages, with this REF specifically investigating the Henry Lawson Drive Upgrade Stage 1A (the REF proposal component), located between Keys Parade, Milperra and Tower Road, Milperra.



### 1.1.2 Proposal location and setting

The overall proposal is located around 20 kilometres south west of the Sydney Central Business District (CBD) in the City of Canterbury Bankstown local government area (LGA). The overall proposal is mainly along Henry Lawson Drive and includes intersection upgrades at Tower Road, Newbridge/Milperra Road and Auld Avenue.

Henry Lawson Drive is a key connection for traffic moving between the Hume Highway, Milperra Road/Newbridge Road and the M5 Motorway. It is also used for local travel trips between residences and services. In terms of heavy vehicle access, Henry Lawson Drive is designated as a B-Double access route that connects surrounding large industrial areas of Milperra, Revesby, Chipping Norton and Moorebank.

The overall proposal is located to the east of the Georges River and surrounding recreational areas. There are a number of coastal wetlands within and surrounding the overall proposal associated with the Georges River.

Located to the south west of the overall proposal, is a residential area with detached housing, sporting fields and passive recreation areas. To the south east, is the Bankstown Golf Course and urban bushland areas. North of Milperra Road comprises retail and commercial development that backs onto the Bankstown Airport and land currently being redeveloped, all of which access Henry Lawson Drive via Tower Road. Located north of Tower Road is the Georges River Golf Course.

### 1.1.3 REF proposal overview

Key features of the REF proposal would include:

- Widening Henry Lawson Drive from two to four lanes
- Upgrading the signalised intersection of Henry Lawson Drive and Tower Road including:
  - An additional right turn lane from Tower Road onto Henry Lawson Drive
  - A new channelised short left-turn lane from Henry Lawson Drive (southbound) onto Tower Road
  - An additional right turn lane from Henry Lawson Drive (northbound) onto Tower Road
  - Retaining the pedestrian crossing across Henry Lawson Drive on the southern side of the intersection.
- Upgrading the signalised intersection of Henry Lawson Drive and Milperra Road/ Newbridge Road including:
  - An additional right turn lane on the Milperra Road and Newbridge Road approaches to Henry Lawson Drive
  - An additional through lane on the Henry Lawson Drive southbound approach
  - The removal of the bus only lane on Milperra Road to provide an additional right turn lane on Henry Lawson Drive northbound approach.
- Removing the dedicated left turn slip lane into the ALDI and fast food area with access being retained via a standard property driveway.
- Retaining the existing bus stop on Milperra Road (eastbound) and moving the westbound bus stop 20 metres to the west
- Altering access to Auld Avenue to a “left in/left out” only configuration
- Installing a new Henry Lawson Drive road bridge (over Milperra Drain) to the south of Auld Avenue (referred to as the Auld Avenue bridge) to carry northbound traffic and retaining the existing bridge for southbound traffic

- Constructing new footpaths on the eastern side of Henry Lawson Drive to connect Tower Road to the existing bus stop on the eastbound lanes of Milperra Road and a new footpath on the southern side between Henry Lawson Drive to the bus stop on the westbound lanes of Milperra Road
- Widening the shared user pathway between Flower Power (Keys Parade) and Newbridge Road to three metres and reconstructing footpaths along the western side of Henry Lawson Drive, where required.
- Adjusting existing drainage, including lengthening culverts, installing new drainage infrastructure and water quality controls
- Relocating utilities (including electrical, gas, water and telecommunications)
- Final roadworks including pavement, kerb and gutters, signs, lighting and line marking
- Ancillary work for the project including, but not limited to road furniture, tie-in works, landscaping, earthworks and the like
- Temporary ancillary compounds, stockpile sites and associated facilities.

An overview of the overall proposal is provided in Figure 1-2. It also shows the area subject to the REF proposal and that which is subject to the EIS proposal.

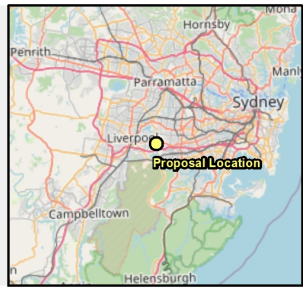
Chapter 3 describes the REF proposal in more detail.



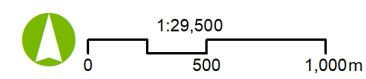


P:\GIS\Project-4\project\10003\_HenryLawsonDrive\HLD\_REF\_Figure 1-1\_Location of proposal rev1.mxd\LOB No.1\3-07-21\Virgil Robinson\Rev 0

- Overall proposal boundary
- Coastal Wetlands
- Coastal Wetlands Proximity Area



Source: Aurecon, TfNSW, Spatial Services, Nearmap, Esri

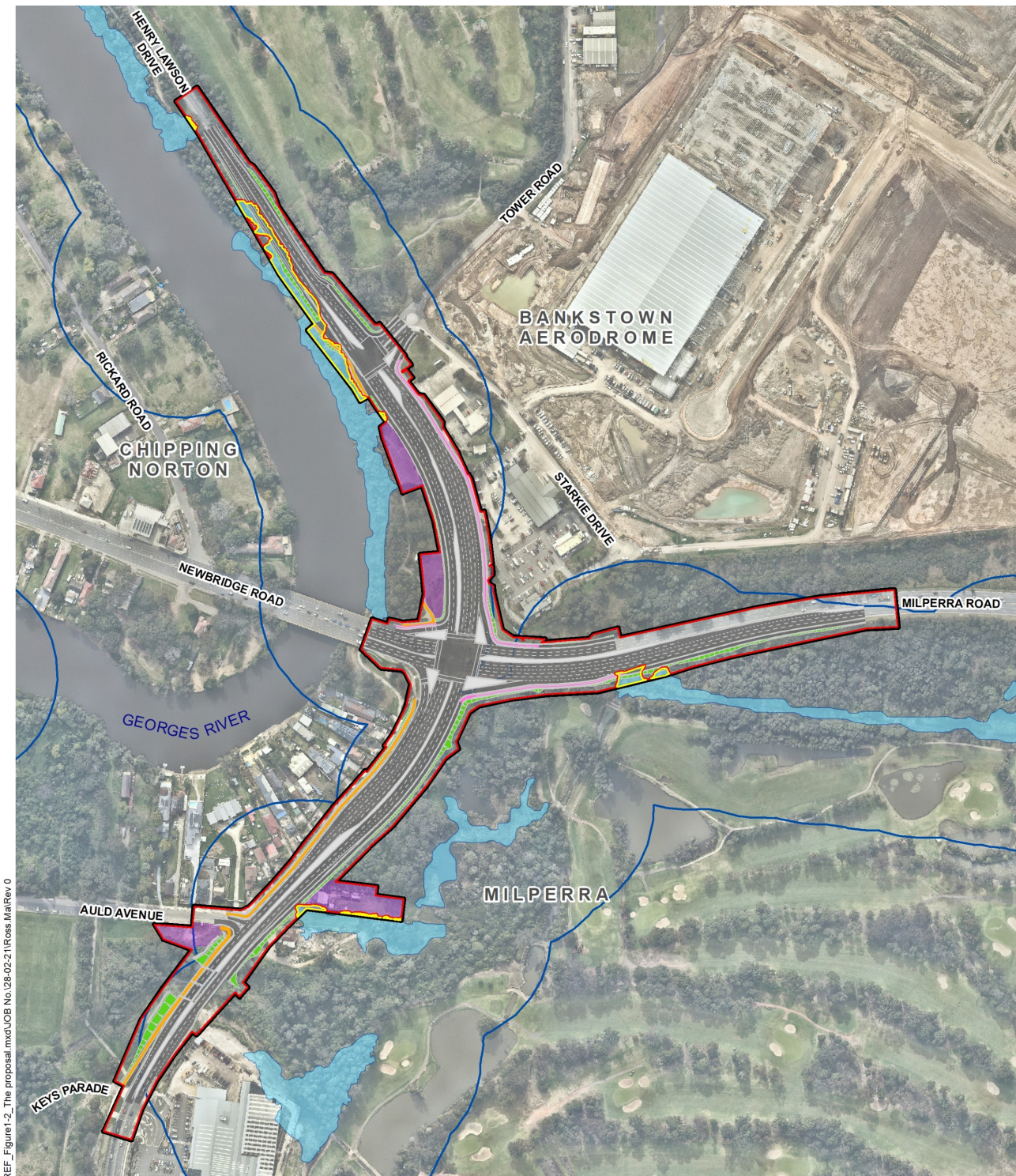


Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A **Review of Environmental Factors**

FIGURE 1-1: Location of proposal





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- |  |                           |  |                                 |
|--|---------------------------|--|---------------------------------|
|  | Concept design            |  | Cut                             |
|  | EIS proposal area         |  | Fill                            |
|  | REF proposal area         |  | Coastal Wetlands                |
|  | Overall proposal boundary |  | Coastal Wetlands Proximity Area |
|  | Potential compound sites  |  |                                 |
|  | Pedestrian path (2m)      |  |                                 |
|  | Shared path (3m)          |  |                                 |

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Projection: GDA 1994 MGA Zone 56

Henry Lawson Drive Stage 1A **Review of Environmental Factors**

**FIGURE 1-2: The proposal**



## 1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Aurecon Australasia on behalf of Transport for NSW (Transport). For the purposes of these works, Transport is the proponent and the determining authority under Division 5.1 of the EP&A Act. The REF also addresses the relevant provisions of clause 228(2) factors and matters of national environmental significance (MNES) of the EP&A Act (Appendix A).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the *Australian Government's Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity
- The strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Transport's road activities on nationally listed threatened species, ecological communities and migratory species.
- The findings of the REF would be considered when assessing:
- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.
- The potential for the proposal to significantly impact any other MNES or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

### 1.3 Relationship of the REF and EIS

Development consent under Part 4 of the EP&A Act is usually not required for development for the purposes of a road being undertaken by Transport as a public authority. This type of development is ordinarily assessed as an 'activity' under Part 5 of the EP&A Act.

However, where the proposal is partially located on land mapped as coastal wetlands under the Coastal Management SEPP, the development is classified as designated development. Consent from the Canterbury Bankstown Council under Part 4 of the EP&A Act is required. As part of the development application to Council to seek this consent, an EIS is required to assess the impacts on the coastal wetlands under the Coastal Management SEPP. A separate EIS has been prepared for this approval and will be lodged with Canterbury Bankstown Council. Detailed discussion of the planning approval framework and approval requirements is provided in Section 4.1.

This REF provides an assessment of the REF proposal, under Part 5 of the EP&A Act. This assessment also considers any indirect and cumulative impacts of the proposal on mapped coastal wetlands. The cumulative impacts of the overall proposal are discussed in Section 6.15. Together, the EIS and this REF assess the potential environmental impacts of the overall proposal and it is intended that these documents be read in conjunction with each other.

Figure 1-2 shows the area of the overall proposal and the parts that are assessed under Part 5 (the REF proposal) and the area subject to assessment under Part 4 (the EIS proposal). The EIS proposal area consists of a number of small areas located opposite Auld Avenue, on the southern verge of Milperra Road between Henry Lawson Drive and the Georges River, opposite Tower Road. Activities that would occur within the EIS proposal area primarily include road widening, embankment work, changes to the shared user path way, installation of a new bus stop, installation of a section of a new footpath and the temporary use of an ancillary facility required during construction of the proposal. Consideration of the impacts of the EIS proposal area in conjunction with the REF proposal are detailed in Section 6.15.

An overall proposal area is also included in Figure 1-2 encompassing both the REF and EIS proposal areas. In this REF assessment, proposal objectives, options considered and consultation and stakeholder engagement has been undertaken for the overall proposal.

## 2 Need and options considered

---

This chapter describes the need for the overall proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option.

### 2.1 Strategic need for the proposal

The overall proposal is needed to:

- Alleviate congestion along the corridor that causes frustrating and costly delays for all road users across spreading peaks
- Address a road environment contributing to a high rate of casualty crashes
- Support growth in the area from large scale development in and around Milperra and the Bankstown Airport.
- Without the development of the overall proposal, road and traffic conditions within the overall proposal area that would continue into the future include:
  - Worsening congestion along the corridor causing frustrating and costly delays for all road users across spreading peaks.
  - Poor driver behaviour in an unforgiving road environment contributing to a high rate of casualty crashes.

The overall proposal would provide increased intersection capacity to alleviate congestion and provide additional capacity to address future development.

#### 2.1.1 Existing road network conditions

Henry Lawson Drive is largely a two lane road providing one-lane in each direction at mid-block locations in the overall proposal area. There is localised widening associated with the Tower Road and the Newbridge Road/Milperra Road intersections. The posted speed limit on Henry Lawson Drive in this area is 60 km/h.

The corridor currently provides limited pedestrian and cycling facilities, although pedestrian movements are catered for at both signalised intersections on Tower Road and Newbridge Road/Milperra Road. There are no public transport routes along Henry Lawson Drive in the REF proposal area. There is a bus service (M90) that passes through the REF proposal area along Newbridge Road and Milperra Road.

Preliminary traffic surveys and modelling were undertaken by GHD in 2018 on behalf of Transport. The traffic surveys were undertaken in the first half of 2018 across Henry Lawson Drive and associated feeder streets between the Hume Highway and M5 Motorway. Traffic surveys identified around 55,500 vehicles per hour during the AM peak (7:00am to 9:00am) and 58,500 vehicles per hour during the PM peak (4:00pm to 6:00pm) in both directions (Transport, 2019a).

Heavy vehicles accounted for about nine per cent of total traffic volumes during the AM peak period and about six per cent of total traffic volumes during the PM peak period. The proportion of heavy vehicles on Henry Lawson Drive is high when compared to the average of four per cent for heavy commercial vehicles during peak periods across the broader Sydney urban road network (Transport, 2019a).

Congestion within the overall proposal area (and Henry Lawson Drive generally) is a substantial problem for local and regional road users. Travel time data was collected on Henry Lawson Drive between the Hume Highway and M5 Motorway during both AM and PM peak hours in 2018. The data collected showed that travel speeds during peak periods in both directions on Henry Lawson Drive were well below signposted speeds (60 kilometre per hour and 70 kilometre per hour (north of Stage 1A)). In the AM peak, travel speeds reached as low as 24 kilometre per hour for vehicles travelling north and 36 kilometre per hour for vehicles travelling south. The PM peak also had substantially low travel speeds, with vehicles travelling north reaching 38 kilometre per hour and vehicles travelling south reaching as low as 15 kilometre per hour. Modelling has indicated that these speeds would continue to reduce as a result of worsening congestion within the overall proposal area (Transport, 2019a).

## 2.1.2 Crash statistics, including available information on crash causes

The current and predicted levels of congestion on Henry Lawson Drive coupled with a constrained road environment (i.e. one way in each direction with limited median and road shoulders) has contributed to a high rate of vehicle crashes.

Crash data was extracted between 2010 and 2019 from the Crash Link database within Transport for the overall proposal area and a section of Newbridge Road.

The crash history data shows an average of 12.6 crashes and 9.7 casualties per year within the overall proposal area. Rear end crashes made up the majority of crashes (67.5 per cent) followed by opposing vehicles turning (20 per cent) and lane changes (12 per cent). The data also shows most crashes occurred within 10 metres of the intersection (66 per cent). The main period when crashes occurred were during the AM and PM peak periods on weekdays.

Crash data was compared with other sections of Henry Lawson Drive between the Hume Highway and the M5 Motorway. The comparison indicated that the number of crashes within the overall proposal area (Henry Lawson Drive Stage 1A) had the highest crash rate compared to other sections.

The crash history is summarised in Figure 2-1 and crash types are shown in Figure 2-2.

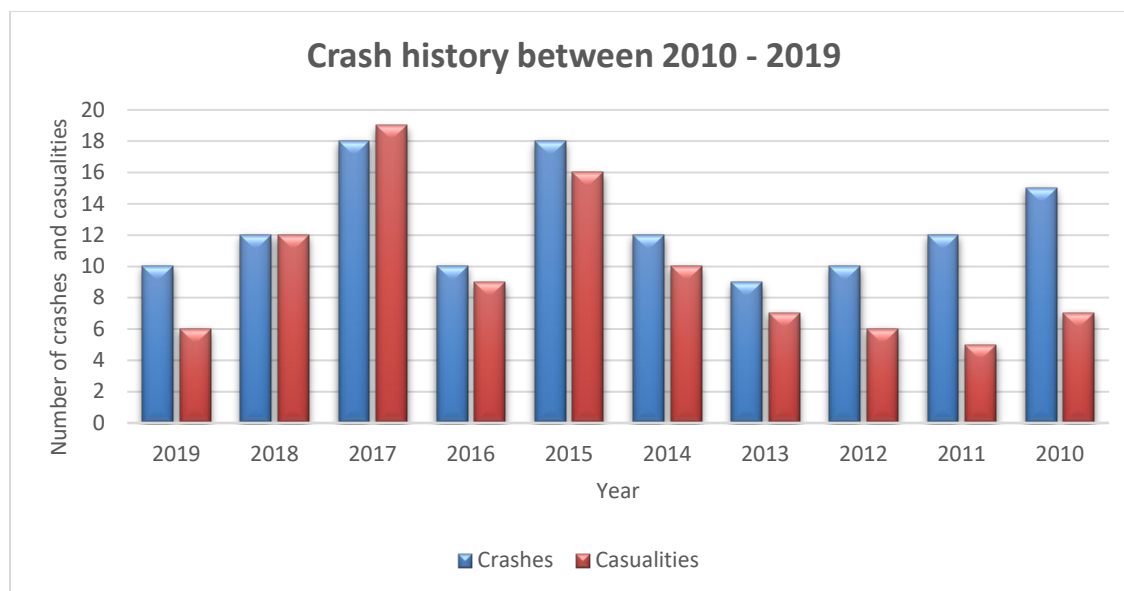


Figure 2-1 Crash history along Henry Lawson Drive and Milperra Road (2010 – 2019) (GTA Consulting, 2019)



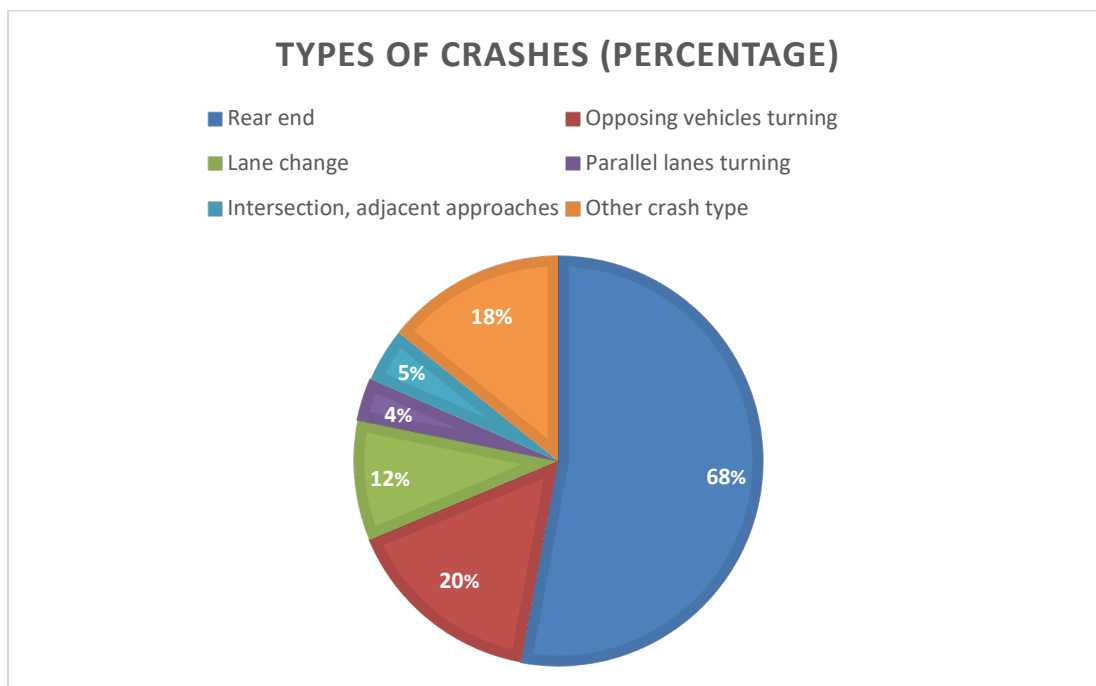


Figure 2-2 Crash by type along Henry Lawson Drive and Milperra Road (2010 – 2019) (GTA Consulting, 2019)

### 2.1.3 Further development and growth in the area

There are three developments recently established or proposed in the surrounding area that would interact with the overall proposal. Trips generated from these developments is expected to add to the existing congested conditions. The developments include:

#### 2.1.3.1 Flower Power Complex – operational

The Flower Power Complex is located at the intersection of Henry Lawson Drive and Keys Parade immediately south of the REF proposal area. The complex was constructed in 2018 and is currently operational (Transport, 2018a). Based on traffic generation information provided to Transport in late 2018, the development of the Flower Power Complex is expected to contribute an additional 220 vehicle movements in the AM peak and 320 in the PM peak on Henry Lawson Drive (Transport, 2019a).

#### 2.1.3.2 Bankstown Airport – under construction

Bankstown Airport is accessed from Tower Road within the REF proposal area. The *Bankstown Airport Master Plan 2019* was approved by the Federal Minister for Infrastructure, Transport, and Regional Development in November 2019. Bankstown Airport Limited is building a retail precinct and leisure centres, factory outlets and restaurants to maximise opportunities to increase economic activity and jobs growth within the Bankstown to Liverpool Enterprise corridor. As stated in the Bankstown Airport Masterplan 2019, the new non-aviation component of the development at the airport is expected to generate an additional 1,300 to 1,850 peak hour vehicle trips by 2024 (Bankstown Airport Limited, 2019). These vehicles would access the airport via Henry Lawson Drive, Newbridge Road and Milperra Road in the REF proposal area.

### 2.1.3.3 Riverlands Development – planning phase

The Riverlands Development is a residential subdivision located south of the REF proposal. It is expected to result in increased traffic along Henry Lawson Drive. The development would provide 500 dwellings in the first phase of development and another 500 dwellings in phase two (The Transport Planning Partnership Pty Ltd, 2020). The main access points to the development would be via Keys Parade, Raleigh Road and Prescot Parade in Milperra (The Transport Planning Partnership, 2020). Based on traffic generation information provided to Transport in late 2018, the predicted development is expected to result in an additional 427 movements in AM peak, 528 in PM peak movements in the REF proposal area (Transport, 2019a).

These traffic generating developments would result in increased demand on Henry Lawson Drive and could worsen existing congestion issues.

## 2.2 NSW policy context

### 2.2.1 Premier's Priorities

The *Premier's Priorities* represent the NSW Government's commitment to making a difference in enhancing the quality of life of the people of NSW, with each priority set with an ambitious target. The key policy priorities for the NSW Government are:

- A strong economy
- Highest quality education
- Well-connected communities with quality local environments
- Putting customer at the centre of everything we [the NSW Government] do
- Breaking the cycle of disadvantage.

While the overall proposal is not specifically mentioned within the Premier's Priorities, the proposal supports the key policy priority of enhancing the people of NSW's quality of life through 'well connected communities with quality local environments'. The proposed widening of Henry Lawson Drive would help to alleviate congestion and improve travel time, allowing road users to move more effectively. The proposal would also improve connections and enhance safety for pedestrians and cyclists, improving transport options for the community.

### 2.2.2 Future Transport Strategy 2056

The *Future Transport 2056* (Future Transport Strategy) is an update of the NSW Government's *NSW Long Term Transport Master Plan*, providing an integrated vision for NSW through a suite of strategies and plans for transport developed alongside the SIS, Greater Sydney Region Plan and the Department of Planning and Environment's regional plans. The Future Transport Strategy outlines the 40 year vision, directions and outcomes framework for customer mobility in NSW, guiding investment over the longer term. The Future Transport Strategy outlines six state-wide outcomes to guide investment, policy and reform and service provision.

Within the Future Transport Strategy, a network issue to be addressed for the improvement, use and management of the network over the next 40 years is 'Optimising the network and better using existing infrastructure'. As part of this network issue, mitigating the costs and impacts of congestion is identified as a major focus for planning the future network. The proposal would help to alleviate congestion and improve travel time, aligning with the Future Transport Strategy's strategic objective to optimise the network and improve the use of existing infrastructure.

In addition, the Future Transport Strategy also discusses Transport's 'Movement and Place' framework. The framework is defined in the strategy as a tool to manage the road network in a way that supports safe, efficient and reliable journeys for people and freight whilst enhancing the liveability and amenity of places (Transport, 2018b). The overall proposal aligns with the framework through the objective to improve travel times and journey time reliability for all road users. The overall proposal would promote the Movement and Place framework through the provision of increased capacity at intersections and improved connectivity and safety for active transport users, contributing to the liveability of the community and local/regional road users.

### **2.2.3 Greater Sydney Services and Infrastructure Plan**

The *Greater Sydney Services and Infrastructure Plan* (Services and Infrastructure Plan) forms part of the Future Transport Strategy. The Services and Infrastructure Plan's overall transport vision for Greater Sydney has been developed to support the Greater Sydney City's vision for Greater Sydney as a "30 minute city", a metropolis of three cities, where people have access to jobs and services within 30 minutes by public transport.

The Services and Infrastructure Plan builds on the state-wide transport outcomes identified in the Future Transport Strategy, establishing specific outcomes that Transport's customers can expect and identifying the policy, service and infrastructure initiatives to achieve these.

The Future Transport State-wide Outcomes and Greater Sydney Transport Customer Outcomes are as follows:

- Customer focused – convenient and responsive to customer needs
- Successful places – sustaining and enhancing the liveability of our places
- A strong economy – connecting people and places in the growing city
- Safety and performance – safely, efficiently and reliably moving people and goods
- Accessible services – accessible for all customers
- Sustainability – makes the best use of available resources and assets

The overall proposal would contribute to achieving these customer outcomes through improving travel efficiency and reliability, managing congestion and improving travel times along Henry Lawson Drive, particularly during weekday peak periods. The provision of new footpaths and the reinstatement of the shared user pathway would also provide accessible transport options for the community, particularly for people using the bus stops on Milperra Road.

### **2.2.4 Freight and Ports Plan 2018 – 2023**

In September 2018, Transport released the *Freight and Ports Plan 2018-2023* (FPP) as a supporting plan to the Future Transport Strategy. The FPP was released to provide a guide for the freight industry over a five year period to make the long-term investments required to benefit the freight industry as well as the State's future growth (Transport, 2018c). The main aim of the FPP is for the industry and government to work together to achieve the following objectives:

- Objective 1: Economic growth
- Objective 2: Efficiency, connectivity and access
- Objective 3: Capacity
- Objective 4: Safety
- Objective 5: Sustainability.

The overall proposal aligns closely with the objectives of the FPP through the upgrade of Henry Lawson Drive, increasing capacity, addressing existing congestion issues and accommodating growth. In doing so, the overall proposal would improve efficiency and provide better connectivity and access for the community and all road users. The FPP discusses the contribution that congestion makes to the cost of moving freight, particularly around high-density urban areas (Transport, 2018c). The overall proposal would aim to improve freight efficiency and reduce vehicle operating costs on the road network through the upgrade of Henry Lawson Drive. In particular, the upgrade at signalised intersections and provision of increased through lanes and dedicated turning lanes would aim to improve efficiency and safety.

### **2.2.5 Road Safety Plan 2021**

The *Road Safety Plan 2021* (Road Safety Plan) was established to guide the improvement of road safety in NSW. The plan is based on consultation with the NSW community to identify trends and key issues that can be responded to. The international 'Safe System Approach' is adopted in the plan to achieve the NSW target of 'zero fatalities and serious injuries on our roads by 2056' (Transport, 2018d). The steps to achieving a safer system that align closely with the overall proposal include creating safer urban places and communities and building a safe future. Developing 'liveable and safe urban communities' is a priority area highlighted in the Road Safety Plan. Actions that are discussed to achieve this include exploring options to accelerate safety upgrades at intersections (Transport, 2018d). The overall proposal would upgrade Henry Lawson Drive including intersections to improve road safety outcomes for all road users. This includes motorists, pedestrians and cyclists. This would have benefits for current and future people living and travelling through the overall proposal area, contributing to the liveability of the community through the provision of safer infrastructure and connections.

### **2.2.6 State Infrastructure Strategy**

The *State Infrastructure Strategy 2018-2038: Building Momentum* (SIS) outlines the NSW Government's 20-year strategic vision for infrastructure needs and priorities (Infrastructure NSW, 2018). The SIS identifies policies and strategies needed to meet the needs of the growing NSW population and economy.

The SIS recognises that different parts of NSW face different opportunities and needs, and sets geographic directions for infrastructure planning, investment and policy. The proposal is located within the Central River City of Greater Sydney, an area facing infrastructure challenges and opportunities such as poor connectivity, emerging innovation precincts and competitive and growing industries. The SIS identifies the following infrastructure responses to these challenges and opportunities, which are supported by the overall proposal:

- Improve intercity and intracity transport connections
- Improve intracity walking and cycling connections
- Improve north-south transport connections (for example to and from Greater Parramatta from the south).

In addition to identifying infrastructure responses to geographic areas, the SIS also identifies transport-specific challenges and opportunities, which include:

- Addressing capacity constraints
- Improving productivity
- Improving road safety

The overall proposal would support these opportunities as it would:

- Result in significant improvements in delay and volume throughput at the Milperra/ Newbridge Road and Tower Road intersections due to capacity improvements

- Increase travel efficiency for local road users by allowing for greater traffic capacity at key intersections
- Significantly impact road safety in the area due to increased intersection capacity and smoother operation of the network in general
- Improve freight access to surrounding area

In addition, the overall proposal in conjunction with other stages of the Henry Lawson Drive upgrade program would ease existing traffic congestion issues and improve freight access between the M5 Motorway and Hume Highway.

Further detail on the traffic impacts of the overall proposal is provided in Section 6.6.

## **2.2.7 Greater Sydney Region Plan – A Metropolis of Three Cities**

The *Greater Sydney Region Plan: A Metropolis of Three Cities* (GSRP) outlines the vision to transform Greater Sydney into a metropolis of three cities:

- The established Eastern Harbour City – building on its recognised economic strength and addressing liveability and sustainability.
- The developing Central River City – investing in a wide variety of infrastructure and services and improving amenity.
- The emerging Western Parkland City – establishing the framework for the development and success of an emerging new city.

The proposal is located within the developed Central River City. The GSRP highlights the importance of providing infrastructure to support cities, while also having the ability to adapt to meet the needs of future growth. The proposal would contribute to meeting these objectives through the upgrading of infrastructure on Henry Lawson Drive and its connecting roads. This would increase traffic efficiency for local road users and provide for future growth by allowing greater traffic capacity at key intersections.

One of the GSRP objectives also focuses on ensuring the freight and logistics network is competitive and efficient. It highlights the importance of locations surrounding key freight networks and ensuring they are not adversely impacted by traffic patterns and congestion. The upgrade of Henry Lawson Drive would contribute to achieving the GSRP objectives relating to freight and logistic networks through the provision of additional capacity in the direct study area. This would also benefit the community through decreasing traffic congestion on local roads, improving access within the neighbouring communities.

## **2.2.8 South District Plan**

The South District Plan provides a 20-year plan to manage growth and achieve the 40-year vision, while enhancing Greater Sydney's liveability, productivity and sustainability into the future. It is a guide for implementing The Greater Sydney Region Plan at a district level and is a bridge between regional and local planning.

The proposal supports the following planning priorities within the South District Plan:

- Planning Priority S1 Planning for a city supported by infrastructure
- Planning Priority S12 Delivering integrated land use and transport planning and a 30-minute city.

The overall proposal would support the proposed developments within the surrounding area, including the Riverlands Development and the Bankstown Airport. In addition, it would also support increased demand for capacity required for road users travelling through the overall proposal area to access other parts of south-western Sydney.

## 2.2.9 Canterbury Bankstown Local Strategic Planning Statement ‘Connective City 2036’

The Canterbury Bankstown Local Strategic Planning Statement ‘Connective City 2036’ was approved in December 2019 and provides an over-arching strategic plan to help guide growth in Canterbury-Bankstown over the next 20 years. It identifies a suite of 20-year strategic initiatives that Council would need to start planning for now to ensure a successful and prosperous city over the medium to long term.

Connective City 2036 aims to integrate a variety of transport modes with different land uses so that more people can connect to more places within the City and beyond. It will help to improve the City’s ecological and river systems and create quality places for healthy living and ecological integrity.

The overall proposal supports the following priorities relating to one of the 10 Evolutions - *Movement for Commerce and Place*:

- Maintain and improve strategic road and rail transport corridors
- Address blockages in the road network to improve traffic flow on Greater Sydney-serving roads
- Protect Greater Sydney’s regional freight corridors

Henry Lawson Drive is identified in Connective City 2036 as one of the major roads reinforced as metropolitan transport and freight routes. Duplicating Henry Lawson Drive from the Hume Highway to the M5 Motorway is highlighted as a project that would complement the work on Bankstown City Centre. It is subsequently identified as a key action which would assist in the need to address blockages in the road network to improve traffic flow.

### 2.2.10 Bankstown CBD and Bankstown Airport Place Strategy

The Bankstown CBD and Bankstown Airport Collaboration Area Place Strategy provides a vision and shared objectives for the place and sets out priorities and actions to realise this vision. The vision is that by 2036, Bankstown CBD and Bankstown Airport Collaboration Area will be a green, healthy and dynamic destination that capitalises on its diverse culture and its proximity to Salt Pan Creek and Georges River. The Strategy was approved by the Greater Sydney Commission in December 2019.

It is acknowledged in the strategy document that the industrial and freight cluster is serviced by roads such as Henry Lawson Drive, Milperra Road and the M5 Motorway which are subject to major congestion, due mainly to the higher proportion of private vehicle use in and around the area.

Two of the key actions are:

- To develop a place-based integrated transport strategy that considers the health, academic, research and training precinct, growth at Bankstown CBD and connectivity to, from and within the Collaboration Area (Action 1)
- Investigate and deliver improvements for pedestrian and cyclist connectivity and better at-grade pedestrian facilities across major road corridors and provide enhanced design, place and safety outcomes at the interface of Bankstown CBD, key gateways and destinations (Action 5)

Both of the above actions includes reference to Henry Lawson Drive where it is suggested that walking and cycling facilities should be improved at intersections around Haig Avenue – Rabaul Road and Milperra Road to enhance access to Georges River with consideration to flood level and design. The overall proposal would also improve walking facilities at intersections as a new pedestrian pathway would be installed to the bus stop on Milperra Road (as shown in Figure 3-1b).



## **2.2.11 Road Network Plan Summary Report: Henry Lawson Drive and Woodville Road**

The Henry Lawson Drive and Woodville Road network plan (Transport, 2018) provides a framework for the development and management of Henry Lawson Drive/Woodville Road, based on the network's strategic movement and place function and customer needs. The plan outlines the following objectives:

- A safe road system for every customer supporting the Towards Zero vision of zero fatalities and serious injuries on NSW roads by 2056.
- Improve travel time and reliability for key customer group (freight and car users) along the corridor to support and enhance its function as a primary north-south link between M5 and Parramatta.
- Support access to safe crossing opportunities of the corridor for active modes, for both commuting and recreational uses, linking local centres, and transport interchanges on parallel rail lines.
- Facilitate the efficient, safe and reliable movement of goods along the corridor and beyond, supporting the growth of freight precincts such as Yennora, Villawood and Bankstown Airport, the metropolitan centre of Parramatta and strategic centres of Fairfield and Bankstown.
- Integrate current and future land use planning with road network development to ensure compatible and complementary uses and functions.

The overall proposal would help achieve the objectives of the road network plan through the increased capacity of the proposal improving travel times and efficiency for motorists and freight operators, as well as improved connectivity and safety for active transport users.

## **2.3 Limitations of existing infrastructure**

Henry Lawson Drive is currently a narrow two lane road, with an undulating topography. The road is a primary freight route and carries a substantial number of heavy vehicles for the north/south corridor linking the Hume Highway and the M5 Motorway. As mentioned in Section 2.1, Henry Lawson Drive is currently constrained by a range of factors. Primarily, Henry Lawson Drive experiences congestion due to the limited capacity at the intersections along its extent. This has flow on impacts to safety and accessibility for the community and people travelling through the overall proposal area. The following section provides more detail on the limitations of existing infrastructure within the overall proposal area.

### **2.3.1 Intersection at Newbridge Road and Milperra Road**

The intersection of Henry Lawson Drive and Milperra Road/Newbridge Road currently experiences high volumes of traffic. There is substantial traffic queuing on all roads that connect to the intersection at most times of the day as shown in Figure 2-3 and Figure 2-4. The AM and PM peak periods experience the most impacts to queuing and congestion, operating at a level of service (LoS) "F" during these periods (traffic studies undertaken in 2018).

The current configuration of the intersection does not accommodate the current demand of vehicles. There are currently two northbound lanes and three southbound lanes on Henry Lawson Drive. At the Milperra Road /Newbridge Road intersection, there are also dedicated turning lanes to and from Milperra Road and Newbridge Road. There is also a slip lane to the north of the intersection, which provides access into the ALDI Supermarket and fast food restaurants to the east of Henry Lawson Drive. Although this slip lane removes vehicles from the general flow of traffic, it takes up space that could be used to extend the left turn lane for traffic to access Milperra Road. These businesses are also accessible via Tower Road and Starkie Drive.



Figure 2-3 Henry Lawson Drive/Milperra Road/Newbridge Road intersection facing north



Figure 2-4 Henry Lawson Drive/Milperra Road/Newbridge Road intersection facing south east



### 2.3.2 Capacity and road safety on Henry Lawson Drive

Henry Lawson Drive currently has limited capacity. At intersections there are additional lanes to assist traffic moving through the intersection, at mid block locations, this changes to one lane in each direction. This results in traffic needing to merge into one lane, slowing speeds.

As growth and demand on the road network continues in south-western Sydney, the capacity of Henry Lawson Drive will need to increase to cater for the demand. In particular, surrounding development near the overall proposal area is expected to result in more vehicle movements on Henry Lawson Drive which is currently congested and has unreliable travel times.

Congestion and capacity constraints on the broader Henry Lawson Drive corridor has also resulted in road users 'rat running' within surrounding residential areas, creating community concerns about safety and health. In particular, Bullecourt Avenue and Ashford Avenue in Milperra are local streets that are subject to rat running by motorists attempting to avoid the Henry Lawson Drive/Milperra Road/Newbridge Road intersection. Traffic surveys undertaken in 2018 indicated that a total of 26 heavy vehicles used Bullecourt and Ashford Avenues as rat run routes during the AM and PM peak periods, which is equivalent to around one heavy vehicle every 10 minutes. As demand on the road network increases, the use of the rat runs in local areas are also expected to increase.

As mentioned in Section 2.1.2, there is a high rate of crashes along Henry Lawson Drive, which is a factor of congestion as well as the constrained road environment. The overall proposal area had the highest crash rate compared to other sections of Henry Lawson Drive between the Hume Highway and the M5 Motorway.

The crash data indicates that over 65 per cent of crashes occurred within 10 metres of the Milperra Road/Newbridge Road intersection, with increased occurrences during the peak weekday periods.



Figure 2-5 Narrow traffic lanes at the Tower Road intersection (facing north)

### 2.3.3 Intersection with Tower Road

Currently, the existing Henry Lawson Drive intersection with Tower Road is a signalised T-junction intersection. Tower Road is accessible from Henry Lawson Drive via a dedicated right-turn lane on the northbound side and a through traffic lane on the southbound side. There are two turning lanes for traffic exiting Tower Road onto Henry Lawson Drive. One lane is a dedicated left turn lane for movements southbound and the other is a dedicated right-turn lane for traffic movements northbound.

The current intersection configuration at Tower Road does not provide sufficient capacity for vehicles wanting to exit onto Henry Lawson Drive. The limited lanes result in queuing further down Tower Road and Starkie Drive, resulting in access impacts for the businesses in this area (refer Figure 2-6).

In addition, the proposed development of Bankstown Airport would include internal road upgrade projects. This includes upgrades that connect to Tower Road. The planned development within Bankstown Airport includes a commercial precinct located within the south western area of the airport, consisting of new retail services and warehouses. Access to this precinct within the airport would be obtained via Tower Road. As mentioned in Section 2.1, the new development is expected to cause an increase in traffic using the Tower Road/Henry Lawson Drive intersection. Currently, the Tower Road intersection would not be able to support a substantial increase in vehicles.



Figure 2-6 Queuing on Tower Road (facing north)

### 2.3.4 Auld Avenue Bridge

The existing Auld Avenue Bridge is a two way bridge that currently facilitates one lane of traffic in each direction (refer Figure 2-7). The bridge structure is narrow which is not suitable for the high percentage of heavy vehicles using Henry Lawson Drive.

There is also a 1.5 metre wide footpath adjacent to the northbound lane of the bridge. This footpath is in relatively poor condition, narrow and is not separated from the traffic lanes on Henry Lawson Drive via a barrier or sufficient shoulder. Pedestrians rarely use the path across the bridge due to perceived safety concerns.



The existing infrastructure is unable to incorporate duplication of the Henry Lawson Drive.



Figure 2-7 Auld Avenue Bridge (facing north)

### **2.3.5 Pedestrian connectivity on Milperra Road and the southbound side of Henry Lawson Drive**

There are currently two bus stops on Milperra Road, east of Henry Lawson Drive (refer Figure 2-8). One bus stop is located on the westbound side and the other on the eastbound side of Milperra Road. Both bus stops are serviced by the M90 route (Burwood to Liverpool).

As shown in Figure 2-9, there are currently no formal footpaths that provide access to these bus stops. Commuters currently access bus stops on Milperra Road via the grassed areas along the road corridor. This provides limited access for people with less mobility such as people with prams, disabilities and the elderly. During and following rainy/wet weather periods, accessing these areas would be difficult and present some risk if people are travelling close to the road corridor.

Similarly, there are no pedestrian pathways to the east of Henry Lawson Drive on the north side of the intersection. Pedestrians wanting to access Tower Road or the businesses on the east of Henry Lawson Drive must also navigate across the grassed area (refer Figure 2-10).





Figure 2-8 Bus stops on Milperra Road (facing east)



Figure 2-9 Bus stop on the eastbound side of Milperra Road and informal walking path (facing east)





Figure 2-10 Grassed area on the southbound side of Henry Lawson Drive (facing south)

## 2.4 Proposal objectives and development criteria

### 2.4.1 Proposal objectives

The key objectives of the overall proposal include:

- Improve travel times, journey time reliability and road safety outcomes for all road users.
- Improve freight efficiency and reduce vehicle operating costs on the road network.
- Support new development in the precinct by improving traffic flow and connectivity to Bankstown Airport, Milperra Industrial Estate and proposed residential development in the area and the surrounding road network in the south west of Sydney
- Improve connectivity and safety for pedestrians and cyclists.

The REF proposal would support these objectives as being part of the overall proposal.

### 2.4.2 Urban design objectives

The urban design objectives for the overall proposal are derived from the nine urban design principles in the Transport for NSW (2020) urban design policy – Beyond the Pavement. The objectives are discussed in relation to these principles in Section 3.1.

## 2.5 Alternatives and options considered

This section summarises the options that were considered for the overall proposal and details the justification of why the preferred option was chosen.

### 2.5.1 Henry Lawson Drive upgrade alternatives

#### 2.5.1.1 Strategic responses

A range of strategic options were developed in response to the existing challenges on Henry Lawson Drive. Non-infrastructure and infrastructure solutions were identified and assessed through a series of Investment Logic Mapping (ILM) workshop conducted in November 2018 (GTA Consultants, 2019).

The challenges identified in the ILM workshop were congestion, lack of future capacity, road closures due to flooding and other events, rat running in surrounding residential areas and crash history along Henry Lawson Drive.

Four strategic response options were considered:

- Do-minimum – maintenance of the Henry Lawson Drive only
- Increase supply – duplication of the Henry Lawson Drive
- Travel demand management – implementation of contra-flow arrangements on the Henry Lawson Drive
- Increase productivity – upgrade Henry Lawson Drive to a rapid transit or light rail corridor.

Of these strategic options, the 'increase supply' option was selected as it is expected to address the identified challenges associated with Henry Lawson Drive. It was also acknowledged that the strategic options of 'travel demand management' and 'increase productivity' would be considered at a later stage (GTA Consultants, 2019).

#### 2.5.1.2 Strategic alternatives

Following the selection of the 'increase supply' strategic option, a range of strategic alternatives were investigated. Three different strategic alternatives were considered. These included:

- Alternative 1 – four lane widening (two lanes either direction)
- Alternative 2 – four lanes widening (two lanes either direction) with a widened median to allow for six lanes into the future
- Alternative 3 – six lane widening (three lanes either direction).

A Value Management (VM) Workshop was held in September 2019 to evaluate the three alternatives. The three alternatives were compared against the 'do minimum' strategic response (without upgrade, ongoing maintenance and optimising intersection operations such as signalling optimisations or minor intersection reconfiguration only). The participants of the VM Workshop included the Transport project team and other Transport stakeholders.

A traffic benefit and economic analysis was also used to help identify the most optimal solution. Traffic modelling used in the analysis included a range of factors such as vehicle-kilometre-travelled (VKT), vehicle-hour travelled (VHT), number of vehicle stops, average speed and traffic volume (Transport, 2019a). These were assessed for the three alternatives and the do minimum alternatives for the existing case (2018) and the future cases (2026 and 2036). Following the comparison of traffic modelling results, the three alternatives and do minimum alternative were assessed against three benefits, which were:

- Savings in travel time
- Vehicle operating costs
- Crash costs.



The VM workshop concluded that the four lane widening (Alternative 1) was the preferred option, as it had the most benefits. Primarily, traffic modelling showed that Alternative 1 would sufficiently address the congestion problem within the foreseeable future. Alternative 2 and 3 were discounted as they only provided marginal benefits. Both alternatives (2 and 3) to upgrade the Henry Lawson Drive to six lanes was predicted to also result in increased costs and impacts to the community as a result of property acquisition. Overall, Option 1 offers the best value-for-money solution supported by the highest benefits to savings in travel time among the alternatives assessed.

## **2.5.2 Overall proposal options**

Option assessments were undertaken for various features of the overall proposal. This section details the options assessment undertaken for the following key proposal features:

- Proposal alignment
- Henry Lawson Drive intersections (Milperra Road and Tower Road)
- Auld Avenue bridge duplication

The methodology, identified options, assessment and preferred option for each of these features are detailed in the following sections.

### **2.5.2.1 Proposal alignment**

#### **2.5.2.1.1 Methodology**

The methodology for selection of the preferred option involved a collaborative process. Concept design development (which included assessing all the evaluation criteria referred to below) and value management workshops took place, which included concurrences from Transport's subject matter experts (SMEs), network operations concurrence, metro bus planning and development concurrence, safety-in-design and constructability workshop for assessment of preferred option. A long term strategic vision assessment was conducted to assess what is the best fit for the wider corridor and upcoming development, and onsite investigations were also carried out.

The options were assessed against a criteria of minimising property acquisition, lesser impacts to utilities and better design alignment considerations (eg geometry).

#### **2.5.2.1.2 Identified options**

There were two options (with one containing two sub-options) considered for the overall proposal. These options were compared against a "do minimum" scenario.

The options investigated included:

- Do minimum – Henry Lawson Drive to remain in its current condition
- Option 1 – Widening to the western side of Henry Lawson Drive
- Option 2A – Widening Henry Lawson Drive to the east with a free flow left turn from Newbridge Road
- Option 2B – Widening Henry Lawson Drive to the east with a signalised left turn from Newbridge Road.

#### **'Do minimum' option**

The 'do minimum' option would result in the Henry Lawson Drive remaining in its current state without any improvements to the intersection

In comparison to existing travel times, traffic modelling for the 'do nothing' option showed northbound and southbound travel time would increase by as much as 300 per cent across all future years for both the AM and PM peaks (Transport, 2019b).

### Option 1 – Widening to the western side of Henry Lawson Drive

Option 1 proposes to maximise usage of the Transport owned land and existing areas along the western side of Henry Lawson Drive, south of Newbridge Road. This option would avoid impacts to two properties along the eastern side of Henry Lawson Drive between Auld Avenue and Newbridge Road, but result in some acquisition of properties on the western side.

Option 1 would provide three through lanes southbound and two through lanes northbound along Henry Lawson Drive.

### Option 2A – Widening Henry Lawson Drive to the east with a free flow left turn

This option proposes to reduce property acquisitions along the western side of Henry Lawson Drive which contains waterfront properties. This option would still require a full acquisition of a property along the eastern side.

Option 2A would provide three through lanes southbound and two through lanes northbound along Henry Lawson Drive, with a free flow left turn lane from Newbridge Road into Henry Lawson Drive (northbound).

### Option 2B – Widening Henry Lawson Drive to the east with a high angle entry left turn

Option 2B is the same as Option 2A with the following differences:

- Three through lanes northbound along Henry Lawson Drive.
- Provision of a high entry angle left turn lane from Newbridge Road into Henry Lawson Drive.

#### **2.5.2.1.3 Evaluation**

The options were evaluated based on the following key indicators:

- Traffic assessment benefits
- Road geometry and forgiving road environment
- Increased safety and connectivity for motorists and pedestrians
- Cost implications (land acquisition, available funds)
- Community needs
- Intersection improvements
- Supporting upcoming development.

#### **2.5.2.1.4 Assessment**

##### 'Do nothing' option

In analysing the 'do nothing' option against the proposal objectives, it was found that this option would not:

- Ease existing traffic issues between the M5 Motorway and Hume Highway
- Increase travel efficiency for local road users
- Integrate with the neighbouring Bankstown Airport Masterplan
- Provide greater cycling options
- Improve upon existing pedestrian infrastructure
- Enhance road safety in the area.

As the 'do nothing' option would not meet the proposal objectives and did not present a solution to the strategic need of the proposal, it was discounted and not investigated further.

### Option 1

Option 1 avoids impacts to residential properties along the eastern side of Henry Lawson Drive south of Milperra Road. This option would also improve efficiency through the provision of a 20 metre dual right turn lane along Newbridge Road into Henry Lawson Drive southbound.

Widening to the western side of Henry Lawson Drive for Option 1 would result in the acquisition of waterfront properties along the western side of Henry Lawson Drive including a full property acquisition.

In addition, this option would have the shortest dual right-hand turn lane from Newbridge Road into Henry Lawson Drive. Option 1 would have a shorter merge lane on Henry Lawson Drive for the left turn traffic exiting Newbridge Road.

Option 1 would also require utility relocations along both sides of Henry Lawson Drive for the entire limit of works.

### Option 2A

Option 2A would reduce property acquisition impacts by widening the road to the east. This option would result in strip property acquisition for properties to the south of the Henry Lawson Drive intersection with Milperra Road/Newbridge Road and one full property acquisition on the eastern side of Henry Lawson Drive. This property has been identified as part of the NSW Government's *Floodplain Management Program to implement voluntary purchase (VP) schemes* due to local flooding issues and risk reduction. There would also be an increased impact to Council-owned land on the eastern side of Henry Lawson Drive.

This option provides a free flow left turn lane from Newbridge Road onto Henry Lawson Drive northbound, which is expected to improve efficiency of the left turn movement. This option would also increase dual right turn storage eastbound along Newbridge Road into Henry Lawson Drive (also proposed within Option 1). Turn bay storage would be increased from 20 metres to 30 metres allowing storage for additional vehicles.

Option 2A allows additional length within the left turn lane from Newbridge Road into Henry Lawson Drive for vehicles to access the left turn lane compared to Option 1.

This option also avoids impacting utilities along the western side of Henry Lawson Drive from about 50 metres north of Auld Avenue to Newbridge Road (about a 240 metre length).

### Option 2B

Option 2B has the same advantages and disadvantages as Option 2A. The difference between the two options is that Option 2B provides three through lanes northbound along Henry Lawson Drive (in comparison to Option 2A which provides two through lanes northbound) and a high entry angle left turn lane from Newbridge Road into Henry Lawson Drive (in comparison to Option 2A which provides a free turn left lane).

There would also be additional utility relocations required for Option 2B in comparison to Option 2A, along the western side of Henry Lawson Drive, south of Newbridge Road.

The advantages and disadvantages of Option 2B are the same as Option 2A.

### **2.5.2.1.5 Preferred option**

Based on a combination of factors Option 2A was deemed as preferred, not only due to reduced property impacts on residential properties (and therefore cost) but also due to further design reasons, including:

- Reduced utility impacts along the western side of Henry Lawson Drive south of Newbridge Road.
- Improved geometry along Henry Lawson Drive compared to Option 1.
- Improvement in intersection efficiency by allowing increased dual right turn storage on Henry Lawson Drive to Tower Road and Milperra Road.
- The alignment allows future proofing of Henry Lawson Drive at the intersection with Newbridge Road and Milperra Road. This option allows for an additional through lane along Henry Lawson Drive northbound in the future with limited strip property acquisitions.

### **2.5.2.2 Intersection layouts**

#### **2.5.2.2.1 Methodology**

Different intersection layouts for the Milperra Road and Tower Road intersections were investigated to provide the optimal layout.

All intersection layouts were developed based on a traffic SIDRA model, which assessed both intersections as a network. The dominant AM and PM peak movements were investigated for current conditions and layout (Transport, 2019c). Based on this, minor improvements were made for the layouts (including increasing lane lengths of all right turn legs). Using this model, the intersection layout was then refined to build in specific improvements to increase the intersection capacity and performance, as a whole and taking into consideration expected traffic generation from Bankstown Airport Development (Transport, 2019c).

A Value Management workshop was held in September 2019, bringing together the Transport project team and stakeholders to review and confirm that optimal intersection layout. The workshop considered the different layouts in terms of:

- Alignment with the announced budget (best value for money outcome)
- Ability to address project objectives
- Priority staging due to upcoming major developments.

The Henry Lawson Drive/Milperra Road intersection was assessed by reviewing the proposed alignment and refining intersection arrangements. While options were not developed for this intersection, the workshop presented detailed traffic modelling and intersection analysis of the Henry Lawson Drive intersection with Milperra Road. This determined that the proposed changes to the initially proposed intersection arrangement resulted in better traffic efficiencies. Transport stakeholder groups had the opportunity to reflect on work completed to date and offer recommendations concerning key aspects associated with the revised scope of works.

For the Henry Lawson Drive/Tower Road intersection, the proposed layout was also discussed and refined in the workshop. For this intersection, a series of options were developed and evaluated. There were detailed presentations on the traffic modelling and intersection analysis for four options under consideration.

## 2.5.2.2.2 Identified options

### Henry Lawson Drive and Milperra Road intersection

Multiple refinements were discussed and considered for the Henry Lawson Drive and Milperra Road intersection. The following refinements for the Henry Lawson Drive and Milperra Road intersection were proposed:

- Removal of the bus jump lane – the original proposed alignment featured a bus jump lane. This lane was not as effective as previously considered. Due to congestion, buses are unable to reach the bus jump lane, therefore it remains underutilised during peak hour.  
By removing the bus jump and dedicating it as a traffic through-lane, the westbound capacity on Milperra Road through flow would be increased.
- Provision of dual right turn and increased lane lengths for Milperra Road into Henry Lawson Drive - The right turn movement from Milperra Road into Henry Lawson Drive is a dominant PM peak movement, with right turn queuing out of the bay on Milperra Road. The original proposed alignment had a shorter storage length. By increasing the length of the right turn lanes there is expected to be improvements to storage capacity and right turn movements.
- Continuous left turn slip lane from Newbridge road into Henry Lawson Drive - The left turn movement from Newbridge Road into Henry Lawson Drive is a dominant AM movement, predominately due to journey to work movements northwards towards Parramatta. In the PM, the movement is reversed to homeward journeys with a dominant right turn movement onto Newbridge Road. By providing a continuous left slip lane for this major movement, SIDRA analysis showed improvements with the overall intersection performance. As lane capacity for left turn movements cannot be increased due to spatial constraints of the bridge, the continuous left slip lane was seen as a better option to improve traffic performance and efficiency.
- An additional southbound lane on Henry Lawson Drive - Based on congestion currently experienced during PM peak, an additional southbound lane was found to be beneficial to the intersection. The original proposed alignment featured a northbound lane. The southbound lane option would provide more benefits due to spatial constraints on the northbound side, the upcoming development of Bankstown Airport and the movements to access the M5 Motorway.
- Increased dual right turn with one right turn lane as a trap lane from Henry Lawson Drive to Newbridge Road – As a dominant PM peak movement, this option would increase storage capacity and improved intersection movements. The addition of a southbound lane counteracts the use of one lane as a trap lane.

These refinements were combined to prepare a revised intersection arrangement for Henry Lawson Drive and Milperra Road (shown in Figure 2-11).

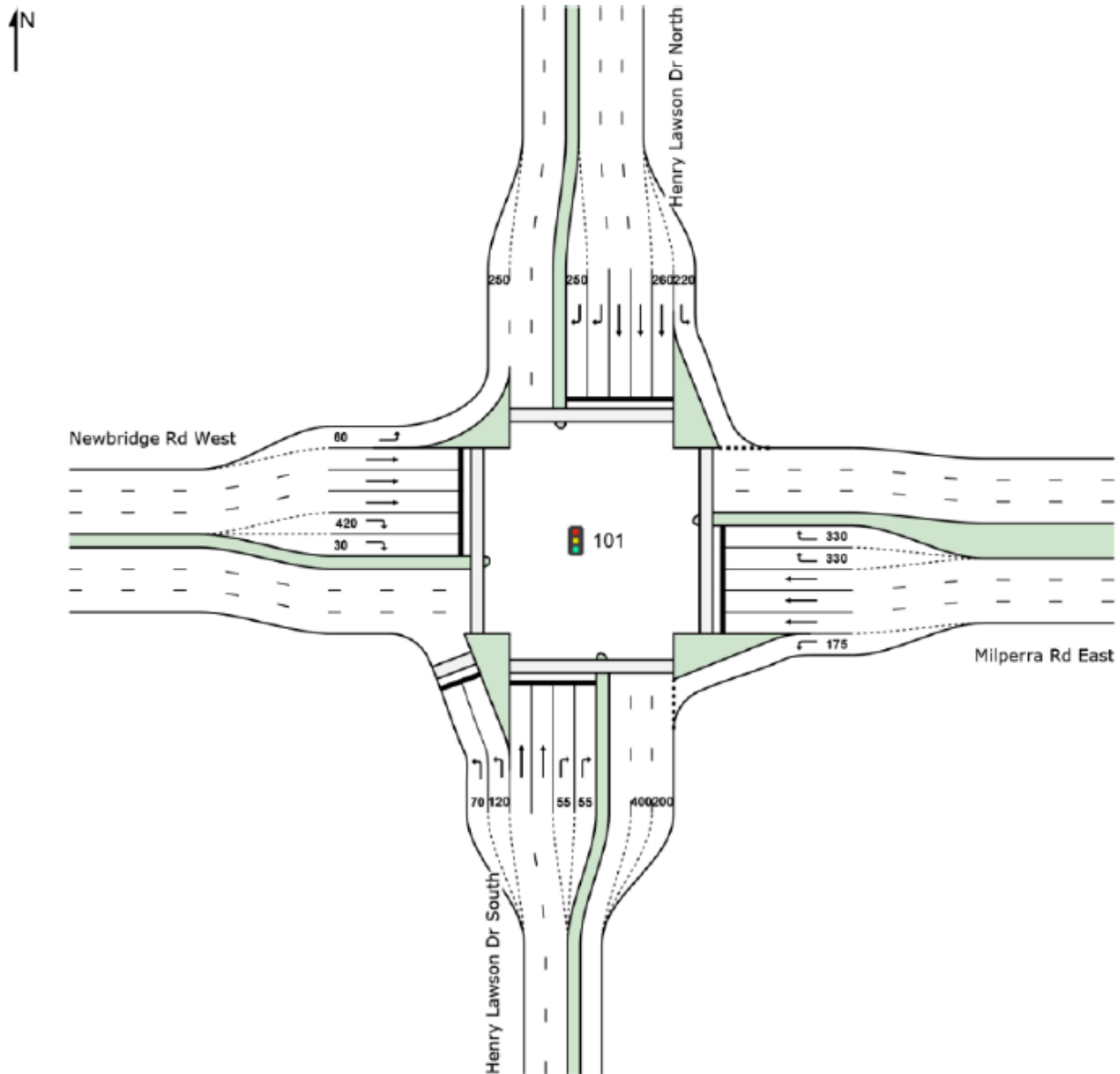


Figure 2-11 Milperra Road/Henry Lawson Drive Intersection

#### Henry Lawson Drive and Tower Road intersection

Four options were developed and tested for the Henry Lawson Drive and Tower Road intersection. All options considered the additional south bound lane identified for the preferred option for the Henry Lawson Drive and Milperra Road options assessment. The additional left slip lane into Tower Road was also identified for all options due to the requirement to provide capacity for additional traffic demand accessing the Bankstown Airport Development.

The four options and their key differences are:

- Option 1 – Revised proposal design:
  - Dual right turn into Tower Road
  - Left-out and right-out from Tower Road onto Henry Lawson Drive
  - Additional merge length for northbound movements



- Option 2 - Fully operational (seagull):
  - Dual Right turn into Tower Road
  - Left-out and right-out from Tower Road onto Henry Lawson Drive
  - Additional merge length for northbound movements
  - Free flow northbound movement
- Option 3 - Left in/left out of Tower Road:
  - Left-in and left-out movements to Tower Road
  - Additional merge length for northbound movements
  - Free flow northbound and southbound through movement
- Option 4 - No right turn out of Tower Road
  - No right turn out from Tower Road
  - Additional merge length
  - Free flow north bound.

These option arrangements are shown in the following figures (Figure 2-12 to Figure 2-15).

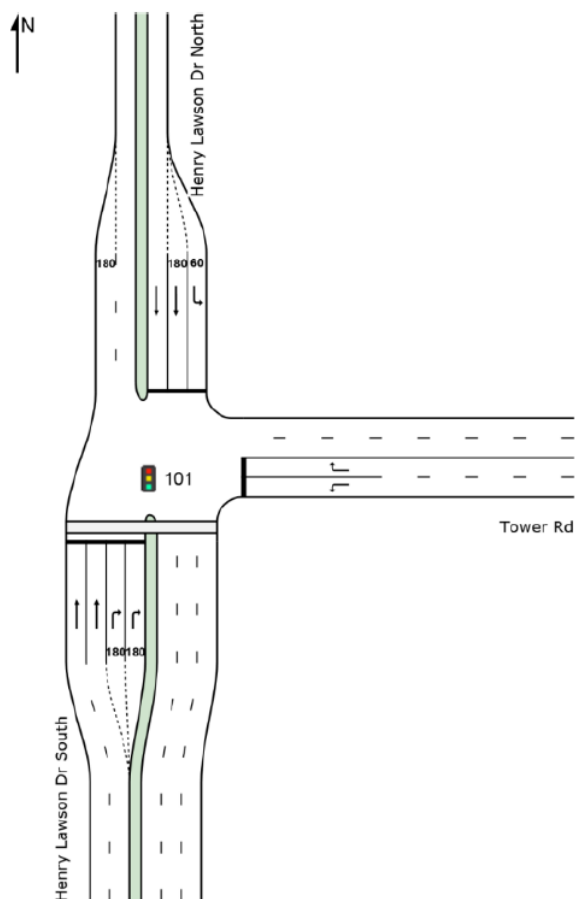


Figure 2-12 Henry Lawson Drive and Tower Road intersection Option 1

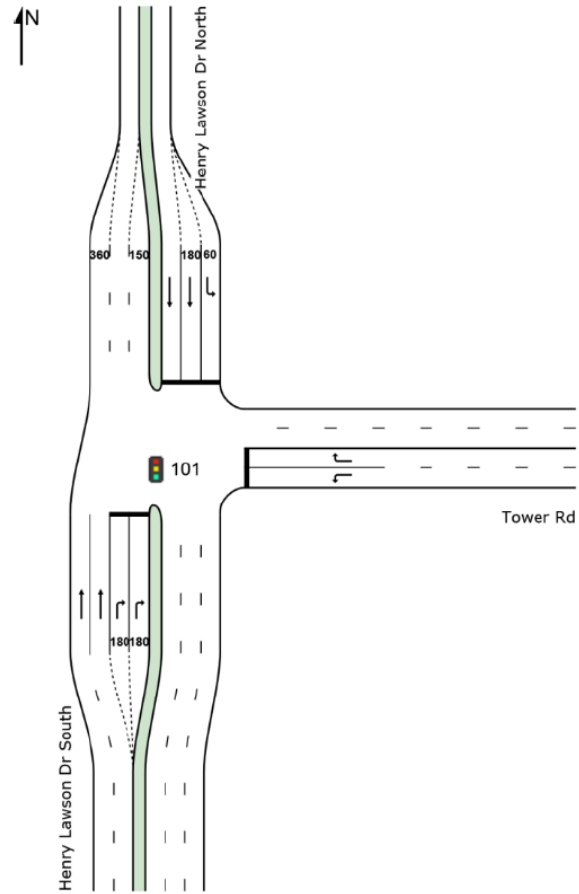


Figure 2-13 Henry Lawson Drive and Tower Road intersection Option 2

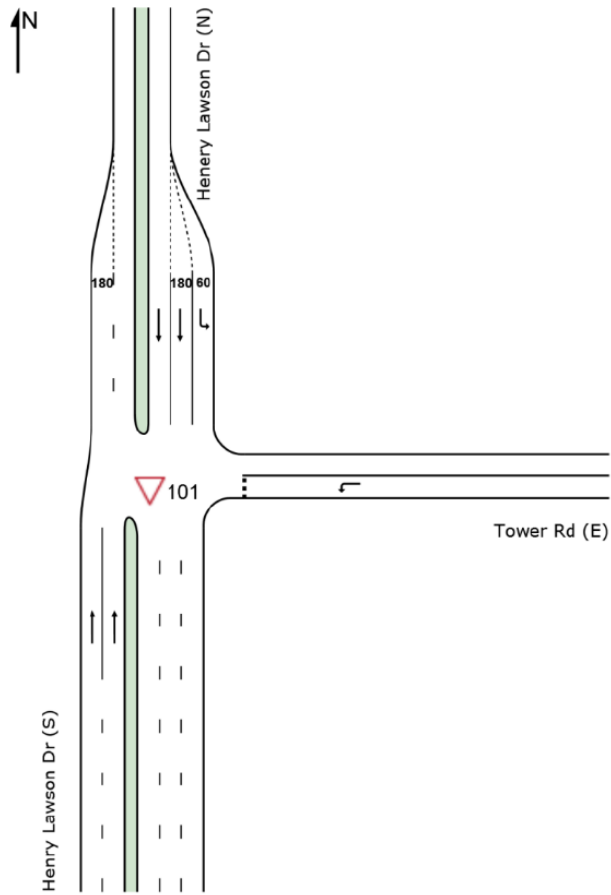


Figure 2-14 Henry Lawson Drive and Tower Road intersection Option 3

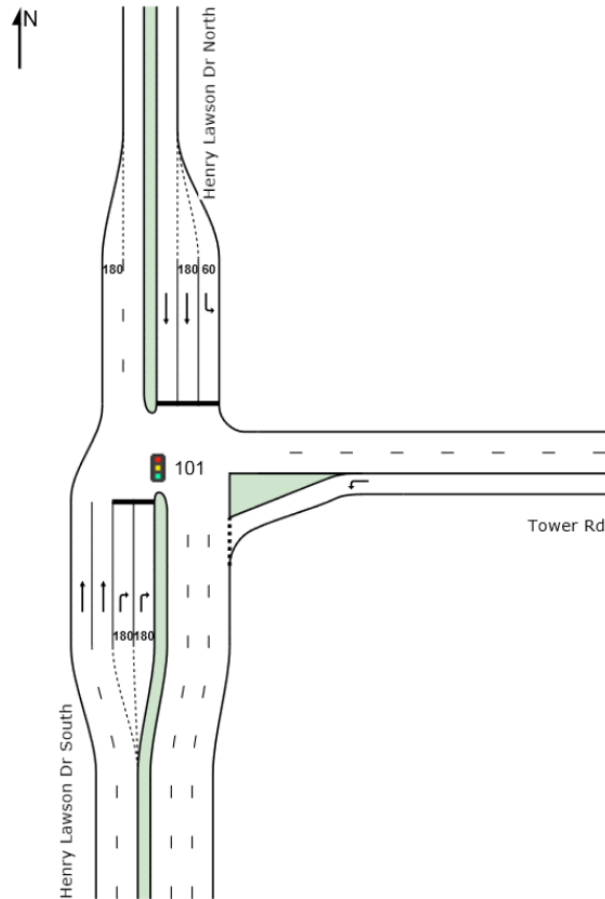


Figure 2-15 Henry Lawson Drive and Tower Road intersection Option 4

### 2.5.2.2.3 Assessment

#### Henry Lawson Drive and Milperra Road intersection

Multiple refinements were assessed and tested for the Henry Lawson Drive and Milperra Road intersections. This included the addition of northbound and southbound lanes, continuous left slip lane from Newbridge Road, extension of dual right turn lanes on Milperra Road, extension of right turn trap lane from Henry Lawson Drive onto Newbridge Road and removal of the bus jump start on Milperra Road.

Numerous iterations with a combination of the above changes were undertaken to generate an optimised layout for the intersection.

The improvements were further workshoped through the VM workshop, with recommendations from stakeholders taken into consideration and incorporated into the design where appropriate.

#### Henry Lawson Drive and Tower Road intersection

Table 2-1 details the primary advantages and disadvantages identified for each option considered for the Henry Lawson Drive and Tower Road intersection, as noted at the VM workshop.

Table 2-1 Primary advantages and disadvantages of Henry Lawson Drive and Tower Road intersection options

Primary advantages	Primary disadvantages
<b>Option 1</b>	
<ul style="list-style-type: none"> <li>• All turning movements provided</li> <li>• Can provide pedestrian connectivity across all legs</li> <li>• Enables controlled movements</li> <li>• Small footprint compared to some other options</li> <li>• Meets Bankstown Airport requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Not as good as the other options from a network performance perspective</li> <li>• Location of the pedestrian crossing on Henry Lawson Drive was unresolved</li> <li>• Requires resolution of the weave issue for traffic turning left from Newbridge Road</li> <li>• Dual right turn bay storage may queue back onto Henry Lawson Drive.</li> </ul>
<b>Option 2</b>	
<ul style="list-style-type: none"> <li>• Maintains all movements for Henry Lawson Drive and Tower Road, accommodating the Bankstown Airport Development traffic entering and exiting the area</li> <li>• Better traffic performance than Option 1</li> <li>• Enhance performance for north bound traffic coming from Milperra Road intersection (ties in well with Milperra Road dominant movements and peak demands)</li> <li>• Meets requirements for entry and exit into the Bankstown Airport precinct</li> </ul>	<ul style="list-style-type: none"> <li>• Requires the largest footprint</li> <li>• Has the greatest impact on land mapped as coastal wetlands</li> <li>• Requires the most property acquisition from the Georges River Golf Course</li> <li>• Right to left out of the seagull is less safe than a left to right movement</li> <li>• Harder to cater for pedestrians.</li> </ul>
<b>Option 3</b>	
<ul style="list-style-type: none"> <li>• Eliminates the weaving issues from the left turn into Henry Lawson Drive from Newbridge Road, and weaving right to access Tower Road. This promotes access to the Airport Development via the Milperra and Murray Jones intersection.</li> </ul>	<ul style="list-style-type: none"> <li>• Precludes the introduction of a bus route through the Bankstown Airport - although an alternative can be provided with access from Milperra Road and Murray Jones intersection.</li> </ul>
<b>Option 4</b>	
<ul style="list-style-type: none"> <li>• Meets most of the requirements for Bankstown Airport with the exception of right out of Tower Road.</li> <li>• Second most efficient design of the intersection</li> <li>• Same footprint as Option 1</li> <li>• Maintains pedestrian crossing of Henry Lawson Drive</li> <li>• Maintains the option of a bus route through the area</li> <li>• Provides a continuous north bound lane.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires resolution of the weave issue for traffic turning left onto HLD from Newbridge Road</li> <li>• Does not provide a right out of Tower Road. Banning this movement is subject to negotiation with Bankstown Airport Limited.</li> </ul>

In assessing the options for further analysis, the VM workshop discounted Option 3 as the left in left out access arrangement restricts right turn movements into and out of the Bankstown Airport Development from Henry Lawson Drive. This would not support the proposed capacity demands from surrounding areas, specifically the Bankstown Airport Development.

It was noted that Option 4 would not provide all turning movements at the Tower Road intersection but has the advantage over Option 3 in that it caters for the right turn into Tower Road from Henry Lawson Drive.

In undertaking a review of the three remaining options, Option 1 was the preferred option when Options 1 and 2 were compared. Option 4 was the preferred option when Options 1, 2 and 4 were compared subject to additional consideration being given to providing two left out lanes from Tower Road.

#### **2.5.2.2.4 Preferred option**

##### **Henry Lawson Drive and Milperra Road**

The optimised layout for the Henry Lawson Drive/Milperra Road intersection with maximum traffic benefits involved:

- Deletion of the bus jump on Milperra Road (westbound)
- Extension of dual right turns from Milperra Road into Henry Lawson Drive to provide increased storage
- Insertion of a continuous left turn slip lane from Newbridge Road to Henry Lawson Drive (northbound)
- Additional southbound lane (to three lanes) on Henry Lawson Drive
- Increasing the dual right turn from Henry Lawson Drive onto Newbridge Road which allows additional storage and release of right turn traffic.

##### **Henry Lawson Drive and Tower Road**

The VM workshop identified that the project team should proceed with the design of Option 1, but that further work should be undertaken to further refine this option in consultation with Transport Network Planning.

A modified Option 1 was identified through consultation with Transport Network Planning, which provided an additional dedicated left turn lane into Henry Lawson Drive.

However, as the modified Option 1 resulted in geometrical turning constraints, additional land acquisition and required additional funding, it was not considered to be better than the original Option 1. As such, the preferred option become the original Option 1, as per the recommendations of the VM workshop.

#### **2.5.2.3 Auld Avenue bridge duplication**

The bridge required over the Milperra Drain, located near Auld Avenue, requires duplication to accommodate the widening of Henry Lawson Drive.

##### **2.5.2.3.1 Methodology**

A number of different structural options were considered for this bridge during the design development. The options were developed and compared to identify the optimal structure type based on:

- A structure able to support the upgraded road, with two traffic lanes, a road shoulder and a shared pedestrian and cyclist path.
- 60 km/h design speed
- Minimisation of impacts on waterway performance during flooding
- Clearance from the existing bridge
- Construction and maintenance costs.

##### **2.5.2.3.2 Identified options**

The following bridge structure types were considered as potential options for the design of the bridge duplication:

- Prestressed concrete spaced plank
- Prestressed concrete Super-T girders
- Prestressed concrete Bulb-T girders
- Prestressed concrete planks matching existing span lengths



- Prestressed concrete modular bridge units
- Steel girders
- Unstressed reinforced concrete similar to the existing.

### 2.5.2.3.3 Assessment

Options that were considered in the bridge design for the Auld Avenue bridge duplication are detailed within Table 2-2.

Table 2-2 Options considered for Auld Avenue bridge duplication design

Options considered	Commentary
Prestressed concrete spaced plank	The bridge type provides a shallow structure depth and performs well when submerged.
Prestressed concrete Super-T girders	This bridge type is not suitable for submersion
Prestressed concrete Bulb-T girders	Suitable for submersion but less economical than planks for short spans and have a deeper section
Prestressed concrete planks matching existing span lengths	The cost of two additional piers, including the added complexity of one in the normal flow path of the watercourse, outweighs the small incremental cost of the larger plank size for the longer spans. The proposed two spans also minimises the number of bearings.
Prestressed concrete modular bridge units	The need for the shared path and the regular performance level barriers renders prestressed concrete modular bridge units unsuitable. Their short span lengths also require more piers.
Steel girders	Higher capital cost as well as ongoing costs due to the requirement for maintaining and replacing the protective coating. Weathering steel could alleviate the ongoing costs for an even higher initial capital investment.
Unstressed reinforced concrete similar to the existing bridge	Substantial quantities of reinforced concrete are labour-intensive and environmentally intrusive due to the extensive falsework required. Precast concrete solutions provide fast, economical and safe construction.

### 2.5.2.3.4 Preferred option

The most suitable bridge type for the proposed duplication bridge was identified to be the prestressed concrete spaced plank. This option was chosen due to the following features:

- The bridge would provide a shallow structure depth and operate well when submerged, making it most suited to the creek
- The shallow structure depth of this option means that the road level would not be too far above the existing
- This option is a commonly used option, fast to implement and includes a safe construction method
- The cost of construction is relatively low
- The bridge structure would be easy to access during maintenance works in operation.

## **2.6 Design refinements**

### **2.6.1 Operational technologies**

There are a number of operational technologies that are currently being used along the overall proposal area. This includes CCTV, traffic control signals, traffic detection system and red light speed camera. All these systems would be upgraded as part of the overall proposal, with location and upgrades required to be confirmed during the detailed design.

However, during the options assessment, two further operational technologies were considered for use. These were variable message signs (VMS) and flood warning alerts. VMSs are not required as there are existing VMSs to the south of Stage 1A on approach to the M5 Motorway.

### **2.6.2 Future design refinements**

Further design refinements of all key features would be undertaken during detail design.

Additional traffic assessments will also be undertaken to better understand the traffic flows on Auld Avenue during different periods of the year, influenced by community usage of sporting fields along Auld Avenue. Detailed design would further evaluate the layout of the Auld Avenue intersection to identify suitable options with consideration to optimal traffic network outcomes, safety, engineering constraints and community need.

## 3 Description of the proposal

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### 3.1 The proposal

The proposal involves the upgrade of Henry Lawson Drive along a 1.3-kilometre section between Keys Parade and Tower Road. The proposal would include widening Henry Lawson Drive from two lanes to four lanes, increasing the number of lanes at the Tower Road and Newbridge/Milperra Road intersections and duplicating the Auld Avenue Bridge.

The REF proposal incorporates the majority of the overall proposal, however excludes works which are located within the SEPP (Coastal Management) area. These areas have been assessed as part of the EIS that has been prepared in parallel with this REF (as outlined in Section 1.3 and shown on Figure 1-2).

Key features of the proposal would include:

- Widening Henry Lawson Drive from two to four lanes
- Upgrading the signalised intersection of Henry Lawson Drive and Tower Road including:
  - An additional right turn lane from Tower Road onto Henry Lawson Drive
  - A new channelised short left-turn lane from Henry Lawson Drive (southbound) onto Tower Road
  - An additional right turn lane from Henry Lawson Drive (northbound) onto Tower Road
  - Retaining the pedestrian crossing across Henry Lawson Drive on the southern side of the intersection.
- Upgrading the signalised intersection of Henry Lawson Drive and Milperra Road/ Newbridge Road including:
  - An additional right turn lane on the Milperra Road and Newbridge Road approaches to Henry Lawson Drive
  - An additional through lane on the Henry Lawson Drive southbound approach
  - The removal of the bus only lane on Milperra Road to provide an additional right turn lane onto the Henry Lawson Drive northbound approach.
- Removing the dedicated left turn slip lane into the ALDI and fast food area with access being retained via a standard property driveway.
- Retaining the existing bus stop on Milperra Road (eastbound) and moving the westbound bus stop 20 metres to the west
- Altering access to Auld Avenue to a “left in/left out” only configuration
- Installing a new Henry Lawson Drive road bridge (over Milperra Drain) to the south of Auld Avenue (referred to as the Auld Avenue bridge) to carry northbound traffic and retaining the existing bridge for southbound traffic
- Constructing new footpaths on the eastern side of Henry Lawson Drive to connect Tower Road to the existing bus stop on the eastbound lanes of Milperra Road and a new footpath on the southern side between Henry Lawson Drive to the bus stop on the westbound lanes of Milperra Road
- Widening the shared user pathway between Flower Power (Keys Parade) and Newbridge Road to three metres and reconstructing footpaths along the western side of Henry Lawson Drive, where required.
- Adjusting existing drainage, including lengthening culverts, installing new drainage infrastructure and water quality controls
- Relocating utilities (including electrical, gas, water and telecommunications)
- Final roadworks including pavement, kerb and gutters, signs, lighting and line marking

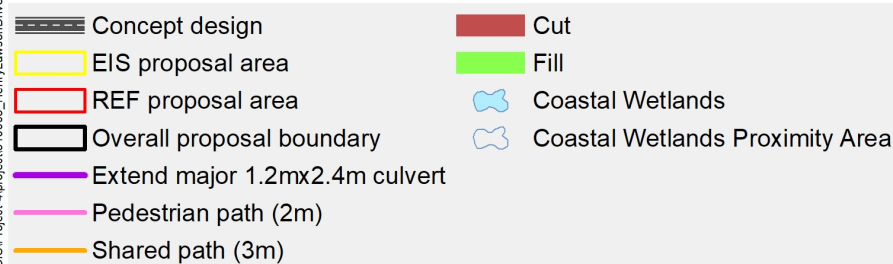
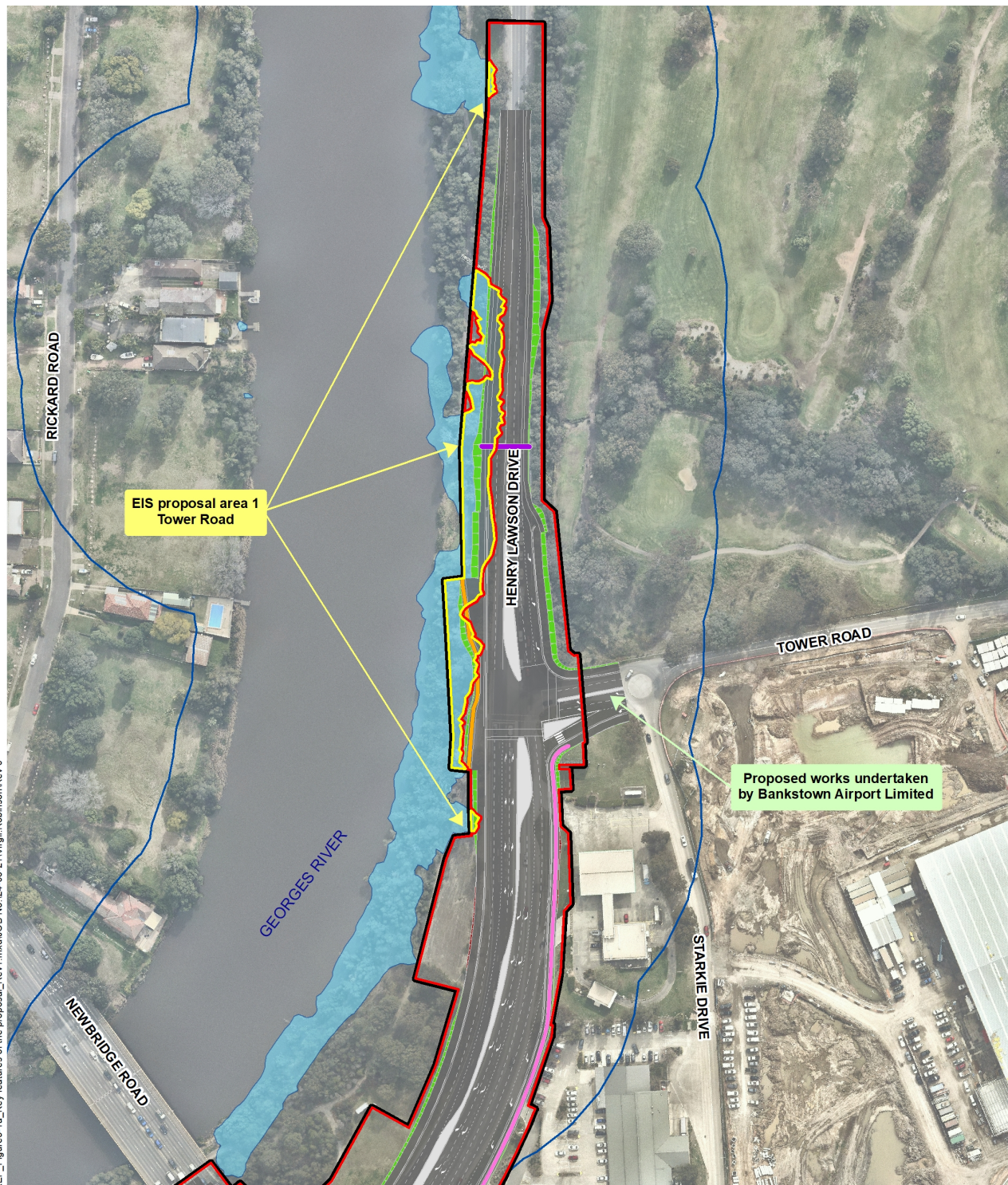
- Ancillary work for the project including, but not limited to road furniture, tie-in works, landscaping, earthworks and the like
- Temporary ancillary compounds, stockpile sites and associated facilities.

The proposal forms Stage 1A of the progressive upgrade of Henry Lawson Drive between the Hume Highway, Villawood, and the M5 South Western Motorway, Milperra. Subject to approval, construction of the Stage 1A proposal may commence in early 2023 and would take about two years to complete. Other stages of upgrading Henry Lawson Drive would be developed separately in the future and will be subject to a separate assessment process.

The proposal is shown in detail in Figure 3-1a, Figure 3-1b and Figure 3-1c.



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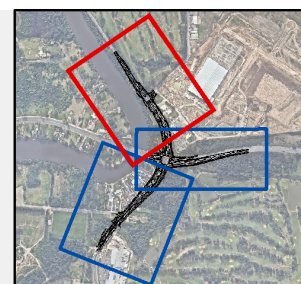


Source: Aurecon, TfNSW, Spatial Services, Nearmap



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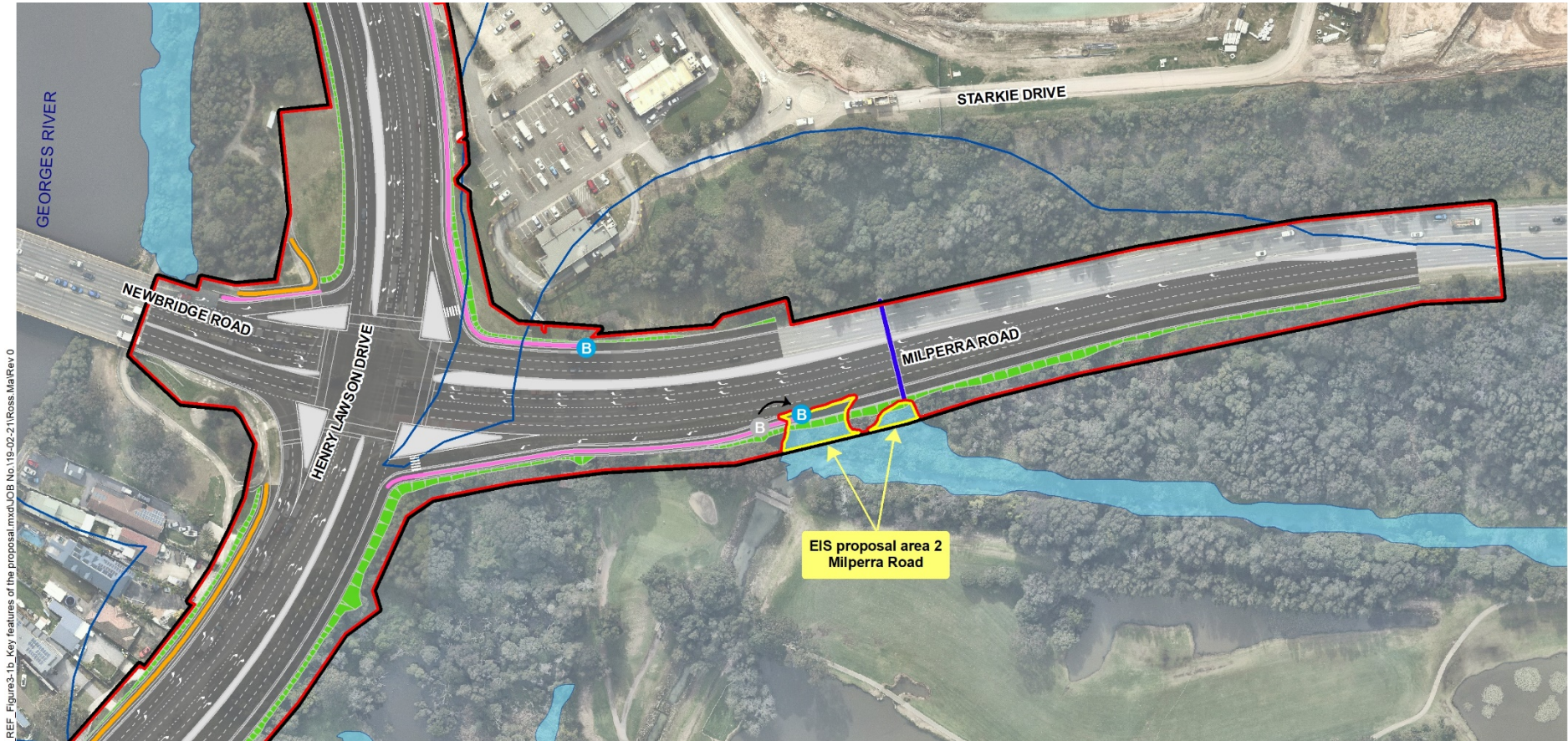
Projection: GDA 1994 MGA Zone 56



Henry Lawson Drive Stage 1A **Review of Environmental Factors**

FIGURE 3-1a: Key features of the proposal





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- |                                 |                                 |
|---------------------------------|---------------------------------|
| Concept design                  | Cut                             |
| EIS proposal area               | Fill                            |
| REF proposal area               | Coastal Wetlands                |
| Overall proposal boundary       | Coastal Wetlands Proximity Area |
| Extend major 2x1.2m box culvert |                                 |
| Pedestrian path (2m)            |                                 |
| Shared path (3m)                |                                 |

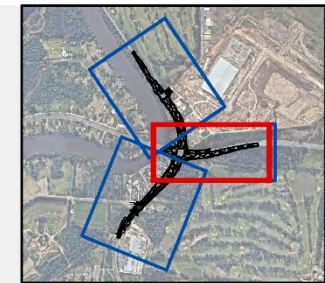
Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:2,150

0 25 50m

Projection: GDA 1994 MGA Zone 56

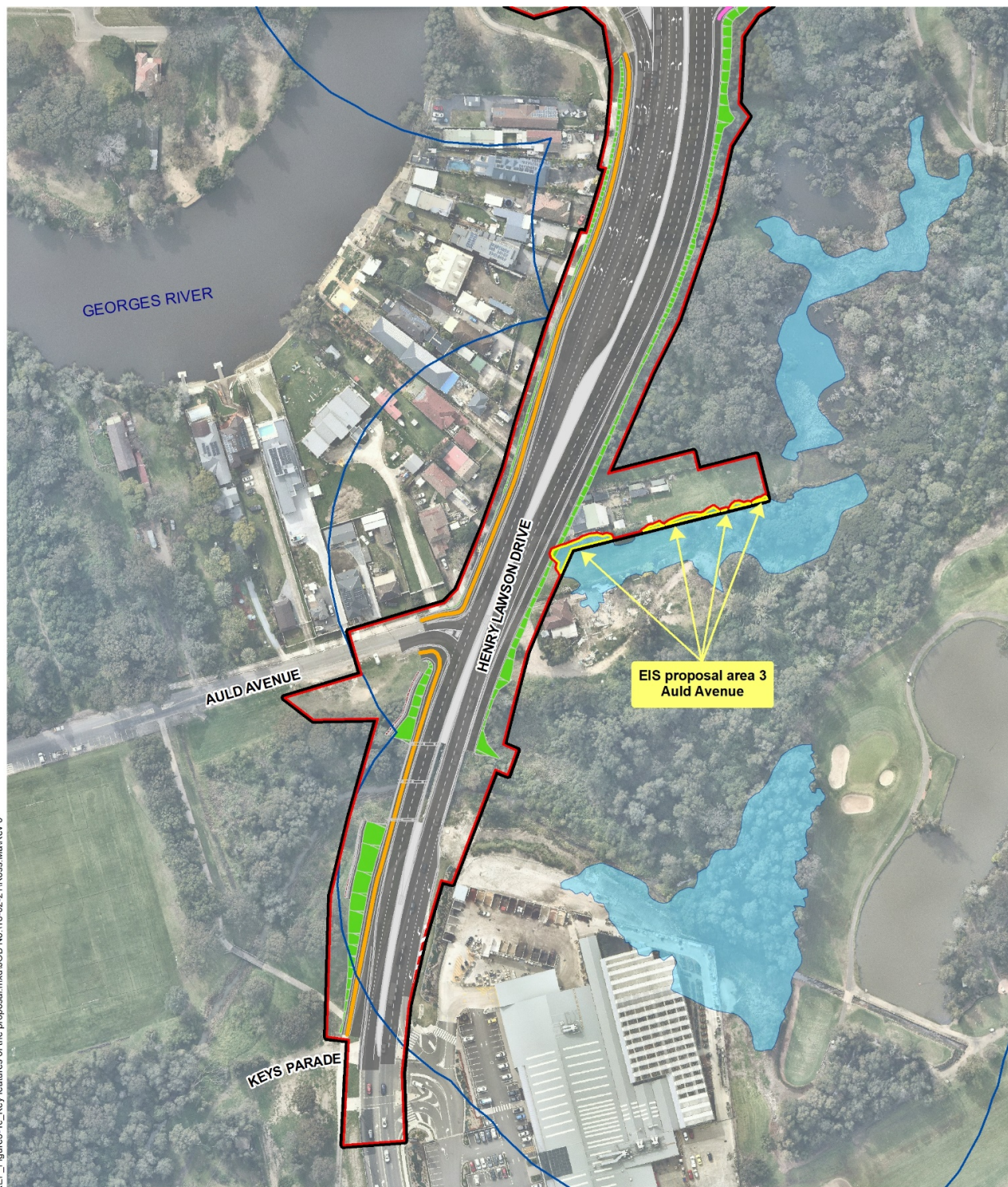


Henry Lawson Drive Stage 1A **Review of Environmental Factors**

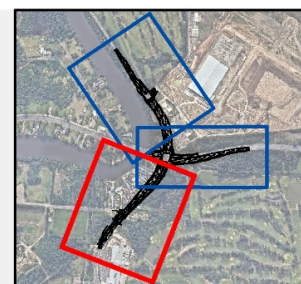
**FIGURE 3-1b:** Key features of the proposal



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- |                           |                                 |
|---------------------------|---------------------------------|
| Concept design            | Fill                            |
| EIS proposal area         | Coastal Wetlands                |
| REF proposal area         | Coastal Wetlands Proximity Area |
| Overall proposal boundary |                                 |
| Pedestrian path (2m)      |                                 |
| Shared path (3m)          |                                 |
| Cut                       |                                 |



Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:2,500  
0 25 50m

## Henry Lawson Drive Stage 1A Review of Environmental Factors

Projection: GDA 1994 MGA Zone 56

FIGURE 3-1c: Key features of the proposal



## 3.2 Design

A description of the overall proposal design is provided in the following sections. This is based on the concept design and will be further developed during the detailed design stage.

### 3.2.1 Design criteria

The proposal has been designed to satisfy relevant standards and applications, including:

- Published Transport supplements to Austroads Guides
- Austroads Road Design Guides
- Australian Standards

The bridge standards used in the design of the proposal include:

- Roads and Maritime Bridge Technical Direction (BTD) Manual (Roads and Maritime 2017)
- Australian Standard AS 5100 - 2017 Bridge Design Code. Bridge Policy Circulars, Chief Bridge Engineer's Circulars
- Roads and Maritime Bridge Waterway Manual (Roads and Maritime 1994)
- A Guide to the Hydraulic Design of Bridges, Culverts and Floodways (Austroads 1994)
- Roads and Maritime Aesthetics of Bridges – Design Guidelines to Improve the Appearance of Bridges in NSW (Roads and Maritime 2004).

Specific design criteria for the elements of the proposal are presented in Table 3-1.

Table 3-1 Design criteria

Design element	Location	Design criteria
Carriageway	Whole alignment	Two-lane dual carriageway
Design speed	Henry Lawson Drive	70km/h
	Newbridge Road and Milperra Road	80km/h
Posted speed	Henry Lawson Drive	60km/h
	Newbridge Road and Milperra Road	70km/h
Through lane widths	Henry Lawson Drive	3.5 metres 4 metres for kerb side lanes
	Milperra Road and Newbridge Road	3.2 metres eastbound 3.3 metres westbound Retention of wider kerbside lane
Turning lane width	Throughout project (Excluding the dual right turn lanes from Newbridge Road)	3.3 metres
	Dual right turn lanes from Newbridge Road into Henry Lawson Drive	3 metres
Shoulder width	Proposed new northbound Auld Avenue Bridge	0.5 metres in front of proposed bridge barrier 0.7 metres along both sides of carriageway in front of proposed barriers
	Henry Lawson Drive north of Tower Road	2.0 metres on northbound lanes 1.0 metres southbound

Design element	Location	Design criteria
Median widths	Throughout proposal	Type SF kerb 0.5 to 7 metres throughout project 1.5 metres at signalised intersections 0.5 metres at isolated locations generally at the end of right turn bays
Pedestrian and cycle footpaths	Western side of Henry Lawson Drive from Tower Road to Keys Parade	3.0 metres wide shared path
	Eastern side of Henry Lawson Drive from Tower Road to Milperra Road	Proposed pedestrian footpath. Size to be confirmed at a later stage.
Batter	Throughout the project	4:1
	The southern side of Milperra Road between Ch 180 and 270	2:1
	The east and western side of Henry Lawson Drive north of Tower Road	2:1
Safety Barriers	Safety barriers to be installed in critical areas along the alignment. 4:1 batter has been adopted for most of the project to minimise need for excessive safety barriers	Combination of steel safety barriers and crash cushions.
Pavement	Across the project area	Dense grade asphalt

### 3.2.2 Urban design and landscaping principles

Urban design and landscaping along the proposal alignment would be designed to minimise the need for maintenance and to avoid any possible impacts to sight distance, particularly around driveway accesses.

The urban design and landscaping principles are shown in Table 3-2.

Table 3-2 Urban design objectives for the overall proposal

Principle	Objectives
Principle 1 – Contribute to the overall landscape structure and revitalisation of the region	<ul style="list-style-type: none"> <li>Develop an alignment which permits the ongoing development of Henry Lawson Drive through the provision of upgraded capacity and intersections to service the increasing demand on the roads</li> <li>Design an alignment which is responsive to its landscape setting and does not detract from it</li> <li>Minimise negative physical impacts on drainage corridors and open space networks associated with these</li> <li>Seek opportunities to minimise landscape impacts by investigating possibilities to minimise footprint including the use of retaining walls.</li> </ul>
Principle 2 – Respect the land uses and built form of the corridor	<ul style="list-style-type: none"> <li>Minimise the footprint of the corridor to limit impacts to adjoining vegetation, communities, services and service corridors, and industrial lands</li> <li>Respond to the ecological communities of the area and landscape character of the corridor</li> <li>Minimise the intrusion of road-related elements on the local landscape.</li> </ul>

Principle	Objectives
Principle 3 – Connecting modes and communities	<ul style="list-style-type: none"> <li>• Provide safe and efficient access to the residential communities of Bankstown residential and commercial precincts</li> <li>• Investigate best access routes for cyclists and pedestrians to provide high quality crossing points, comfortable and safe connections</li> <li>• Provide active transport opportunities both within the alignment and connecting to the broader local context and networks, where a need has been identified. A key consideration will be the connection to the Hume Highway, M5 Motorway and to Liverpool</li> <li>• Provide flood free access which maintains access in all weather.</li> </ul>
Principle 4 – Fit the landform of the corridor	<ul style="list-style-type: none"> <li>• Minimise the footprint of the corridor to limit impacts to adjoining vegetation communities and adjoining land uses</li> <li>• Provide a formation which addresses local flood patterns</li> <li>• Consider form of potential cut and fills and how this sits within the existing landscape.</li> </ul>
Principle 5 – Responding to natural pattern	<ul style="list-style-type: none"> <li>• Provide a response which addresses the close proximity to commercial properties and the effect of changing character</li> <li>• Drainage and its management should reflect the fact the alignment is on the floodplain and respond accordingly to areas expected to be subject to inundation</li> <li>• Preserve existing cultural patterns within the landscape where evident within the corridor</li> <li>• Vary the gradient of earthworks to provide visual interest and reflect characteristics of the surrounding landform and landscape.</li> </ul>
Principle 6 – Protect and enhance the heritage and cultural values of the corridor	<ul style="list-style-type: none"> <li>• Preserve the integrity of heritage items and area of cultural importance to the local community</li> <li>• Avoid, where possible areas of identified historic and cultural value</li> <li>• Acknowledge and respond to the heritage and cultural values of the project area</li> <li>• Acknowledge and respond to the Aboriginal values and places in the broader landscape</li> <li>• Consider the interpretation of the heritage areas along the corridor.</li> </ul>
Principle 7 – Designing an experience in movement	<ul style="list-style-type: none"> <li>• Minimise disruption to the visual qualities of the land use</li> <li>• Use landscape to frame or define views from the road, providing a backdrop and context to the road</li> <li>• Investigate potential of using planting to heighten Henry Lawson Drive's sense of place.</li> </ul>
Principle 8 – Creating self-explaining road environments	<ul style="list-style-type: none"> <li>• Provide plantings that reinforce the character and connections of the corridor with the adjoining development</li> <li>• Provide a landscape design which reflects the needs and performance requirements of intersections along the corridor</li> <li>• Utilise landscape design as a way to differentiate character zones, heightening the sense of place.</li> </ul>
Principle 9 – Achieving integrated and minimal maintenance design	<ul style="list-style-type: none"> <li>• Develop a consistent approach to the design of soft landscaping along the alignment which is responsive to the character and feel of the road environment with which it connects as well as the character of the corridor through which it passes. Planting design Principles to be consistent to those outlined in the 'Landscape Design Guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime, 2018).</li> <li>• Provide plantings to frame views and guide the driver along the alignment, provide a backdrop and screen in part to the development that is adjacent.</li> </ul>

### 3.2.3 Engineering constraints

A number of engineering constraints have been considered in the development of the design. The major constraints considered are described in Table 3-3.

Table 3-3 Engineering and development constraints of the proposal

Constraint	Description
Construction and traffic staging	Due to the constrained nature of the site and pavement overlay strategy, a significant portion of construction would occur along heavily trafficked roads, particularly at the Milperra Road and Newbridge Road intersection. Effective traffic control and construction staging would be required to minimise impacts to local traffic.
Coastal Management SEPP area	The overall proposal would impact upon areas mapped under the Coastal Management SEPP. While the REF proposal does not impact on coastal wetlands, it does pass through the coastal wetlands proximity buffer. Where possible, the proposal has been designed to minimise any additional or unnecessary impacts to the wetlands such as through the adjustment of batter size.
Crown land and Aboriginal land claim	The proposal passes through areas of Crown land and is adjacent to an Aboriginal land claim located north and south of Milperra Road (Airport Reserve and Ashford Reserve). The impact footprint of the proposal has been designed to minimised impact to Crown land. While all attempts have been made to not affect the area of Aboriginal land claim, the proposal would impact on a small area as a result of Milperra Road being widened and embankments falling within areas of Crown land.
Retention of existing bridge south of Auld Avenue	The decision to retain the existing Auld Avenue Bridge constrained the alignment of the southern section of Henry Lawson Drive and the location of the proposed new bridge.
Flower Power development	Impacts to the recent Flower Power development located at the southern end of the proposal area were to be avoided. Because of this constraint, the new Auld Avenue bridge needed to be located west of the existing bridge to avoid the development.
Existing Newbridge Road bridge	The design was developed to tie into the existing Newbridge Road bridge west of Henry Lawson Drive spanning the Georges River to avoid any changes to this major bridge structure.
Property impacts	The road alignment has been designed to minimise full property acquisition of residential properties adjacent to Henry Lawson Drive. Driveway access to residential properties is being considered in detailed design. Sight distances, setbacks and gradients will be designed in accordance with the Austroads Road Design Guides, Roads and Maritime Services (Transport) Supplements and Canterbury Bankstown Council Standard Drawings.



### **3.2.4 Major design features**

The major design features of the proposal are described in the following sections and shown in Figure 3-2 to Figure 3-6.

#### **3.2.4.1 Widening of Henry Lawson Drive**

The proposal would involve the widening of Henry Lawson Drive from two lanes to four lanes (two lanes either direction) between Keys Parade to Tower Road, over a distance of about 1.3 kilometres. The southern limit of the proposal is 200 metres south of the Henry Lawson Drive and Auld Avenue intersection. The northern limit of the proposal extends around 260 metres north of the Henry Lawson Drive and Tower Road intersection to tie back into the existing two lane road corridor.

The four lanes would be travel lanes along Henry Lawson Drive, with increased widening at intersections to account for turning lanes, as discussed in the following sections.

#### **3.2.4.2 Henry Lawson Drive and Tower Road intersection**

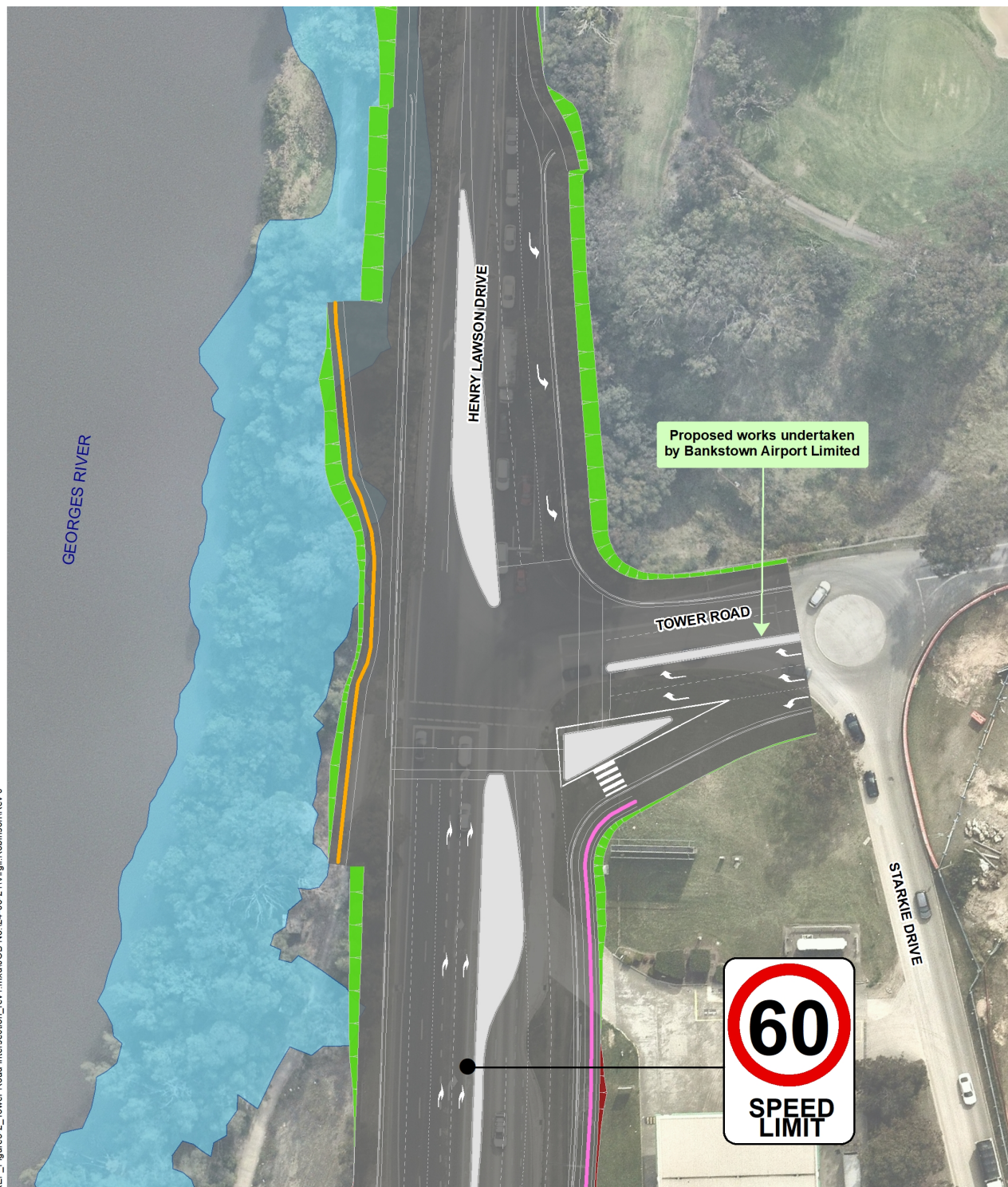
The proposed configuration of the Henry Lawson Drive and Tower Road intersection is shown in Figure 3-2.

The proposal would provide an additional right turn lane from Tower Road onto Henry Lawson Drive. This would result in two right-turn lanes from Tower Road onto Henry Lawson Drive. The left turn lane from Tower Road onto Henry Lawson Drive would remain, however would be upgraded to a channelised short-turn left slip lane.

The proposal would also include an additional right turn lane from Henry Lawson Drive (northbound) into Tower Road. The pedestrian crossing across Henry Lawson Drive would be retained.

Upgrades to the Tower Road intersection would tie in with the Bankstown Airport development, which includes internal road upgrades to facilitate airport planning. The Tower Road upgrade would be carried out by Bankstown Airport Limited (discussed further in Section 6.15).

There would be embankments required around the intersection. Embankment slopes would range between 1:2 to 1:4. Further refinement may be undertaken during detailed design to reduce impacts to coastal wetlands.



- Concept design
- Pedestrian path (2m)
- Shared path (3m)
- Cut
- Fill
- Coastal Wetlands

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:850  
0 10 20m

Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 3-2: Major design features - Tower Road intersection

### **3.2.4.3 Henry Lawson Drive and Milperra Road/Newbridge Road intersection**

The proposed configuration of the Henry Lawson Drive, Milperra Road and Newbridge Road intersection is shown in Figure 3-3.

The northbound carriageway along Henry Lawson Drive would be widened to accommodate an additional right lane, while the entering southbound lanes configuration would be widened to accommodate an additional through lane.

To increase traffic storage capacity for vehicles turning onto Milperra Road, the northbound right turn lanes along Henry Lawson Drive would be lengthened. The turning lanes would be lengthened by about 120 metres to allow space for additional vehicles to queue at the intersection.

The existing slip lane southbound on Henry Lawson Drive to turn eastbound onto Milperra Road would remain unchanged and have a pedestrian crossing to facilitate pedestrian movements across the intersection. The slip lane from Newbridge Road to turn northbound onto Henry Lawson Drive would be converted to a signalised intersection, with a signalised shared path crossing.

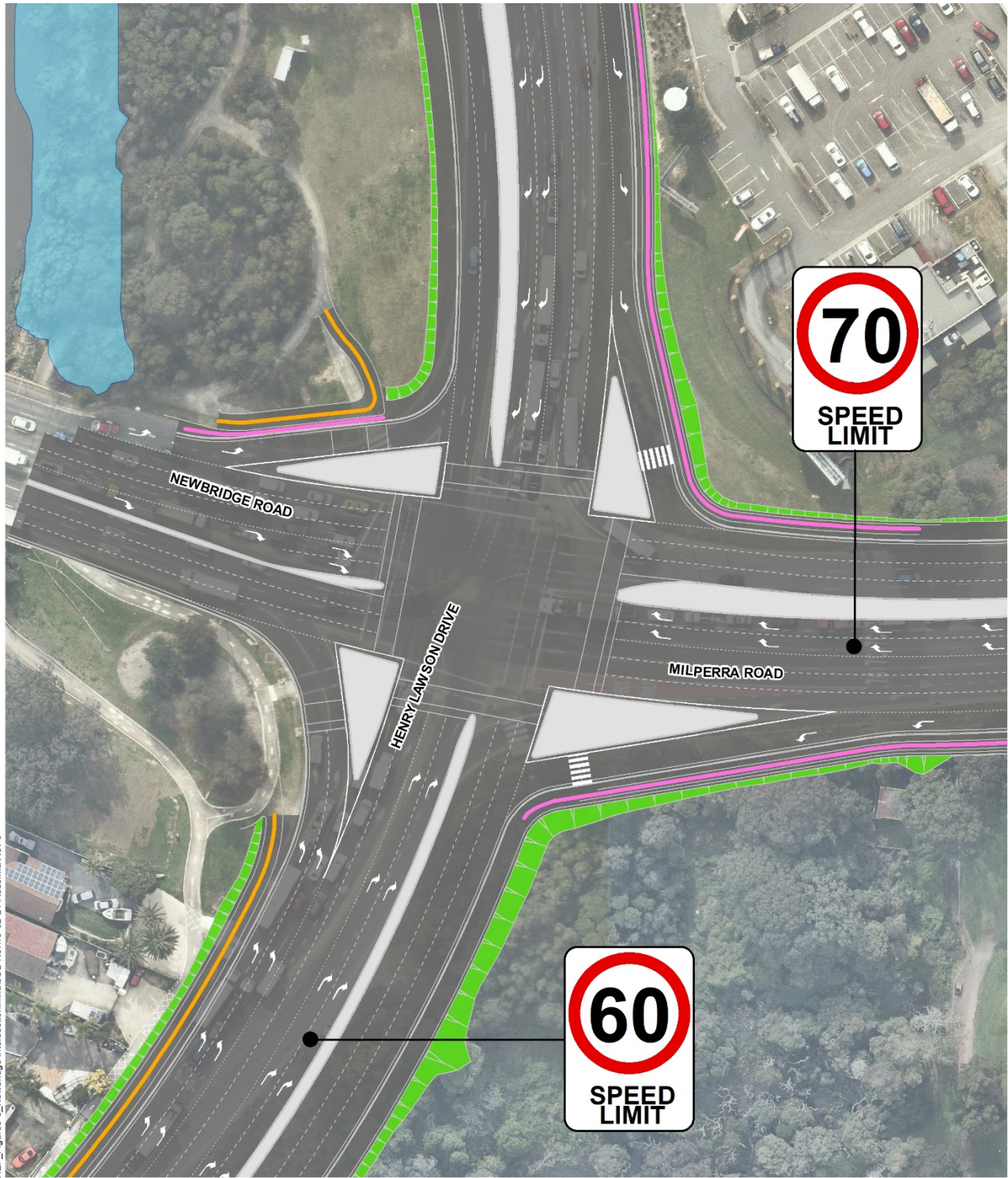
A typical cross section of Henry Lawson Drive just south of the Milperra Road/ Newbridge Road intersection is shown in Figure 3-4.

The westbound carriageway along Milperra Road would be widened due to the addition of a second right turn lane. To accommodate this widening, the existing westbound Bus Only jump start lane located along Milperra Road would be removed alongside the northward adjustment of the three eastbound lanes. Due to the removal of the Bus Only jump start lane, the current location of the bus stop located on the lane westbound of Milperra Road would need to be relocated about 10 metres east of its current position. This would allow buses to pick up passengers on the through lane, as opposed to the left turn lane, and would prevent unnecessary lane merges back onto the through lane. The existing bus stop on the eastbound Milperra Road carriageway would also be retained.

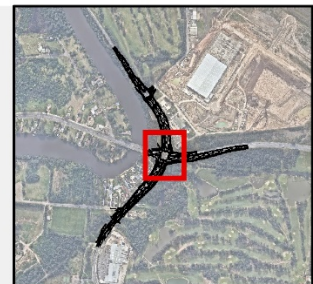
The eastbound carriageway along Newbridge Road would be shifted northward to allow for the addition of a second right turn lane onto Henry Lawson Drive. Furthermore, the left turn lane turning from Newbridge Road onto the northbound lanes of Henry Lawson Drive would be upgraded to a signalised slip lane. The westbound Newbridge Road carriageway would retain the existing three through lane configuration and would not be significantly altered.

There would be embankments required around the intersection. Embankment slopes would range between 1:2 to 1:4.





- Concept design
- Pedestrian path (2m)
- Shared path (3m)
- Fill
- Coastal Wetlands



Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:1,000  
0 10 20m

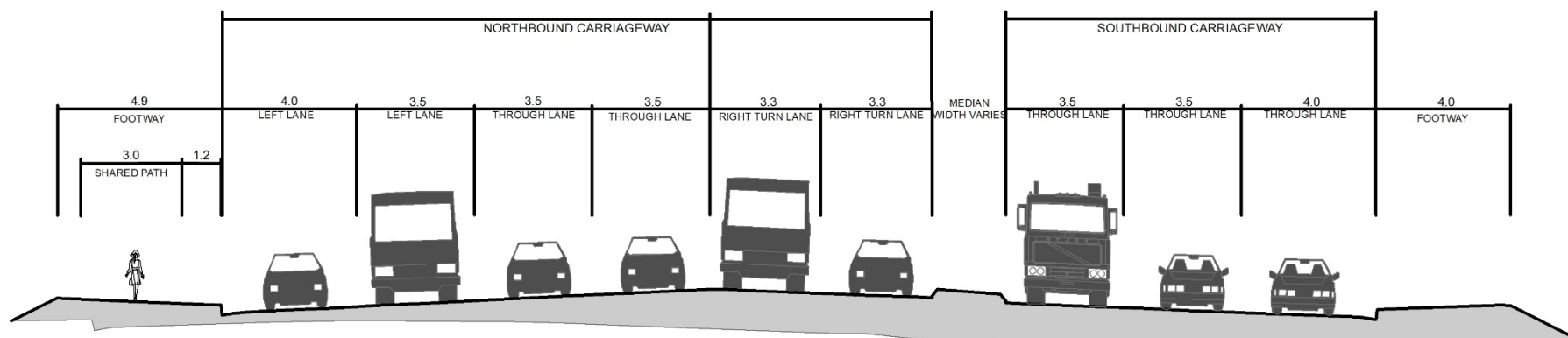
Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 3-3: Newbridge Road/Milperra Road intersection

Source: Aurecon, TfNSW

**NO SCALE**



Henry Lawson Drive Stage 1A **Review of Environmental Factors**  
**FIGURE 3-4:** Typical cross section view of Henry Lawson Drive south of Milperra Road

#### **3.2.4.4 Henry Lawson Drive and Auld Avenue intersection**

The intersection of Auld Avenue and Henry Lawson Drive would change to a left-in/left-out arrangement.

A raised concrete median would separate the northbound and southbound lanes at this location.

The configuration of the Auld Avenue intersection is shown in Figure 3-5.

Based on community feedback, further investigations on the layout of this intersection would be undertaken during detailed design. Further traffic monitoring and design options would be undertaken to identify the most optimal layout for this intersection. Any change in the layout would be based on balancing a range of issues including road safety and road network performance, as well as considering any future opportunities for broader connectivity.

#### **3.2.4.5 Duplication of Auld Avenue bridge**

The proposal would require the duplication of the existing bridge over the Milperra Drain south of Auld Avenue. The new bridge would be separated from the existing bridge by a distance of about two metres.

The new bridge would be about 36 metres long and would form the two northbound lanes, while the existing bridge would be upgraded to two southbound lanes. The new bridge would be a two span bridge over a central pier.

The new bridge would have two traffic lanes, one lane being four metres in width and the other being 3.5 metres in width, a 0.5 metre wide shoulder and a 3.5 metre wide shared path on the western side. The new bridge would have a higher pavement level than the existing bridge structure (around 0.3-0.5 metres higher) which would provide over a 50 year average recurrence interval (ARI) flood immunity.







The existing bridge would have the current narrow pedestrian path removed, with the two traffic lanes to increase in width from 2.9 metres to 3.5 metres each. Pedestrian and cyclist movements would be along the new shared path on the new bridge. Pedestrian safety barriers would not be provided on the bridge structure as they would pose a sight line obstruction to drivers especially due to the closeness of the Auld Avenue intersection. However, this would be reconsidered during detailed design of the proposal.

Steel safety barriers and crash cushions would be provided at both ends of the two bridges.

An indicative cross section of the two bridges are shown in Figure 3-6.





-  Concept design
-  Shared path (3m)
-  Cut
-  Fill
-  Creeks
-  Coastal Wetlands



Projection: GDA 1994 MGA Zone 56

Source: Aurecon, TfNSW, Spatial Services, Nearmap



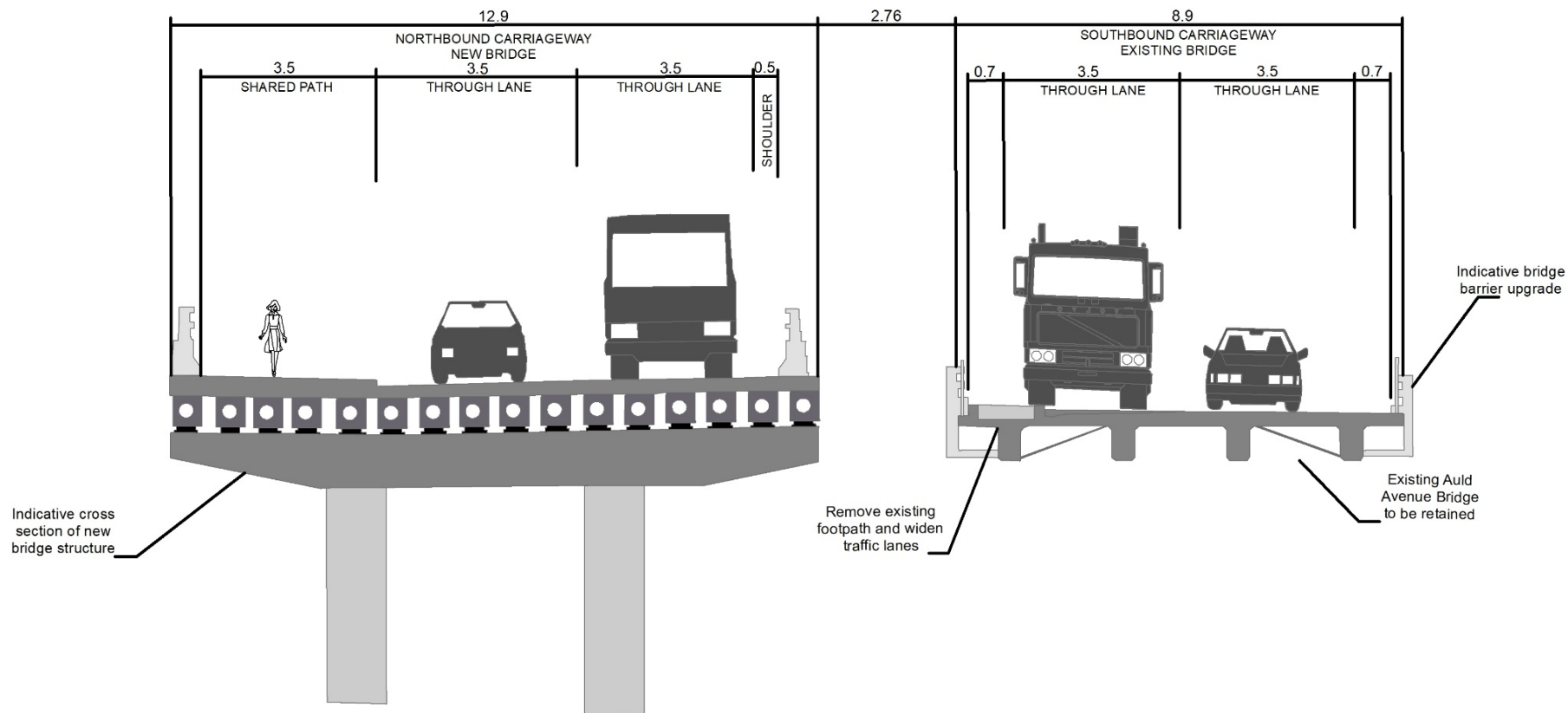
1:750  
0 10 20m

## Henry Lawson Drive Stage 1A **Review of Environmental Factors**

**FIGURE 3-5: Major design features - Auld Avenue intersection and bridge duplication**

Source: Aurecon, TfNSW

**NO SCALE**



Henry Lawson Drive Stage 1A **Review of Environmental Factors**  
**FIGURE 3-6:** Typical cross section view of existing and new Auld Avenue bridges



### **3.2.4.6 Shared use path and pedestrian footpaths**

#### **3.2.4.6.1 Shared use path**

Currently a 2.5 metre wide shared use path is available to the west of Henry Lawson Drive along the Georges River from north of Tower Road down to Auld Avenue. Between Tower Road and Newbridge Road, this shared path would be retained. Between Flower Power (Keys Parade) and Newbridge Road, the size of this shared path would be increased to three metres and tie into existing footpaths. Paths would be concrete.

#### **3.2.4.6.2 Pedestrian footpaths**

To the east of Henry Lawson Drive, between Tower Road and Milperra Road, a concrete footpath would be constructed for pedestrians. This would provide better pedestrian connectivity between the Bankstown Airport development, the service station and Milperra Road intersection where bus stops and signalised pedestrian crossings are currently available.

A 3.5 metre wide footway would be constructed along the southern side of Milperra Road from the Henry Lawson Drive pedestrian crossing to the bus stop.

The pedestrian and shared paths are shown in Figure 3-1a, Figure 3-1b and Figure 3-1c.

#### **3.2.4.7 Pavements**

The proposal would use the existing pavements as much as possible to avoid the need for extensive new pavement layers along Henry Lawson Drive and Milperra Road. A variable asphalt overlay would be used to rehabilitate the existing pavement in areas where the proposal is on top of the existing alignment. In sections where widening of the road is required, a full depth flexible pavement would be constructed to match the same road level as the rehabilitated pavement.

The pavement on Tower Road from Henry Lawson Drive to the interface with the Bankstown Airport development's road upgrade would be rehabilitated with an asphalt overlay. A short section of new full depth pavement would be provided on the western side of Tower Road.

Auld Avenue would require an asphalt overlay to tie in with the existing road levels and a short section of new full depth pavement where the road is widened on the southern side.

#### **3.2.4.8 Road drainage infrastructure**

The drainage design along Henry Lawson Drive would be developed to provide road immunity above a 20-year ARI flood event. To achieve this, existing cross drainage structures would be utilised where possible (and extended where needed), while new pit and longitudinal drainage pipe networks would be required.

Key drainage upgrades that have been identified include:

- Extension of the existing dual 1.2 metre box culverts on the southern side of Milperra Road by an additional 8.7 metres (refer Figure 3-1a)
- Extension of the existing 1.2 metre high by 2.4 metre wide culvert on the western side of Henry Lawson Drive by an additional six metres (refer Figure 3-1b)
- Upgrading of existing 375 millimetre diameter pipes to 450 millimetre diameter.

Water quality management and stormwater treatment measures could include:

- Water quality bio-retention basins
- Vegetated swales
- Scour protection at transverse culverts, longitudinal pipes and channels to prevent erosion and scour from the flow of water.

### **3.2.4.9 Removal of the dedicated left turn slip lane south of Tower Road**

The proposal would include the removal of the dedicated left turn entry slip lane into the ALDI and fast food retail area located south of the Tower Road and Henry Lawson Drive intersection (refer Figure 3-1a). This is due to the lengthening of the Milperra Road left turn slip lane. Access to the retail area would be retained with one standard entry-only property driveway from Henry Lawson Drive. This driveway access has been designed in accordance with relevant road design and safety guidelines.

### **3.2.4.10 Bus stops**

The existing bus stop on Milperra Road (eastbound) would be retained. The existing bus stop (westbound) on Milperra Road would be moved 20 metres to the east. Features of the bus stops would be similar to existing, including bus stop signage and timetables. The proposed relocation of the bus stop is shown in Figure 3 1b.

### **3.2.4.11 Supporting infrastructure**

The proposal would feature supporting road infrastructure, lighting, signage and street furniture, which would be confirmed during detailed design and likely include provision of:

- Landscaping in the road verges and medians in accordance with the urban and landscape design
- Traffic control signals at signalised intersections
- Intelligent transport system infrastructure including traffic monitoring units and CCTV cameras and associated utilities
- Guide, regulatory and warning signs for road users
- Line marking along the road corridor, retroreflective raised pavement markers (RRPMs) on all lane, edge and barrier lines.
- Roadside furniture to support public and active transport
- Street lighting along the road corridor.

## **3.3 Construction activities**

### **3.3.1 Construction footprint**

A construction footprint has been developed for the proposal to cover all works and construction activities (refer Figure 1-2). This is represented by the REF proposal area on Figure 3-1. In general, the construction footprint has assumed a five metre buffer from the edge of design. The footprint also takes into account ancillary facilities and works areas for equipment and machinery. Where possible, the footprint has been developed to minimise environmental impacts.

### **3.3.2 Staging**

Construction staging of the overall proposal would be determined by the construction contractor. However, it is anticipated that works for the overall proposal would be undertaken in one construction stage, with the potential for early works.

The early works would take place prior to the formal approval of construction management plans and would be managed by a separate 'Early works environmental management plan'.

Early works may include:

- Establishment works including ancillary facilities
- Utility relocations
- Construction access areas and the implementation of environmental, traffic and pedestrian controls
- Existing fencing removal
- Clearing and grubbing.

During the main construction works, works would need to be staged to maintain traffic flow along the corridor. An indicative construction staging would be:

- Stage 1 – Auld Avenue bridge construction. All lanes to be retained for construction.
- Stage 2 – Widening north of Auld Avenue on the western side to cater for the 4 lanes of traffic. Also, widening to the north of Tower Road on the southbound lanes. All lanes to be retained during construction.
- Stage 3 – Widening along Milperra Road, Henry Lawson Drive southbound and northbound near Tower Road. Most lanes to be retained except for the right turn lane from Milperra Road into Henry Lawson Drive. The 320m right turn bay will be reduced down to 170m during stage 3 to provide width for widening on the southern side.
- Stage 4 – Widening along the western side of Henry Lawson Drive northbound and along Milperra Road to the northern side.

Detailed activities involving the construction staging and work sequencing would be further developed in detailed design and confirmed once construction contractors have been engaged.

### **3.3.3 Work methodology**

Construction activities would be carried out in accordance with a construction environmental management plan (CEMP) to ensure work complies with Transport's commitments and legislative requirements. Detailed work methodologies would be identified by the construction contractor.

The proposal is expected to involve the following activities:

- Preliminary works: establishment works including ancillary facilities, construction access areas and the implementation of environmental, traffic and pedestrian controls, existing building and fencing removal, clearing and grubbing
- Utility adjustment works
- Earthworks
- Widening and pavement works
- Bridge and drainage works
- Pedestrian pathway, intersection crossing, and shared path works
- Intersection configuration and traffic signals
- Landscaping and finishing works
- Removal of ancillary facilities and site rehabilitation.

These construction activities are described in further detail in Table 3-4.



Table 3-4 Proposed methodology for each construction activity

Activity	Proposed methodology
Preliminary works	<ul style="list-style-type: none"> <li>• Installation of construction boundary hoarding/ fencing</li> <li>• Installation of sediment and erosion controls</li> <li>• Vegetation removal and grubbing works</li> <li>• Establishing ancillary facilities, designated laydown areas and services required for these facilities (e.g communication, water, electrical and security)</li> <li>• Adjusting existing fencing structures</li> <li>• Installation of temporary traffic and pedestrian controls</li> </ul>
Utility works	<ul style="list-style-type: none"> <li>• Preconstruction utility location identification</li> <li>• Protection of services where required</li> <li>• Adjusting, relocation and installation of services</li> <li>• Underboring of Milperra Drain south of Auld Avenue to relocate existing 11kV electrical cables located under the existing bridge</li> <li>• Testing and commissioning of services</li> <li>• Reinstatement of surfaces, including backfill and compaction</li> </ul>
Earthworks	<ul style="list-style-type: none"> <li>• Site inspection and survey</li> <li>• Removal of topsoil, stockpiling and/or disposal if weed affected</li> <li>• Cut to subgrade</li> <li>• Foundation treatments, where required</li> <li>• Grading and compaction of materials to required levels</li> </ul>
Widening and pavement works	<ul style="list-style-type: none"> <li>• Install new kerb and gutter (including new driveway crossings) as required</li> <li>• Traffic switches as required during construction</li> <li>• Traffic flow is to be maintained whilst widening and pavement works are being undertaken</li> </ul>
Existing bridge	<ul style="list-style-type: none"> <li>• Stormwater runoff along the northbound carriageway will be redirected to the road drainage stormwater pit on the bridge approach</li> <li>• Upgrading of existing stormwater drainage and installation of environmental controls as required</li> <li>• Modification to existing bridge structure including removal of the western side concrete footpath and kerb for widening of lane widths, removal of existing barriers and replaced with regular performance barriers</li> <li>• Excavation of trenches and pits for drainage, delivery of and placement of precast pipe and pits filling of trenches and compaction. Structural elements would be stored at the Auld Avenue ancillary site.</li> <li>• 11kV electrical cables located under the existing footpath will be relocated off the bridge during the construction of the project.</li> </ul>
New bridge	<ul style="list-style-type: none"> <li>• Construction of new bridge structure involving piling, concrete pours and placement of precast elements</li> <li>• Construction of a shared path on the western side</li> <li>• Shorter bridge structure to enhance the longitudinal drainage along the shoulder off the end of the bridge into the road drainage system without the need for scuppers</li> <li>• Excavation of trenches and pits for drainage, delivery and placement of precast pipe and pits, filling of trenches and compaction</li> </ul>
Drainage works	<ul style="list-style-type: none"> <li>• Upgrade stormwater drainage and install environmental controls as required</li> <li>• Excavation of trenches and pits for drainage, delivery of and placement of precast pipe and pits, filling of trenches and compaction</li> </ul>
Pedestrian pathway, intersection crossings and shared path works	<ul style="list-style-type: none"> <li>• Survey and set-out of formwork</li> <li>• Cut to level and graded</li> <li>• Construction of pathways and crossing locations</li> </ul>

Activity	Proposed methodology
Intersection configuration and traffic signals	<ul style="list-style-type: none"> <li>• Traffic switches as required</li> <li>• Redirection of pedestrians and cyclists to temporary paths</li> <li>• Survey and set-out of intersection layout</li> <li>• Removal/relocation of concrete medians and islands as required</li> <li>• Temporary pavement constructed where required.</li> <li>• Removal/ relocation of traffic control signal poles as required under the construction staging plan</li> <li>• Construction of permanent pavement and line marking</li> <li>• Reinstatement of pavement, pedestrian paths and signal functionality</li> </ul>
Landscaping and finishing works	<ul style="list-style-type: none"> <li>• Progressive landscaping would be undertaken throughout the construction. This would include: <ul style="list-style-type: none"> <li>○ Spreading of topsoil and mulch</li> <li>○ Planting</li> </ul> </li> <li>• Finishing works would include: <ul style="list-style-type: none"> <li>○ Installation of new street lighting, road furniture and signage.</li> <li>○ Line marking</li> <li>○ Removal of all traffic management devices and environmental controls.</li> </ul> </li> </ul>
Removal of ancillary facilities and site rehabilitation	<ul style="list-style-type: none"> <li>• Relocation/decommissioning of utilities and services</li> <li>• Decommission and removal of site offices, equipment and materials at completion, including demolition of existing buildings and structures no longer required at the Henry Lawson Drive ancillary facility in consultation with council</li> <li>• Restore ground surface and rehabilitate</li> </ul>

### 3.3.4 Construction workforce

The number and types of workers would vary throughout the different stages of construction but would include workers such as:

- Plant and machinery operators
- Traffic controllers
- Labourers
- Utilities servicers
- Project and site managers.

A total of about 70 construction workforce staff is estimated to work on the proposal. Final details of the workforce would be identified at a later stage by the construction contractor.

### 3.3.5 Construction hours and duration

Construction is expected to commence in early 2023 and would take about two years to complete.

Construction works would be undertaken in both standard hours and out-of-hours works (OOHW) for the proposal. Standard construction hours as defined in the Interim Construction Noise Guideline (DECC 2009b) (ICNG) are:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sunday and Public Holidays: No work.

Out of hours works would be required to minimise disruptions to the road network. The main works that would be required to occur out of hours would include:

- intersection works at the Milperra Road/ Henry Lawson Drive and Tower Road/ Henry Lawson Drive intersections
- Auld Avenue bridge upgrade works.

Any OOHW would be undertaken in accordance with the *Construction Noise and Vibration Guidelines* (Roads and Maritime 2016).

### 3.3.6 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be identified by the contractor. An indicative list of plant and equipment that would be used for each construction phase is provided in Table 3-5.

Table 3-5 Indicative list of plant and equipment

Activity	Plant and equipment
Preliminary works	Vacuum truck, light vehicles, bogie tipper truck
Utility works	Vacuum truck, light vehicles, backhoe/ excavator, concrete saw, daymaker, generator, crane, whacker plate, compactor, bogie tipper truck, jumping jack
Building and fencing removal	Light vehicle, vacuum truck, excavator, rigid truck, handheld tools, hammer drill, crane, bogie tipper truck
Earthworks	Excavator, grader, light vehicles, bogie tipper truck, rigid truck, backhoe/ excavator, loader, profiler, truck and dog, vacuum truck, water cart, road sweeper, daymaker, generator
Widening and pavement works	Trencher, trucks, hand held tools, angle grinder, backhoe/ excavator, vacuum truck, paver and asphalt finisher, compactor, vibratory roller, concrete saw, concrete pump, concrete agitators, line marking machine, road sweeper, water cart, daymaker, generator, vibratory roller, jumping jack, grader, crane
Bridge and drainage works	Hand held tools, angle grinder, underbore directional drill, vacuum truck, bored piling rig, rigid truck, truck and dog, light vehicle, concrete saw, concrete pump, concrete agitators, road sweeper, water cart, hiab crane, daymaker, vibratory roller, water truck, asphalt paver, grader, crane, large capacity crane
Pedestrian pathway, intersection crossings and shared path works	Handheld tools, angle grinder, vacuum truck, rigid truck, excavator, road sweeper, water cart, concrete saw, concrete pump, concrete agitators, water truck, whacker plate, crane, daymaker, generator
Intersection configuration and traffic signals	Crane, daymaker, vacuum truck, light vehicle, rigid truck, excavator, concrete saw, generator
Landscaping and finishing works	Grader, bobcat, trucks, handheld tools, compactor, trencher, light vehicle, bogie tipper truck, crane, whacker plate, front loader
Removal of ancillary facilities and site rehabilitation	Light vehicle, excavator, trucks, bobcat, handheld tools, crane, bogie tipper truck

### 3.3.7 Earthworks

The proposal would retain, in general, the existing road pavement and level, so that there are minimal earthworks required. However, areas of largest earthwork include either side of the new bridge south of Auld Avenue and adjacent to the Georges River, near Tower Road.

Table 3-6 provides the estimated quantities of materials associated with earthworks as calculated during the concept design stage. As there would be a budget deficit of about 16,000 cubic metres of excavated material to required fill material, additional material would need to be sourced from local suppliers or, preferably, from other Transport projects. Earthworks would be also undertaken for utility works and road widening along Henry Lawson Drive and Milperra Road as shown in Figure 3 1a, Figure 3 1b and Figure 3-1c.

Where possible, cut material would be re-used on site. However, if material is not suitable, it would be classified in accordance with the NSW Environment Protection Authority (EPA) Waste Classification Guidelines (EPA 2014) and disposed of at an approved materials recycling or waste disposal facility.

The final earthwork requirements would be confirmed during detail design.

Table 3-6 Estimated earthworks quantities

Feature of the design	Volume (cubic metres)
Material from excavations (cut)	185
Material required for road alignment (fill)	16,340
Total deficit of cut to fill	16,155

### 3.3.8 Source and quantity of materials

About 620 cubic metres of concrete and 15,850 cubic metres of asphalt would be required. Concrete culverts and pits, along with other materials, would also be required for the proposal. These would be transported to the site and stored temporarily at ancillary sites during construction. Other typical materials that would be used for the construction of the REF proposal include:

- Earthwork materials, such as topsoil, general fill and select fill
- Aggregates for drainage, producing concrete and asphalt and spray seals
- Sand for drainage and producing concrete and asphalt
- Cement for producing concrete
- Concrete for drainage, bridge work and miscellaneous work such as barrier kerbs, kerbs and gutters, paving and signpost footings
- Road base for constructing flexible road surfaces
- Precast concrete elements for bridgework (piles, girders and parapets) and miscellaneous work
- Steel for bridge girders, barrier railings and concrete reinforcement.

Materials would be sourced from appropriately licensed commercial suppliers in nearby areas to minimise haulage routes, where possible. None of the materials proposed to be used are considered to be in short supply.



Water demand for the proposal is only indicative at this stage, however given the nature and scale of the proposal, the proposal is not expected to be water intensive. Water use during construction would be minor and largely used for dust suppression and for the construction of the widened carriageway (e.g. compaction). The water requirement would vary, dependent on material sources and methodologies applied by the construction contractor, and weather conditions. Sufficient potable water would be supplied for about 70 construction staff and this is expected to be about 80kL per annum. The proposed ancillary site on Henry Lawson Drive, for site offices, is an existing building connected to the main water supply network. For other ancillary sites, potable water would be obtained from sources such as portable office water dispensers.

All non-potable water would be sourced from construction sediment sumps, a standpipe (if one is located nearby), local sub-contractor watercarts or an alternative nearby source. Water would be sourced responsibly and in accordance with any water restrictions at the time of construction, or relevant exemptions would be sought. The proposal does not propose to extract water or to apply for a licence to extract water for construction needs or for domestic purposes. Water requirements and water supply options would be further investigated during detailed design.

Source and quantity of road furniture, steel, aggregates and other materials would be confirmed during the detailed design phase.

### **3.3.9 Traffic management and access**

The proposal is expected to generate traffic movements during construction associated with the following activities:

- Delivery of construction materials including concrete and precast structural elements
- Spoil removal
- Importation of fill material for earthworks
- Delivery and removal of construction equipment and machinery
- Construction worker labour force travelling to work and during work.

#### **3.3.9.1 Construction haulage routes**

Several haulage route options would be available during construction and would enable access to the ancillary facilities and work areas from the north (Hume Highway), south (M5 Motorway) and east (Milperra Road). Haulage within the locality of the proposal area may take several routes including:

- Henry Lawson Drive (north) – the proposed road widening work extends north beyond Tower Road. As a result, a turnaround point for construction vehicles would be required further north. A left turn on Rabaul Road would be made using the nearby car park to safely turn around and then make a right turn movement onto Henry Lawson Drive southbound.
- Henry Lawson Drive (south) – work around the southern extent of the proposal and use of the ancillary sites on Auld Avenue and Henry Lawson Drive (opposite Auld Avenue) would require a turnaround point to the south of the proposal. A number of options exist and include:
  - Auld Avenue ancillary facility
  - Roundabout at Bullecourt Avenue and Ashford Avenue intersection accessed via the signalised intersection with Henry Lawson Drive.
  - Raleigh Road tennis centre car park. This option would require traffic management, including temporary line marking and traffic control devices to ensure safe movements without the need for attended traffic control. Further consideration would need to be given to existing pavement conditions, required maintenance and the need to restore any damaged surfaces in consultation with Council.

- Milperra Road (east) – haulage along Milperra Road would be required where a turnaround point could be undertaken at several locations:
  - Roundabout on Nancy Ellis Leebold Drive
  - Roundabout at Bullecourt Avenue and Ashford Avenue intersection accessed via the signalised intersection with Milperra Road.
  - Car parking area close to the signalised intersection of Milperra Road and Murray Jones Drive. Further consideration would need to be given to existing pavement conditions, required maintenance and the need to restore any damaged surfaces in consultation with landowners and/or Council.
- Tower Road – local road adjustments currently in construction for the Bankstown Airport redevelopment may also present opportunities for haulage and construction vehicles to make a safe loop from Henry Lawson Drive/ Tower Road, through the new commercial precinct of the Bankstown Airport, to Murray Jones Drive/ Milperra Road. Consultation with stakeholders including Bankstown Airport Limited would be required should this route be a designated haulage route.

The construction haulage routes are shown in Figure 6-7. The haulage routes would be further investigated prior to construction.

### 3.3.9.2 Construction traffic numbers

Indicative construction traffic numbers for the proposal are provided in Table 3-7.

Table 3-7 Estimated construction traffic

Vehicle type	Total vehicle movements per day	Vehicle movements per day at peak construction period	AM peak movements	PM peak movements
Construction personnel (cars and private vehicles)	15	30	30	35
Light construction vehicles and utes	20	40	35	40
Heavy vehicles and trucks	30	60	70	90

### 3.3.9.3 Access management

Temporary changes in local road and property access during construction are likely to occur along Henry Lawson Drive, Auld Avenue, Tower Road and Starkie Drive. This is likely to occur for the duration of the construction contract. Landowners and occupiers would be consulted about any potential access impacts prior to the commencement of construction.

Access to properties would be maintained during construction. Access may need to be disturbed on a short-term basis and the construction contractor would consult with individual properties and businesses to minimise impacts.

Access for pedestrians and to public transport would be maintained around the construction site during construction. Bus stops on Milperra Road would be moved to allow for safe access. Detours for pedestrian/cyclist access would be implemented within the proposal area. In particular, pedestrian access along the existing shared path along Georges River may be detoured or removed for part of construction. Alternative arrangements would be managed through signage and wayfinding.

Access along Henry Lawson Drive would be maintained through the construction, however, traffic switches and lane closures may be required. Motorists would be kept informed of changed traffic conditions throughout the construction. Access for emergency vehicles would be maintained.

### 3.3.9.4 Road closures

Temporary localised closures of parts of the road network may be required for the widening works, however, these closures would be timed during low traffic periods (such as at night or outside peak periods).

Henry Lawson Drive, Milperra Road and Newbridge Road would all have traffic access maintained, with only lane closures being in effect.

Road closures may occur at Auld Avenue and Tower Road during construction, resulting in restricted access impacts for residents and businesses in these areas.

A Road Occupancy Licence (ROL) would be obtained and consultation with the community undertaken prior to road or lane closures.

## 3.4 Ancillary facilities

To support construction, a range of ancillary facilities would be required. The facilities would include:

- Site compounds for site offices, car parking, sheds, workshops and storage
- Areas for material delivery and storage, including auld avenue bridge structural elements
- Water capture and treatment locations
- Stockpile locations for materials spoil and mulch.

Ancillary facilities would be temporary sites and structures and would be developed for the sole purpose of the construction of the proposal and be returned to pre-existing conditions or rehabilitated.

A range of potential ancillary facilities have been identified within the REF proposal area. The location of these facilities was determined as they are readily accessible to the construction area, and have already been cleared of native vegetation and therefore are likely to be of low ecological or heritage value.

Due to the constrained nature of the site, and nearby presence of the Georges River, identified ancillary sites may have the potential to be impacted by mid to large sized flood events. As such, a Flood Management Plan would be required prior to the development of the sites to ensure appropriate mitigation measures are in place that would minimise any environmental impact associated with flooding of the ancillary site.

If any additional ancillary sites are required, further consultation would be undertaken to identify the suitability of ancillary site locations and whether any additional environmental controls or assessments are necessary.

Furthermore, stockpile sites have been chosen in areas where the possibility of contamination into the surrounding environment from potential acid sulfate soils (ASS) or hazardous materials can be minimised. Effective management in accordance with *Stockpile Site Management Procedure and the QA Specification R44 – Earthworks* would help to mitigate against any potential harm.

Additional information on the environmental impacts of the ancillary sites, including noise impacts to sensitive receivers, are detailed in Chapter 6.

Four sites have been identified for use as ancillary facilities:

- Georges River site –on Henry Lawson Drive on a previous car park area
- Newbridge Road site –on the corner of Newbridge Road and Henry Lawson Drive in the road reserve
- Henry Lawson Drive site –on Henry Lawson Drive opposite Auld Avenue (flood prone land)
- Auld Avenue site –on the corner of Auld Avenue and Henry Lawson Drive.

Erosion and sediment (ERSED) controls are to be installed around ancillary facilities located within the floodplain to reduce the risk of sediment runoff.

An overview of these sites is shown in Figure 3-7.

### **3.4.1 Georges River site**

The Georges River site is located on Henry Lawson Drive opposite the service station (Lot14 DP128950). The site is about 0.13 hectares and is located between Henry Lawson Drive and the shared user pathway along the Georges River (about 22 metres east of the river). Although surrounded by dense vegetation, the site is a former carpark and is mostly cleared with some existing pavement. The Georges River site access would be via Henry Lawson Drive, via a left in/left out arrangement under traffic control. The proximity to the Georges River means that proposed uses on this site are limited to avoid the potential for materials moving off site in the event of a flood.

The proposed site facilities and the storage of materials has the potential to obstruct the conveyance of flow from the Georges River should a flood event greater than 5 per cent AEP in magnitude occur during the construction phase of the proposal. The resulting impacts on flood behaviour are likely to be relatively localised given the extent of Georges River flooding relative to the extent of the ancillary site. However, there is also the potential for materials stored within the ancillary site to be displaced and transported along the Georges River.

The proposed activities associated with the site would not impact on Milperra catchment flooding for events up to 1 per cent AEP.

Potential uses for this ancillary site include:

- General material storage (no fuel or hazmat-based materials)
- Site staff parking
- General waste storage (appropriately bunded or secured) and pick up bay.

### **3.4.2 Newbridge Road site**

Located on the corner of Newbridge Road and Henry Lawson Drive, the Newbridge Road site is about 0.24 hectares. The site is located on Lot11/12/13/14DP1128950 and 3/4/DP17144. The site is mostly cleared, with some vegetation located along the western and northern borders. Newbridge Road borders the site to the south, and Henry Lawson Drive to the east. The Georges River is about 20 metres west of the site.

Site facilities, material storage and associated perimeter fencing have the potential to obstruct the conveyance of flow from the Georges River should a flood event greater than 5 per cent AEP in magnitude occur during the construction phase of the proposal. The resulting impacts on flood behaviour are likely to be relatively localised given the extent of Georges River flooding relative to the extent of the ancillary site. However, there is also the potential for materials stored within the ancillary site to be displaced and transported along the Georges River.

The proposed activities associated with the site would not impact on Milperra catchment flooding for events up to 1 per cent AEP.

The Camoufleur artwork is located adjacent to the site and would be protected throughout the use of the site.

Two sections of the shared user pathway that connects the Henry Lawson Drive and Newbridge Road pathway to the Georges River pathway would be located within the Newbridge Road site. These parts of the shared user path would not be accessible during construction, however access to the shared user path along the Georges River and under the Georges River Bridge would be maintained.



A large portion of the site would form part of the road corridor and associated features during the operation of the proposal.

The Newbridge Road site access would be via Henry Lawson Drive, via a left in/left out arrangement under traffic control.

Potential uses for this ancillary site include:

- Storage of equipment and machinery
- Materials storage
- Delivery pick up and drop off
- Site staff parking.

### **3.4.3 Henry Lawson Drive site**

The Henry Lawson Drive site is located on residential land, Lot16 DP18399. The site would be acquired by Transport for the proposal as the road would be widened to immediately adjacent to the residence. The current residential site encroaches on land that is defined as coastal wetlands under the Coastal Management SEPP along its southern property border. The Henry Lawson Drive site is about 0.29 hectares. The eastern border of the site is comprised of a vegetated creekline and grassed areas that connect to Bankstown Golf Course. There are a number of residential properties close to the site including one property to the north on the eastern side of Henry Lawson Drive and properties on the western side of Henry Lawson Drive and Auld Avenue. Impacts to the residents from construction and use of compound sites are considered in Chapter 6.

While facilities and materials located within the ancillary site have the potential to displace floodwater that backs up from both the Georges River and Milperra Drain, impacts on flood behaviour for events up to 1 per cent AEP are likely to be minor given the extent of flooding relative to the extent of the ancillary site. However, there is the potential for materials stored within the ancillary site to be displaced and transported along Milperra Drain and the Georges River.

This site is the least likely to flood, so is more suited for loose material storage than other areas. These would all be appropriately bunded and secured so as to not impact the adjoining wetlands.

If possible, the existing building structure would be used to form part of the main office space.

Access to the site would be off Henry Lawson Drive via a left in/left out arrangement. Larger trucks and deliveries would require traffic controls to access the site.

Potential uses for this ancillary site include:

- Site staff parking
- Main site offices
- Materials storage
- Storage of topsoil, imported material, green waste.

The Henry Lawson Drive ancillary facility has been identified by Canterbury Bankstown Council as a property that is part of the Voluntary Buyback Scheme as it is located in a flood prone area. Transport would consult with Canterbury Bankstown Council and the Department of Planning, Industry and Environment (DPIE) – Environment, Energy and Science (EES) (former Office of Environment and Heritage) during detailed design. This would determine site restoration requirements for this site, which may include the removal of the existing dwelling and associated structures, following the completion of construction.

#### **3.4.4 Auld Avenue site**

The Auld Avenue site would be located on the corner of Auld Avenue and Henry Lawson Drive. Comprising an area of about 0.14 hectares, the site is located on Lot44 DP7304. It is located on cleared land. The site is currently used as an informal parking area and for undertaking U-turns in Auld Avenue.

There is dense vegetation bordering the south of the site, surrounding a creekline and residential properties located to the north. Gordon Parker Reserve and a shared user path are located to the west of the site, with vehicles accessing the reserve via Auld Avenue.

While facilities and materials located within the ancillary site have the potential to displace floodwater that backs up from both the Georges River and Milperra Drain, impacts on flood behaviour for events up to 1 per cent AEP are likely to be minor given the extent of flooding relative to the extent of the ancillary site. There is the potential for materials stored within the ancillary site to be displaced and transported along Milperra Drain and the Georges River. These materials would all be appropriately bundled and secured so as to not impact the adjoining waterway.

The site is located north and next to the Auld Avenue bridge location and as such, can be used to facilitate activities and materials specific to the bridge construction.

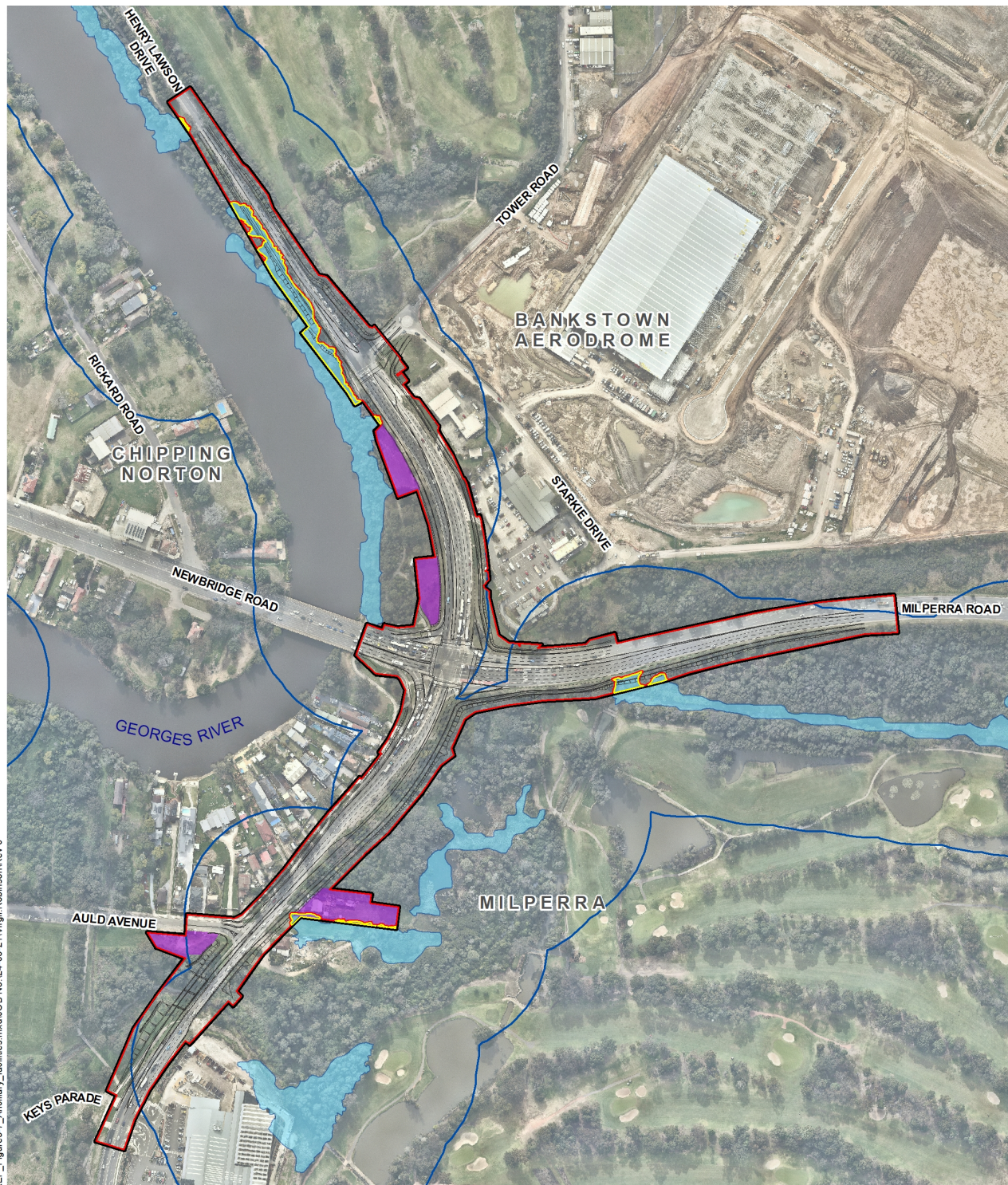
The Auld Avenue site access would be via Auld Avenue and would be a left in, right out arrangement.

Potential uses for this ancillary site include:

- Hardstand and laydown area
- Minor fuel storage
- Crane setup
- Bridge and underbore material storage
- Plant and equipment storage
- Alternative location for site offices.



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- Concept design
- EIS proposal area
- REF proposal area
- Overall proposal boundary
- Ancillary facilities
- Coastal Wetlands
- Coastal Wetlands Proximity Area

Source: Aurecon, TfNSW, Spatial Services, Nearmap



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0 50 100m

Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 3-7: Ancillary facilities



### 3.5 Public utility adjustment

Public utility adjustments and relocations would be required for the proposal (refer Table 3-8). This would include:

- Electricity supply and street lighting
- Gas
- Telecommunications
- Mains water and sewer.

Generally, utility relocations and adjustments along Henry Lawson Drive would largely occur on the eastern side, with utilities on the western side of the road mostly to be retained unless specified in further investigations or designs.

Proposed adjustments would be finalised in consultation with utility providers during detail design. Potential impacts to utilities are discussed further in Chapter 6 of this report.

Table 3-8 Proposed utility adjustments

Utility type	Utility description	Location	Adjustment required
Telecommunications	Telstra, TPG and NBN underground assets	Western side of Henry Lawson Drive from Auld Avenue to the Milperra Road intersection.	Telstra/TPG/NBN conduits from CH360 to CH380 to be relocated.
	Telstra conduit	CH500 crossing Henry Lawson Drive to the eastern side of the road and then north to the Milperra Road intersection.	This section of Telstra asset would need to be relocated.
	Optus optic fibre	Western side of Henry Lawson Drive from CH140 to CH340 at Auld Avenue	Optic fibre to be relocated.
	NBN optic fibre	Milperra Road at CH380	To be relocated
	Telstra (1x P35) conduit	South-east corner of Henry Lawson Drive/Milperra Road intersection	To be relocated
	Six conduits including Telstra, NBN, TPG, Optus, Ucomm and Nextgen assets	Southern side of Milperra Road east of the intersection with Henry Lawson Drive	To be relocated or adjusted
Electricity supply and street lighting	Multiple poles and overhead transmission line	Eastern side of Henry Lawson Drive from CH140 to the intersection with Milperra Road	Electricity supply and street lighting to be relocated
	Ausgrid High Voltage underground asset	Western side of Henry Lawson Drive from CH140 to Auld Avenue (CH340).	To be relocated, potential underboring
Water and sewer	450mm CICAL watermain	CH140 to CH230 on eastern side of Henry Lawson Drive	May need to be adjusted.
	Existing 180mm directional bored PE watermain	Western side of the Auld Avenue bridge	To be relocated



Utility type	Utility description	Location	Adjustment required
	450mm CICL watermain	Eastern side of Henry Lawson Drive that currently runs under the shoulder (CH360 to CH610)	To be relocated
	450mm CICL watermain	Eastern side of Henry Lawson Drive north from the Milperra Road intersection to Tower Road (CH700 to CH980)	To be relocated
Gas	Jemena High Pressure gas main (1050kpa, 150mm steel pipe)	Crosses Henry Lawson Drive at CH600 then runs north-east to Milperra Road.	The section on the eastern side of Henry Lawson Drive would need to be relocated or adjusted
	High Pressure Gas main	Southern side of Milperra Road east of the intersection with Henry Lawson Drive	To be relocated or adjusted

### 3.6 Property acquisition and access

The proposal would require both full and partial property acquisition. Permanent acquisition and temporary lease arrangements would be required on Henry Lawson Drive, Milperra Road and Newbridge Road.

The property acquisition process would be undertaken in accordance with the *Land Acquisition Policy and the Land Acquisition (Just Terms Compensation) Act 1991* and *Land Acquisition Reform 2016*. Throughout the detailed design phase, the extent of property acquisition would be refined and consultation with relevant property owners would occur to develop property adjustment plans.

Proposed property acquisition is presented in Table 3-9 and Figure 3-8.

Table 3-9 Property acquisition and leases

Lot and DP	Total property area m <sup>2</sup>	Area of acquisition/ lease m <sup>2</sup>	Acquisition type	Current owner	Land use zone (LEP)
1//DP1058521	8462	89	Partially acquired	Council	RE1 Public Recreation
1//DP1103168	548	67	Partially acquired	Council	RE1 Public Recreation
1//DP1241576	537	48	Partially acquired	Council	SP2 Infrastructure
		9	Partially acquired		RE1 Public Recreation
1//DP132420	3489	118	Partially acquired	Private	RE1 Public Recreation
		95	Partially leased		RE1 Public Recreation
1//DP181456	2157	155	Partially acquired	Council	SP2 Infrastructure
		520	Partially acquired		RE1 Public Recreation
1//DP433616	41464	99	Partially acquired	NSW Government	SP2 Infrastructure
		111	Partially acquired		RE1 Public Recreation
1//DP433616	41464	116	Partially leased	NSW Government	SP2 Infrastructure
		0	Partially leased		RE1 Public Recreation

Lot and DP	Total property area m <sup>2</sup>	Area of acquisition/ lease m <sup>2</sup>	Acquisition type	Current owner	Land use zone (LEP)
1//DP547711	1551	983	Partially acquired	Council	RE1 Public Recreation
11//DP1128950	516	57	Partially acquired	Council	SP2 Infrastructure
		82	Partially acquired		RE1 Public Recreation
12//DP1128950	428	428	Totally acquired	Council	SP2 Infrastructure
		0	Partially acquired		RE1 Public Recreation
122//DP1037071	6125	229	Partially leased	Federal Government	SP2 Infrastructure
13//DP1128950	368	368	Totally acquired	Council	SP2 Infrastructure
13//DP584447	456855	33	Partially leased	Private	RE1 Public Recreation
14//DP1128950	28085	14254	Partially acquired	Council	SP2 Infrastructure
		2024	Partially acquired		RE1 Public Recreation
		39	Partially leased		RE1 Public Recreation
14//DP18399	3035	121	Partially acquired	Council	SP2 Infrastructure
		594	Partially acquired		RE1 Public Recreation
15//DP17516	1305	31	Partially acquired	Private	SP2 Infrastructure
		46	Partially leased		SP2 Infrastructure
15//DP18399	3411	40	Partially acquired	Council	SP2 Infrastructure
		559	Partially acquired		RE1 Public Recreation
		347	Partially leased		RE1 Public Recreation
16//DP17516	1360	32	Partially acquired	Private	SP2 Infrastructure
		43	Partially leased		SP2 Infrastructure
16//DP18399	3000	3000	Totally acquired	Private	RE1 Public Recreation
17//DP18399	3240	199	Partially acquired	Council	RE1 Public Recreation
		42	Partially leased		RE1 Public Recreation
2//DP1103168	597	58	Partially acquired	Private	RE1 Public Recreation
2//DP132420	3722	108	Partially acquired	Council	RE1 Public Recreation
		82	Partially leased		RE1 Public Recreation
2//DP213387	77564	191	Partially acquired	NSW Government	SP2 Infrastructure
		313	Partially acquired		RE1 Public Recreation
2//DP547711	1230	779	Partially acquired	Council	RE1 Public Recreation
23//DP1254914	9658	712	Partially leased	Private	RE1 Public Recreation
231//DP1132273	23508	390	Partially acquired	Federal Government	SP2 Infrastructure

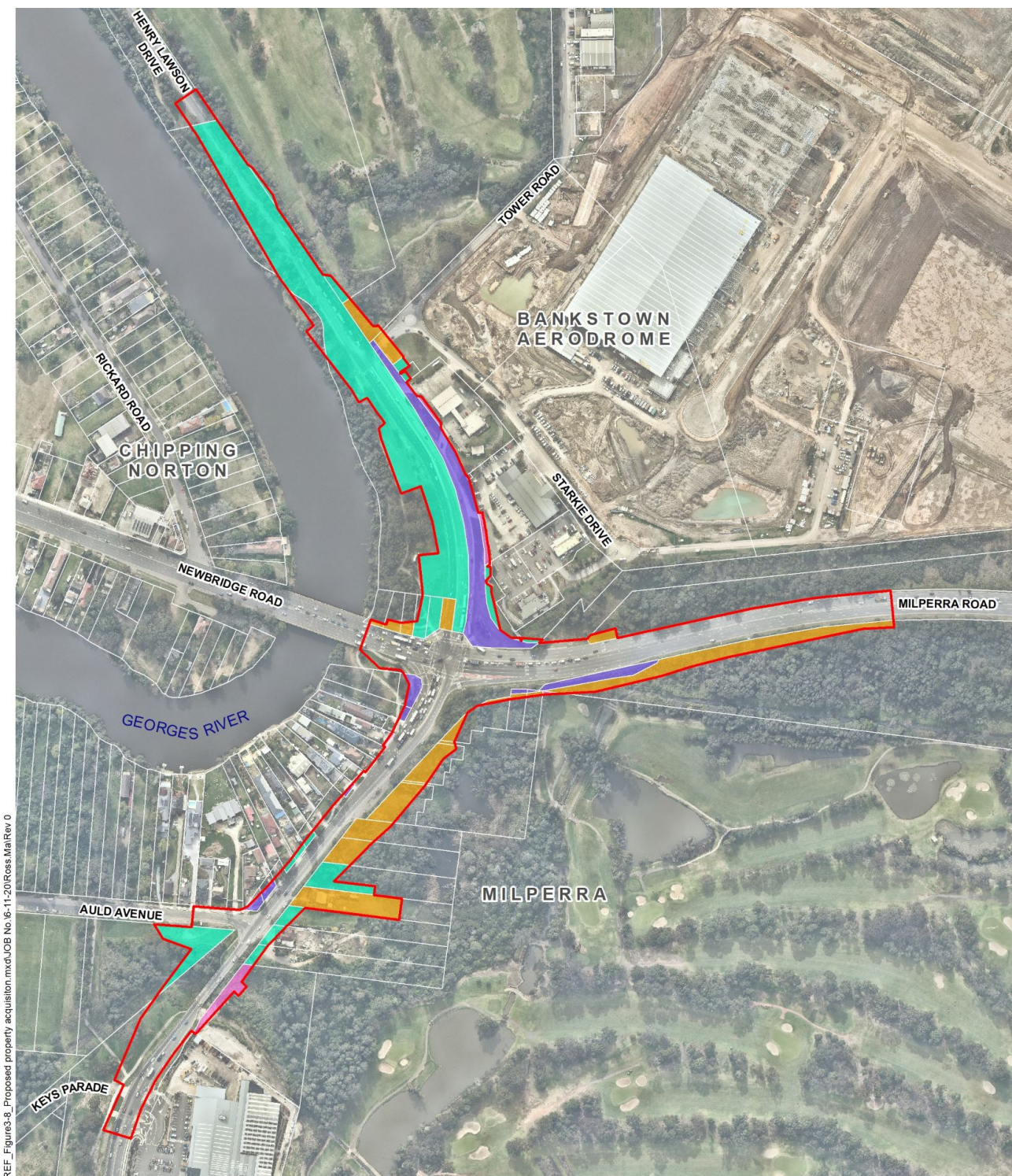
Lot and DP	Total property area m <sup>2</sup>	Area of acquisition/ lease m <sup>2</sup>	Acquisition type	Current owner	Land use zone (LEP)
232//DP1132273	314	53	Partially acquired	Federal Government	SP2 Infrastructure
		121	Partially leased		SP2 Infrastructure
275//DP1122545	4131	79	Partially acquired	Federal Government	SP2 Infrastructure
		299	Partially leased		SP2 Infrastructure
292//DP41530	21171	129	Partially acquired	Crown	SP2 Infrastructure
		103	Partially acquired		RE1 Public Recreation
294//DP1122545	23	5	Partially leased	Federal Government	SP2 Infrastructure
3//DP1103168	55648	2845	Partially acquired	Crown	RE1 Public Recreation
3//DP17144	480	45	Partially acquired	Council	SP2 Infrastructure
		102	Partially acquired		RE1 Public Recreation
3//DP547711	1432	274	Partially acquired	Council	RE1 Public Recreation
4//DP17144	495	155	Partially acquired	Council	SP2 Infrastructure
		248	Partially acquired		RE1 Public Recreation
44//DP7304	9869	76	Partially acquired	Council	SP2 Infrastructure
		1537	Partially acquired		RE1 Public Recreation
6//DP17516	1014	37	Partially leased	Private	SP2 Infrastructure
687//DP869348	5017	105	Partially leased	Federal Government	SP2 Infrastructure
Crown Waterway	N/A	24.3	Partially acquired	Crown	RE1 Public Recreation
		7.25	Partially acquired		SP2 Infrastructure

The proposal would require a partial property acquisition of 125 square metres of Aboriginal claim land surrounding Milperra Road. The land is impacted by the widening of Milperra Road and the encroachment of road embankments. Transport would continue to consult with Local Aboriginal Land Councils during the detailed design phase to minimise impacts to both the acquired land and adjacent Aboriginal claim land.

The proposal would also require the partial acquisition of five areas of crown land, including areas of crown water along the Georges River. Additionally, another five areas of crown land would be temporarily leased during the construction of the project. The acquisition and lease of these properties would be undertaken in accordance with the legislative requirements as listed in the *Crown Lands Management Act 2016* (Crown Lands Act). Further details of the Crown Lands Act are described in Section 4.2.2.

Access to properties would be maintained by the proposal. Access to businesses north of Tower Road is discussed in Section 3.2.3. Access to residential properties along Henry Lawson Drive, south of Newbridge Road would also be maintained. While the setback from Henry Lawson Drive to the property boundary would be reduced, driveway access would be maintained. Driveways would be designed in accordance with relevant road design and safety guidelines. Further discussion of the driveways and access impacts are considered in Section 6.6. Driveway access to residential properties would be further considered during detailed design. Sight distances, setbacks and gradients will be designed in accordance with the Austroads Road Design Guides, Roads and Maritime Service (Transport) Supplements and Canterbury Bankstown Council Standard Drawings.





- Overall proposal boundary
- Property acquisition
- Property to be leased for construction
- Property acquisition and to be leased for construction
- Property owned by TfNSW

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Source: Aurecon, TfNSW, Spatial Services, Nearmap



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## Henry Lawson Drive Stage 1A Review of Environmental Factors

Projection: GDA 1994 MGA Zone 56

FIGURE 3-8: Proposed property acquisition

## 4 Statutory and planning framework

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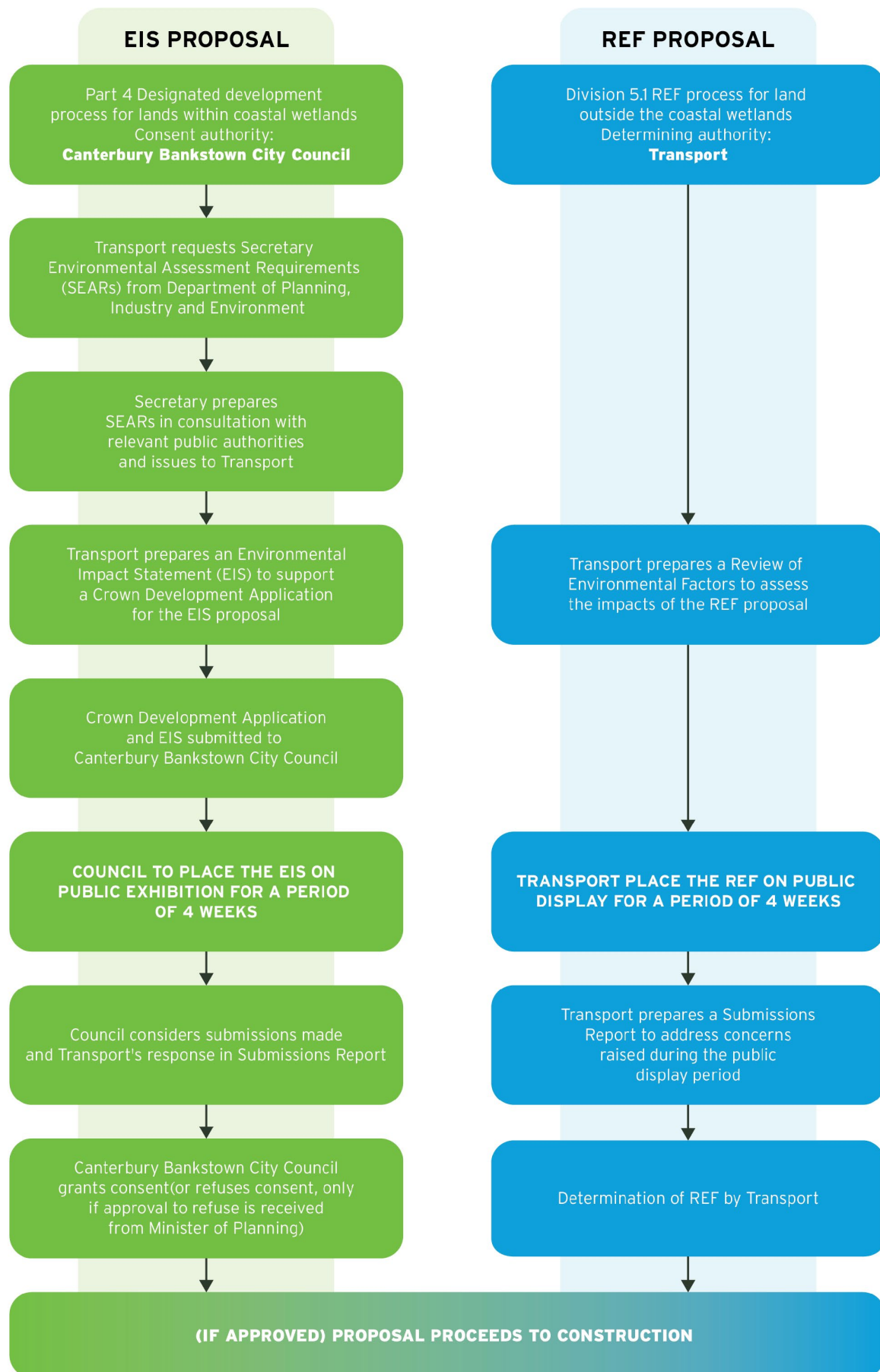
This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans (LEPs) and other legislation.

### 4.1 Environmental Planning and Assessment Act 1979

The EP&A Act provides the statutory basis for planning and environmental assessment in NSW. The EP&A Act provides the framework for environmental planning and development approvals, including provisions to ensure that the potential environmental impacts of a development are assessed and considered in the decision making process. The REF proposal is subject to assessment under Part 5 of the EP&A Act. Part of the proposal is also required to be assessed under Part 4 of the EP&A Act due to the application of the Coastal Management SEPP.

The requirement for a separate approval is discussed in Section 4.2.1, while the relationship between this REF and the EIS is discussed in Section 1.3. The planning and assessment framework for the REF proposal is outlined in the following sections. Figure 4-1 shows the approval process for the proposal under both Parts 4 and 5 of the EP&A Act.





Source: Aurecon

Figure 4-1 Approval process for the REF and the EIS

## 4.1.1 State Environmental Planning Policies

### 4.1.1.1 State Environmental Planning Policy (Infrastructure) 2007

*State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of the ISEPP allows for development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. Outside of land mapped as coastal wetlands (discussed further in the following section), the proposal is for a road and road infrastructure facilities and is to be carried out by or on behalf of Transport, a public authority. Therefore the REF proposal would be assessed under Division 5.1 of the EP&A Act.

Where the proposal is located within areas of land mapped as coastal wetlands, the remainder of the proposal (i.e. the EIS proposal) would be assessed under Part 4 of the EP&A Act.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) and does not require development consent or approval under the *State Environmental Planning Policy (State and Regional Development) 2011* or the *State Environmental Planning Policy (State Significant Precincts) 2005*.

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF. Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

### 4.1.1.2 State Environmental Planning Policy (Coastal Management) 2018

The Coastal Management SEPP aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the [Coastal Management Act 2016](#) (Coastal Management Act). The coastal zone is defined in the Coastal Management Act as being the area of land comprised of one or more of four coastal management areas:

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

Under clause 10 of the Coastal Management SEPP, any development carried out on land identified as coastal wetlands requires development consent. Development may include earthworks, draining the land and clearing of certain vegetation.

Coastal wetlands are located within the EIS proposal areas shown on Figure 1-2 in the following areas:

- On the western side of Henry Lawson Drive, north of Newbridge Road and opposite Tower Road. This area includes some of the existing road footprint and parts of the vegetated corridor between the Georges River and Henry Lawson Drive.
- On the southern side of Milperra Road. Mainly within the road corridor and reserve, with some small areas located within Ashford Reserve.
- On the eastern side of Henry Lawson Drive, opposite the Auld Avenue intersection. This includes some areas within private property to be acquired and sections of the road corridor.

As the EIS proposal requires development within areas mapped as coastal wetlands, the development is declared as designated development pursuant to Clause 10(2) of the Coastal Management SEPP and Section 3.17 of the EP&A Act. The EIS proposal and impacts are assessed in the Henry Lawson Drive Stage 1A Environmental Impact Statement.



Indirect impacts of the REF proposal on the coastal wetlands are considered as part of the REF. Together, the EIS and this REF assess the potential environmental impacts of the overall proposal and it is intended that these documents be read in conjunction with each other.

The REF proposal is not on any land identified as coastal wetlands, however, is located within the 'proximity area for coastal wetlands' mapped under the Coastal Management SEPP. Clause 11 of the Coastal Management SEPP details states that development consent must not be granted to development on land wholly or partly identified as "proximity area for coastal wetlands" unless the consent authority is satisfied that the proposed development would not significantly impact on the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or; the quantity and quality of surface and ground water flows to the adjacent coastal wetland. While the REF is being assessed under Part 5 of the EP&A Act and development consent is not required, as due diligence, Chapter 6 of the REF assesses these potential impacts from the REF proposal and have identified that these impacts would not be significant.

Sections of the REF proposal area are also mapped as coastal use and coastal environment areas under the Coastal Management SEPP. The matters of consideration for the coastal use and coastal environment areas are also located within the REF proposal area and where they are considered in the REF is detailed in Table 4-1.

Table 4-1 Coastal Management SEPP Matters for consideration

Area	Matter for consideration	Where addressed in REF
Coastal environment area (CI 13)	Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—	
	a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	Section 6.1, Section 6.3 and Section 6.4
	b) coastal environmental values and natural coastal processes	Section 6.3 and Section 6.4
	c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	Section 6.3 and Section 6.4
	d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	Section 6.1
	e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	Section 6.11
	f) Aboriginal cultural heritage, practices and places	Section 6.8
	g) the use of the surf zone.	N/A
Coastal use area (CI 14)	Development consent must not be granted to development on land that is within the coastal use area unless the consent authority:	
	a) has considered whether the proposed development is likely to cause an adverse impact on the following—	
	(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	Section 6.2

Area	Matter for consideration	Where addressed in REF
	(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores	Section 6.10 and Section 6.11
	(iii) the visual amenity and scenic qualities of the coast, including coastal headlands	Section 6.10
	(iv) Aboriginal cultural heritage, practices and places	Section 6.8
	(v) cultural and built environment heritage	Section 6.8 and Section 6.9

#### 4.1.1.3 State Environmental Planning Policy No 55 – Remediation of Land

The *State Environmental Planning Policy No 55 – Remediation of Land (1998 EPI 520)* aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment –

- a) By specifying when consent is required, and when it is not required, for a remediation work, and
- b) By specifying certain considerations that are relevant in rezoning land and in determining development applications in general and development applications for consent to carry out a remediation work in particular, and
- c) By requiring that a remediation work meet certain standards and notification requirements.

A preliminary site investigation (PSI) has been carried out for the overall proposal area and is summarised in Section 6.5. The investigation detected contamination and potential contaminated areas within and near the REF proposal area. As a result of these findings, recommendations were made for further investigation. As part of the overall proposal, a Detailed Site Investigation would be undertaken.

#### 4.1.1.4 Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment

The Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment 1999 (GMREP) provides planning principles that apply to land within the Georges River Catchment. The GMREP aims to maintain and improve water quality and river flows of the Georges River to ensure that development avoids and/or minimises impacts to the catchment. The other objectives of the GMREP include the need to protect and enhance the environmental quality of the catchment, manage the use of resources in the catchment and deliver the principles of ecologically sustainable development (ESD) within the catchment.

Part 2, Clause 7 of the GMREP states that the planning principles identified in the plan apply when a public authority proposes to carry out development or an activity which does not require development consent, but which has the potential to adversely affect the water quality, river flows, flood regime or ecosystems within the catchment.

The overall proposal is consistent with the objectives and planning principles of the GMREP. The overall proposal would consider potential impacts to water quality, river flows, flooding and ecosystems within the catchment, including erosion and sedimentation and potential water quality impacts during construction (refer Chapter 6). Specialist studies undertaken are provided in the Appendices. Mitigation measures to avoid and reduce the potential impacts on the Georges River are included in Section 7.2.

## 4.1.2 Local Environmental Plans

### 4.1.2.1 Bankstown Local Environmental Plan 2015

The overall proposal is located within the City of Canterbury-Bankstown LGA. The City of Canterbury-Bankstown was formed in May 2016, replacing the former Bankstown City and Canterbury City Councils. The amalgamation process did not consolidate the LEPs of the local councils, and as a result, the Bankstown Local Environmental Plan 2015 (Bankstown LEP) and Canterbury Local Environmental Plan 2012 (Canterbury LEP) remain in force.

As the proposal is located within the former Bankstown City Council LGA, the Bankstown LEP applies. Table 4-2 outlines the land use zones under the Bankstown LEP and consistency of the REF proposal against the objectives of each zone. Figure 4-2 illustrates the land use zones under the Bankstown LEP within the REF proposal area.

Table 4-2 Consistency of REF proposal with LEP zones

Zone	Objective of zone	Consistency of proposal with objectives
SP2 Infrastructure	<ul style="list-style-type: none"><li>To provide for infrastructure and related uses</li><li>To prevent development that is not compatible with or that may detract from the provision of infrastructure</li></ul>	The proposal would be consistent with the objectives of this zone as it is road infrastructure.
RE1 Public Recreation	<ul style="list-style-type: none"><li>To enable land to be used for public open space or recreational purposes</li><li>To provide a range of recreational settings and activities and compatible land uses</li><li>To protect and enhance the natural environment for recreational purposes</li></ul>	<p>The proposal once constructed would improve recreational settings through improvements to active transport linkages.</p> <p>The proposal has been designed to minimise impacts on the natural environment and scenic resources.</p>

Under the LEP, development for the purposes of roads is permitted in the SP2 and RE1 zones with consent from Council. However, as the ISEPP overwrites the LEP, the REF proposal can be approved under Part 5.1 of the EP&A Act, development consent from Council is not required.

There are also a series of additional local provisions in Part 6 of the Bankstown LEP, including provisions relating to:

- ASS (clause 6.1)
- Earthworks (clause 6.2)
- Flood planning (clause 6.3)
- Biodiversity (clause 6.4)
- Riparian land and watercourses (clause 6.5).

In October 2020, a consolidated LEP for the LGA was drafted by Canterbury Bankstown Council. The *Draft Canterbury Bankstown Consolidated Local Environmental Plan* (Draft Consolidated LEP) has undergone public consultation and is currently being reviewed by DPIE.

As the Draft Consolidated LEP has not yet commenced, the provisions of the Bankstown LEP apply to the REF proposal. However, the Draft Consolidated LEP land zoning map illustrates zones within the proposal to remain SP2 Infrastructure and RE1 Public Recreation, consistent with the zones identified within Table 4-2.





## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 4-2: Land zoning



## 4.2 Other relevant NSW legislation

### 4.2.1 Coastal Management Act 2016

The Coastal Management Act replaces the repealed *Coastal Protection Act 1979*, establishing a strategic framework and objectives for managing coastal issues in NSW. The Coastal Management Act promotes strategic and integrated management, use and development of the coast for the social, cultural and economic wellbeing of the people of NSW.

As mentioned in Section 4.1.1, the Coastal Management Act defines the coastal zone as comprising of the four coastal management areas. The Coastal Management Act establishes management objectives specific to each of the management areas, reflecting their different values to coastal communities and the priorities for those areas.

The REF proposal is subject to the provisions of the Coastal Management Act as it partially located within proximity to coastal wetlands, coastal environment and coastal use areas. The Coastal Management Act has the following management objectives for coastal environment and coastal use areas.

#### 4.2.1.1 Coastal environment areas management objectives

- To protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity,
- To reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change,
- To maintain and improve water quality and estuary health,
- To support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons,
- To maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place,
- To maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.

Assessment of potential impacts to biodiversity, surface and groundwater and socio economic from the REF proposal are assessed in Chapter 6.

#### 4.2.1.2 Coastal use areas management objectives

To protect and enhance the scenic, social and cultural values of the coast by ensuring that—

- (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and
  - (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and
  - (iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and
  - (iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and
  - (v) the use of the surf zone is considered,
- to accommodate both urbanised and natural stretches of coastline.

Assessment of potential impacts to biodiversity, surface and groundwater and socio economic from the REF proposal are assessed in Chapter 6.

Areas of the EIS proposal impacting on land mapped as a coastal wetlands area are assessed in the Henry Lawson Drive Stage 1A Environmental Impact Statement.

The EIS assesses the potential environmental impacts in accordance with the requirements of the Coastal Management Act and Coastal Management SEPP.

#### **4.2.2 Crown Lands Management Act 2016**

The *Crown Land Management Act 2016* (Crown Land Management Act) provides a streamlined framework from Crown land administration and management in NSW. The objectives of the Crown Land Management Act include:

- Providing for the ownership, use and management of the Crown land
- Requirements that environmental, social, cultural heritage and economic considerations be taken into account in decision-making about Crown land
- Facilitating the use of Crown land by the Aboriginal people of NSW
- Providing for the management of Crown land whilst having regard to the principles of 'Crown land management'.

Under Clause 2.18 (1), the Minister for Primary Industries can:

'Despite any other provision of this Act, the Minister may grant a lease, licence, permit, easement or right of way over dedicated or reserved Crown land for any of the following purposes (a relevant interest)—

- (a) Any facility or infrastructure,
- (b) Any other purpose the Minister thinks fit.'

As detailed within Section 3.6, the REF proposal would require the occupation of parcels of Crown land. The need and extent of acquisition and any relevant permit/lease of Crown land for the REF proposal would be discussed with DPIE (Crown land) and in accordance with the requirements of the Crown Land Management Act.

Once REF and EIS has been determined and funding approved, Transport will acquire the Crown land through Treasury Direction.

#### **4.2.3 Roads Act 1993**

The *Roads Act 1993* (The Roads Act) provides guidance on the use and access of public roads, including procedures regarding the opening and closure of public roads. The Act also classifies roads and identifies the functions of road authorities.

The Roads Act states that a road authority may carry out road work on any public road for which it is the road's authority and on any other land under its control (Division 1, Clause 71). If the road is not under the control of the authority undertaking the works, then consent is required.

The overall proposal is located on roads that are managed by Transport. A ROL would be required from Transport by the Contractor for road works and any temporary road closures during construction of the proposal.

#### **4.2.4 Protection of the Environment Operations Act 1997**

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates land, air, noise and water pollution in NSW. It also aims to provide opportunity for increased public involvement and access to information regarding environmental protection.

An environment protection licence (EPL) is required for scheduled activities or scheduled development work outlined in Schedule 1 of the POEO Act. The following scheduled activities potentially apply to the proposal:

- Road construction if it results in four or more traffic lanes (not including bicycle lanes or lanes used for entry or exit), where the road is classified or proposed to be classified as a main road for at least three kilometres of its length in the metropolitan area, and for at least five kilometres in any other area
- Extractive activities, where excavation required for the proposal is greater than 30,000 tonnes per year
- Cement or lime handling, meaning the handling of cement, fly ash, powdered lime (other than agricultural lime) or any other similar dry cement products.

The overall proposal does not meet these trigger levels, therefore an EPL would not be required for the proposal.

#### **4.2.5 Heritage Act 1977**

The *Heritage Act 1977* (Heritage Act) is concerned with all aspects of conservation ranging from the most basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.

Approval under Section 57(1) is required for works to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register. No State Heritage Register items are identified within the overall proposal area. The Heritage Act states that an excavation permit is required under Section 139 to disturb or excavate any land containing or likely to contain a relic. The historical archaeological potential of the overall proposal area is summarised in Section 6.9.

Section 170 of the Heritage Act requires that culturally significant items or places managed or owned by Government agencies are listed on the departmental Heritage and Conservation Register (Section 170 Register). Information on these registers has been prepared in accordance with Heritage Division guidelines. No items listed on the Transport Section 170 register have been identified within or close to the overall proposal area.

No heritage approvals are required for the REF proposal area.

#### **4.2.6 National Parks and Wildlife Act 1979**

The NPW Act provides the basis for legal protection and management of National Parks estate and Aboriginal sites and objects in NSW. Section 86 lists offences relating to harming or desecrating Aboriginal objects. An Aboriginal heritage impact permit (AHIP) is required under Section 90 of the NPW Act to harm an Aboriginal heritage object.

An Aboriginal cultural heritage assessment was undertaken for the proposal (Appendix C). Findings of the assessment are summarised in Section 6.8. The proposal would impact one Aboriginal archaeological site located within the REF proposal area. An AHIP would be required and would be implemented as part of the CEMP, in consultation with all relevant Aboriginal groups.

If unexpected archaeological items or items of indigenous heritage significance are discovered during the construction of the overall proposal, all works would cease, and Transport's *Standard Management Procedure - Unexpected Heritage Items* would be implemented.

#### **4.2.7 Aboriginal Land Rights Act 1983**

Through the *Aboriginal Land Rights Act 1983*, vacant Crown land not lawfully used or occupied or required for an essential purpose or for residential land, is returned to Aboriginal people (and vested in Aboriginal Land Councils). In accordance with Section 42B of the *Aboriginal Land Rights Act*, land vested in an Aboriginal Land Council can only be acquired by Transport through an Act of Parliament.

Under section 39, the Minister may acquire land (including an interest in land) by agreement or by compulsory process in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*. The Minister may only do so if the Minister is of the opinion that there are exceptional circumstances which warrant the acquisition of land for the purpose of satisfying the objectives of this Act.

The REF proposal would require a partial property acquisition of properties that are subject to an Aboriginal land claim. Transport would continue to consult with Local Land Councils during the detailed design phase to minimise impacts to any Aboriginal land claim land.

#### **4.2.8 Water Management Act 2000**

The *Water Management Act 2000* (WM Act) aims to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The WM Act is based on the principles of ESD, aiming to ensure the fundamental health of rivers and groundwater systems and associated wetlands, floodplains, estuaries are protected.

The REF proposal area is covered by the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011*. Therefore, the WM Act applies to the REF proposal area.

A controlled activity approval is required from the DPIE (Water) for certain types of developments and activities that are carried out in or near a river, lake or estuary. Transport, as a public authority, is exempt from the requirements to obtain a controlled activity approval under Clause 38 of the *Water Management (General) Regulation 2011*.

As mentioned in the Groundwater Impact Assessment undertaken for the proposal (Aurecon, 2021), features of the WM Act (including relation to drainage management, aquifer interference activities) and general principles for design specific to the overall proposal have been considered (refer Section 6.4).

A controlled activity approval is required from the DPIE (Water) for certain types of developments and activities that are carried out in or near a river, lake or estuary. Transport, as a public authority, is exempt from the requirements to obtain a controlled activity approval under Clause 38 of the *Water Management (General) Regulation 2004*. Aquifer interference approval is therefore not required in regard to the potential impacts to groundwater dependent ecosystems (GDEs).

Elements of the WM Act (including relation to drainage management, aquifer interference activities) and general principles for design specific to the overall proposal have been considered in this assessment to inform potential construction and operational phase risks of the proposal. The REF proposal has several direct and indirect impacts relevant to groundwater. Groundwater monitoring and other safeguards are therefore proposed. It is noted that the proposal does not intend to extract large quantities of groundwater that would trigger the need to apply for a water extraction licence (under the NSW AIP (DPI Office of Water, 2012)). There is potential to encounter groundwater, however, the proposal would not extract groundwater for the purposes of water supply.



#### 4.2.9 Fisheries Management Act 1994

The FM Act aims to conserve, develop and share the fishery resources for the benefit of present and future generations in NSW.

The Georges River is located next to the REF proposal and is classified as key fish habitat. Milperra Drain is also located within the overall proposal area, under the Auld Avenue Bridge. Section 199 of FM Act states that a public authority that proposes to carry out dredging or reclamation must provide the Minister written notice of the proposed work and consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice. Dredging and reclamation would not be required for the REF proposal, therefore notice to the Minister would not be required for these activities.

Section 205 of the FM Act states that a person must not harm marine vegetation in a protected area, except under the authority of a permit issued by the Minister. Marine vegetation includes mangroves, seagrasses and other marine vegetation declared by regulation. The REF proposal would remove a small amount of mangrove forest vegetation community. As such, a permit from the Minister would be required prior to the commencement of construction. Impacts on mangroves are considered further in Section 6.2.3.

While the REF proposal would involve work near the Georges River and over Milperra Drain near Auld Avenue, work would not obstruct fish passage as the majority of the river and creek would be passable to fish at any given time. A permit would not be required for this part of the proposal under Section 219 of the FM Act.

#### 4.2.10 Biodiversity Conservation Act 2016

The BC Act seeks to conserve biological diversity, promote ESD, prevent extinction and promote the recovery of threatened species, populations and ecological communities and to protect areas of outstanding biodiversity value.

A Biodiversity Assessment Report (BAR) was undertaken for the REF and a Biodiversity Development Assessment Report (BDAR) developed for the EIS (undertaken by WSP on behalf of Transport in 2021). Section 7.3 of the BC Act and Part 7A of the FM Act require that the significance of the impact on threatened species, and endangered ecological communities is assessed using a five-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Results of biodiversity assessments undertaken for the proposal have indicated that four threatened ecological communities (TECs) listed under the BC Act and three TECs under the EPBC Act were recorded within the overall proposal area:

- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (BC/EPBC Acts)
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act)
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC/EPBC Acts)
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. (BC/EPBC Acts).

Two threatened flora species, *Callistemon linearifolius* and *Acacia pubescens*, both listed as vulnerable under the BC Act and the EPBC Act were recorded within the overall proposal area. *Callistemon linearifolius* would be affected by the proposal via the direct removal of approximately 23 plants.

The three EPBC Act listed threatened fauna species that are considered at least moderately likely to occur within the study area on occasion based on the presence of suitable habitat include:

- Swift Parrot (listed as Critically Endangered)
- White-throated Needletail (listed as Vulnerable)
- Grey-headed Flying-fox (listed as Vulnerable).

The overall outcome of the tests of significance and EPBC Act assessments of significance indicated that there is a high level of certainty that the impacts to threatened biodiversity are unlikely to be significant. Given the proposal is not likely to lead to a significant impact on threatened species, populations, ecological communities or their habitats, a SIS or BDAR is not required under the BC Act to support this proposal.

Further detail on the biodiversity assessment conducted for this proposal is provided in Section 6.1.

#### **4.2.11 Biosecurity Act 2015**

To prevent, eliminate and minimise biosecurity risks posed by biosecurity matter and carriers, the NSW Government established the *Biosecurity Act in 2015*, repealing the *Noxious Weeds Act 1993*. The *Biosecurity Act 2015* promotes biodiversity and the management of:

- Pests, diseases, contaminants and other biosecurity matter that are economically significant for primary production industries
- Threats to terrestrial and aquatic environments arising from pests, diseases, contaminants and other biosecurity matter
- Public health and safety risks arising from contaminants, non-indigenous animals, bees, weeds and other biosecurity matter known to contribute to human health problems
- Pests, diseases, contaminants and other biosecurity matter that may have an adverse effect on community activities and infrastructure.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Weeds were identified within the overall proposal area and would be managed in accordance with the requirements of the Biosecurity Act. Further information is provided in Section 6.1

### **4.3 Commonwealth legislation**

#### **4.3.1 Environment Protection and Biodiversity Conservation Act 1999**

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on MNES or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6.

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of Chapter 6 and Appendix A.

#### **4.3.1.1 Findings – matters of national environmental significance**

The assessment of the REF proposal's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Agriculture, Water and the Environment under the EPBC Act.

#### **4.3.1.2 Findings – nationally listed biodiversity matters (where the strategic assessment applies)**

The assessment of the REF proposal's impact on nationally listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

#### **4.3.2 Native Title Act 1993**

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken, with no Native Title holders/claimants identified for the REF proposal.

### **4.4 Confirmation of statutory position**

The overall proposal is categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. There are different statutory positions for the REF and EIS proposals.

Under clause 94 of ISEPP the REF proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act. Transport is the determining authority for the proposal. This REF fulfils Transport's obligation under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

Under clause 94 of ISEPP, the EIS proposal is not permissible without consent as it is located on coastal wetlands. Under the Coastal Management SEPP, the development is declared as designated development pursuant to Clause 10(2). As such, a Crown Development Application is to be submitted to Canterbury Bankstown Council as the consent authority.

## 5 Consultation

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This chapter discusses the overall proposal's consultation to date, as well as future consultation activities.

### 5.1 Consultation strategy

The *Henry Lawson Drive Upgrade Stage 1A: Communication and Consultation Strategy* (consultation strategy) has been implemented for the overall proposal. The objective of the consultation strategy is to ensure local residents, businesses and stakeholders are aware of and are consulted during the development and delivery of the proposal. This includes during the development of the concept design, environmental assessment, detailed design and construction phases.

The consultation strategy outlines Transport for NSW milestones, methods and reporting. Communication and consultation milestones include (but are not limited to):

- Consultation and reporting on the early concept design (completed 2020)
- Consultation with affected residents, businesses and stakeholders for the preparation of the SEARS report (completed 2020)
- Public display of the REF and EIS (expected mid-2021), which would include:
  - Notifications
  - Engagement with local council
  - Project web portal
  - Public meetings and/or community information events (virtual or otherwise)
  - Publication of frequently asked questions (faq) documents
  - Briefing notes
  - Media engagement (coordinated with transport media)
  - Publication of outcomes
- Targeted community and stakeholder consultation during the detailed design phase
- Public engagement during construction
  - Advanced/start of work notifications
  - Traffic management notifications, including any lane closures
  - Night time work notifications and consultation
  - Quarterly project updates
  - Responding to enquiries and complaints
  - End of construction
- Ongoing construction communication (jointly provided by Transport and the construction contractor).

Other activities include (but are not limited to) separate engagement with local residents, businesses and stakeholders on specific or sensitive aspects of the proposal (i.e. continued access to Auld Avenue).



## 5.2 Community involvement

Transport has involved the community during the concept design development phases, and in preparing the REF.

Community consultation and engagement activities sought comments, feedback, ideas and suggestions on the proposed early concept design features. It also served as contact with potentially-affected residents and stakeholders, and to build a comprehensive database of any interested and concerned community members.

Consultation activities with the community undertaken to date are detailed within Table 5-1.

Table 5-1 Summary of community consultation undertaken to date

Date	Summary
February 2020	Have your say – early concept design features The ‘have your say’ consultation was undertaken to inform community members and stakeholders about the early concept design features. 78 submissions were received over a one month period
July 2020	Early concept design community consultation A consultation report was published in July 2020, presenting community feedback. A community update was distributed to around 5500 properties in the surrounding area.
October 2020	Community feedback A range of community feedback was received from telephone discussions in response to Transport letters.
September 2020	Community feedback Consultation letters to residents and businesses seeking feedback for Transport to consider when undertaking impact assessments and preparing the REF and EIS.
September 2020	Meeting with Registered Aboriginal Parties (refer to Section 5.3)
November 2020	Community feedback A range of community feedback was received on November 2020 regarding the proposed upgrades to Henry Lawson Drive. Transport responded to community concerns via letter and email.
February 2021	Henry Lawson Drive, Georges Hall – community consultation A separate upgrade of Henry Lawson Drive at Georges Hall. Public notifications and social media advertising reached an audience of 31,500 people and received 92 submissions.

### 5.2.1 Summary of community consultation activities

The key themes and issues identified through the consultation period relate to the extent of the Stage 1A upgrade and proposed widening, design alterations/options including consideration of an underpass or overpass, as well as other design suggestions for consideration.

A summary of the key issues raised by the community during community consultation activities is provided in Table 5-2. The summary outlines how they are relevant to the proposal, and how they have been addressed in the REF.

### **5.2.1.1 Consultation undertaken before preparation of the REF**

Transport undertook community consultation around the concept design for the overall proposal in February 2020.

Community consultation and community engagement was carried out to understand community views and values so that feedback could be considered in further development of the concept design. Community consultation aimed to seek comments, feedback, ideas, and suggestions on the proposed early concept design features, identify and contact any potentially affected residents and stakeholders, and to build a comprehensive database of any interested and concerned community members.

Throughout the consultation period, there was a community update that occurred via a letterbox distribution to 5500 local properties. During this period there were 78 comments/submission received.

Community consultation on the early concept design was done over a period of 28 days. The consultation report was prepared in July 2020 and is placed on the project website **[nswroads.work/henrylawsondrive](https://nswroads.work/henrylawsondrive)**

Table 5-2: Summary of issues raised by the community

Issue category	Issue raised	Response/where addressed in the REF
Recommended Option		
Proposal justification	Concerns that the overall proposal is not a viable long-term solution to ease traffic congestion	The proposed intersection improvements have been based on traffic modelling that models to 2026 and 2036. Although Henry Lawson Drive Stage 1A may not be the most congested section along Henry Lawson Drive, it has been prioritised as it has the highest crash rate and has the greatest growth rate for surrounding future development. Refer to Section 3 for detail on design features and Section 6.6 for the Traffic and transport assessment.
	Were vehicle counts completed for both directions to support proposal justification?	Yes, these counts were completed as part of the early investigation work for the project and were used to identify the optimal proposal alignment and intersection layouts. Please see Section 2.1. A traffic and transport assessment has been undertaken to assess existing traffic conditions and forecast future traffic conditions. Refer to Section 6.6 for the traffic and transport assessment.
Project staging	Concerns over the extent, scope and number of stages	The Henry Lawson Drive upgrade has been split into four stages (1A, 1B, 2 and 3). Stage 1A has been prioritised as it upgrades the key intersection of Henry Lawson Drive/Milperra Road/Newbridge Road and due to its connectivity with the recent/planned developments including Bankstown Airport, the Flower Power Nursery and the Riverlands Development. Refer to Section 3.3 for detail on construction activities.
Design and scope	Concerns over widening of the proposal including widening extent, location, number of additional lanes and the impacts to local/adjacent roads	The Henry Lawson Drive Upgrade has been separated into stages due to the length and complexity of the project with the overall proposal forming Stage 1A. The proposal and proposal extent has been identified as priority due to the high crash rate and to support the growth of surrounding future and proposed developments. Other areas/locations for widening would be addressed in subsequent stages. A Traffic and Transport assessment has been undertaken to assess existing traffic issues, including congestion, and takes into consideration traffic future growth. This traffic assessment shows that the overall proposal and increase in lanes is sufficient to meet the demand in the future. This assessment has also considered the impact on the wider road network. Refer to Section 6.6 for the Traffic and transport assessment.
	Consideration of additional bridges, underpasses and overpasses	A Traffic and Transport assessment has been undertaken to assess existing traffic issues, including congestion, and takes into consideration traffic future growth numbers. This traffic assessment shows that the overall proposal and increase in lanes is sufficient to meet the demand in the future and no additional bridges, underpasses or overpasses are required. This assessment has also considered the impact on the wider road network. Refer to Section 3.2 for detail on design features.
Noise	Recommendation of installation of noise barriers	A noise and vibration assessment has been undertaken to assess the potential noise and vibration impacts. Refer to Section 6.7 for details on the Noise and vibration assessment.

Issue category	Issue raised	Response/where addressed in the REF
Traffic	Impacts of the proposal during construction	There are anticipated to be construction impacts from the works that have been assessed in this REF and supporting technical studies. Refer to Section 3.3 for detail on the construction activities and Section 6 for environmental assessments of construction impacts.
	Concerns over traffic movements including turning and turning capacity into Auld Avenue and Milperra Road/Newbridge Road	A traffic and transport assessment has been undertaken and includes information on traffic movements and turning lane capacities. Further investigations are underway to further confirm the layout of the Auld Avenue intersection. Refer to Section 6.6 for the traffic and transport assessment.
	Parking restrictions	There is no on-street parking on Henry Lawson Drive and Newbridge Road/Milperra Road in the proposal area. As such, there would not be any impacts to on-street parking. Refer to Section 6.6 for the traffic and transport assessment.
	Concerns over traffic modelling	Traffic modelling has been undertaken by Transport to support the justification of the overall proposal and has been updated for a traffic and transport assessment undertaken as part of this REF. Refer to Section 6.6 for the traffic and transport assessment.
	Concerns and consideration for public transport improvements	No change to public transport services or routes are proposed as part of the overall proposal. However, improved pedestrian facilities to existing bus stops within the overall proposal areas would be provided. Refer to Section 6.6 for the traffic and transport assessment and Section 6.11 for the socio-economic impact assessment.
	Concerns around speed limits changes	The speed limit on Henry Lawson Drive through the overall proposal areas would not be changed (temporary speed limit changes during construction notwithstanding). Refer to Section 3.2 for design criteria and speed limit information.
	Traffic light phasing issues at the Milperra Road/Newbridge Road intersection	The intersection improvements are designed to improve the overall operation of the intersection. The traffic light phasing would be reconfigured part of the upgrade to ensure efficient operation. Refer to Section 3.2 and Section 6.6.
Active transport	Recommendation that cycling infrastructure be retained and the integration of active transport facility improvements	Under the proposal, existing cycling infrastructure would be retained or improved. The proposal involves widening the existing Henry Lawson Drive bridge near Auld Avenue (over Milperra Drain). To ensure continued pedestrian and cyclist access, a 3.5 metre-wide shared path would be constructed adjacent to the road, connecting to a three-metre shared path on the western side of Henry Lawson Drive. On the road's eastern side, a 1.8 metre pathway would connect to existing bus stops and the businesses at the Henry Lawson Drive/Milperra Road intersection. Refer to Section 3.2.



Issue category	Issue raised	Response/where addressed in the REF
Environment	Tree amenity and visual impacts	An assessment on potential impacts to landscape and visual amenity has been undertaken for the proposal. Refer to Section 6.10 for the landscape character and visual impacts assessment.
	Biodiversity impacts	An assessment on potential impacts to biodiversity has been undertaken for the proposal. Refer to Section 6.1 for the biodiversity assessment.
Safety	Safety of residents living on Henry Lawson Drive	Road safety audits would be carried out to reduce safety impacts for motorists, pedestrians, cyclists and the community within the overall proposal area. Refer to Section 3.2 for more details about the criteria used to develop the assessment and key features of the proposal.
	Safety issues relating to merge conflicts and overtaking	The proposal would reduce congestion on Henry Lawson Drive which may change/alter driver behaviours. Refer to Section 3.2 for detail on design features and Section 6.6 for the traffic and transport assessment.
Drainage and Flooding	Frequent flooding of Henry Lawson Drive and surrounding private properties	Refer to Section 6.2 for the flooding and hydrology assessment prepared for the overall proposal
	Construction impacts to flooding	During construction the construction contractor would implement mitigation measures and safeguards detailed in the CEMP. Refer to Section 6.2.4 for a list of mitigation measures.
Property	Impacts to residential property access/egress from road widening and impacts of property acquisition including property value	Accessibility to properties during construction is discussed in Section 3.3.9. Impacts to access and property acquisition is also discussed further in the socio-economic impact assessment summarised in Section 6.11.
	Cumulative impacts and future surrounding development	The proposal takes into consideration future land use changes, surrounding developments and cumulative impacts. Refer to Section 2 and Section 6.15 for cumulative impacts.

### 5.3 Aboriginal community involvement

An Aboriginal heritage assessment was undertaken for the proposal in accordance with the *Procedure for Aboriginal Cultural Heritage Consultation and Investigations* (PACHCI) (Roads and Maritime, 2011). Effective consultation with Aboriginal people is an important step in the process of identifying and minimising cultural heritage impacts. A summary of the four stages of the PACHCI procedure is provided in Table 5-3.

Table 5-3: Summary of Transport Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial Transport assessment
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

Aboriginal community consultation carried out to date for the proposal has involved:

- A site survey undertaken in consultation with Aboriginal stakeholders for Stage 2 of the PACHCI assessment. For this stage, Transport (previously Roads and Maritime) organised the involvement of representatives from the Gandangara Local Aboriginal Land Council (GLALC) and Deerubbin Local Aboriginal Land Council (DLALC). Individuals from both land councils were consulted to assist in the field survey and to identify whether the study area held any sites and/or values known to the local Aboriginal community. The results of the survey were also presented to Aboriginal representatives at the end of each day for review and discussion. The findings from this site assessment are documented in the *Henry Lawson Drive Upgrade (Hume Highway to M5) Aboriginal Archaeological Survey Report* (Kelleher Nightingale, 2018)
- As part of the Aboriginal cultural heritage assessment report (CHAR) prepared in accordance with Stage 3 of the PACHCI, formal consultation was undertaken with Aboriginal stakeholders. Transport invited Aboriginal people who hold knowledge relevant to determine the cultural heritage significance of Aboriginal objects and Aboriginal places in the area to register an interest in a process of community consultation. The investigations included consultation with 18 Aboriginal community groups and individuals. All stakeholders were also provided with a copy of the proposed test excavation methodology and CHAR methodology. Eight formal responses were received, with all stating support or agreement with the proposed assessment methodology.

The formal consultation process for the CHAR has included:

- Advertising for registered Aboriginal parties
- Government agency notification letters
- Notification of closing date for registration
- Provision of proposed assessment methodology
- Ongoing compilation of registrants list, through continuing to register individuals and groups for consultation on the proposal
- Provision of draft CHAR for review
- An Aboriginal Focus Group meeting to discuss investigation results in September 2020, draft CHAR and detailed mitigation strategies
- Ongoing consultation with the local Aboriginal community.

Feedback from the Aboriginal Focus Group meeting related to:

- Questions on the age of the trees affected
- The mitigation measures in Stage 1A if potential archaeological deposits (PADs) would be affected in future stages of the corridor upgrade
- The mandatory training on unexpected heritage finds
- Whether there was also potential for discoveries in the sand deposits
- Potential for burials deeper down than the test excavations.

## 5.4 ISEPP consultation

Canterbury Bankstown Council has been consulted about the proposal as per the requirements of clauses 13 and 15A of ISEPP. The State Emergency Service (SES) have also been consulted about the proposal as per the requirements of clause 15AA of ISEPP.

Appendix B contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

Issues that have been raised as a result of this consultation are outlined in Table 5-4.

Table 5-4: Issues raised through ISEPP consultation

Agency	Issue raised	Response/where addressed in REF
Canterbury Bankstown Council	<ul style="list-style-type: none"> <li>• Flood liable land which is reserved for acquisition</li> <li>• Additional local provisions for Acid Sulfate Soils</li> <li>• Proximity of the proposal to riparian land and watercourses</li> <li>• Proximity of the proposal to items of local heritage significance</li> <li>• The potential acoustic impacts on residential dwellings from widening Henry Lawson Drive and reducing the setbacks between the road and the dwellings</li> <li>• The role of the Georges River as part of a broader biodiversity corridor</li> </ul>	<ul style="list-style-type: none"> <li>• A hydrology and flooding assessment has been undertaken (refer to Section 6.2)</li> <li>• Consideration of the potential impacts of Acid Sulfate Soils are addressed within Section 6.5</li> <li>• Impacts to riparian land and watercourses are discussed in Section 6.2 and 6.4.</li> <li>• The proposal's proximity to items of local heritage significance are addressed within Section 6.8 and Section 6.9</li> <li>• Potential noise and vibration impacts to nearby sensitive receptors, including residential dwellings, are discussed within Section 6.7</li> <li>• The proposal's potential impact to biodiversity, including impacts to the Georges River, are addressed within Section 6.1</li> </ul>
SES	<ul style="list-style-type: none"> <li>• Queried the design of the proposal in relation to flood evacuation as road design heights influence the ability to evacuate flood areas by vehicle</li> <li>• Queried the nature of channel bed and bank treatments around Auld Avenue bridge</li> </ul>	<ul style="list-style-type: none"> <li>• Transport provided SES with additional information on the concept design regarding the road heights</li> <li>• Transport will continue to inform SES throughout the detailed design phase regarding design of road heights and channel treatments</li> </ul>

## 5.5 Government agency and stakeholder involvement

Various government agencies and stakeholders have been consulted about the overall proposal, including:

- Government agencies:
  - DPIE – Transport Assessments
  - DPIE - Environment, Energy and Science - Biodiversity and Conservation
  - Department of Environment, Energy and Science - EPA
  - DPIE - Regions, Industry, Agriculture and Resources - Department of Primary Industries - Fisheries
  - DPIE - Regions, Industry, Agriculture and Resources - Water
  - DPI Fisheries
  - Environmental Protection Authority
  - Sydney Water
  - NSW Rural Fire Service
  - Heritage NSW
- Stakeholder groups:
  - Sydney Metro Airports
  - TfSNW Integrated Public Transport Planning,

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined below in Table 5-5.

Table 5-5: Issues raised through stakeholder consultation

Agency	Issue raised	Response/where addressed in REF
DPI Fisheries	<ul style="list-style-type: none"> <li>A section of Georges River affected by the overall proposal is marked as coastal wetlands under the Coast Management SEPP, affording statutory protection</li> <li>Queries regarding the protection and mitigation measures for the riparian vegetation around the Tower Road and Milperra Road intersection work, through direct and indirect impact</li> <li>Any water discharge to Georges River would need to be appropriately treated (if required) so as not to reduce water quality in the River</li> </ul>	<ul style="list-style-type: none"> <li>Where the proposal is partially located on land mapped as coastal wetlands under the Coast Management SEPP, impacts will be assessed within a separate EIS which has been prepared for this approval and will be lodged with Canterbury Bankstown Council.</li> <li>Potential impacts to riparian vegetation and proposed safeguards and mitigation measures are detailed within Section 6.1</li> <li>The potential discharge of water is discussed in Section 6.3</li> </ul>
Environmental Protection Authority	<ul style="list-style-type: none"> <li>Ensure that the cumulative impacts from other projects in the area is considered effectively</li> <li>If required, the EPA should be contacted for an EPL</li> <li>Requirement to have management plans for noise and vibration control, soil and water quality, air quality and waste impacts from the proposal</li> <li>Requirement to follow the appropriate ANZECC Guidelines for surface and groundwater management</li> </ul>	<ul style="list-style-type: none"> <li>Cumulative impacts are detailed within Section 6.15</li> <li>An EPL will be sought for scheduled activities or scheduled development work in accordance with the POEO Act (refer to Section 4.2.4)</li> <li>Sub-management plans for noise and vibration control, soil and water quality, air quality and waste will be prepared and implemented as part of the CEMP (refer to Section 6 for further detail)</li> <li>ANZECC Guidelines for surface and groundwater management are discussed in Section 6.3 and 6.4</li> </ul>



Agency	Issue raised	Response/where addressed in REF
Sydney Water	<ul style="list-style-type: none"> <li>• Ensure there will be unrestricted access to all assets during construction</li> <li>• Any trade waste licence request, most notably for discharge of leachates to a Sydney Water sewer, will need to meet Sydney Water's requirements</li> <li>• Environmental approval needs to meet the discharge protocols of chlorinated water due to watermain shutdown and reconnection of live Sydney water assets that will need to be adjusted</li> <li>• Early design work to ensure sufficient time for Sydney Water to schedule and program shutdowns and reconnections of their assets</li> <li>• Consultation with Sydney Water to ensure any amplification of assets is identified, planned and confirmed early. Additionally, measures to be in place for the protection and safety of any stormwater assets found during construction</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with Sydney Water, including details of any impacts to Sydney Water assets and proposed construction timeframes, will be undertaken in accordance with the Consultation Strategy throughout the detailed design and construction phases of the proposal</li> <li>• The potential discharge of water is discussed in Section 6.3</li> </ul>
NSW Rural Fire Service	<ul style="list-style-type: none"> <li>• Requested information on the proposal's potential impact to bush fire prone land and the requirement for a Bushfire Management Plan in accordance with the Rural Fire Service's requirements</li> </ul>	<ul style="list-style-type: none"> <li>• The proposal's potential impact to bush fire prone land and proposed control measures is addressed within Section 6.13</li> </ul>
Heritage NSW	<ul style="list-style-type: none"> <li>• Office supports the SEARS requirement to consult with the GLALC and Registered Aboriginal Parties</li> <li>• Elements of the proposal have the potential to impact unidentified Aboriginal and non-Aboriginal archaeological sites in the overall proposal area - particularly the road widening, the construction of a new road bridge, footpaths and works to drainage and utilities. It is therefore suggested that an Unexpected Finds Procedure be prepared in accordance with the guidelines and standards prepared by Heritage NSW.</li> <li>• Heritage awareness training to be made available for contractors to understand the procedure in the event of the discovery of the unexpected historical heritage materials, features or deposits, any cultural findings or even the discovery of human remains.</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation has occurred with the GLALC, Registered Aboriginal Parties and other Aboriginal stakeholders (refer to Section 5.3)</li> <li>• The proposal's potential to impact unidentified Aboriginal and non-Aboriginal archaeological sites, as well as safeguards and management impacts, is discussed within Section 6.8 and Section 6.9</li> <li>• An Aboriginal Heritage Management Plan will be prepared in accordance with the <i>Procedure for Aboriginal cultural heritage consultation and investigation</i> (Transport, 2012) and <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport, 2015) and implemented as part of the CEMP. This will include measures to ensure contractors are aware of the required procedure for unexpected finds.</li> </ul>
Sydney Metro Airports (Bankstown Airport)	<ul style="list-style-type: none"> <li>• Lighting impacts to the airport</li> <li>• Impacts to the airport masterplan</li> <li>• Design requirements relating to airspace protection</li> </ul>	<ul style="list-style-type: none"> <li>• The proposal's association with Bankstown Airport is addressed within Section 6.13.</li> <li>• Street lighting will be considered further as part of the detailed design phase in consultation with the airport.</li> </ul>

Agency	Issue raised	Response/where addressed in REF
TfSNW Integrated Public Transport Planning	<ul style="list-style-type: none"> <li>• Future bus routes/bus stops</li> <li>• Removal of the bus only lane</li> </ul>	<ul style="list-style-type: none"> <li>• TfSNW Integrated Public Transport Planning indicated that there were no future plans for new bus services along the Henry Lawson Drive corridor.</li> <li>• M90 bus service along Milperra Road and Newbridge Road would continue and bus stops would need to remain</li> <li>• They were comfortable with the reasoning behind the removal of the bus only lane as it has limited benefit due to long queues at the intersection preventing buses from accessing the bus only lane.</li> <li>• Temporary and permanent bus stop relocation will be discussed with the relevant bus operator. This forms one of the safeguards proposed in Section 6.6.</li> </ul>

## 5.6 Ongoing or future consultation

Transport will continue to consult with the community and relevant stakeholders during design and construction of the overall proposal.

### 5.6.1 Consultation during the public display of the REF

The REF will be placed on public display and comments invited. A range of consultation activities will be undertaken in accordance with the consultation strategy and include:

- Briefings for stakeholders, local councils and government agencies
- Meetings with directly affected property owners
- Communication materials
- Community information displays and sessions (online or other format, as relevant)
- Door knocks/letter box drops
- Website updates.

Following public display, submissions will be collated, and a submissions report prepared to address any issues raised by stakeholders. The submissions report will be made available to the public via the Transport website (<https://www.rms.nsw.gov.au/projects/henry-lawson-drive/index.html>).

Transport for NSW will continue to identify and manage issues of interest or concern to the community through the REF and EIS display period, through the assessment and determination process. Consultation will be ongoing if and when the upgrade proceed as determined

The community will be informed of any major design changes that are required to address concerns raised in submissions.

### 5.6.2 Consultation for the EIS proposal

Canterbury Bankstown Council will place the EIS on public exhibition, in accordance with the requirements of Part 4 of the EP&A Act. The public display periods for the EIS and REF documents will occur in parallel.

For further information on consultation activities carried out for EIS proposal or to make a submission to the EIS proposal, go to the Canterbury Bankstown Council website

<https://haveyoursay.cbcity.nsw.gov.au/projects>

### 5.6.3 Consultation during construction

Following the REF/EIS display period and continuing into the construction phase of proposal, Transport will continue to identify and manage issues of interest or concern to the community through the assessment and determination process. The aims of ongoing communications and consultation are to provide the community with:

- Accurate and accessible information regarding the processes and activities associated with the proposal
- Information in a timely manner
- Appropriate avenues for providing comment or raising concerns, and to ensure they are aware of the avenues
- A high level of responsiveness to their issues and concerns throughout development and delivery of the proposal.

Following determination, the community would continue to be updated about the progress of construction and provided notification of any road closures or night works in advance of the works occurring.

Community engagement through the construction phase for the overall proposal would be undertaken by Transport and the construction contractor. Activities/notifications that could occur include:

- Advanced/start of work notifications
- Traffic management notifications, including any lane closures
- Night time work notifications and consultation
- Quarterly project updates
- Responding to enquiries and complaints
- End of construction
- Ongoing construction communications.

Other activities include (but are not limited to) separate engagement with local residents, businesses and stakeholders on specific or sensitive aspects of the overall proposal.

To effectively manage consultation during the construction stage of the proposal a *Community and Stakeholder Engagement Plan* would be developed and implemented by the construction contractor.

## 6 Environmental assessment

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Chapter 6 of the REF provides a detailed description of the likely environmental impacts associated with the construction and operation of the REF proposal. For each likely impact (direct and indirect), the existing environment is characterised and then an assessment is undertaken as to how the REF proposal would impact on the existing environment. Proposed management and mitigation measures are described within each section and collated in Chapter 7.

### 6.1 Biodiversity

The potential impacts on biodiversity during construction and operation of the proposal have been assessed as part of the *Henry Lawson Drive Upgrade (Stage 1A), between Keys Parade and Tower Road Biodiversity Assessment Report* (BAR) (WSP, 2021), provided in Appendix C. The existing environment, potential impacts of the proposal and safeguards to mitigate them, are summarised in this chapter.

#### 6.1.1 Methodology

The following activities were undertaken to complete the BAR:

- Desk-based searches of relevant databases to understand the existing environment and obtain records of threatened species, populations and ecological communities known or predicted to occur in the locality of the study area
- A habitat assessment was undertaken within the study area on the identified list of threatened flora and fauna species known or predicted to occur within a 10 kilometre radius of the REF proposal. The habitat assessment formed the basis for targeted surveys within the study area.
- Field inspections of the study area to identify and assess biodiversity values in accordance with the BAM including vegetation (PCT) surveys and threatened flora and fauna surveys
- An assessment of 'likelihood of occurrence' following the collation of database records and species and community profiles
- Assessing the potential impacts to flora, fauna, migratory and aquatic species including assessments of significance where required
- Identification of construction and operational management measures as well as the need for offsets.

Field investigations undertaken for the assessment included:

- Initial native plant community types (PCT) surveys undertaken by WSP (2019) over an eight-day period on the 21 to 25 and 31 May, 1 and 21 of June 2018
- Additional field surveys were undertaken on the 6 and 7 April, 29 and 30 September and 1 October 2020. These surveys were undertaken as per BAM requirements, as well as ground-truthing the background research, habitat suitability assessments, presence of threatened species and breeding habitat features for threatened fauna.



## 6.1.2 Existing environment

### 6.1.2.1 Landscape

The landscape context of the study area (which includes the REF proposal area, and adjacent areas of vegetation surveyed as part of the BAR) is described in Table 6-1. The study area is illustrated in Figure 6-1, Figure 6-2 and Figure 6-3.

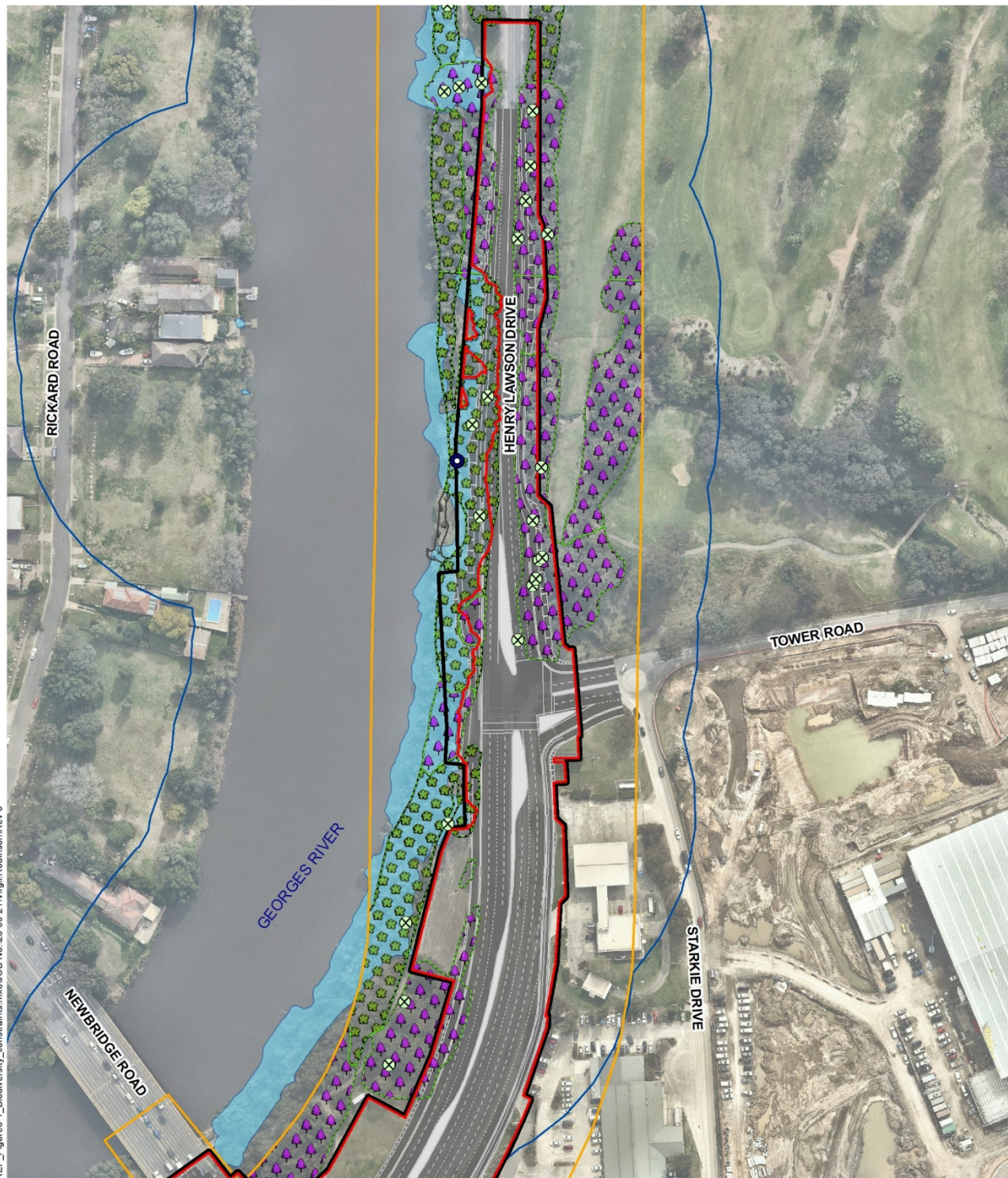
Table 6-1: Landscape features

Landscape feature	Subject land
IBRA <sup>1</sup> bioregions and subregions	Sydney Basin Bioregion/SYB08 Cumberland subregion.
NSW landscape regions (Mitchell landscapes)	Ashfield Plains and Georges River Alluvial Plain.
Native vegetation extent in the buffer area	Within the study area buffer, as defined in the BAM, native vegetation cover has been identified as 30 – 70%.
Cleared areas	Cleared areas are associated with residential housing in the suburbs of Georges Hall, Bankstown Aerodrome and Milperra. Large cleared areas also occur on Bankstown Airport lands and golf courses that are adjacent to Henry Lawson Drive.
Rivers and streams	Georges River, Prospect Creek and associated tributaries including Milperra Drain.
Wetlands	Several Coastal Wetlands and associated buffer area within the study area.
Connectivity features	Native vegetation within the study area provides connectivity to large patches on remnant native vegetation within Lansdowne Reserve and patches fringing Georges River and Prospect Creek.
Areas of geological significance and soil hazard features	There are no areas identified as having geological significance. Potential high-risk acid sulphate soils, associated with low lying alluvial flats along the Georges River have been identified within the study area.
Areas of outstanding biodiversity value	None recorded.

The biodiversity constraints are shown for the REF proposal in Figure 6-1, Figure 6-2 and Figure 6-3.

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<sup>1</sup> Interim Biogeographic Regionalisation for Australia



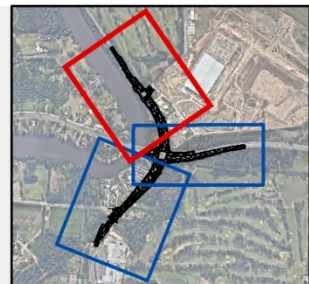
- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>Concept design</li> <li>REF proposal area</li> <li>Overall proposal boundary</li> <li>Study area</li> <li>Southern Myotis Habitat</li> <li>Hollow bearing tree</li> <li>Callistemon linearifolius</li> </ul> | <ul style="list-style-type: none"> <li>Threatened Fauna Species</li> <li>Microbat roosting culvert (Southern Myotis)</li> </ul>   | <ul style="list-style-type: none"> <li>Threatened Ecological Communities - EPBC Act</li> <li>River Flat Eucalypt Forest</li> <li>Swamp Oak Floodplain Forest</li> </ul> |
| <ul style="list-style-type: none"> <li>Coastal Wetland Management</li> <li>Coastal Wetlands</li> <li>Coastal Wetlands Proximity Area</li> </ul>   | <ul style="list-style-type: none"> <li>Threatened Ecological Communities - BC Act</li> <li>River Flat Eucalypt Forest</li> <li>Swamp Oak Floodplain Forest</li> <li>Freshwater Wetlands on Coastal Floodplains</li> </ul> |   |

Source: Aurecon, TfNSW, Spatial Services, Nearmap



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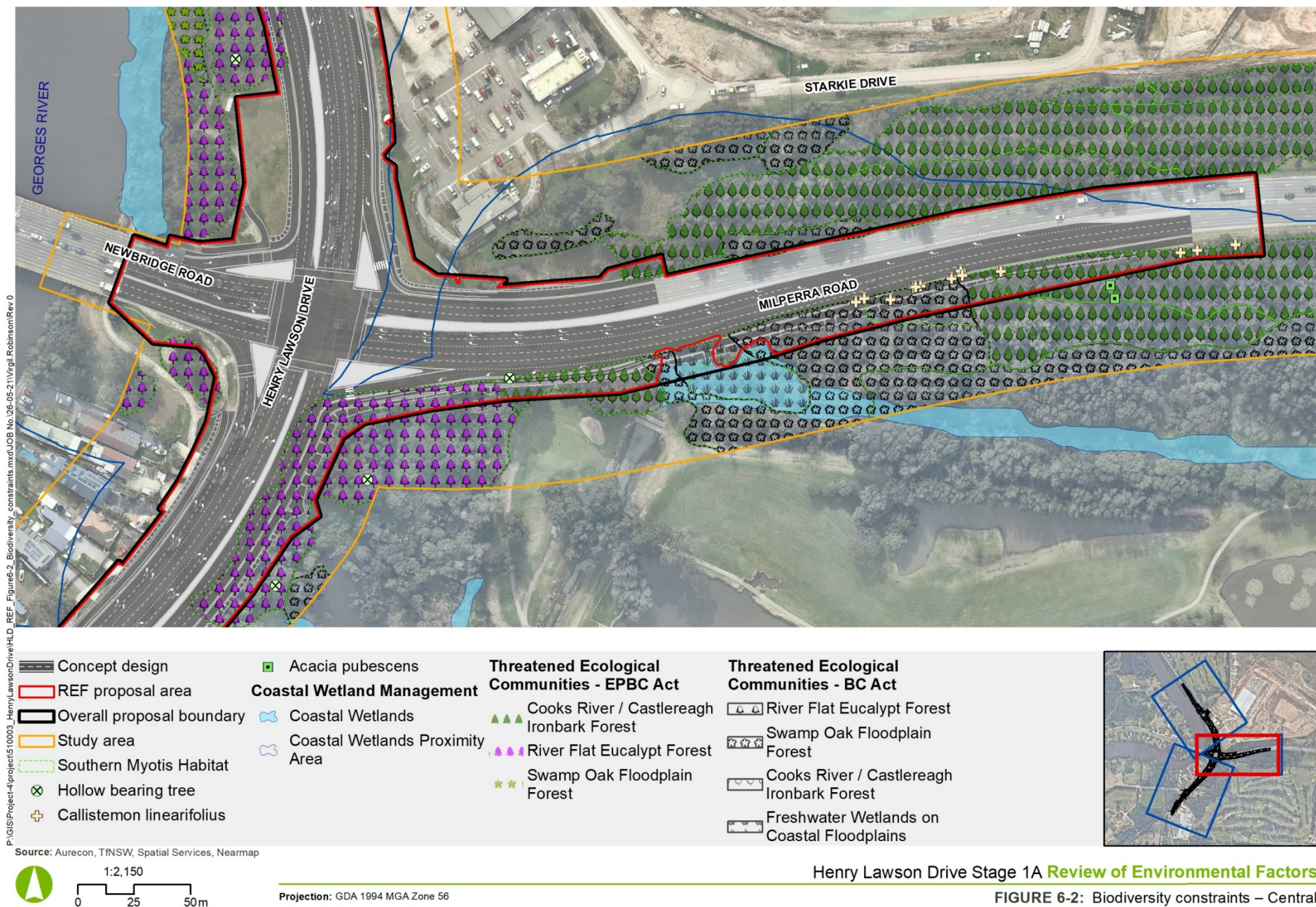
Projection: GDA 1994 MGA Zone 56



## Henry Lawson Drive Stage 1A Review of Environmental Factors

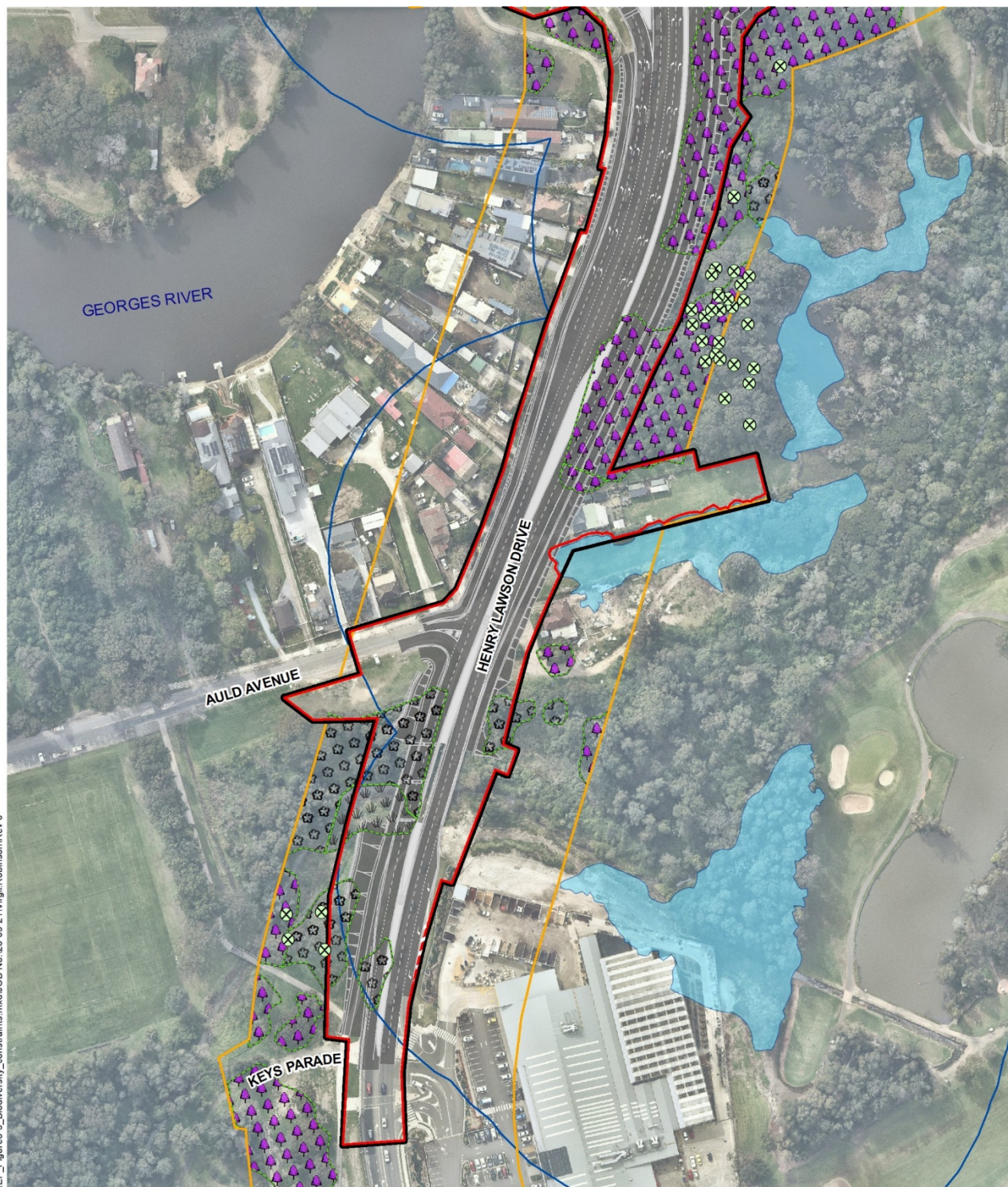
FIGURE 6-1: Biodiversity constraints – North







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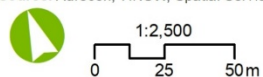


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| <ul style="list-style-type: none"> <li>Concept design</li> <li>REF proposal area</li> <li>Overall proposal boundary</li> <li>Study area</li> <li>Southern Myotis Habitat</li> <li>Hollow bearing tree</li> <li>Callistemon linearifolius</li> </ul> | <p><b>Threatened Ecological Communities - EPBC Act</b></p> <ul style="list-style-type: none"> <li>Cooks River / Castlereagh Ironbark Forest</li> <li>River Flat Eucalypt Forest</li> </ul> <p><b>Threatened Ecological Communities - BC Act</b></p> <ul style="list-style-type: none"> <li>River Flat Eucalypt Forest</li> <li>Swamp Oak Floodplain Forest</li> <li>Freshwater Wetlands on Coastal Floodplains</li> </ul> |
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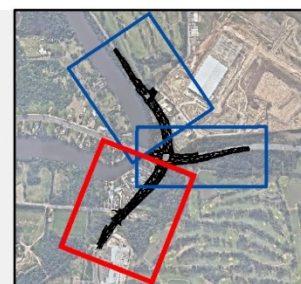
**Coastal Wetland Management**

- Coastal Wetlands
- Coastal Wetlands Proximity Area

Source: Aurecon, TNSW, Spatial Services, Nearmap



Projection: GDA 1994 MGA Zone 56



## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 6-3: Biodiversity constraints – South



### 6.1.2.2 Native vegetation

Seven NSW Plant Community Types (PCTs) were recorded in the REF proposal study area and another two vegetation types and waterbody classified.

A summary of PCTs and associated vegetation zones are presented in Table 6-2.

Table 6-2: Plant community types

Plant community type (PCT)	Condition class	Threatened ecological community? (BC Act)	Area (ha) in study area
PCT 725: Broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Moderate condition	Yes - Cooks River/ Castlereagh Ironbark Forest in the Sydney Basin Bioregion	2.33
	Poor condition (regrowth)	Yes - Cooks River/ Castlereagh Ironbark Forest in the Sydney Basin Bioregion	0.60
PCT 781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner	Moderate condition	Yes - Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.21
PCT 835: Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	Moderate condition – Forest Red Gum variant	Yes - River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	2.32
	Moderate condition – Blue Box variant		0.64
PCT 920: Mangrove Forest in Estuaries of the Sydney Basin and South East Corner	Moderate condition	No	0.29
PCT 1236: Swamp Paperbark – Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Poor condition	Yes - Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.84
PCT 1234: Swamp Oak Swamp Forest Fringing Estuaries, Sydney Basin and South East Corner	Moderate condition	Yes - Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1.32
PCT 1800: Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	Poor condition	Yes - Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.90
<b>Total extent of native vegetation</b>			<b>9.45</b>
Miscellaneous ecosystem – Urban exotic/native landscape plantings	n/a	No	0.30
Miscellaneous ecosystem – Weeds/exotics – non-native vegetation	n/a	No	8.93

Plant community type (PCT)	Condition class	Threatened ecological community? (BC Act)	Area (ha) in study area
Miscellaneous ecosystem - Waterbodies	n/a	No	1.27
<b>Total extent of non-native vegetation</b>			<b>10.50</b>
<b>Total native and non-native vegetation</b>			<b>19.95</b>

### 6.1.2.3 Threatened ecological communities

A total of four TECs listed under the BC Act were recorded within the study area. All TECs within the study area are assigned a conservation status of endangered (E) under the BC Act.

A summary of the four listed TECs recorded, associated PCT and extent within the study area is provided in Table 6-3.

Table 6-3: A summary of threatened ecological communities listed under the BC Act recorded within the study area

Threatened ecological community	Status	Associated PCT within the study area	Extent
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion	E	PCT 725: Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	2.93
Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	E	PCT 781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner Bioregion	0.21
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	PCT 835: Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin Bioregion	2.96
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	PCT 1236: Swamp Paperbark - Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	0.84
		PCT 1234: Swamp Oak Swamp Forest Fringing Estuaries, Sydney Basin and South East Corner Bioregion	1.32
		PCT 1800: Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.90
Total			9.16

### 6.1.2.4 Threatened species

During field investigations, a total of 179 flora species were recorded in the study area. Of these, 98 were native indigenous (55 per cent) and 81 were non-native exotic species (45 per cent).

There are two threatened flora species found within the study area (shown in Figure 6-1, Figure 6-2 and Figure 6-3). These are:

- *Acacia pubescens* (Downy Wattle) (BC Act, Vulnerable; EPBC Act, Vulnerable)
- *Callistemon linearifolius* (Netted Bottle Brush) (BC Act, Vulnerable).

In terms of threatened fauna species, the results of habitat likelihood of occurrence assessments identified 94 species as known or predicted to occur in the locality of which 16 have been identified as having a moderate or higher likelihood of occurring within the study area. The results of the fauna surveys indicate that the following species use the study area, or their habitats are present:

- Dusky Woodswallow (considered to have a moderate likelihood of occurring due to the presence of potential foraging habitat (open eucalypt forest)). This species has been recorded within the locality.
- Swift Parrot and Little Lorikeet (presence of potential foraging habitat). May occur within study during seasonal movements when blossom resources are in abundance.
- Varied Sittella (considered to have a moderate likelihood of occurring due to the presence of potential habitat (eucalypt forest) and historical records within the wider locality).
- White-bellied Sea-eagle (considered to have a moderate likelihood of occurring. No nests or potential nesting trees were recorded in the study area).
- White-throated Needletail (may occur on a seasonal basis, but unlikely to use terrestrial habitats in the study area).
- Southern Myotis (found to be roosting in a culvert in the northern section of the study area).
- Cave dwelling insectivorous bat species including Little Bent-winged Bat and Large Bent-winged Bat (which occur in the locality, are likely to use the site for foraging on an intermittent basis).
- Tree roosting insectivorous bat species including Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat and Greater Broad-nosed Bat (may use the study area). Some marginal habitat for Eastern False Pipistrelle within the study area, with potential to forage as part of greater home range. Records within the wider locality.
- Grey-headed Flying-fox (considered to have a moderate likelihood of occurring. There are numerous records within the locality. The study area does not contain roosting camps, but the study area does contain potential foraging in the form of flowering tree species).

#### 6.1.2.5 Priority Weeds

Of the 98 recorded exotic species, seven are listed as Priority Weeds under the NSW *Biosecurity Act 2015* (Biosecurity Act) for the Greater Sydney Local Land Service region and are also listed Weeds of National Significance (WONs). Under the Biosecurity Act, land managers are required to follow the regional and non-regional duties which have been allocated to each Priority Weed. The weeds of concern recorded within the study area includes:

- *Alternanthera philoxeroides* (Alligator Weed)
- *Anredera cordifolia* (Madeira Vine)
- *Asparagus aethiopicus* (Asparagus fern)
- *Asparagus asparagoides* (Bridal Creeper)
- *Lantana camara* (Lantana)
- *Rubus fruticosus* agg (Blackberry)
- *Senecio madagascariensis* (Fireweed)

#### 6.1.2.6 Aquatic habitat

Henry Lawson Drive runs parallel or adjacent to the Georges River for most of the proposal area. Relatively high aquatic biodiversity values are associated with the existing riparian vegetation associated with the Georges River. The Georges River is a Class 1 waterway being major key fish habitat with habitat sensitivity Type 2: Moderately sensitive key fish habitat as defined in the Policy and guidelines for fish habitat conservation and management – Update 2013 (Department of Primary Industries, 2013). The mapped Key Fish Habitat of the Georges River is outside of the REF proposal area.

The Milperra Drain, which drains the Bankstown golf course, flowing westward under Henry Lawson Drive to the border of Gordon Parker Reserve in Milperra, is not mapped Key Fish Habitat. Based on the definition of Key Fish Habitat provided by DPI Fisheries (NSW Department of Primary Industries Fisheries, 2021), urban drains such as Milperra Drain are not included in Key Fish Habitat.

No habitat for threatened fish listed under the FM Act occurs within the REF proposal area. Threatened fish species under the EPBC Act include Macquarie Perch and Black Rockcod. Neither of these species are present in the REF proposal study area. The riparian vegetation is dominated by fringing river mangroves which are interspersed with and backed by Swamp Oak forest and eucalypt forest vegetation communities. While riparian vegetation within the proposal area contains weeds and exotic species, the mangrove habitat (River mangroves (*Aegiceras corniculatum*) and Grey mangroves (*Avicennia marina*)) represents a significant natural aquatic feature of high conservation value. The REF proposal would remove a small amount of mangrove forest vegetation community. As such, under the FM Act a permit from the Minister would be required prior to the commencement of construction.

The REF proposal areas include areas mapped as 'Proximity Coastal Wetlands (100 metre buffer)' with coastal wetlands present adjacent to the REF proposal areas.

GDEs which are surface expressions of groundwater within the locality of the study area (<10 km) include the Georges River. Other GDEs which are reliant on subsurface groundwater in the study area include:

- PCT 781 - Coastal Freshwater Lagoons of the Sydney Basin and South East Corner
- PCT 835 - Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin
- PCT 920 - Mangrove Forest in Estuaries of the Sydney Basin and South East Corner
- PCT 1236 - Swamp Paperbark – Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion
- PCT 1234 - Swamp Oak Swamp Forest Fringing Estuaries, Sydney Basin and South East Corner
- PCT 1800 - Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter Valley.

#### **6.1.2.7 Matters of National Environmental Significance**

##### **6.1.2.7.1 Wetlands of International and National Importance**

One wetland of international importance (Ramsar) occurs within 10km of the study area which is the Towra Point Nature Reserve. Towra Point Nature Reserve lies on the northern side of Kurnell Peninsula, forming the southern and eastern shores of Botany Bay. Additionally, the REF proposal occurs downstream of a nationally important wetland, Voyager Point wetland.

##### **6.1.2.7.2 Listed threatened ecological communities**

The study area contains vegetation corresponding to three EPBC Act listed TECs:

- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion
- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.

##### **6.1.2.7.3 Listed threatened flora species**

A population of *Acacia pubescens* (listed as Vulnerable) was recorded during the field survey on the southern side of Milperra Road within Ashford Reserve. The targeted flora surveys did not record any other EPBC Act listed threatened flora species from within or directly adjacent to the study area.



#### 6.1.2.7.4 Listed threatened fauna species

The three EPBC Act listed threatened fauna species that are considered at least moderately likely to occur within the study area on occasion based on the presence of suitable habitat include:

- Swift Parrot (listed as Critically Endangered)
- White-throated Needletail (listed as Vulnerable)
- Grey-headed Flying-fox (listed as Vulnerable).

#### 6.1.2.7.5 Listed migratory species

The two listed Migratory species that have potential to occur in the study area are the White-throated Needletail and Eastern Osprey. However, the habitats in the study area are unlikely to constitute important habitat for any of the listed migratory species. The habitat present in the study area was unlikely to support significant proportions of populations of any migratory species nor are the habitats in the study area critical to any life stage of identified species.

### 6.1.3 Potential impacts

The REF proposal's likely direct and indirect impacts on biodiversity during construction and operational phases are summarised in the following sections.

#### 6.1.3.1 Direct impacts

##### 6.1.3.1.1 Removal of native vegetation

The REF proposal would result in the removal of 1.69 hectares of native vegetation, as shown in Table 6-4. The proposal would also result in the removal of about 0.3 hectares of exotic/landscape plantings and about 8.93 hectares of weeds/exotics – non-native vegetation with no or limited native vegetation.

Table 6-4: Impacts on native vegetation

Plant community type (PCT)	Condition class	BC Act	EPBC Act	Percent cleared in IBRA region <sup>1</sup>	Area (ha) to be cleared <sup>2</sup>
PCT 725: Broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Moderate condition	E	CE	95%	0.21
PCT 781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner	Moderate condition	E	-	74%	0.07
PCT 835: Forest Red Gum-Rough-barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	Moderate condition – Forest Red Gum variant	E	CE	93%	0.77
	Moderate condition – Blue Box variant				0.19
PCT 1236: Swamp Paperbark – Swamp Oak tall shrubland on estuarine flats, Sydney Basin Bioregion and South East Corner Bioregion	Poor condition	E	-	32%	0.14
PCT 1234: Swamp Oak Swamp Forest Fringing Estuaries,	Moderate condition	E	E	90%	0.10

Plant community type (PCT)	Condition class	BC Act	EPBC Act	Percent cleared in IBRA region <sup>1</sup>	Area (ha) to be cleared <sup>2</sup>
Sydney Basin and South East Corner					
PCT 1800: – Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	Poor condition	E	E	60%	0.21
Total extent of native vegetation					1.69

<sup>1</sup> Based on the VIS classification database.

<sup>2</sup> Area to be cleared based on ground-truthed vegetation mapping within the study area.

#### 6.1.3.1.2 Removal of threatened fauna habitat

The removal of vegetation outlined above has an impact on threatened fauna habitat. Vegetation, including planted trees, provides suitable habitat for a range of threatened fauna species listed under the BC Act and EPBC Act. As such, direct impacts to available habitat for threatened fauna species (although it is only moderate to poor quality) would occur during construction.

The direct impacts of the proposal to habitats for threatened fauna has been estimated based on the current concept design. A breakdown of the direct impacts to habitat for threatened fauna species is provided in Table 6-5.

Table 6-5: Impacts on threatened fauna and fauna habitat

Species	Potential occurrence	Habitat impacted by REF proposal	Impact - habitat loss (ha/ individuals)
Artamus cyanopterus cyanopterus (Dusky Woodswallow)	Moderate	PCT 725, PCT 835	1.17
Pandion cristatus (Eastern Osprey)	Moderate	PCT 835, PCT 1234, PCT 1800	1.27
Glossopsitta pusilla (Little Lorikeet)	Moderate	PCT 725, PCT 835	1.17
Lathamus discolor (Swift Parrot)	Moderate	PCT 725, PCT 835	1.17
Daphoenositta chrysoptera (Varied Sittella)	Moderate	PCT 725, PCT 835	1.17
Haliaeetus leucogaster (White-bellied Sea-eagle)	Moderate	PCT 835, PCT 1234, PCT 1800	1.27
Hirundapus caudacutus (White – throated Needletail)	Moderate	PCT 725, PCT 835	1.17
Miniopterus australis (Little Bent-winged Bat)	Moderate	All PCTs	1.69
Miniopterus orianae oceanensis (Large Bent - winged Bat)	Moderate	All PCTs	1.69
Falsistrellus tasmaniensis (Eastern False Pipistrelle)	Moderate	All PCTs	1.69
Mormopterus norfolkensis (Eastern Coastal Free – tailed Bat)	Moderate	All PCTs	1.69
Scoteanax rueppellii (Greater Broad-nosed Bat)	Moderate	All PCTs	1.69
Myotis macropus (Southern Myotis)	Recorded	PCT 835, PCT 1234, PCT 1800	1.27

Species	Potential occurrence	Habitat impacted by REF proposal	Impact - habitat loss (ha/ individuals)
<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheathtail Bat)	Moderate	PCT 725, PCT 835	1.17
<i>Pteropus poliocephalus</i> (Grey Headed Flying Fox)	Moderate	PCT 725, PCT 835	1.17

#### 6.1.3.1.3 Removal of threatened flora

There would be direct impacts to one threatened flora species, *Callistemon linearifolius* (Netted Bottle Brush) that was recorded within the study area.

Twenty-nine individuals of the threatened flora species, *Callistemon linearifolius* (Netted Bottle Brush), which is listed as Vulnerable under the BC Act and the EPBC Act, were recorded in the study area. All individuals of this species were recorded along the southern verge of Milperra Road and within Ashford Reserve. Twenty-three plants would be impacted, located on the existing roadside verge. Six plants growing in remnant bushland in Ashford Reserve would be retained and protected.

While the species *Acacia pubescens* was recorded in the study area, the REF proposal would not have a direct impact on these species. However, due to the proximity of the species to the design footprint, further ground survey will be undertaken to identify their locations on detailed design plans to avoid impacts.

#### 6.1.3.1.4 Aquatic impacts

Unmitigated impacts to aquatic habitats (specifically Georges River) may arise from construction activities. The potential impacts on aquatic ecology are mainly due to the orientation of Henry Lawson Drive which runs parallel or adjacent to the Georges River for most of the study area. The riparian vegetation present along the Georges River has relatively high aquatic biodiversity value. The riparian vegetation is dominated by fringing river mangroves which are interspersed with and backed by Swamp Oak forest and eucalypt forest vegetation communities. While riparian vegetation within the study area contains weeds and exotic species, the mangrove habitat represents a significant natural aquatic feature of high conservation value.

The REF proposal would result in two Key Threatening Processes (KTP) being:

- Clearing of native vegetation
- The degradation of native riparian vegetation along New South Wales water courses.

Both KTPs address the potential consequences on aquatic ecology of removal of vegetation immediately along river and creek banks (mangroves) and behind them (Swamp Oak forest and Eucalypt forest) which provide important ecosystem functions. Removal of riparian vegetation could degrade water quality due to increased sediment-laden runoff, intensify longer term bank erosion, mobilise potential acid sulphate soils, decrease food availability for aquatic biota and result in loss of bank-associated habitat such as overhangs and shade.

Direct impacts on listed threatened fish species are unlikely due to the low probability of their occurrence in the study area.

A number of mitigation measures would be implemented to minimise impacts as far as practicable.

#### Impact to proximity area for coastal wetlands

The REF proposal area will not directly impact the mapped Coastal Wetlands but it will impact on about 7.10 hectares of Proximity Coastal Wetlands (100 metre buffer). The REF proposal incorporates the majority of the overall proposal, however, excludes works which are located within the SEPP (Coastal Management) area.

## **Impact to Key Fish Habitat**

The Georges River is the only mapped Key Fish Habitat within the study area. However, the mapped Key Fish Habitat of the Georges River is outside of the REF proposal area so no direct impacts to mapped Key Fish Habitat would occur.

### **6.1.3.1.5 Indirect impact – Voyager Point Nationally Important Wetland**

Negative indirect impact on the Voyager Point wetland could result from an increase in suspended sediments in estuarine water that generally accompany vegetation removal and promote subsequent bank erosion.

However, where possible, mangroves would be retained wherever possible and appropriate soil and erosion controls would be implemented to avoid erosion and suspended sediments moving away from the site. This would avoid any significant impact to the Voyager Point Nationally Important Wetland. As such, no referral under the EPBC Act would be required.

### **6.1.3.1.6 Injury and mortality**

Fauna injury or death has the greatest potential to occur during construction when vegetation clearing would occur. The extent of this impact would be proportionate to the extent of vegetation that is cleared. Less mobile species (e.g. ground dwelling reptiles), or those that are nocturnal and nest or roost in trees during the day (e.g. arboreal mammals and microbat species), may find it difficult to rapidly move away from the clearing when disturbed. The study area is only likely to contain a limited number of arboreal species (e.g. possums) and birds that may be impacted during vegetation removal. Reptiles and frogs may also be impacted during construction as habitat is cleared.

Entrapment of wildlife in any trenches or pits that are dug is a possibility if the trenches are deep and steep sided. Wildlife may also become trapped in or may choose to shelter in machinery that is stored in the study area overnight. If these animals were to remain inside the machinery, or under the wheels or tracks, they may be injured or may die once the machinery is in use.

There is a chance of fauna mortality during the operational phase of the REF proposal through vehicle collision (i.e. roadkill). Vehicle collision is a direct impact that reduces local population numbers. Mammals, reptiles, amphibians and birds are all at risk of vehicle strike. As there are no definitive data on current rates of roadkill or fauna population densities in the study area, the consequences of vehicle strike on local populations is unknown. With the expansion of an existing road the risk of vehicle strike should remain in a similar level to that currently experienced but the significance of such an impact cannot be predicted. The impact on threatened species however is expected to be minimal. Based on evidence from other roadways in the locality, most vehicle strike impacts can be expected to occur to common mammals such as birds and possums and exotic animals, including foxes.

## **6.1.3.2 Indirect/operational impacts**

### **6.1.3.2.1 Wildlife connectivity and habitat fragmentation**

The habitats within the study area are fragments that have formed since the initial habitat clearing that has occurred. The current alignment of Henry Lawson Drive and Milperra Road divide the remaining habitats in the study area. The barrier posed by the existing Henry Lawson Drive and Milperra Road serve to restrict fauna movements between habitat patches. However, functional habitat connectivity for more mobile species (e.g. birds, flying-foxes, insectivorous bats, insects, plants) is still present. The current roadways do not totally prevent fauna movement between habitat fragments (fauna can and likely do cross the road) but the roads do create a considerable hazard.



The REF proposal would not separate continuous habitats into smaller fragments, but would increase habitat isolation by reducing the size of current habitat patches and increasing the distance between habitat fragments. The isolation that may be caused by the REF proposal is not likely to have an appreciable impact on nomadic or migratory species such as birds. The REF proposal would only result in marginal impact to the dispersal of arboreal mammals and other species including frogs and reptiles, compared to what is already experienced.

The predicted level of isolation from the REF proposal is not likely to be enough to prevent the breeding and dispersal of plant pollinators or the dispersal of plant propagules (i.e. seed or other vegetative reproductive material) between habitat patches. Functional connectivity for many species would remain in the study area. However, local division of some wildlife populations, isolation of key habitat resources, loss of genetic interchange, and loss of population viability for some species may result.

#### **6.1.3.2.2 Edge effects on adjacent native vegetation and habitat**

Currently, edge effects from the Henry Lawson Drive and Milperra Road impact native vegetation particularly through weed invasion. As the REF proposal involves widening the road this impact is likely to exacerbate and introduce this impact into additional areas of native vegetation and habitat.

The vegetation recorded within the study area mostly occurred in linear patches with some degree of weed invasion. Vegetation recorded in moderate condition and/or with connectivity to larger patches of vegetation is most vulnerable to edge effects. The viability of these areas may be reduced by the REF proposal if not appropriately managed.

A landscape plan would be implemented as part of the overall proposal that would include planting of locally indigenous plants similar to those currently planted.

#### **6.1.3.2.3 Invasion and spread of weeds**

Proliferation of weeds is likely to occur during construction and operation, although impacts would be greatest because of vegetation clearing during the construction phase. The most likely causes of weed dispersal and importation associated with the REF proposal include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery during all phases. The study area contains significant weed growth and no undisturbed weed free habitat exists. As such, weeds would need to be managed during construction.

#### **6.1.3.2.4 Invasion and spread of pests**

The study area is currently habitat for a range of commonly occurring pest species including European Fox, Black Rat and possibly rabbits. REF proposal activities have the potential to disperse pest species out of the REF proposal area across the surrounding landscape, but the magnitude of this impact would be low.

#### **6.1.3.2.5 Invasion and spread of pathogens and disease**

Plant and animal pathogens can affect threatened biodiversity through direct mortality and modification to vegetation structure and composition. The following pathogens are considered to have potential to affect the biodiversity within the REF proposal area and are the subject of KTP listings:

- Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*)
- Exotic Rust Fungi (order Pucciniales, e.g. Myrtle rust fungus *Uredo rangelii*)
- Phytophthora Root Rot Fungus (*Phytophthora cinnamomi*).

These three pathogens have all been recorded in the Sydney Basin bioregion and have potential to occur on within the REF proposal site at present or in the future.

The main way in which Exotic Rust Fungi and Phytophthora Root Rot Fungus may be spread is through the movement of infected plant material and/or soil. The construction and operation of the REF proposal may increase the risk of disturbing and spreading these pathogens. With the implementation of hygiene procedures for the use of vehicles and the importation of materials to the REF proposal area, the risk of introducing these pathogens would, however, be low. Preferential use of plant materials sourced on-site (e.g. mulch, seeds) used for vegetation restoration would also help to minimise this risk.

Amphibian Chytrid Fungus can be spread through the movement of infected animals or water (including mud or moist soil) from infected areas. With the implementation of hygiene procedures for the use of vehicles and the importation of materials to the REF proposal area, the risk of introducing this pathogen to uninfected areas is low.

Pathogens would be managed within the REF proposal site according to the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (NSW Roads and Traffic Authority, 2011).

#### **6.1.3.2.6 Changes to hydrology**

The existing hydrological conditions of the REF proposal are already affected by altered landform and altered stormwater runoff and velocity because of surrounding land uses and existing roads. The REF proposal may result in further alteration to the hydrology of the study area due to an increase in surface runoff. The stormwater design for operational phase would aim to maintain, wherever possible, the existing flood regime and levels. A summary of the hydrology assessment is provided in Section 6.2.

#### **6.1.3.2.7 Noise, light and vibration**

Considering the existing levels of noise and vibration from the surrounding urban development and the high levels of use of the existing Henry Lawson Drive and Milperra Road by vehicles, it is unlikely there would be a significant increase in noise and vibration during operation of the road that would result in any increased impacts to biodiversity within the study area. There is however potential for impacts to locally common fauna from noise and vibration during construction, which may result in fauna temporarily avoiding habitats adjacent to the construction, however traffic noise is likely to be significant deterrent to most fauna groups already. The magnitude of this impact would be low.

Lighting may be used at night to enable work to be completed that may result in impacts to nocturnal fauna. Nocturnal species such as possums and microbats may avoid the habitat in the study area during construction as temporary 'daylight' conditions would be created by the mobile lighting system. This impact is considered temporary and would not have long lasting effects on the biodiversity of the study area. The magnitude of this impact would be low.

Street lighting proposed as part of the overall proposal would be similar to that currently on the road, so that there would be no increase in impact to surrounding biodiversity.

#### **6.1.3.2.8 Groundwater dependent ecosystems**

The groundwater impact assessment (refer Section 6.4) identified that there would only be a minor extent of excavations. With the implementation of environmental groundwater safeguards, it is unlikely that interception of groundwater flows would significantly affect GDEs within the study area. The REF proposal is not expected to substantially interfere with subsurface or groundwater flows associated with the Georges River.

## 6.1.4 Safeguards and management measures

Safeguards and management measures for biodiversity are presented in Table 6-6. Other safeguards and management measures that would address biodiversity impacts are identified in Sections 6.2.4, 6.3.4 and 6.4.4.

Table 6-6: Safeguards and management measures for impacts to biodiversity

Impact	Environmental management measure	Responsibility	Timing
Removal of native vegetation and habitat features/ Removal of threatened species habitat	Native vegetation removal will be minimised through detailed design processes, in particular, to minimise impacts on Hollow-bearing trees, <i>Callistemon linearifolius</i> and Threatened Ecological Communities, where possible, with consideration to: <ul style="list-style-type: none"> <li>• placement of embankments and adopting alternative options such as retaining walls to minimise the construction footprint.</li> <li>• ground survey locations of hollow bearing trees, <i>Callistemon linearifolius</i> and <i>Acacia pubescens</i> for inclusion onto design plans and integration into constructability assessments.</li> </ul>	Transport	Detailed design
Removal of native vegetation and habitat/ Removal of threatened plants	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	Prior to construction
Removal of native and non-native vegetation and habitat/ Injury and mortality of fauna	Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
Removal of native vegetation and habitat/ Wildlife corridors and connectivity	Native vegetation will be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011) and landscaping plans for the proposal.	Contractor	During construction
Removal of native vegetation and habitat/ Wildlife corridors and connectivity	The unexpected species find procedure under Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (RTA 2011) will be implemented if TECs or threatened fauna, not assessed in the biodiversity assessment, are identified in the REF proposal area.	Contractor	During construction
Removal of native vegetation and habitat/ Impacts to habitat in human made structures/ Injury and mortality of fauna	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
Impacts to habitat in human made structures	Develop options for providing microbat roosting habitat during detailed design processes for culvert structures particularly for the Southern Myotis ( <i>Myotis macropus</i> ).	Transport	Detailed design

Impact	Environmental management measure	Responsibility	Timing
Microbat survey and habitat	<p>A targeted microbat survey of structures within the footprint and proposed for removal or modification would be undertaken in accordance with 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (NSW Office Of Environment and Heritage (OEH), 2018b), prior to construction or as soon as feasible prior to disturbance.</p> <p>If threatened microbats are detected, a Microbat Management Plan will be developed as part of the Construction Environment Management Plan and implemented by a suitably qualified bat specialist. A copy of the Microbat Management Plan would be submitted to Canterbury Bankstown Council for review</p>	Contractor	Pre-construction and during construction
Removal of native vegetation/ Aquatic impacts/ Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011). This will include demarcating riparian exclusions zones to protect aquatic habitats and riparian zones where works are not required.	Contractor	During construction
Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
Invasion and spread of weeds	The Landscaping Plan and the Construction Flora and Fauna Management Plan, the latter comprising a Weed Management Sub-Plan will be prepared in accordance with the DPI Office of Water Guidelines for Vegetation Management Plans on Waterfront Land (2012).	Contractor	Pre-construction
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
Indirect impacts on native vegetation and habitat	<p>Shading and artificial light impacts will be minimised where practicable taking into account minimum luminescence requirements for:</p> <ul style="list-style-type: none"> <li>• Safety when constructing during the night-time period</li> <li>• An urban road as outlined in the Australian Standards through detailed design.</li> </ul>	Transport/ Contractor	Detailed design/ during construction
Impacts to habitat in non- native vegetation	<p>Habitat will be replaced or re-instated in accordance with:</p> <ul style="list-style-type: none"> <li>• Urban design landscaping plans which will include revegetation with local native vegetation species, suitable for the riparian zone considering vegetation species that adopts existing communities and landscape character, and uses local provenance.</li> <li>• Guide 5: Re-use of woody debris and bushrock</li> </ul>	Transport/ Contractor	Detailed design/ during construction



Impact	Environmental management measure	Responsibility	Timing
	<ul style="list-style-type: none"> <li>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).</li> </ul> <p>Canterbury Bankstown Council will be consulted with at the detailed design stage in regard to the selection of vegetation species in the landscaping plans.</p>		
Injury and mortality to fauna - vehicle strike	<p>Opportunities to minimise road-kill will be identified in the design process with consideration to:</p> <ul style="list-style-type: none"> <li>Available space.</li> <li>Avoid creating features too close to the roadside that would attract fauna to the roadside.</li> <li>Using landscaping techniques to create suitable buffers and to separate any potential attracting features from the roadside.</li> <li>A roadside planting palette that does not intentionally attract fauna to the roadside.</li> </ul>	Transport	Detailed design
Aquatic impacts	<p>Aquatic habitat will be protected in accordance with:</p> <ul style="list-style-type: none"> <li>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011)</li> <li>Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013)</li> <li>Acid Sulfate Soil Management Plan (ASSMP)</li> <li>Construction Soil and Water Management Plan</li> </ul>	Contractor	During construction
Aquatic impacts	<p>Consider detailed design refinements and constructability options that ensure that fish passage is not blocked during construction of the new Auld Avenue bridge.</p> <p>During construction, in stream works to construct the Auld Avenue bridge will ensure that fish passage is not blocked.</p>	Transport/ Contractor	Detailed design/ During construction
Aquatic impacts	<p>Consultation with NSW DPI Fisheries Regional Conservation Manager will be undertaken to discuss the best approach to construction works within aquatic habitats and riparian zones. This will also help identify whether any trees to be removed for the proposal can be used to re-snag waterways.</p>	Contractor	Pre-construction
Removal of riparian vegetation, and impacts to GDEs	<p>Consider detailed design refinements and constructability options that minimise removal of riparian vegetation. This includes ensuring any access to the waterway, if required, minimises the removal of riparian vegetation and is restricted to the minimum amount of bank length required for the construction activity.</p> <p>Further consideration of minimising direct impacts to riparian vegetation and GDEs will be undertaken during detailed design and construction.</p>	Transport	Detailed design

Impact	Environmental management measure	Responsibility	Timing
	Relevant approvals and permits must be obtained prior to removal of mangroves.		

### 6.1.5 Biodiversity offsets

Although efforts have been made to avoid, minimise and mitigate potential ecological impacts associated with the proposal, some residual impacts would occur. The BAR identifies that the REF proposal is not likely to have a significant impact on any threatened biodiversity listed under the BC Act or EPBC Act. In this instance, and due to the Strategic Assessment, the EPBC Act environmental offsets policy does not apply.

Transport would provide biodiversity offsets or where offsets are not reasonable or feasible, supplementary measures for impacts that exceed the thresholds in the Transport 'Guideline for Biodiversity Offsets' (Roads and Maritime Services, 2016). Table 6-7 compares the residual impacts of the proposal against these thresholds. The assessment indicates that offsets would be required for this proposal as the impacts exceed biodiversity offset thresholds.

An estimate of the quantum of offsets required in accordance with the simplified offset ratios within Table 2 of the Transport 'Guideline for Biodiversity Offsets' (Roads and Maritime Services, 2016) has been provided in Table 6-8.

Table 6-7: Transport offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Does the proposal trigger an offset
Activities in accordance with Transport for NSW Services Environmental assessment procedure: Routine and Minor Works (RTA 2011)	No	No
Works on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	No
Works involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	No	No
Works involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of a CEEC in moderate to good condition	Yes. 0.21 ha of moderate condition PCT 725 and 0.96 ha of moderate condition PCT 835 is proposed for removal (combined = 1.17 ha)
Works involving clearing of nationally listed threatened ecological community (TEC) or nationally listed threatened species habitat	Where clearing >1 ha of a TEC or habitat in moderate to good condition	Yes. 0.21 ha of moderate condition PCT 725 and 0.96 ha of moderate condition PCT 835 is proposed for removal (combined = 1.17 ha)  1.17 ha of habitat for Swift Parrot, White-throated Needletail and Grey-headed Flying-fox.

Description of activity or impact	Consider offsets or supplementary measures	Does the proposal trigger an offset
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	No. <5 ha of NSW TEC would be impacted upon and no TEC present is subject to a SIS.
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database (TSPD)	Where clearing > 1ha or where the species is the subject of an SIS	Yes. 1.27 ha of Southern Myotis habitat is proposed for removal.  Yes. Removal of 23 <i>Callistemon linearifolius</i> .
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's Threatened Species Profile Database (TSPD)	Where clearing > 5ha or where the species is the subject of an SIS	No. 1.27 ha of habitat in moderate to good condition for ecosystem credit fauna species is proposed for removal.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No

Implementation of the Transport *Guideline for Biodiversity Offsets* (November 2016) indicates that offsets are required for the REF proposal as the impacts exceed biodiversity offset thresholds. The biodiversity offset obligations would need to be re-evaluated during detailed design once a final disturbance footprint has been determined.

Table 6-8: Offset quantum based on REF proposal offset ratios

Type of impact	Offset ratio	REF proposal impact	Potential offset obligation
Loss of nationally listed TEC	Offset area of habitat lost at a ratio of 4:1	0.21 ha of moderate condition PCT 725 and 0.96 ha of moderate condition PCT 835 is proposed for removal (combined = 1.17 ha)	0.84 ha of PCT 725 and 3.84 ha of PCT 835 (combined 4.68 ha)
Loss of threatened fauna species	Offset area of habitat lost at a ratio of 3:1	1.17 ha of nationally listed threatened fauna species habitat in moderate to good condition	3.51 ha of habitat for Grey-headed Flying-fox, White-throated Needletail and Swift Parrot
		1.27 ha of NSW listed threatened species credit species habitat in moderate to good condition <sup>1</sup>	3.81 ha of habitat for Southern Myotis.
Loss of threatened flora species	Offset individuals lost at a ratio of 3:1	23 <i>Callistemon linearifolius</i>	69 <i>Callistemon linearifolius</i> individuals
NSW listed threatened species habitat and the species is an ecosystem credit species	Offset habitat lost at a ratio of 3:1	1.27 ha of habitat in moderate to good condition for ecosystem credit fauna species is proposed for removal.	3.81 ha of habitat for ecosystem credit fauna species.

### 6.1.5.1 Biodiversity Offset Scheme

The Biodiversity Offset Scheme (BOS) only applies to activities assessed and determined under Part 5 of the EP&A Act if proponents choose to 'opt in' to the Scheme. To satisfy the offset requirements for the proposal, Transport may consider participating in DPIE's BOS.

## 6.2 Hydrology, flooding and coastal processes

The potential impacts on hydrology, flooding and coastal processes during construction and operation of the proposal have been assessed as part of the *Henry Lawson Upgrade Stage 1A Review of Environmental Factors & Environmental Impact Statement Environmental Working Paper: Flooding* (Lyll & Associates 2021), provided in Appendix E.

### 6.2.1 Methodology

#### 6.2.1.1 Data collection

A desktop review was undertaken to gather available data and review existing flood studies of the catchments relevant to the overall proposal.

#### 6.2.1.2 Existing environmental modelling and analysis

The hydrologic and hydraulic models that were relied upon for the flooding assessment were based on models previously developed for the following Canterbury Bankstown Council studies:

- Georges River Flood Study (BMT 2020a)
- Milperra Catchment Flood Study (BMT WBM 2015).

BMT 2020a investigated hydrologic modelling approaches based on Australian Rainfall and Runoff (ARR) 1987 and a draft version of ARR 2019 that was released in 2016 (ARR 2016). Based on a comparison of peak flow estimates from the two modelling approaches it was decided to adopt the procedures in ARR 1987 as it gave a better match to peak flows derived from a flood frequency analysis of stream gauge records at the Liverpool Weir and was also consistent with Canterbury Bankstown Council's existing flood mapping and flood planning levels.

For consistency with BMT 2020a, the assessment of flood behaviour in the Georges River as part of the present investigation was also based on ARR 1987 procedures.

As WBM BMT 2015 was prepared prior to the release of both ARR 2016 and ARR 2019 it was based on the procedures in ARR 1987. For the purpose of the present investigation, the flood models that were developed as part of WBM BMT 2015 have therefore been updated using the procedures in ARR 2019.

The ARR guideline provides specific recommendations in relation to the climate change impacts on rainfall intensities based on the recommendations set out in DECC 2007.

Once the set of hydrologic and hydraulic models ('flood models') were developed, flood modelling showing flood behaviour under present day (i.e. pre-proposal), and under proposal (construction and operation) was prepared for design floods with annual exceedance probabilities (AEPs) of 50 per cent, 20 per cent, 10 per cent, 2 per cent, 1 per cent, 0.5 per cent and 0.2 per cent as well as the Probable Maximum Flood (PMF). The 0.5 per cent AEP and 0.2 per cent AEP design storm events were adopted to assess climate change impact on flooding as per the NSW Government's Floodplain Risk Management Guideline: Practical Considerations of Climate Change (DECC 2007). These design storm events are analogous to an increase in 1 per cent AEP design rainfall intensities of 10 and 30 per cent respectively.



### **6.2.1.3 Coastal processes**

In the absence of a formal State Government policy on sea level rise benchmarks (noting that in 2012, the NSW Government recommended against state-wide sea level rise benchmarks), the previously recommended rises in sea level of 0.4 metres by 2050 and 0.9 metres by 2100 have been adopted for assessing the impact future climate change could have on flooding conditions in the vicinity of the proposal. This approach is consistent with both the Georges River Estuary Coastal Zone Management Plan (Georges River Combined Councils' Committee (GRCCC) 2013) as well as the Georges River Tidal Inundation Study (BMT 2018) that was prepared on behalf of Georges River Council, to assess the impact of sea level rise on an increase in tidal inundation in the lower reach of the Georges River.

### **6.2.1.4 Impact assessment**

- Construction phase impact assessment assessed:
  - Flood risk and inundation of the construction area and ancillary facilities during construction
  - Potential impacts that proposed construction activities could have on flood behaviour to the surrounding area.
- Operational phase impact assessment assessed:
  - Flood risk to and inundation of the operational proposal
  - The impact of the proposal on the floodplain and flood behaviour.
  - Flood impacts under conditions of a partial blockage of major hydraulic structures
  - Flood impacts under future climate change conditions
  - Cumulative impacts (addressed in Section 6.15).

## **6.2.2 Existing environment**

The proposal is located within the Georges River and the Milperra Drain catchments. The extent of the two catchments with reference to the proposal's location is shown in Figure 4.1 of Appendix E.

### **6.2.2.1 Georges River**

#### **6.2.2.1.1 Catchment overview**

The Georges River is about 100 kilometres long and has a total catchment area of around 960 square kilometres.

The section of the REF proposal area to the north of Milperra Road runs along the eastern bank near the Georges River. The section of Henry Lawson Drive between Milperra Road and Tower Road is kerb and guttered, with runoff controlled by a series of pit and pipe drainage systems that include two outlets that discharge into the Georges River along its eastern bank.

The section of Henry Lawson Drive to the north of Tower Road that lies within the proposal area is on fill embankment where runoff flows off the road as relatively shallow 'sheet' flow into the adjoining areas where it is conveyed overland to the Georges River.

A 2.4 metres wide by 1.2 metres high box culvert crosses Henry Lawson Drive about 100 metres to the north of Tower Road where it discharges into the Georges River.

### **6.2.2.1.2 Existing flooding**

The nature of flooding under present day conditions in the Georges River catchment was modelled and found:

- During a 20 per cent AEP event, floodwater from the Georges River overtops its eastern bank and inundate a section of Henry Lawson Drive to the north of Tower Road over a length of about 1.2 kilometres and to a maximum depth of about 0.9 metres. At this depth floodwaters would be unsafe to vehicles and persons. Only a 200 metre length within the proposal area would be inundated.
- During a 5 per cent AEP event, floodwater from the Georges River would back up Milperra Drain and overtop the deck of the Auld Avenue bridge to a depth of 0.3 metres, while the section of Henry Lawson Drive to the south of the bridge would be inundated over a 260 metre length (140 metres of which is located within the proposal area) and to a maximum depth of one metre. It would also impact the section of Henry Lawson Drive to the north of Tower Road over a length of about 1.2 kilometres (200 metres of which is located within the overall proposal boundary) and to a maximum depth of about 0.9 metre. It would also inundate a 1.2 kilometres length of Milperra Road to the east of Henry Lawson Drive to a maximum depth of about 1 metre.
- Floodwater that surcharges the eastern bank of the Georges River during a 1 per cent AEP event would inundate the full length of Henry Lawson Drive and Milperra Road within the proposal area to a maximum depth of over 3 metres. The floodwater would also inundate Henry Lawson Drive up to 1.1 kilometre distance to the north and 300 metres to the south of the proposal, while flooding along Milperra Road would extend over 1.1 kilometres to the east of the overall proposal.
- A number of residential properties that are located to the south of the Newbridge Road Bridge, would be inundated during a 1 per cent AEP event as well as commercial properties on the eastern side of Henry Lawson Drive to the north of Milperra Road.
- The proposal area would be inundated to depths of between 6 and 8 metres during the PMF.
- The extent and depth of flooding to Henry Lawson Drive and Milperra Road, both within the proposal area and in its immediate vicinity, would limit the ability to improve the road corridor's level of flood immunity.

### **6.2.2.2 Milperra Drain**

#### **6.2.2.2.1 Catchment overview**

Milperra Drain has a catchment area of about 10 square kilometres. Milperra Drain runs from east to west over a length of about 4.5 kilometres and joins the Georges River on its left (eastern) bank approximately 1.7 kilometres downstream of the Newbridge Road Bridge.

A large part of the catchment lies to the north of Milperra Road and is drained by four small tributaries that run through Bankstown Airport land. A fifth tributary drains the south-eastern portion of the catchment.

The catchment contains a variety of land usage, with extensive areas of open space, which includes the Bankstown Airport at its centre. A heavy concentration of industry is present adjacent to the middle to lower reaches of Milperra Drain between Milperra Road and Ashford Avenue. Areas of residential development are located in the upper reaches of the drainage system which is typically piped along most of its length.

The section of Milperra Drain where it runs through the Bankstown Golf Course to the south of the proposal area comprises a vegetated channel of varying width. Canterbury Bankstown Council is in the process of widening the channel over a 570 metre length of the drain where it runs through the northern portion of the golf course.

Between the golf course crossings and the Georges River, the Milperra Drain is natural in its condition and of limited capacity due to the presence of dense vegetation on both the in bank and overbank areas of the watercourse.

Henry Lawson Drive where it crosses Milperra Drain is located on the Auld Avenue bridge structure which comprises four spans of a total length of 32 metres.

A 1.5 metre wide by 1.2 metres high box culvert crosses Milperra Road about 190 metres east of its intersection with Henry Lawson Drive where it discharges into Milperra Drain on its northern bank. The box culvert controls runoff from an area of reserve to the north of Milperra Road, as well as a portion of Bankstown Airport.

#### **6.2.2.2.2 Existing flooding**

The nature of flooding under present day conditions in the Milperra Drain catchment has been modelled and found:

- During storms as frequent as 50 per cent AEP, floodwater would surcharge the section of Milperra Drain that runs to the south of Milperra Road where it would inundate areas of Bankstown Golf Course to depths that exceed 1 metre in a number of locations. Floodwater would also surcharge the main channel of Milperra Drain to the west (downstream) of Henry Lawson Drive where it would inundate the section of Auld Avenue that is located west of the proposal area.
- The section of Milperra Road to the east of Henry Lawson Drive is impacted by floodwater that surcharges the main channel of Milperra Drain where it runs through the Bankstown Golf Course during a 10 per cent AEP storm event. It is noted that flooding would be confined to the outer traffic lanes and to relatively shallow depths of 0.2 metres or less.
- During a 1 per cent AEP storm on the Milperra catchment in the absence of elevated flood levels in the Georges River, flooding from the Milperra Drain would inundate the section of Milperra Road to the east of Henry Lawson Drive across its full width. Flooding due to runoff from the Milperra catchment would pond in the Georges River Golf Course to a level that is about 0.1 metres below the adjacent level of Henry Lawson Drive.
- During a 1 per cent AEP storm on the Milperra catchment in combination with a 5 per cent AEP flood in the Georges River, peak flood levels near the proposal area are controlled by flood levels in the Georges River. Under this combination of flooding, the peak flood level at the Milperra Drain (Auld Avenue) bridge is about 0.3 metres above its deck level. Floodwaters would also inundate the northern and eastern portions of the proposal area from peak flood levels in the Georges River.

#### **6.2.2.3 Flood evacuation routes**

Consultation with the NSW State Emergency Services (SES), indicated that flood evacuation routes through the area include both Henry Lawson Drive and Milperra Road.

### **6.2.3 Potential impacts**

#### **6.2.3.1 Construction impacts**

The potential flooding and hydrology impacts during construction that have been assessed include:

- Potential flood risks of construction work areas
- Potential impacts of construction activities on flood behaviour.

Construction of the overall proposal area has been split into three areas of work to assess impacts to different areas of construction.

The range of construction activities that would be undertaken in the REF proposal area includes earthworks, construction ancillary facilities and the construction of the Auld Avenue Bridge (with a temporary piling platform).

#### **6.2.3.1.1 Potential flood risks of construction work areas**

Without the implementation of appropriate management measures, the inundation of the construction work areas and ancillary sites by floodwater has the potential to:

- Cause damage to the proposal works and delays in construction programming
- Pose a safety risk to construction workers
- Detrimentially impact the downstream waterways through the transport of sediments and construction materials by floodwater
- Obstruct the passage of floodwater and overland flow through ancillary works such as site sheds, stockpiles and some types of temporary fencing, which in turn could exacerbate flooding conditions in existing development located outside the construction footprint.

Assessment of each construction work area is discussed in Table 6-9.

#### **Potential impacts of construction activities on flood behaviour**

Construction activities have the potential to exacerbate flooding conditions as they typically impose a larger footprint on the floodplain outside of the operational proposal footprint. This is because construction activities typically impose a larger footprint on the floodplain due to the need to provide temporary structures, such as ancillary sites, outside the operational proposal footprint which would be removed following the completion of construction activities. Assessment of each construction work area and potential impacts on flood behaviour is discussed in Table 6-9.



Table 6-9: Summary of assessed flood risks and potential impacts at proposed construction work areas

Construction work area	Compounds / other areas	Description of existing flood behaviour (pre-mitigation)	Potential impacts of construction activities on flood behaviour
Henry Lawson Drive north	Georges River ancillary site	<p>Should a 5% AEP Georges River flood occur during the construction of the proposal then the site would be inundated, albeit over a relatively localised area of about 150 m<sup>2</sup> and to a maximum depth of 0.4 m.</p> <p>Should a 2% AEP Georges River flood occur during the construction of the proposal the majority of the site would be inundated to maximum depth of 1.0 m, increasing to 1.2 m during a 1% AEP Georges River flood.</p> <p>The site is not impacted by Milperra catchment flooding for events up to 1% AEP in magnitude.</p>	<p>The proposed site facilities and the storage of materials has the potential to obstruct the conveyance of flow from the Georges River should a flood event greater than 5% AEP in magnitude occur during the construction phase of the proposal. The resulting impacts on flood behaviour are likely to be relatively localised given the extent of Georges River flooding relative to the extent of the ancillary site. However, there is also the potential for materials stored within the ancillary site to be displaced and transported along the Georges River.</p> <p>The proposed activities associated with the site would not impact on Milperra catchment flooding for events up to 1% AEP.</p>
	Other construction works area	<p>Should a 20% AEP Georges River flood occur during construction of the proposal the portion of Henry Lawson Drive north to the north of Tower Road would be inundated to depths that are typically between 0.5 and 1.5 m.</p> <p>Should a 1% AEP Georges River flood occur during the construction of the proposal the full extent of earthworks within Henry Lawson Drive north would be inundated to a maximum depth of over 3 m.</p> <p>Local catchment runoff that surcharges a channel that runs through the Georges River golf course would inundate the proposed earthworks along the eastern side of Henry Lawson Drive during storms as frequent as 50% AEP.</p>	<p>Should a flood occur on the Georges River during the construction of the proposal then there is a risk of scour to any exposed surfaces and the transport of sediment into the Georges River. The impact of the proposed earthworks on changes to flood behaviour in the Georges River is not expected to be significantly greater than those under operational conditions in this area.</p>
Milperra Road	Newbridge Road ancillary site	<p>Should a 2% AEP Georges River flood occur during the construction of the proposal the full extent of the site would be inundated to a maximum depth of 0.3 m, increasing to 0.6 m during a 1% AEP event.</p> <p>The site is not impacted by Milperra catchment flooding for events up to 1% AEP in magnitude.</p>	<p>Site facilities, material storage and associated perimeter fencing have the potential to obstruct the conveyance of flow from the Georges River should a flood event greater than 5% AEP in magnitude occur during the construction phase of the proposal. The resulting impacts on flood behaviour are likely to be relatively localised given the extent of Georges River flooding relative to the extent of the ancillary site.</p>

Construction work area	Compounds / other areas	Description of existing flood behaviour (pre-mitigation)	Potential impacts of construction activities on flood behaviour
			However, there is also the potential for materials stored within the ancillary site to be displaced and transported along the Georges River. The proposed activities associated with the site would not impact on Milperra catchment flooding for events up to 1% AEP.
	Other construction works area	<p>Should a 10% AEP Georges River flood occur during the construction of the proposal then floodwater would back up the Milperra Drain and inundate an area of proposed earthworks along the southern side of Milperra Road.</p> <p>Should a 5% AEP Georges River flood occur during the construction of the proposal then the full extent of earthworks along the section of Milperra Road to the east of Henry Lawson Drive would be inundated to a maximum depth of about 2 m, increasing to 3 m during a 1% AEP event.</p> <p>The proposed earthworks along the southern side of Milperra Road would be inundated by runoff that surcharges the section of Milperra Drain that runs through the Bankstown golf course during storms as frequent as 50% AEP.</p> <p>The proposed earthworks along the southern side of Milperra Road would be frequently inundated by runoff that is conveyed by the box culvert that crosses Milperra Road to the east of Henry Lawson Drive.</p>	Should a flood occur on the Georges River during the construction of the proposal of 10% AEP magnitude or greater then there is a risk of scour to any exposed surfaces and the transport of sediment into the Georges River. The impact of the proposed earthworks on changes to flood behaviour in the Georges River is not expected to be significantly greater than those under operational conditions in this area.
Henry Lawson Drive south	Henry Lawson Drive ancillary site	<p>Should a 20% AEP Georges River flood occur during the construction of the proposal then a relatively localised area in the south-east corner of the site would be inundated, albeit over a relatively localised area of about 280 m<sup>2</sup> and to a maximum depth of 0.4 m.</p> <p>Should a 5% AEP Georges River flood occur during the construction of the proposal the majority of the site would be inundated to a depth of between 0.5 and 2.2 m, increasing to between 1.5 and 3.3 m during a 1% AEP event.</p>	While facilities and materials located within the ancillary site have the potential to displace floodwater that backs up from both the Georges River and Milperra Drain, impacts on flood behaviour for events up to 1% AEP are likely to be minor given the extent of flooding relative to the extent of the ancillary site. However, there is the potential for materials stored within the ancillary site to be displaced and transported along Milperra Drain and the Georges River.

Construction work area	Compounds / other areas	Description of existing flood behaviour (pre-mitigation)	Potential impacts of construction activities on flood behaviour
		<p>Due to the low lying nature of the south-eastern portion of the site it would be inundated by flow that surcharges the section of Milperra Drain where it runs through the Bankstown golf course during storms more frequent than 50% AEP.</p> <p>Should a 5% AEP storm event occur on the Milperra catchment during the construction of the proposal then almost half of the site would be inundated to a maximum depth of 1.1 metres, while the majority of the site would be inundated to a maximum depth of 1.4 m during a 1% AEP storm event.</p>	
	Auld Avenue ancillary site	<p>Should a 5% AEP Georges River flood occur during the construction of the proposal then the majority of the site would be inundated to a maximum depth of 0.6 metres, increasing to 1.6 metres during a 1% AEP event.</p> <p>Should a 5% AEP Georges River flood occur during the construction of the proposal the majority of the site would be inundated to a depth of 0.6 m, increasing to 1.6 m during a 1% AEP Georges River flood.</p> <p>The site is not impacted by Milperra catchment flooding for storm events up to 1% AEP in intensity in the absence of elevated flood levels in the Georges River.</p>	While facilities and materials located within the ancillary site have the potential to displace floodwater that backs up from both the Georges River and Milperra Drain, impacts on flood behaviour for events up to 1% AEP are likely to be minor given the extent of flooding relative to the extent of the ancillary site. However, there is the potential for materials stored within the ancillary site to be displaced and transported along Milperra Drain and the Georges River.
	Auld Avenue bridge working platform	<p>The area where the working platform would be located is frequently inundated by both Georges River and Milperra Drain flooding.</p> <p>Should a 20% AEP Georges River flood occur during the construction of the proposal then the area where the working platform is proposed would be inundated to a depth of over 3 m, increasing to more than 4 m during a 1% AEP event.</p>	The working platform for the construction of the new Auld Avenue bridge has the potential to obstruct the conveyance of flow in Milperra Drain during events more frequent than 50% AEP. This in turn may impact on the extent and depth of inundation and flow velocities in Milperra Drain.

Construction work area	Compounds / other areas	Description of existing flood behaviour (pre-mitigation)	Potential impacts of construction activities on flood behaviour
		Should a 1% AEP design storm occur over the Milperra catchment during the construction of the proposal in the absence of elevated flood levels in the Georges River then the area where the working platform is proposed would be inundated to a depth of over 1 m.	
	Other construction works area	An area of proposed earthworks along the western side of Henry Lawson Drive, to the south of Auld Avenue bridge would be impacted by floodwater that backs up Milperra Drain should a 10% AEP flood or greater occur during the construction of the proposal. The remainder of the proposed earthworks within Henry Lawson Drive south are located on land that typically lies above the 5% AEP Georges River flood.	Should a flood occur on the Georges River during the construction of the proposal of 10% AEP magnitude or greater then there is a risk of scour to any exposed surfaces and the transport of sediment into the Georges River. The impact of the proposed earthworks on changes to flood behaviour in the Georges River is not expected to be significantly greater than those under operational conditions in this area.
		<p>Should a 1% AEP Georges River flood occur during the construction of the proposal the full extent of earthworks within Henry Lawson Drive south would be inundated to a maximum depth of over 2 metres.</p> <p>The proposed earthworks are located on land that typically lies above the 1% AEP Milperra catchment flood with the exception of some relatively localised areas around the Auld Avenue bridge and the outlet to the pipe culvert that crosses the road to the south of Milperra Road that would be exposed to relatively frequent inundation due to their lying nature.</p>	The proposed earthworks along the eastern side of Henry Lawson Drive to the south of Milperra Road have the potential to impact on local catchment runoff discharging from the pipe culvert that crosses the road to the north of Tower Road unless the works are staged in a manner that maintains a temporary flow path through the site during the construction of the new pipe culvert.



### **6.2.3.2 Operational impacts**

This section provides an assessment of the flood risk to the proposal and the impact it would have on flood behaviour during operation if appropriate mitigation measures are not incorporated into its design.

#### **6.2.3.2.1 Potential flood risk to the proposal**

The proposal has been designed to maintain the existing level of flood immunity. While it was possible to increase the road level to improve flood immunity, this would have had the effect of increasing flood levels on adjoining land.

The potential flood risk to the proposal includes the following:

- The Georges River flooding assessment found:
  - The proposed upgrade of the section of Henry Lawson Drive to the north of Milperra Road would be inundated by floodwater that surcharges the river during storms more frequent than 20 per cent AEP
  - The proposed upgrade of the sections of Milperra Road and Henry Lawson Drive to its south would both have a 10 per cent AEP level of flood immunity against Georges River flooding.
- The Milperra catchment flooding investigation found:
  - The proposed upgrade of Henry Lawson Drive to the north and south of Milperra Road would have a 1 per cent AEP level of flood immunity against Milperra catchment flooding in the absence of elevated flood levels in the Georges River
  - The proposed upgrade of Milperra Road would have about a 10 per cent AEP level of flood immunity against Milperra catchment flooding.
- Floodwater that surcharges the Georges River during a 1 per cent AEP event and inundates Milperra Road and the sections of Henry Lawson Drive to its north and south would be hazardous to persons and vehicles using these sections of road, but would be no worse than under pre-proposal conditions.
- Based on the current design the new bridge over Milperra Drain would provide 0.3 metres of freeboard between the underside of the bridge structure and the peak 1 per cent AEP flood level. In comparison the existing bridge would be submerged by 0.3 m below the same peak flood level.

#### **6.2.3.2.2 Impact of the proposal on flood behaviour**

The assessment found there is the potential to increase peak flood levels in adjoining development at a number of locations due to the raised level of Henry Lawson Drive and the obstruction this would have on flow that presently overtops the road during coincident Georges River and Milperra catchment flooding.

The following potential impacts on Georges River flooding have been identified:

- Peak 2 per cent and 1 per cent AEP flood levels would be increased in an area to the west of Henry Lawson Drive between Newbridge Road and the Auld Avenue bridge that includes several residential properties by a maximum of 0.08 m, and 0.03 m, respectively.
- Peak 2 per cent and 1 per cent AEP flood levels would be increased in an area to the west of Henry Lawson Drive, north of Milperra Road that includes an existing shared user path. Flooding along the shared user path would be increased by a maximum of 0.1 m on an existing depth of about 0.2 m during a 2 per cent AEP event, and by 0.05 m on an existing depth of about 0.5 m during a 1 per cent AEP event.

- Peak 1 per cent AEP peak flood levels would be increased within two commercial premises that lie to the east of Henry Lawson Drive and north of Milperra Road by a maximum of 0.02 m on existing depths of between 0.1 and 0.3 m. While impacts are mainly confined to areas of landscaping, driveway and car parking, there is a car wash facility that would experience an increase in the depth of inundation of 0.02 m on an existing depth of 0.3 m. The increases in peak flood levels in areas outside the proposal area are due to the raised level of Henry Lawson Drive under post-proposal conditions which leads to an increase in the obstruction it has on floodwater that surcharges the Georges River.

The following potential impacts on Milperra catchment flooding have been identified:

- There would be an increase in the depth and extent of ponding within a commercial property that lies to the south of Tower Road during storms that surcharge the internal drainage system. The depths of inundation within the property would increase by a maximum of 0.04 m during a 10 per cent and 1 per cent AEP event on existing depths of between 0.2 and 0.3 m.
- During a 1 per cent AEP storm in combination with a 5 per cent AEP flood in the Georges River there would be an increase in the depth and extent of inundation within the front yards of four residential properties that lie on the western side of Henry Lawson Drive between Newbridge Road and the Auld Avenue bridge. Depths of inundation would be increased by 0.3 m which would lead to an increase in the extent of inundation from about 60 m<sup>2</sup> (pre-proposal conditions) to 440 m<sup>2</sup> (post-proposal conditions). The refinement of the road design during detailed design to lower finished levels along this section of Henry Lawson Drive that is discussed under Georges River flooding would also reduce its impact on Milperra catchment flooding.
- During a 1 per cent AEP storm in combination with a 5 per cent AEP flood in the Georges River, peak flood levels along the section of Milperra Drain where it runs to the east (upstream) of Henry Lawson Drive would be increased by a maximum of 0.013 m, with impacts extending to several industrial type properties that front Ashford Avenue and Milperra Road.

During detailed design the road alignment will be further refined with the aim of minimising the increase in road levels and therefore impacts on peak flood levels compared to pre-proposal conditions.

The proposal would have only a minor impact on peak flows in the Georges River and Milperra Drain. However, there is the potential for a localised increase in scour potential due to a localised increase in flow velocities at the outlet of new, upgraded or extended drainage structures. During detailed design, scour protection and energy dissipation measures would be incorporated into the design of the drainage outlets to manage localised increases in flow velocity.

### **6.2.3.2.3 Impact of future climate change on flood behaviour**

#### **Impact of flood behaviour under future climate change conditions on the proposal**

The increase in rainfall intensities from climate change has the potential to increase the frequency to flood events in the overall proposal area. These include:

- The section of Henry Lawson Drive to the north of Tower Road is presently inundated during a 20 per cent AEP Georges River flood (which occurs on average once every 5 years), whereas under future climate change it could be inundated during a 40 per cent AEP Georges River flood (which occurs on average once every 2 years).
- The section of Milperra Road to the east of Henry Lawson Drive is presently inundated during a 5 per cent AEP Georges River flood (which occurs on average once every 20 years), whereas under future climate change it could be inundated during a 10 per cent AEP Georges River flood (which occurs on average once every 10 years).

- The section of Henry Lawson Drive to the south of Milperra Road is presently inundated during a 5 per cent AEP Georges River flood (which occurs on average once every 20 years), whereas under future climate change it could be inundated during a 10 per cent AEP Georges River flood (which occurs on average once every 10 years).

The increase in rainfall intensities attributable to future climate change has the potential to increase the depth of inundation to the overall proposal. This has been taken into account in the assessment of the peak 1 per cent AEP flood levels for the overall proposal (e.g. both current climatic conditions and future climate change scenarios have been assessed).

Sea level rise under future climate change conditions would only have a minor impact on peak flood levels near the overall proposal area.

A summary of the peak 1 per cent AEP flood levels in regard to current and future climate change conditions indicates that the REF proposal would have the following impacts:

- Upgrade of existing road
  - At Henry Lawson Drive, north of its intersection with Milperra Road, the depth of inundation due to Georges River flooding would be increased from 1.9 metres under current climatic conditions, to between 2.1 and 2.4 metres under future climate change conditions.
  - At Milperra Road and Newbridge Road, the depth of inundation due to Georges River flooding would be increased from 1.8 metres under current climatic conditions, to between 2.0 and 2.4 metres under future climate change conditions.
  - At Henry Lawson Drive, south of its intersection with Milperra Road, the depth of inundation due to Georges River flooding would be increased from 1.9 metres under current climatic conditions, to between 2.1 and 2.5 metres under future climate change conditions.
- Duplication of the Auld Avenue bridge
  - The depth of overtopping of the existing Auld Avenue bridge due to Georges River flooding would be increased from 1.3 m under current climatic conditions, to between 1.5 and 1.9 m under future climate change conditions. Based on the current design the depth of overtopping of the new bridge would be 0.6 m less than that of the existing bridge.

### **Impact of the proposal on flood behaviour under future climate change conditions**

In regards to the impact of the proposal on flood behaviour under future climate change conditions, the 0.5 per cent and 0.2 per cent AEP events were adopted as proxies for assessing the sensitivity to an increase in 1 per cent AEP design rainfall intensities of between 10 per cent and 30 per cent due to future climate change.

The assessment of flood impacts across a range of events has identified that the overall proposal has the greatest potential for increases in peak flood levels in neighbouring properties as a result of Georges River flooding during a 2 per cent and 1 per cent AEP event. The increase in rainfall intensities under future climate change would mean that the rainfall intensities that produce these flood events would occur more frequently. That is, unless suitable mitigation measures are incorporated into the overall proposal, then the impacts would occur on a more frequent basis than once every 100 years on the average.

There would be either no change or a reduction in the flood impacts during a 1 per cent AEP flood in the Georges River catchment that are attributable to the overall proposal under the lower and upper bound future climate change scenarios.

The assessment of flood impacts in the Milperra catchment across a range of events in combination with and without elevated flood levels in the Georges River has identified that the overall proposal has the greatest potential for increases in peak flood levels in adjoining development as a result of flooding in the Milperra catchment during 1 per cent AEP event, in combination with a 5 per cent AEP flood on the Georges River. The increase in rainfall intensities under future climate change would mean that the rainfall intensities that produce these flood events would occur more frequently. That is, unless suitable mitigation measures are incorporated into the proposal, then under future climate change conditions the impacts would occur on a more frequent basis when compared to current climatic conditions.

There would be either no change or a reduction in the flood impacts during a 1 per cent AEP flood in the Milperra catchment that are attributable to the overall proposal under the lower and upper bound future climate change scenarios.

### **Impact of a partial blockage of major hydraulic structures on flood behaviour**

The flooding assessment showed that a partial blockage of major hydraulic structures (the culverts and Auld Avenue bridge) would generally have only a minor impact on flooding to the proposal. The impact would range from an increase in peak flood levels of about 0.02 m at Auld Avenue bridge to 0.12 m at Henry Lawson Drive north of Milperra Road compared to 'without blockage' conditions.

#### **6.2.4 Safeguards and management measures**

Safeguards and management measures for hydrology, flooding and coastal processes are presented in Table 6-10.



Table 6-10 Environmental management measures for hydrology, flooding and coastal processes impacts

Impact	Environmental management measure	Responsibility	Timing
Construction and management of ingress, changes to surface water flows and scour	<p>A Construction Soil and Water Management Plan will be prepared to guide construction methods in implementing the following measures in accordance with Blue Book (Managing Urban Stormwater, Soils and Construction Volume 2D Main Road construction):</p> <ul style="list-style-type: none"> <li>Intercepting clean water flows from areas upslope of the REF proposal areas and diverting it in a controlled manner whether through or around the construction work areas to avoid or minimise mixing of 'clean' water flows with 'dirty' sediment-laden runoff from work areas.</li> <li>Minimise the potential for scour by implementing surface stabilisation, scour protection measures and energy dissipation measures</li> <li>Implement a 'wet weather' Erosion and Sediment Control Plan that includes stabilisation of exposed earthworks prior to the onset of heavy rainfall or predicted flooding.</li> </ul> <p>In addition, changes to surface water flows (volume and velocity) will be minimised by:</p> <ul style="list-style-type: none"> <li>Detailed design of drainage infrastructure that provides sufficient capacity and energy dissipation controls.</li> </ul>	Transport/ Contractor	Detailed design/ Pre-construction
Site facilities and flood emergency management within ancillary sites, management of adverse flood impacts on neighbouring properties	<p>The CEMP will include a Construction Flood Management Plan Sub-Plan. This Sub-Plan will include details and procedures to minimise the potential for construction activities to adversely impact on flood behaviour in neighbouring properties.</p> <p>Measures to manage residual flood impacts will include:</p> <ul style="list-style-type: none"> <li>Staging construction to limit the extent and duration of temporary works on the floodplain</li> <li>Ensuring construction equipment and materials are removed from floodplain areas at the completion of each work activity or should a weather warning be issued of impending flood producing rain</li> <li>Providing temporary flood protection to properties identified as being at risk of adverse flood impacts during any stage of construction of the proposal</li> <li>Developing flood emergency response procedures to remove temporary works during periods of heavy rainfall.</li> </ul> <p>For the ancillary facilities located within the floodplain, a Construction Flood Management Sub-Plan will include the following additional components:</p> <ul style="list-style-type: none"> <li>Limit the extent of works located in floodway areas</li> <li>A procedure to monitor weather conditions (existing and forecast conditions), including minor rain events, local weather warnings and river water level data</li> </ul>	Contractor	Pre-construction

Impact	Environmental management measure	Responsibility	Timing
	<ul style="list-style-type: none"> <li>A communication protocol to disseminate warnings to construction personnel of impending flood producing rain or predicted flooding in the Georges River and actions required to make construction areas stable and safe.</li> <li>An evacuation plan for construction personnel should a severe weather warning or flood alert for the Georges River be issued.</li> </ul>		
Material storage and stockpiling within ancillary sites	<p>The storage of hazardous material in ancillary facilities located within the floodplain will be confined to areas that are not subject to flooding during a 1% AEP extent or either:</p> <ul style="list-style-type: none"> <li>Stored in a manner that prevents their mobilisation during times of flood</li> <li>Be removed from the floodplain when minor rain events are predicted to inundate storage areas and at the onset of a flood.</li> </ul> <p>The Construction Flood Management Sub-Plan will define the flood immunity criteria (including consideration of inundation from minor rain events) for material storage and stockpile areas proposed to be located on land that is inundated during a 1% AEP event.</p> <p>Erosion and sediment (ERSED) controls are to be installed around ancillary facilities located within the floodplain to reduce the risk of sediment runoff. These ERSED controls are to be integrated into any exclusion zone or property boundary demarcation.</p>	Contractor	Pre-construction/ Construction
Management of adverse flood impacts on neighbouring properties	<p>A detailed hydrologic and hydraulic (flood) assessment will be undertaken during detailed design to assess the impacts of the REF proposal on flood behaviour and the associated measures which are required to mitigate those impacts.</p> <p>Subject to the flood assessment during detailed design, a detailed ground survey (including floor levels of buildings) may need to be undertaken in affected areas to determine whether the proposal would increase flood damages in adjacent development (i.e. in properties where there is a potential for increases in peak flood levels for events up to 1% AEP in magnitude).</p>	Transport	Detailed design
Management of adverse flood impacts on the existing environment	<p>During detailed design, the following measures will be implemented to manage adverse flood impacts:</p> <ul style="list-style-type: none"> <li>The road alignment will be further refined to minimise the increase in road levels and peak flood levels compared to pre-proposal conditions.</li> <li>Works within the floodplain will be designed to minimise adverse impacts on surrounding development for flooding up to the 1% AEP event in magnitude.</li> <li>Incorporate measures that are aimed at mitigating its impact on flood behaviour in properties where existing buildings would experience above-floor inundation during floods up to the 1% AEP event.</li> </ul>	Transport	Detailed design

Impact	Environmental management measure	Responsibility	Timing
	<ul style="list-style-type: none"> <li>The provision of scour protection and energy dissipation measures will be included in order to mitigate the localised increases in flow velocities at the outlets that are to be upgraded, relocated or new stormwater drainage systems.</li> </ul>		
Bridge construction – erosion and scour	<p>In order to construct the central pier for the new Auld Avenue bridge, a temporary working platform may be located across part of the main channel of Milperra Drain that is frequently inundated by flow. The temporary working platform will be designed and constructed to manage the potential for scour and transport of material into Milperra Drain, while maintaining passage for floodwater through the construction site.</p> <p>Consider detailed design refinements to temporary working platforms that may be required on the overbank of Milperra Drain to construct the new bridge that minimises the impact on the in-bank area of the watercourse.</p> <p>The contractor will use clean rock fill for the construction of the temporary working platforms.</p>	Transport/ Contractor	Detailed design/ Construction

## 6.3 Surface water

Surface water assessment, produced by NGH Pty Ltd, is provided in Appendix F. This includes the Operational water quality strategy and the Erosion and Sediment Control Strategy, both produced by Lyall & Associates

### 6.3.1 Methodology

The surface water assessment included:

- A literature review of the water quality conditions of the Georges River and Milperra Drain.
- A literature review of turbidity impacts on waterways and riparian environments.
- Establishment of ecological values of each waterway.
- Identification of an indicative protection level for each waterway using Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Guidelines for Fresh and Marine Water Quality and the Water Quality Objectives in NSW.
- Identification of indicators to the risks to environmental values.
- A Water Quality Monitoring Program, and collecting of site-specific baseline surface water quality data.
- Prediction and assessment of the potential impact of possible proposed discharges of construction water to the waterways with consideration to the concept design erosion and sediment control strategy.

The operational surface water quality assessment, within the surface water quality assessment consisted of:

- A qualitative surface water quality assessment of the overall proposal in operation.
- An operational water quality strategy, which informed the surface water assessment. MUSIC rainfall runoff modelling software was used to investigate the impact of the overall proposal, incorporating the increase in pavement (i.e. impervious area) and the increase of future traffic use. Two scenarios were run through the MUSIC software to compare water quality results between the 'pre-upgrade scenario' and the 'post-upgrade scenario', and the post-upgrade scenario with and without mitigation.

### 6.3.2 Existing environment

The overall proposal is located within the Georges River catchment which drains a 930 kilometre square area, including parts of 14 LGAs, and covers a significant portion of the Greater Metropolitan Region (Department of Planning, Industry and Environment, 2018). The Georges River itself extending about 60 kilometres south-west of Sydney. The waters of the Georges River catchment, having come together from such widespread sources as Wollongong and Wollondilly in the south and Blacktown in the north, ultimately flows eastwards into Botany Bay.

The Georges River catchment is one of Australia's most urbanised and developed catchments and this has led to poor health throughout most of the catchment. Land use within the catchment varies, and includes residential, industrial, agricultural, mining and Defence activities and protected areas such as drinking water catchments and conservation areas.

The Georges River is located to the west of the overall proposal area and Milperra Drain to the east. The Georges River is categorised as a 7th order stream under the Strahler Stream Categorisation (DoI 2018) system. The Milperra Drain is a minor tributary of the Georges Rivers and is classified as a 2nd order stream.



The estuary is delimited by the Liverpool Weir. The tidal range within the Georges River is less than 0.1 metres from the Liverpool Weir to Botany Bay (BMT WBM 2013).

Coastal wetlands are mapped adjacent to the REF proposal area.

Surface water quality of waterways within the study area has been heavily impacted over the last two centuries due to changing land uses within the catchment and in-channel works (BMT WBM 2013). The Georges River catchment in the study area is categorised as 'waterways affected by urban development'. Due to the historical anthropogenic impact to the estuary of the last two centuries, the natural variability of the receiving waters is already highly disturbed. The local catchment group 'Georges Riverkeepers', through local government and state legislation, have been working to improve water quality and wetland environments of the estuary through ongoing monitoring and education programs.

Vertically mixing occurs within the water column of the Georges River and its tributaries resulting in minor differences between the top and bottom profiles of the water column. The surface water in the study area is considered to be brackish with typical salinity values of 5 -10 parts per thousand (ppt) (BMT WBM 2013). This indicates that the tidal exchange starts to diminish in the Georges River reach in the study area. As the tidal exchange diminishes, tidal flushing also diminishes reducing pollution dispersion (BMT WBM 2013). It is noted that on occasion water quality monitoring occurs following rainfall, which sometimes explains the large differences in monitoring results.

The surface water monitoring undertaken from 4<sup>th</sup> November 2020 to 10<sup>th</sup> February 2021 noted the following field observations. The visual observations of the water quality at a location upstream of the culvert discharging to the Georges River was slightly turbid water. The visual observations of the water quality at the location within the Milperra Drain was clear water and turbid when the channel bed was disturbed. The results of the parameters analysed in the field and by the laboratory have been averaged across the four sampling events. Refer to Table 6-11 for detail on water quality monitoring results.

### 6.3.3 Guidelines

Several criteria apply to the assessment of surface water quality for construction and operational phases:

- **Ecosystem protection levels:** The ANZG (2018) Guidelines for Fresh and Marine Water Quality provide ecosystem protection levels for toxicants (contaminants of potential concern (CoPC)) for receiving waters based on its ecosystem condition or 'desired' ecosystem condition relative to the degree of human disturbance (ANZG 2018). An assessment of the ecological values resulted in the proposal area being identified in the 'high conservation or ecological values system' category. Therefore, a 99 per cent species protection Derived Guideline Value (DGV) should be applied when assessing water quality for toxicants (ANZG 2018). The assessment of potential contaminants is provided in Section 8.4.
- **ANZG (2018) water quality guidelines:** the Guidelines for Fresh and Marine Water Quality Water Quality provide biophysical water quality guidelines for estuaries in South-east Australia.
- **NSW water quality objectives (WQO):** The relevant water quality objectives for this reach of the Georges River and tributaries (including Milperra Drain) are based on the protection of aquatic ecosystems, visual amenity and primary contact recreation (longer term objective - 10 years or more) (DECCW 2006).
- **Blue Book discharge guidelines:** Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom 2004) and 2D (main road construction) (DECC 2008).
- **Coastal Management SEPP:** water quality objectives of the SEPP.
- **Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment (1999):** water quality objectives for developments and land use within the Georges River catchment.

- **Sydney: Botany Bay Water Quality Improvement Plan:** Identifies objectives for NSW Government to ensure infrastructure developments minimise negative impacts on water quality (Sydney Metropolitan Catchment Management Authority 2011). Identifies water quality reduction targets for greenfield developments and re-developments, which are not relevant to the REF proposal.

Table 6-11 contains guideline values for the Georges River aquatic ecosystems and its tributaries (including Milperra Drain) as listed by ANZG (2018), the NSW WQO and Blue Book. A comparison is made with current water quality conditions identified through the Georges Riverkeeper data from about 1.7 kilometres upstream and the water quality monitoring results collected for this proposal (SW01 (Georges River) and SW02 (Milperra Drain)).

Table 6-11: Water quality guideline values and water quality monitoring results for Georges River and Milperra Drain

Indicator	ANZG (2018) guideline value	WQOs trigger value	Managing Urban Stormwater (V1 and V2D)	Georges Riverkeeper data (Mean, 2019 – 2020)	WQM Results^	
					SW01 Mean	SW02 Mean
Dissolved oxygen (DO) % saturation	80 – 110	80 – 110	-	73.46	4.5 mg/L	9.5 mg/L
Turbidity NTU (Nephelometric Turbidity Unit)	0.5 – 10	0.5 – 10	-	11.16	17.6	6.3
pH	7.0 – 8.5	7.0 – 8.5	6.5 – 8.5	7.33	7.6	7.8
Total suspended solids (TSS) mg/L	-	-	<50	-	22	12
Total dissolved solids mg/L	-	-	-	6.73	2508	605
Total Nitrogen µg/L	300	300	-	-	-	-
Total Phosphorus µg/L	30	30	-	-	-	-

^ Value rounded to nearest significant number

\* Four of the five results were under 22 mg/L with one reading (4/11/2020) of 1420 mg/L.

### 6.3.4 Potential impacts

#### 6.3.4.1 Construction

Key risks to surface water quality during construction would be increased sediment, nutrient loadings and potential mobilisation of contaminants associated with the following:

- Site disturbance resulting from vegetation clearing and exposure of soils. Disturbance activities include:
  - Topsoil stripping.
  - Excavation.
  - Construction of drainage diversions and controls.
  - Soil stockpiling and transport.
  - Trafficking of exposed work areas.

- Earthworks that could potentially disturb ASS<sup>2</sup> or other contaminants within the proposal area
- Accidental spills or leaks from vehicles, plant and machinery used, stored or refuelled on site of petroleum hydrocarbons, oil and grease, heavy metals or chemicals could pollute receiving waters.
- Contaminants from wash down of vehicles
- In-channel works to duplicate the Henry Lawson Road bridge across Milperra Drain
- CoPCs, from surrounding contaminating land uses, exposed as a result of earthworks.

Contaminants from surrounding land uses, exposed as a result of earthworks (refer Section 6.5 for further detail on potential impacts from contamination).

#### **6.3.4.1.1 Construction water demand**

Construction water demand and indicative use is described in Section 3.3.8. The water usage during construction is considered to be a minor impact only, with the predominant use for dust suppression and for compaction. Water would be obtained from the existing piped water supply. Therefore, the REF proposal does not propose to extract water or to apply for a licence to extract water.

#### **6.3.4.2 Operation**

Operation of the proposal could have negative impacts on surface water quality, if left unmitigated. The pollutants from road runoff likely to impact surface water quality of Georges River and Milperra Drain include sediment, nutrients, heavy metals, hydrocarbons from oil and grease, and gross pollutants. Some of these pollutants are typically derived from adjacent land uses and activities, accidental spills/leaks, general litter and wind blown material from uncovered loads.

The MUSIC rainfall runoff modelling software was used to investigate the impact of REF proposal in combination with the overall proposal. Two scenarios were modelled to compare water quality results between the 'pre-upgrade scenario' and the 'post-upgrade scenario', and the post-upgrade scenario with and without treatments.

Possible water quality treatments are constrained by the prevailing topography and limited corridor area as well as the configuration of the existing drainage system. As such, the modelling assessed the operational controls of vegetated swales and bio-retention basins to treat runoff. The strategy for the overall proposal includes two bio-retention basins, both of which would treat runoff discharging to Milperra Drain. Vegetated swales are proposed to treat stormwater runoff from drainage outlets that are located along Henry Lawson Drive. Vegetated swales to the north of the intersection with Milperra Road would treat runoff discharging to the Georges River, while the vegetated swales to the south would treat stormwater runoff discharging to Milperra. Gross pollutant traps were considered in the analysis of potential water quality controls but were not preferred due to reasons concerning safety, maintenance and cost.

The results of the MUSIC modelling are provided in Table 6-12.

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<sup>2</sup>There is a very high probability of ASS being encountered to depths of 3 m in areas of the REF proposal, around the northern extent of the proposal area.

Table 6-12: Results of MUSIC modelling, annual average weights of pollutants

Pollutant	Georges River			Milperra Drain		
	Pre-upgrade	Post upgrade		Pre-upgrade	Post Upgrade	
		No treatment	With treatment		No treatment	With treatment
Total suspended solids (kg)	1803	2548 (745)	1008 (-795)	7940	10820 (2880)	6696 (-1244)
Total nitrogen (kg)	17.0	22.5 (5.5)	20.8 (3.8)	85.1	106.0 (20.9)	92.5 (7.4)
Total phosphorus (kg)	3.4	4.8 (1.4)	2.7 (-0.7)	15.2	20.5 (5.3)	14.4 (-0.8)
Gross pollutants (kg)	206	278 (72)	77.7 (-128.3)	968	1270 (302)	647 (-321)

\*Figures in (brackets) represent the change in pollutant load compared to current conditions. A positive value represents an increase in pollutant whilst a negative value represents a decrease compared to current conditions.

Operation impacts to the net annual average weight of gross pollutants, total nitrogen, total phosphorous and total suspended solids increase as a result of additional pavement areas of a widened road corridor (i.e. greater amount of impervious surfaces).

A number of treatment measures were considered and evaluated by the MUSIC modelling. With the adoption of grass swales and bio-retention basins across the overall proposal, as outlined in Appendix F, the net annual average weight of pollutants for both Georges River and Milperra Drain show a reduction compared to present day conditions with the exception of total nitrogen. The net annual average weight of total nitrogen (kg) increases by 3.8 kg per annum in the Georges River sub catchment and increased by 7.4 kg per annum in the Milperra Drain sub-catchment (with treatments).

These water quality treatments for the operational phase of the overall proposal are detailed in the surface water quality controls as presented in the surface water assessment (Lyll & Associates 2021). It is also noted that the surface water management measures could also provide a beneficial result in groundwater recharge and quality.

### 6.3.5 Safeguards and management measures

Safeguards and management measures for surface water impacts are presented in Table 6-13. The Concept Design Water Quality Strategy and the Erosion and Sediment Control Strategy is provided in Appendix F.

Table 6-13: Safeguards and management measures for impacts to surface water

Impact	Environmental management measure	Responsibility	Timing
Construction surface water quality	The Concept Design Erosion and Sedimentation Strategy will be reviewed and updated during detailed design. The Strategy will be based on detailed design construction staging plans and construction methodologies. The Strategy will be revised in accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom 2004) and 2D (main road construction) (DECC 2008) and Transport's Environmental Management of Construction Dewatering (RTA 2011).	Transport  Contractor	Detailed design  Pre-construction/ Construction



Impact	Environmental management measure	Responsibility	Timing
	<p>A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Construction Soil and Water Management Plan. These Plans will further develop the Construction Erosion and Sediment Control Strategy developed in detailed design and be consistent with the above guidelines (Landcom 2004, DECC 2008 and RTA 2011).</p> <p>The ESCP will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</p>		
Contamination of surface water	The refuelling and maintenance of plant and equipment will be undertaken in a designated sealed bunded area at ancillary facilities, where possible.	Contractor	Construction
	Vehicle wash downs and concrete washouts will be carried out within designated sealed bunded areas at construction ancillary facilities, or carried out off-site.	Contractor	Construction
	Regular visual water quality checks (include for turbid plumes and hydrocarbon spills or slicks) will be carried out when working in or near waterways.	Contractor	Construction
	Construction water quality monitoring will be undertaken upstream and downstream of the REF proposal to ensure that controls and site practices are effective at maintaining current water quality conditions. Monitoring will be undertaken in accordance with the Guideline for Construction Water Quality Monitoring (RTA, undated).		
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will include measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport and EPA).	Contractor	Pre-construction/ Construction
	Emergency spill kit will be kept on site at all times. Spill kits will be located at all ancillary facilities and main construction work areas, including barges. All staff will be made aware of the location of the spill kit and trained in its use.	Contractor	Construction

Impact	Environmental management measure	Responsibility	Timing
Stormwater runoff and water quality of Georges River and Milperra Drain	The Concept Design Operational Water Quality Strategy will be reviewed and updated during detailed design to achieve the operational water quality objective and identify additional opportunities in the wider sub-catchments to reduce total nitrogen loads to Georges River and Milperra Drain, in consultation with Canterbury Bankstown Council. The Operational Water Quality Strategy will consider Transport's Water Sensitive Urban Design Guidelines (RMS 2017) and potential impacts of proposed water quality controls to the surrounding area.	Transport	Detailed design

## 6.4 Groundwater

The potential impacts on groundwater during construction and operation of the proposal have been assessed as part of the *Henry Lawson Upgrade Stage 1A Groundwater Impact Assessment* (Aurecon 2021), provided in Appendix G.

### 6.4.1 Methodology

The assessment methodology undertaken for the groundwater impact assessment involved a two-stage approach.

#### 6.4.1.1 Stage 1: Desktop assessment

This stage determined the hydrogeological characteristics of the groundwater flow system associated with the overall proposal. The following was assessed as part of Stage 1:

- Characterisation of the catchment (including surface, hydrogeological, geological, water quality and groundwater systems) including:
  - Local topography (based on available +/- 2 metre resolution state contours – NSW Spatial Services)
  - Drainage (Public NSW Hydrography)
  - Soil landscapes (DPIE 2020)
  - ASS (Naylor et al 1998)
  - Hydrologic soil groups (OEH 2017)
  - Geology (Penrith 1:100 000 Geological Sheet, Clark and Jones 1991)
  - Hydrogeology (based on data supplied on eSpade and SEED Mapping, OEH 2002 and DPIE 2020).
- A description of groundwater conditions within the study area, including occurrence, flow, and quality/chemistry through review of available public access data and from proposed/completed geotechnical investigations.
- A review of available public access data to identify boreholes, GDEs and groundwater users (if any) within one kilometre of the proposal area.
- Review of PSI to reference any known existing water quality issues
- Review of relevant planning instruments, including the Bankstown LEP and Bankstown Development Control Plan 2015 (DCP), and relevant Water Sharing Plans (WSPs) to contextualise the site relative to sensitive groundwater receiving environments potential constraints on construction and operation of the proposed link road, along with any requirements for licencing/approvals to undertake works.

- Review of potential constraints and impacts relevant to key legislation, including the National Environment Protection Act 2013, National Water Quality Management Strategy 2000, WM Act, NSW State Groundwater Quality Protection Policy (1998), NSW Groundwater Dependent Ecosystems Policy (2002), POEO Act, and NSW Aquifer Interference Policy (2012).

#### **6.4.1.2 Stage 2: Impact assessment**

Stage 2 assessed the impact of the proposal through a hydrogeological conceptual model (HCM). This was undertaken to determine the presence or absence of impacts in accordance with the Practice Note, Aquifer Interference Policy and other relevant legislation and policies. This includes:

- Assessment of potential impacts to groundwater resource/quality and groundwater users/receiving environments from construction stage and operational stage activities (including excavations, surface water diversions, temporary changes to drainage conditions) in consideration of Local Environment Plans (LEPs), Water Sharing Plans (WSPs) and relevant legislation.
- Assessment of suitable management measures/mitigation strategies to control potential risks to groundwater resource/quality and groundwater users/receiving environments from construction and operation of the proposal. Development of mitigation strategies following a hierarchy of priority based on the level of potential risk to the environment.

The impact rating used to assess the groundwater impacts were:

- Very Low/Minimal: Potential adverse impact could result in a minimal decline in the resource in the study area during the life of the proposal. Probability of event occurring may be not anticipated.
- Low: Potential adverse impact could result in a slight decline in the resource/quality of a resource in the study area during the life of the project. Probability of event occurring may be unlikely. Research, monitoring, and/or recovery initiatives would not normally be required.
- Moderate: Potential adverse impact could result in a decline in the resource resource/quality of a resource to lower-than-baseline/worse-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Probability of event occurring may be probable/possible. Regional management actions such as research, monitoring and/or recovery initiatives may be required.
- High: Potential adverse impact could threaten sustainability of the resource/quality of a resource and should be considered a management concern. Probability of event occurring may be likely. Avoidance of this impact through mitigation strategies is recommended. Research, monitoring and/or recovery initiatives should be considered.

#### **6.4.2 Existing environment**

##### **6.4.2.1 Hydrogeological landscapes**

The western portion of the overall proposal area where the roadway is parallel to the Georges River falls within the Parramatta/Georges River hydrogeological landscape. The northern, eastern and southern portions of the study area further from the river are within the Moorebank hydrogeological landscape.

The Parramatta/Georges River landscape (across the REF proposal area) are characterised by low lying Quaternary and Tertiary alluvial floodplains of the Georges River and areas of reclaimed land around the river. This landscape is heavily influenced by ASS and has generally a higher than average salinity, primarily due to cyclic flows with estuarine and acid sulfate influences. Flow is generally unconfined through the alluvial soils into the Georges River; hence groundwater flow direction is expected to the west. Surface water runoff is also expected in this direction towards the river, due to the flat nature of the proposal area and increasing elevation away from the river.

The Moorebank hydrogeological landscape present in the north, east and south of the REF proposal is characterised by moderate salinity shale layers that cyclically flush salts into the lower lying Parramatta/Georges River hydrogeological landscape. The Moorebank landscape is distinguished by its terminal-like ponding of the river with minimal acid sulfate influences.

The Moorebank hydrogeological landscape differs from other hydrogeological areas within the Sydney region due to its very flat and low-lying alluvial plains and ponding in the river bend areas. Ponding and slow drainage is particularly notable in the Chipping Norton area, to the north west of the REF proposal area. This area is dominated by Tertiary alluvium which is distinguishable from the Parramatta/Georges River HGL by a lower salinity signature and less influence from ASS.

Land salinity risk for the REF proposal is shown in Figure 6-4. ASS risk is shown in Figure 6-5.

#### **6.4.2.2 Groundwater levels and flow paths**

Groundwater levels throughout the overall proposal area are expected to be shallow due to the location on alluvium and the close proximity of the Georges River, between zero and eight metres below the surface, varying seasonally (higher in winter, lower in summer). A review of groundwater bores in the area reported groundwater levels near the proposal area of between 4.6 to 5.0 m below ground level (m bgl).

Geotechnical investigations undertaken for the project in 2019 detected groundwater at 2.8 m bgl. at a borehole around 100 m south east of the Henry Lawson Drive ancillary facility. Aquifer vulnerability is considered high due to the unconfined nature of the alluvial deposits which form principal aquifers for the landscape and ecology within and around the study area. Perched systems are likely to be present where shallow but discretely lensed groundwater may be encountered.

Groundwater flow through the alluvial sediments is anticipated to be towards the Georges River. Elevation data indicates that the Georges River forms a local groundwater discharge point (gaining conditions). This preliminary indication would need to be confirmed through groundwater monitoring and baseflow analysis of the Georges River within and around the proposal.

#### **6.4.2.3 Aquifer properties – hydraulic parameters**

The available information indicates that aquifers within both the Moorebank HGL and Parramatta/Georges River HGL are generally unconfined to semi-confined with local perching above clay-rich layers. The hydraulic conductivity ranges from 0.01 to 10 m/day in the Parramatta/Georges River HGL, and from 10 to 30 m/day in the Moorebank HGL.

Overall, the available information indicates that groundwater may have a tendency to perch within the unconsolidated sediments, with seasonal variations in groundwater levels, and moderate to high discharge rates within aquifers.

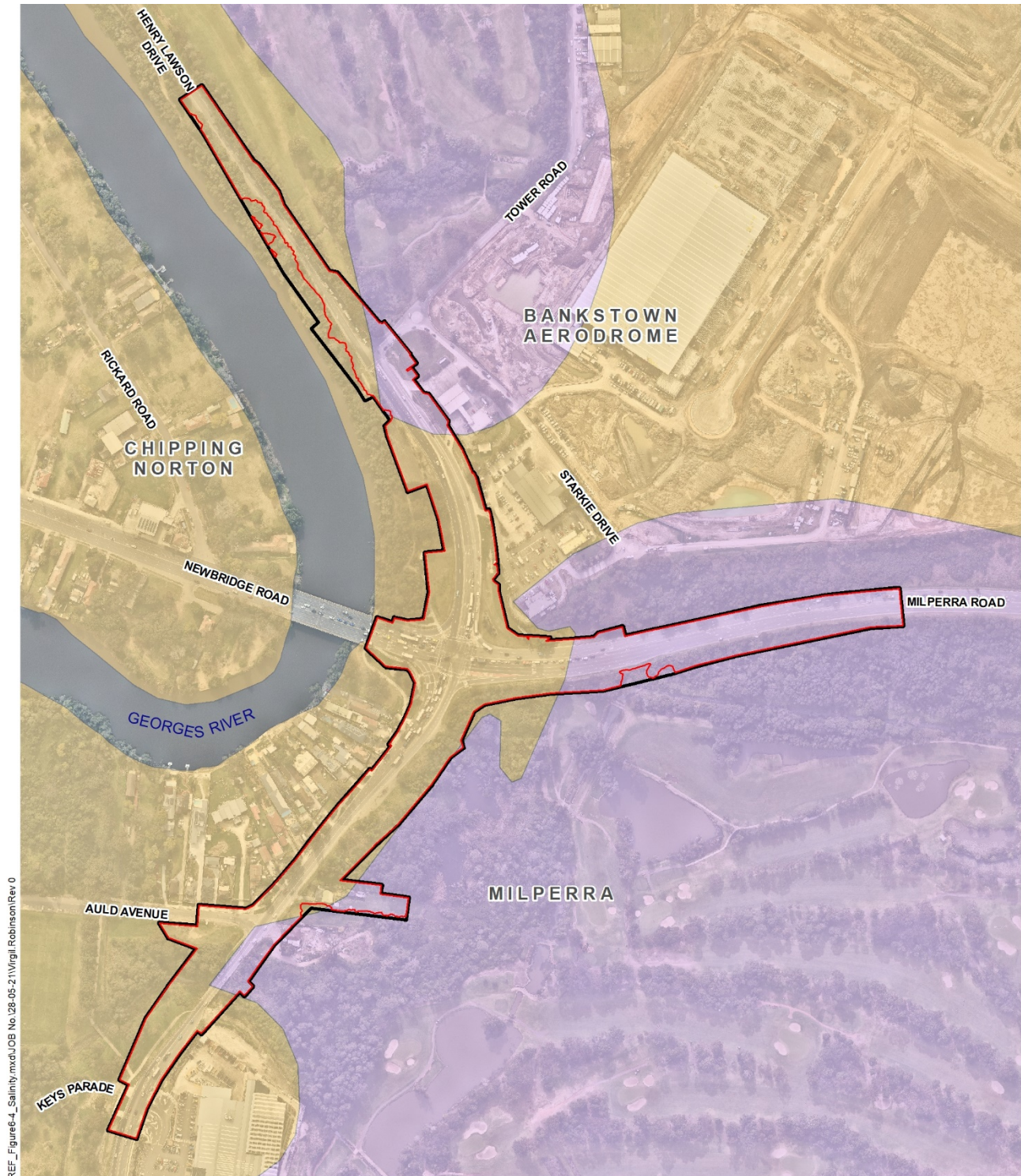
#### **6.4.2.4 Aquifers and aquifer vulnerability**

The proposal area is noted to include two different hydrogeological landscapes. The Parramatta/Georges River landscape (western section) is characterised by unconsolidated Quaternary aged sedimentary fine-grained sands, silts and clays.

Aquifers within the landscape are typically unconfined and unconsolidated, with perched water above the clay-rich layers, which are expected to act as an aquitard.

Aquifers are considered to have a high vulnerability due to their unconfined nature and moderate to high permeability.





- REF proposal area
- Overall proposal boundary
- Land Salinity Risk (HGL)**
- High
- Moderate

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

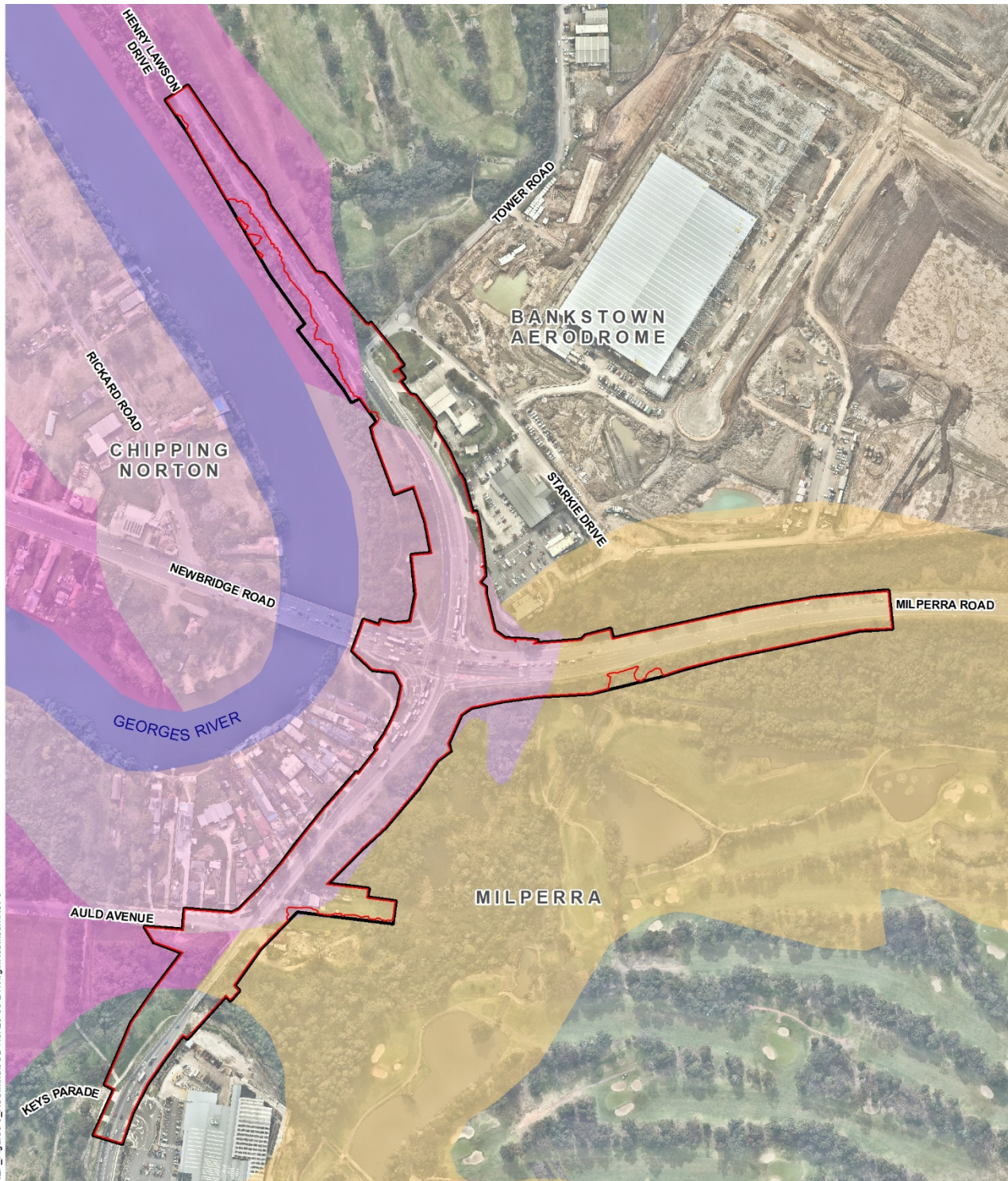
Projection: GDA 1994 MGA Zone 56

Henry Lawson Drive Stage 1A **Review of Environmental Factors**

**FIGURE 6-4: Salinity**



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- REF proposal area
- Overall proposal boundary
- Acid Sulfate Soil Risk (BSG)**
- High Risk 2-4m
- High Risk > 4m
- Low Risk 2-4m
- High Risk Sediments

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Henry Lawson Drive Stage 1A **Review of Environmental Factors**

Projection: GDA 1994 MGA Zone 56

**FIGURE 6-5: Acid Sulfate Soil risks**

#### **6.4.2.5 Registered groundwater bores and groundwater levels**

A search of the Bureau of Meteorology (BOM) Groundwater Explorer and NSW Water databases indicate that there are nine bores within 1 km of the Milperra Road and Henry Lawson Drive intersection and one more from the HDL Geotechnical Factual Report 2019.

#### **6.4.2.6 Groundwater dependent ecosystems**

GDEs are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater (Department of Land and Water Conservation 2002).

GDEs which are surface expressions of groundwater within the locality of the study area (<10 km) include the Georges River. Other GDEs which are reliant on subsurface groundwater in the study area include:

- Cumberland River-flat Forest
- Cumberland Swamp Oak Riparian Forest
- Coastal Freshwater Lagoon
- Coastal Swamp Paperbark – Swamp Oak Scrub
- Estuarine Swamp Forest
- River Mangrove.

GDE's of relevance for the REF proposal are shown on Figure 6-6.

#### **6.4.2.7 Groundwater contamination**

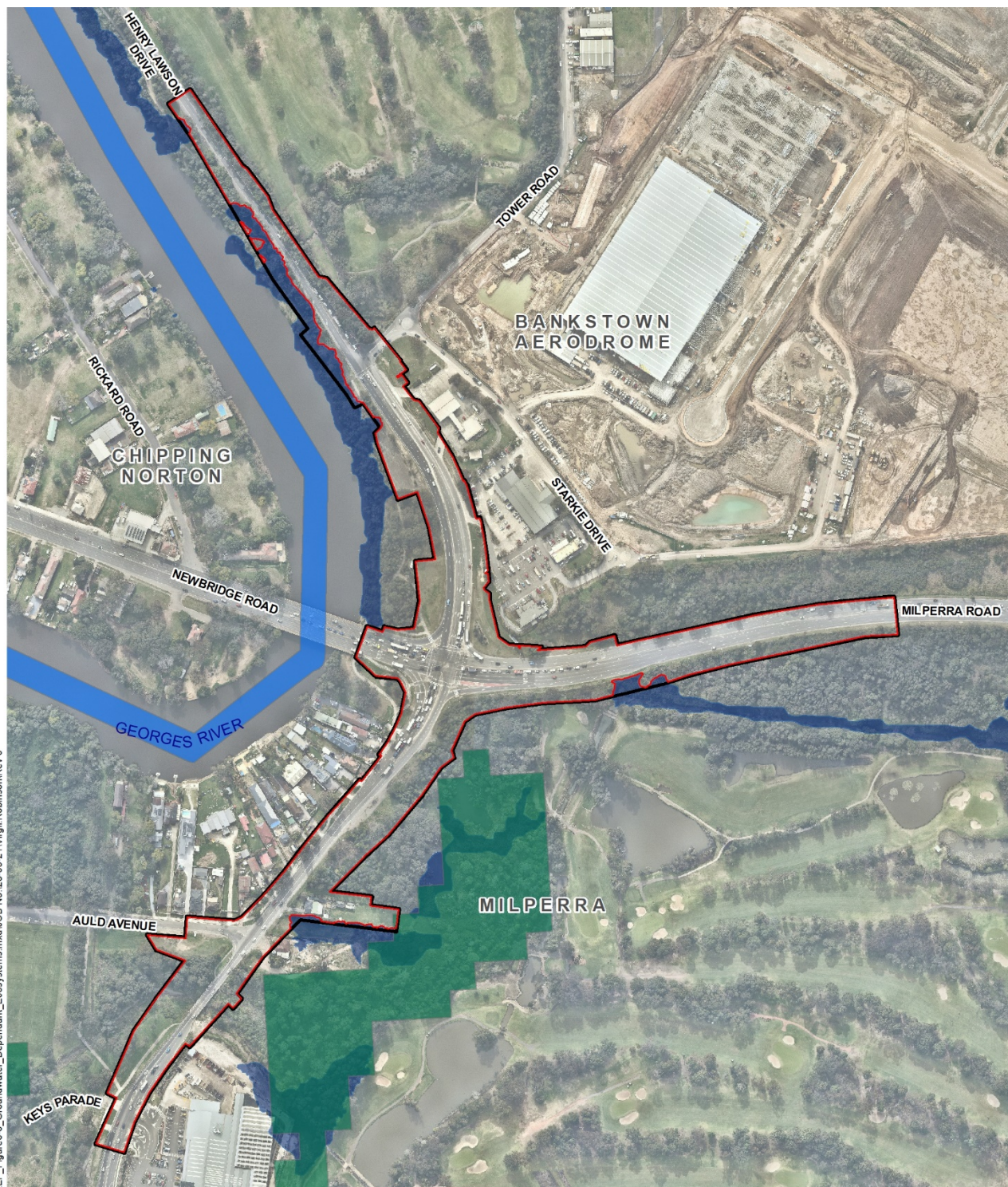
Nearby land use activities and previous investigations undertaken in and around the overall proposal area were reviewed to better assess the site conditions as part of the groundwater assessment. The following potential contamination sources were identified:

- PFAS associated with Bankstown Airport which lies 80m east of the proposal area
- Hydrocarbons, volatile organic compounds, and heavy metals have the potential to be present within groundwater within and around surrounding land uses which include a number of service stations adjacent to the proposal (7-Eleven, located 10m east off Henry Lawson Drive, Shell located 200m west of the proposal off Newbridge Road) and former landfill site.
- Pesticides and herbicides as a result of potential use in maintenance of the nearby golf courses. Two constructed golf courses are present in and adjacent to the REF proposal area; one to the north off Tower Road (closest point 5m from the REF proposal area), and the other south east off Milperra Road (closest point 50m from REF proposal area).

Refer to Section 6.5 for further detail on the impacts of soil contamination on the proposal.



P:\GIS\Project-4\projects\10003\_HenryLawsonDrive\HLD\_REF\_Figure6-6\_Groundwater\_Dependant\_Ecosystems.mxd\JOB No.128-05-21\Virgil Robinson\Rev 0



- REF proposal area
- Overall proposal boundary
- Coastal Wetland Management**
- + Coastal Wetlands

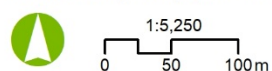
#### Groundwater Dependent Ecosystems (Aquatic)

High potential GDE - from national assessment

#### Groundwater Dependent Ecosystems (Terrestrial)

High potential GDE - from national assessment

Source: Aurecon, TfNSW, Spatial Services, Nearmap



Henry Lawson Drive Stage 1A **Review of Environmental Factors**

Projection: GDA 1994 MGA Zone 56

**FIGURE 6-6: Groundwater Dependent Ecosystems**



### **6.4.3 Potential impacts**

#### **6.4.3.1 Construction**

The REF proposal would interact with groundwater through a number of means during the construction phase:

- Minor excavation activities
- Site levelling and cut and fill
- Ingress of groundwater into bridge piles during piling works
- Installation of drainage infrastructure and underground utility trenches and channels and foundations for overhead infrastructure.

Potential construction impacts from the REF proposal relevant to groundwater and groundwater quality may include:

- Direct impacts to aquatic and terrestrial GDEs through GDE removal during earthworks and leaching of potential ASS into GDE habitats
- Indirect impacts to aquatic and terrestrial GDEs through transport of existing contaminant sources through preferential drainage paths (i.e. backfilled utilities trenches)
- Direct impacts to groundwater quality resulting from pavement seepage and stormwater leakage to groundwater.
- Direct impacts to groundwater quality resulting from pavement seepage and stormwater leakage to groundwater

In addition, only two registered bores used for supply or irrigation are located within 1 kilometre of the overall proposal. The extraction of groundwater for water supply or lowering of the water table is not proposed, therefore potential impacts to surrounding groundwater users are considered minimal.

Specific impacts on groundwater from the REF proposal are detailed in Table 6-14.

Due to the relatively minor extent of excavations and the implementation of environmental groundwater safeguards it is unlikely that interception of groundwater flows would significantly affect GDEs within the study area. The REF proposal is not expected to substantially interfere with subsurface or groundwater flows associated with the Georges River.

Table 6-14: Construction impact assessment on groundwater

Impact	Potential impact rating	Relevance/Discussion
Aquifer Interference: Flow obstruction/ interference	Low	No planned works as part of construction of the REF proposal that would result in flow obstruction or interference beyond localised piling at the Auld Avenue bridge. Localised piling only affects a small special extent and flow interference would be on the scale of 10-1m. As such, potential for aquifer interference is considered to be <b>low</b> and potential impacts downstream or on other groundwater users would be negligible.
Aquifer Interference: Dewatering	Very low	<p>The WM Act 2000 states that an Aquifer Interference Approval is needed for aquifer interference activities (which would include construction dewatering). Approval is required only for significant active dewatering (&gt;3 ML/day) or where GDEs are potentially impacted. Passive dewatering activities of groundwater ingress into excavations and bored piles by public authorities do not require any approvals or permits under the WM Act 2000.</p> <p>Based on current design information pavement, utility and drainage excavations for the REF proposal are likely to be shallow (&lt;1.5m – 2m) compared to groundwater levels generally being 2.8 – 5 mbgl. Therefore, no dewatering is expected. As such, risk of settlement from over-pumping is expected to be negligible.</p> <p>Bridge piles (Auld Avenue bridge) may reach depths of around 30 mbgl but are subject to further analysis during detail design. Groundwater ingress into the bored piles is likely to occur although construction methodologies may be adopted to minimise groundwater ingress. As such, it is considered unlikely that any significant groundwater dewatering would be required as part of construction and thus the potential for aquifer interference is <b>very low</b> and potential impacts on other groundwater users would be negligible.</p> <p>There is potential for groundwater levels to rise in response to higher than average rainfall conditions caused by short-term and long-term climate cycles, leading to potential saturation of planned excavations and dewatering of excavation sites might be necessary, this should be monitored throughout construction.</p>
Discharges to groundwater	Very low	The WM Act 2000 states that an Aquifer Interference Approval is needed for aquifer interference activities (which would include controlled discharges to groundwater). No discharges to groundwater are anticipated as a result of construction activities for the REF proposal, as all collected stormwater, surface water runoff and groundwater (from dewatering activities if they should they be required in high rainfall events) is to be managed under the proposal CEMP, rather than discharged to groundwater. No input or inflows to the aquifers onsite is anticipated as a result of construction works therefore potential impact is considered to be <b>very low</b> .
Acid sulfate soils	Moderate to high	The REF proposal areas are considered to pose a risk of encountering ASS, varying from low risk to high risk. If excavation expose ASS which is likely, infiltration and recharge after rain events of exposed ASS can transport acids into the groundwater.

Impact	Potential impact rating	Relevance/Discussion
		<p>Drawdown of aquifers/seasonal variability of groundwater levels have been known to oxidise PASS which creates ASS causing impacts on groundwater quality. This level of aquifer interference is not proposed or required as part of the REF proposal. Without suitable management measures, disturbance of acid sulfate soils is considered to present a <b>moderate to high</b> potential impact to groundwater.</p>
Salinity	Very low	<p>Salts within the Parramatta/Georges River HGL are known to be highly mobile and pose a severe potential impact to buildings and structures within the proposal area. There is a high risk of excavated soils being saline, which may cause impacts where spoil material is exposed to surface waters and rain. However, it is noted that in the area, groundwater salinity is already high. Runoff from exposed soils could produce a highly saline waste stream that may have minor impacts should it migrate into the groundwater through recharge. Due to the minor amount of soil to be excavated (148m<sup>3</sup>), these impacts are considered <b>very low</b>.</p>
Contamination	Moderate	<p>Piling at the Auld Avenue Bridge area has the potential to mobilise and intersect any contamination that may exist in groundwater within the area.</p> <p>Potential contamination sources include gas (e.g. carbon dioxide and methane), hydrocarbon, volatile organic compound, and heavy metal contamination to be present within groundwater within and around operational service stations as a result of leaks, spills and stormwater leakage to groundwater. There is also potential for PFAS contamination from Bankstown Airport and herbicide/pesticide contamination from golf courses/historical activities including former landfill sites and petrol stations.</p> <p>There are also potential risks to both human health and structures arising from vapour intrusion into excavations from hydrocarbon contaminated soils and groundwater during excavation works.</p> <p>Further risk of contamination to groundwater may occur as a result of on-site leaks, accidental spills of fuels and in appropriate storage of chemicals. Key risks to groundwater quality would include contamination from oils and grease, lead, zinc, copper, cadmium from vehicles, and nitrogen and phosphorous from atmospheric deposition during construction works.</p> <p>The potential impacts from groundwater contamination are considered to be <b>moderate</b>.</p>
Impact to groundwater uses	Moderate - High	<p>There are nine registered bores within 1 km of the proposal area. The majority of these are monitoring bores. The risk of aquifer interference and discharges to groundwater is deemed to be 'Very Low – Low'. As such the water table should not be affected by this Proposal and the risk of changes to water availability to groundwater users is therefore also deemed to be <b>very low – low</b>.</p> <p>The risks of ASS and contamination to groundwater are deemed to be 'Moderate – High'. As such taking a conservative approach, the risk of the quality of water becoming unsuitable for groundwater users is also deemed to be <b>moderate – high</b>.</p>

#### **6.4.3.2      Operation**

Potential operational impacts from the REF proposal relevant to groundwater may include:

- Indirect impacts to aquatic and terrestrial GDEs and coastal wetlands through transport of existing contaminant sources through preferential drainage paths (i.e. backfilled utilities trenches) during operational phases
- Direct impacts to groundwater quality resulting from pavement seepage and stormwater leakage to groundwater during operational phases
- Direct impacts to groundwater quality resulting from pavement seepage and stormwater leakage to groundwater during construction and operational phases.

It is noted that operational phase impacts to groundwater quality are considered minimal due to stormwater treatment options including grass swales and bio-retention basins being proposed for the overall proposal.

The impacts of the REF proposal during operation are shown in Table 6-15.



Table 6-15: Operation impact assessment on groundwater

Impact	Potential impact rating	Relevance/Discussion
Aquifer interference	Very low	<p>The presence of impermeable surfaces and high permeability drainage lines from the REF proposal may reduce local recharge to the underlying aquifer and result in preferential groundwater flows along filled drainage lines. Surface water runoff, stormwater and other associated drainage channels are not expected to interact with groundwater or aquifers across the proposal alignment during operation.</p> <p>Due to the increase in the impermeable pavement for Henry Lawson Drive and Milperra Road, there is likely to be a minor reduction in the overall recharge rate to the underlying unconfined aquifers, as a result of the proposal being upgrades to existing road infrastructure rather than new road infrastructure. The overall reduction is unlikely to produce an effect that would constitute aquifer interference, with the aquifer interference framework, therefore the potential impacts are considered to be <b>very low</b>.</p> <p>The potential impact relative to aquifer interference has been qualitatively assessed as <b>very low</b> based on available information.</p>
Groundwater discharges	Very low	<p>Extraction of water is not a requirement for the continued operation of the REF proposal, the risk to groundwater through over extraction as a part of the operation of this proposal is <b>negligible</b>.</p> <p>There is potential for groundwater levels to rise in response to higher than average rainfall conditions caused by short-term and long-term climate cycles, leading to potential saturation of stormwater networks. Stormwater infrastructure which transport stormwater to Georges River may have an element of groundwater recharge. This is the case for the proposed stormwater treatment infrastructure, including the bio-retention basins, open grassed swales and other treatment methods. These impacts are considered <b>very low</b>.</p>
Groundwater quality	Low	<p>Stormwater leakage containing concentrations of contaminants from the operation of the REF proposal has the potential to impact groundwater quality, by increasing concentrations of nutrients, heavy metals, and hydrocarbons. Stormwater treatment infrastructure including basins/swales would assist in reducing impacts on groundwater quality as an amount of stormwater would become groundwater recharge as its transported to the Georges River.</p> <p>The potential impact on groundwater quality has been qualitatively assessed as <b>low</b> based on available information.</p>
Impact to groundwater uses	Moderate - High	<p>The risk of aquifer interference and discharges to groundwater is deemed to be 'Very Low – Low'. As such the water table should not be affected by this Proposal and the risk of changes to water availability to groundwater users is therefore also deemed to be <b>very low – low</b>.</p> <p>The risks of ASS and contamination to groundwater are deemed to be 'Moderate – High'. As such taking a conservative approach, the risk of the quality of water becoming unsuitable for groundwater users is also deemed to be <b>moderate – high</b>.</p>

Impact	Potential impact rating	Relevance/Discussion
Bio-retention Basin	Low - Moderate	<p>The two bio-retention basins are proposed to reduce the amount of pollutants from the road runoff to the surface water and groundwater environments and thus in terms of groundwater quality, the basins would have a positive impact, therefore, in terms of quality it is deemed to be <b>very low</b></p> <p>In terms of water table interaction, bio-retention basins may cause local mounding of the groundwater table, as a result this impact is deemed to be <b>low to moderate</b>.</p>

#### 6.4.4 Safeguards and management measures

Safeguards and management measures for groundwater impacts are presented in Table 6-16.

Table 6-16: Safeguards and management measures for impacts to groundwater

Impact	Environmental management measure	Responsibility	Timing
Disturbance to GDEs	Where disturbance cannot be avoided, appropriate mitigation measures will be adopted to prevent impacts outside of the required areas of disturbance. This may include use of physical barriers, boundary demarcation and signage to prevent intrusion of contractors and equipment into sensitive areas, and ongoing monitoring to ensure disturbance footprints do not extend outside of set boundaries	Contractor	Construction
Groundwater dewatering during excavation	<p>In the event that groundwater/ aquifer dewatering must occur to lower the groundwater table and reduce or prevent groundwater ingress into excavations, then potential impacts on GDEs must be quantitatively assessed prior to dewatering along with appropriate management measures and documented in a site dewatering management plan.</p> <p>Quantitative assessment must include assessment of the magnitude and duration of drawdown and whether impacts are likely to adversely affect the habitat conditions and ecological communities within the GDEs.</p> <p>Relevant approvals and permits must be obtained prior to groundwater/ aquifer dewatering.</p>	Contractor	Construction
Shallow excavations within the topsoil and fill materials for embankments	A Construction Soil and Water Management Plan, Construction Flora and Fauna Management Plan and a Clearing and Grubbing Plan will include mitigation measures and procedures to identify further opportunities to minimise direct impacts to GDEs.	Contractor	Pre-construction/ Construction
Mobilisation of acid sulfate soils	<p>An Acid Sulfate Soil Management Plan (ASSMP) will be prepared and implemented to manage PASS or ASS exposed from excavations of soils between 2 and 4 metres, changes to groundwater levels and stockpiling.</p> <p>The ASSMP will be informed by the results of the Detailed Site Investigation that will include the identification of presence and extent of ASS/PASS, particularly around the proposed bridge duplication works over Milperra Drain near Auld Avenue.</p>	Contractor	Pre-construction/ Construction
Groundwater contamination – piling and excavations	<p>A site contamination management plan (CMP) will be prepared and implemented in the event that contaminated groundwater is encountered during construction activities, this should be completed before construction occurs.</p> <p>During construction any intercepted groundwater, including piling works, should be managed under the project CEMP to mitigate risks associated with the potential mobilisation or release of contamination to the groundwater, improper storage and disposal of intercepted groundwater.</p>	Contractor	Pre-construction/ During construction

Impact	Environmental management measure	Responsibility	Timing
	A baseline groundwater monitoring program of the overall proposal area will be undertaken during detailed design.		
Groundwater levels and contamination – piling and excavations	Regular inspection of pile borings will be carried out to identify any occurrence of light non-aqueous phase liquids (LNAPL), oils, staining, or odours and to prevent any accumulation of potential contamination within pile borings.	Contractor	Pre-construction/ During construction

## 6.5 Soils

The potential impacts on soils and contaminated land during construction and operation of the proposal have been assessed as part of the *Henry Lawson Upgrade Stage 1A Preliminary Site Investigation* (PSI) (Aurecon 2021), provided in Appendix H.

### 6.5.1 Methodology

The following scope of works was completed to prepare the PSI:

- Collation and review of available desk study information relevant to the site and immediate surrounds
- Review of previous reports and/or related documents, including council records
- Review of past and current activities on neighbouring properties and other potential on-site/offsite sources of contamination
- Review of available historical aerials from the 1930s to 2010s. One aerial photograph from each decade was reviewed.
- Review of NSW EPA databases, the Contaminated Land Record and POEO licences for the site and Canterbury Bankstown Council LGA
- Review of geology, soil, topography and registered groundwater bore maps
- Review of ASS and salinity risk maps
- Review of NSW EPA priority Per and Poly-Fluoroalkyl Substances (PFAS) investigation risk sites within 5 km of the project extents/sites
- Review Department of Defence Unexploded Ordinance Mapping Database
- Review previous Dial Before You Dig records
- Other searches of the NSW Government SEED website as required to assess the potential for subsurface contamination to be present
- Preparation of a PSI report outlining the findings of the desktop study in accordance with Schedule B2 of the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) and the NSW EPA Contaminated Land Guidelines – Consultants Reporting on Contaminated Land (2020).

A Conceptual Site Model (CSM) for the REF proposal area was prepared as part of the PSI which provides a summary of the potential risks to human health and the environment based on the information included in the PSI.

The preliminary risk assessment assessed qualitative risk by estimating the likelihood of each identified potential source-pathway-receptor (SPR) linkage occurring and the foreseeable consequence of the exposure.



Risk ratings are defined as:

- **Negligible** – The presence of the identified source does not give rise to the potential to cause significant harm.
- **Low** – It is possible that harm could arise to a designated receptor from an identified source though this is likely to be mild.
- **Moderate** – It is possible that harm could arise to a specific receptor, but it is unlikely that such harm would be significant.
- **High** – A designated receptor is likely to experience significant harm from an identified source without remedial action.
- **Very high** – There is a high probability that severe harm could arise to a designated receptor from an identified source without appropriate remedial action.

## 6.5.2 Existing environment

The overall proposal area is currently used as a transport corridor consisting of a two-lane roadway with additional turning lanes at the major intersections of Milperra Road/Newbridge Road and at Tower Road. The Bankstown Airport, located to the north east of the REF proposal, was constructed during WW2 and has remained an airport since that time. The surrounding land use has been increasingly developed with a mixture of low density residential and light industrial/commercial. The Georges River is located directly east of the proposal area.

A summary of site features is presented in Table 6-17.

Table 6-17: Site features

Aspect	Details
Adjacent properties	<ul style="list-style-type: none"> <li>• North East– Bankstown Aerodrome lies to the north east of the major Milperra Road/Henry Lawson Drive intersection. The Georges River Golf Course also borders the site north of Tower Road.</li> <li>• North West – The Georges River lies west of the REF proposal. Recreational land along the river borders Henry Lawson Drive to the north west and residential properties are present on the western bank of the Georges River.</li> <li>• South East – The Bankstown Golf Course is situated to the south east of the REF proposal. The residential suburb of Milperra lies further to the south and consists of residential housing and minor commercial and retail businesses.</li> <li>• South West – A small residential area exists along the south west portion of Henry Lawson Drive between Newbridge Road and Auld Avenue with recreational areas at the lower south western extent of the REF proposal.</li> </ul>
Nearby sensitive land uses	Surrounding the overall proposal, sensitive receivers include residences and public recreational golf courses.
Local water bodies	The overall proposal is located on the eastern floodplain of the Georges River at a point where it meanders. Newbridge Road crosses over the river at this meandering point, where the river bends and flows in a westerly direction away from the proposal and then meanders south. A small tributary of the Georges River extends underneath Henry Lawson Drive between Auld Avenue and Keys Parade. Several small ponds are located within the Bankstown Golf Course (south east of the REF proposal) and the Georges River Golf Course (north east of the REF proposal). Coastal wetlands are located along the Georges River and east of the proposal (near the Bankstown Golf Course and opposite the Auld Ave intersection).

The overall proposal area sits within a natural low point in the region, funnelling down into the Georges River. The overall proposal area itself is roughly zero to four metres Australian Height Datum (AHD) in elevation and is relatively flat and consistent across the overall proposal study area.

The geology of the overall proposal area shows the overall proposal area is underlain by alluvium, gravel, sand, silt and clay, and a number of undifferentiated lithologies and alluvium. Alluvial floodplain deposits of quartz rich sands and clays dominate the southern portion of the REF proposal. Unconsolidated alluvial clays, silts, sands and gravels are dominant in the northern portion of the REF proposal and join with alluvial levee and overbank deposits along the Georges River to the north west of the overall proposal area. The Georges River itself on the western boundary of the overall proposal area consists of alluvial channel deposits of sand, gravel, silts and clays, which are also expected to be intersected on the overall proposal area. No structural features (dykes or veins) are mapped at the overall proposal area.

The overall proposal area lies in a flat floodplain area for the nearby Georges River and is underlain with poorly drained and low permeability soils. Several drainage channels carrying runoff underneath Henry Lawson Drive were identified during the site inspection as draining directly toward the Georges River.

#### **6.5.2.1 Database searches and previous investigations**

The following scope of works was completed to prepare the PSI:

- Collation and review of available desk study information relevant to the overall proposal area and immediate surrounds
- Review of previous reports and/or related documents, including council records
- Review of past and current activities on neighbouring properties and other potential on-site/offsite sources of contamination
- Review of available historical aerials from the 1930s to 2010s. One aerial photograph from each decade was reviewed
- Review of NSW EPA databases, the Contaminated Land Record and POEO licences for the overall proposal area and Parramatta Council LGA
- Review of geology, soil, topography and registered groundwater bore maps
- Review of ASS and salinity risk maps
- Review of NSW EPA priority Per and Poly-Fluoroalkyl Substances (PFAS) investigation risk sites within 5 km of the overall proposal area
- Review Department of Defence Unexploded Ordinance Mapping Database
- Review previous Dial Before You Dig records
- Other searches of the NSW Government SEED website as required to assess the potential for subsurface contamination to be present in the study area
- Preparation of the PSI report outlining the findings of the desktop study in accordance with Schedule B2 of the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) and the NSW EPA Contaminated Land Guidelines – Consultants Reporting on Contaminated Land (2020).

A search of the NSW EPA public register (notified sites and the contaminated land record) of contaminated sites identified four records of notified sites within one kilometre of the overall proposal area. The sites and their relationship with the REF proposal area is shown on Figure 7 within the PSI (in Appendix H). The closest ones to the REF proposal are the 7-Eleven Service Station (which adjoins the central north east portion of the REF proposal area) and the Former Landfill (which adjoins the REF proposal area at the southernmost to the east at the current Flower Power development).

There are two Per and Poly-Fluoroalkyl Substances (PFAS) sites subject to the NSW EPA investigation program within 10 kilometres of the overall proposal: the Bankstown Airport and Holsworthy Barracks.

A search conducted revealed one record of UXO (unexploded ordnance) within three kilometres of the overall proposal area.

During previous environmental investigations 20 soil samples were selected for laboratory analysis from one borehole and six test pits along Henry Lawson Drive and Milperra Road. Preliminary screening of the analytical results against relevant criteria in the National Environment Protection Measure (NEPM), amended 2013 and PFAS National Environmental Management Plan (PFAS NEMP) indicates concentrations were below human health screening criteria.

### 6.5.2.2 Areas of Potential Environmental Concern

Based on the desktop assessment and database searches, the Areas of Potential Environmental Concern (APECs) identified that are of relevance to the REF proposal include:

- A former landfill identified along the south east of the REF proposal alignment at 479 Henry Lawson Drive.
- An operational petrol station is located along the commercial shopping strip at the intersection of Milperra Road and Henry Lawson Drive.
- Bankstown Airport is located to the north east of the REF proposal and historical practices could have impacted the soil, groundwater and surface water across the overall proposal area.
- Nearby golf courses due to the maintenance and operational activities have the potential to introduce herbicides, pesticides and excess nutrients to the surrounding soil profile.
- Onsite fill materials observed during Aurecon's site inspection were noted to contain evidence of car oils and fuels from spills and car accidents along the road shoulder.
- A portion of the REF proposal area is in an area of high risk for encountering acid sulphate soils. These areas are in the south west near Auld Avenue, and the north west portion of the REF proposal.

The ASS risks and boundaries were assessed as part of the PSI and the risk profile for the REF proposal area is shown in Table 6-18. The ASS risk mapping for the REF proposal is shown in Figure 6-5 in the previous chapter.

Table 6-18: ASS risk mapping

ASS risk profile	Proposal area impacted
High risk 2-4m	Northern portion and minor southern portion of Henry Lawson Drive
High risk below 4m	Majority of the central portion of Henry Lawson Drive and the western portion of Milperra Road
Low risk 2-4m	Eastern and central portions of Milperra Road and some areas within the southern portion of Henry Lawson Drive
Disturbed terrain	Southern and some minor northern portions of Henry Lawson Drive

### 6.5.3 Potential impacts

Based on the CSM for potential sources of contamination in the proposal area, a preliminary risk assessment has been prepared for the REF proposal (refer Table 6-19).

There is one potential source that has been classified as 'Moderate' risk, which is the former landfill operations site at the Flower Power site. There is still a risk that impacts from the former landfill may still be present at measurable concentrations within or near the REF proposal. Impacts from the former landfill could include encountering wastes, contamination in soil and groundwater, LFG and landfill which could become exposed and mobilised into the environment during construction. Contaminated groundwater may still be present and migrating toward Georges River.

Sources classified as 'low to moderate' were as follows:

- Onsite filling - There may be contamination present within uncontrolled fill presumed to have been used historically. Based on the previous analytical results, soil may be General Solid Waste (GSW). Given the extent of upgrades it is possible that some areas may generate Restricted Solid Waste (RSW) category material).
- Bankstown Airport – One record of UXO was recorded, the Department of Defence has indicated that there would be a very low likelihood of UXO, and construction activities can progress without the need for UXO remediation.

Excavations intercepting groundwater and waterlogged soils – potential to expose acid sulphate soils. Once excavated, ASS, if left unmanaged, could cause harm to nearby waterways and coastal wetlands, flora and fauna in the area, and impact constructability of the road upgrade. As the scale of spoil produced from shallow excavations and standard mitigation practices will be utilised to manage ASS and PASS, the level of risks presented are reduced.

All other potential sources were classed as 'Low' risk rating.



Table 6-19: Preliminary risk assessment

Potential sources	Contaminant	Potential receptors	Assessment of Potential Impact	Likelihood	Consequence	Risk rating
Onsite filling	Heavy metals, TRH, BTEX, PAH, OC/OPs, PCBs, VOC, PFAS, asbestos	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	<p>There may be contaminants present within uncontrolled fill presumed to have been used historically. The results of the Geotechnical investigation conducted in 2019 indicated that there were no elevated contaminants concentrations in the soil samples collected. However, the soil samples were collected from only seven locations and the exact sampling locations are not known.</p> <p>Therefore, it is unlikely that the full lateral extent of the REF proposal area was investigated. It is possible that contaminants at concentrations above the Tier I screening values may be present in fill material within the REF proposal.</p> <p>Up to 148m<sup>3</sup> of waste may be generated during excavation activities. Based on the previous analytical results, soil may be General Solid Waste (GSW). Given the extent of upgrades it is possible that some areas may generate Restricted Solid Waste (RSW) category material. The designs of the bridge piles have not been determined yet so it is not possible to determine volumes of spoil that may be produced during pile construction.</p>	Likely	Moderate	Low to Moderate
Airport operations	Heavy metals, TRH, BTEX, PAH, OC/OPs, PCBs, VOC, PFAS	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water	<p>The use of the airport as a Defence facility (around WW2) and then an operating airport could lead to a range of contaminants being present in the soil and groundwater.</p> <p>Identified contaminants within the soil profile have the potential for leaching to groundwater and impacting the underlying groundwater table, particularly due to regular flooding of the site and stormwater infrastructure from the airport which could cause migration to the REF proposal.</p>	Unlikely	Negligible	Low

Potential sources	Contaminant	Potential receptors	Assessment of Potential Impact	Likelihood	Consequence	Risk rating
		Groundwater Coastal Wetland Flora and Fauna	Given the extensive development around the airport, it is unlikely that significant impacts extend to off-site areas in soil. Low concentrations of contaminants may be detected in groundwater in the REF proposal area which are unlikely to be encountered during the road upgrades			
	UXO (explosive residues and inert industrial wastes)		<p>UXO finds pose a higher risk due to the potential for explosive residues and volatile compounds. UXO could lead to inert industrial wastes within the soil profile such as metal cannisters and other casings. There is a low likelihood of encountering these materials due to the current level of development of the airport and previous widening of Henry Lawson Drive. Based on review of the available aerial photographs, significant soil disturbance has occurred in the area since WW2. However, impacts from these finds cannot be excluded from consideration due to the proximity to the REF proposal.</p> <p>Correspondence from the DoD indicates there is a very low likelihood of UXO being encountered and if there are any small ad-hoc disposals are unlikely to be highly explosive in nature.</p> <p>An Unexpected Finds Protocol is to be implemented prior to construction.</p>	Unlikely	Severe	Low to Moderate

Potential sources	Contaminant	Potential receptors	Assessment of Potential Impact	Likelihood	Consequence	Risk rating
Offsite residential and commercial land uses	Heavy metals, TRH, BTEX, PAH. OCP and OPPs, PCB, Asbestos	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	Any off-site fill (outside of the REF proposal boundary) from surrounding site construction is present below hard stand and not accessible to potential human or environmental receptors. It is highly unlikely that off-site fill material would be disturbed during construction activities.	Unlikely	Negligible	Low
Excavations intercepting groundwater and waterlogged soils	ASS, Sulphuric Acid, hydrogenated metals, heavy metals	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	<p>Excavation of soils within the Parramatta/Georges River hydrogeological landscape across the alignment could expose acid sulphate soils. These areas include south west, west and north west sections of the REF proposal. Preliminary laboratory data indicated the likely presence of ASS in samples from these areas. Once excavated, ASS, if left unmanaged, could cause harm to nearby waterways and coastal wetlands, flora and fauna in the area, and impact constructability of the road upgrade.</p> <p>Relatively small volumes of spoil would be produced from shallow excavations. Additionally, there are standard practices to manage ASS and PASS, particularly the small volumes anticipated to be produced during this proposal.</p>	Likely	Moderate	Low to Moderate

Potential sources	Contaminant	Potential receptors	Assessment of Potential Impact	Likelihood	Consequence	Risk rating
Former Landfill operations	Heavy metals, PCBs, Nutrients, PAHs, TRH, Ammonia, BTEX, Landfill gases, Acids, and Inert landfill wastes	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	<p>A former landfill is located at 479 Henry Lawson Drive.</p> <p>In 2012, elevated concentrations of several COPCs were detected in soil and groundwater including ammonia and ACM. Methane was detected in subsurface soil vapour and reportedly was accumulating (Geologix, 2012).</p> <p>In 2012, Council required a RAP be prepared and implemented to render the site suitable for the intended land use as the Flower Power complex. Council also required a Site Audit Statement and Site Audit Report (SAS and SAR) be prepared to verify that the remediation and validation works were completed in accordance with the applicable guidelines and legislation.</p> <p>While there is no available documentation to show completion of remediation works, the Flower Power complex has since been constructed so it is reasonable to assume that remediation and validation was completed.</p> <p>There is still a risk that impacts from the former landfill at 479 Henry Lawson Drive may still be present at measurable concentrations within or near the REF proposal. Impacts from the former landfill could include encountering wastes, contaminants in soil and groundwater, LFG and landfill which could become exposed and mobilised into the environment during construction. Contaminated groundwater may still be present and migrating toward Georges River.</p>	Possible	Moderate	Moderate



Potential sources	Contaminant	Potential receptors	Assessment of Potential Impact	Likelihood	Consequence	Risk rating
Golf Course operations and maintenance	OCPs/OPPs and Nutrients	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	<p>General upkeep and maintenance of the two golf courses in the area have the potential for pesticide, herbicide, and elevated nutrients from fertiliser use, to migrate offsite through surface runoffs, leach into groundwater and surface water.</p> <p>The presence of nutrients in the REF proposal area is not a risk. Given the area is generally sealed, it is highly unlikely that OCPs/OPPS have migrated to soils in the REF proposal area.</p>	Unlikely	Negligible	Low
Current BP Truck Stop service station operations and infrastructure	Heavy metals 8, TRH, BTEX, PAH, VOCs, and PFAS	<b>Human</b> Future construction workers <b>Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna <b>Downstream Environmental</b> Surface water Groundwater Coastal Wetland Flora and Fauna	<p>The status of the BP Truck Stop service station's underground infrastructure is not currently known and there is a risk of underground storage tanks (USTs), which store petrol and other fuels, to have potentially leaked and impacted the surrounding soils and groundwater. These could pose a risk to construction workers and the wider environment should any spills or leaks be encountered during nearby construction works particularly to the north of the Milperra Road intersection. Further impacts to groundwater from UST leakage are unknown and may be encountered during piling works and deeper excavations.</p> <p>Preliminary soil analysis during the 2019 geotechnical investigation results indicate the presence of PFAS compounds and heavy metals in the soil profile in this area.</p>	Possible	Moderate	Low to Moderate

#### 6.5.4 Safeguards and management measures

Safeguards and management measures for contamination and soil quality are presented in Table 6-20.

Table 6-20: Safeguards and management measures for contamination and soil quality

Impact	Environmental management measure	Responsibility	Timing
Risk of contamination from APECs	A Detailed Site Investigation will be undertaken near the APECs showing a moderate risk of COPCs at concentrations above the Tier I screening values. This will involve collection of soil, surface water, groundwater and landfill gas samples near moderate risk APECs and will be undertaken in accordance with the NEPM 2013. The DSI will report the analytical results and compare these to the applicable Tier I screening values in Schedule B2 of the NEPM 2013.	Transport	Detailed design
Contamination from onsite filling	<p>Analytical results from any spoil requiring off-site disposal will be sorted in accordance with:</p> <ul style="list-style-type: none"> <li>NSW EPA Waste Classification Guidelines Parts 1 to 4 and Addendum 1.</li> </ul> <p>If natural soil is disturbed, it may meet the definition of Excavated Natural Material and the analytical data will be compared to the concentrations and requirements with:</p> <ul style="list-style-type: none"> <li>ENM Resource Recovery Order and Exemption under the Protection of Environmental Operations (Waste) Act 2000.</li> </ul>	Contractor	Construction
Risk of potentially impacted soil migrating	<p>A Contaminated Land Management Sub-Plan will be prepared and implemented as part of the CEMP. This will address the risk of potentially impacted soil migrating from site during construction and include standard practices for dust suppression, and erosion and sedimentation control. Other controls in the Contaminated Land Management Sub-Plan will include:</p> <ul style="list-style-type: none"> <li>An Unexpected Finds Protocol (UFP) and the Construction Work Health and Safety (WHS) Plan will include a UXO risk assessment and any management measures.</li> <li>Mitigation of the risk that contaminated groundwater is encountered during construction activities. During construction any intercepted groundwater will be managed under the CEMP to mitigate risks associated with the potential mobilisation or release of contamination to the groundwater, improper storage and disposal of intercepted groundwater.</li> <li>Monitoring of excavations for volatile gases that may be present as a result of hydrocarbon contamination, which may pose a risk to human health and built environment.</li> <li>Proper use of work health and safety (WHS) equipment and monitoring of works where asbestos or other contamination is identified.</li> <li>Response plan if accidental major spills and leaks occur detailing remediation steps necessary to reduce impact to nearby coastal wetlands and GDEs.</li> </ul>	Contractor	Pre-construction
UXO	Prior to any ground disturbance directly west of the Bankstown Aerodrome property boundary, a risk assessment will be undertaken to determine the likelihood of UXO being present and the required management measures to mitigate the risk.	Transport/ Contractor	Detailed design/pre-construction

## 6.6 Traffic and transport

A Traffic and transport impact assessment report (Transport, 2021) was prepared for the overall proposal. Due to the integrated nature of the proposal, the traffic and transport assessment cannot provide a separate impact assessment of the REF proposal. This section details the traffic and transport assessment for the overall proposal. The assessment is provided in Appendix I.

### 6.6.1 Methodology

The methodology for the traffic and transport assessment consisted of:

- Reviewing the existing and future conditions of the transport network within and surrounding the proposal using publicly available information as well as data that had been previously collected for the proposal
- SIDRA traffic modelling to assess construction impacts based on a future year of 2023
- Preparing a microsimulation traffic model for the concept design of the proposal
- Modelling the traffic performance for the operation of the proposal for several scenarios (refer Future development approach section)
- Assessing the impacts of the proposal on traffic and transport performance during construction and operational stages
- Recommending mitigation measures to minimise potential traffic or transport impacts from the proposal.

The investigation of the existing environment and impacts for the traffic and transport assessment were developed in consideration of the overall proposal area.

The study area for the traffic model used considered a broader road network than just the overall proposal area. The purpose of this was to:

- Incorporate future projects in the area that would result in increased traffic volumes or changed traffic movements through the proposal area
- Assess the impacts of the proposal on the broader road network.

The study area captured existing transport routes within and around the overall proposal area extending out to Georges Hall, Chipping Norton and Milperra, as shown in Figure 6-7.







### 6.6.1.1 Future Development Approach

Future year models were developed for the proposal for the following assessment scenarios:

- 2026 AM/PM peak period without works (Do-Minimum)
- 2036 AM/PM peak period with the proposal.

The future year models for 2026 (opening year) and 2036 (ten years after opening) were developed for the future AM and PM peaks by adding the predicted traffic growth to the base case 2019 calibrated demand volumes. The traffic growth was derived using traffic volumes from the Sydney Strategic Traffic Forecasting Model (STFM).

It is noted that at the time of modelling, there were several key developments not included within the future land use assumptions within Land Use 2016. These developments include Bankstown Airport and Riverlands Golf Course Subdivision. Traffic generated by these developments have been based Bankstown Airport Masterplan and the Riverland's Golf Course Residential Subdivision Traffic Impact Assessment (TTPP, 2020) respectively and considered in future traffic volumes.

In addition, the Georges Hall Pinch Point upgrade to be constructed north of the proposal on Henry Lawson Drive between Beale Street and Rabaul Road has been considered in all future year assessment scenarios. The changed traffic movements and improvements to the traffic on Henry Lawson Drive from that project has been modelled in these scenarios.

## 6.6.2 Existing environment

The study area is located predominantly within the City of Canterbury-Bankstown LGA, though it is noted that a minor part of the area encompassing Newbridge Road extends into the Liverpool LGA (west of the Georges River). Local development within the Canterbury-Bankstown LGA is largely governed by the Bankstown LEP, which establishes land zonings that control the types of land uses that are permitted.

### 6.6.2.1 Road network

#### 6.6.2.1.1 Key roads

The study area includes several key roads including:

- State roads – Milperra Road, Henry Lawson Drive, Newbridge Road
- Regional roads – Haig Avenue, Ashford Avenue
- Local roads – Tower Road, Rabaul Road, Auld Avenue.

Further discussions on roads that are within the REF proposal area are discussed in Table 6-21.

Table 6-21: Description of key roads within the REF proposal area

Road	Construction
Henry Lawson Drive	Henry Lawson Drive is a 20 kilometre- long State road that runs predominantly north-south from Hume Highway in Villawood to Forest Road in Peakhurst. Within the study area, Henry Lawson Drive intersects with Newbridge Road and Milperra Road at an at-grade signalised intersection. South of this intersection, Henry Lawson Drive has one-lane in each direction, with additional auxiliary turning lanes. North of this intersection, it has two lanes in each direction until Tower Road, where it reduces to one-lane in each direction. Both sections are sign posted at 60 kilometres per hour.
Milperra Road	Milperra Road is a State road that runs predominantly east-west from Newbridge Road in Milperra to Canterbury Road in Revesby. It is part of the A34 arterial route which connects Newtown and Liverpool.

Road	Construction
	Within the study area, Milperra Road intersects with Newbridge Road and Henry Lawson Drive at an at-grade signalised intersection. This section of Milperra Road has three lanes in each direction, with additional auxiliary turning lanes. It is signposted at 70 kilometres per hour.
Newbridge Road	Newbridge Road is a State road that runs predominantly east-west from Milperra Road in Milperra to Terminus Road/Hume Highway in Liverpool. It is part of the A34 arterial route which connects Newtown and Liverpool. Within the study area, Newbridge Road intersects with Milperra Road and Henry Lawson Drive at an at-grade signalised intersection. This section of Milperra Road has three lanes in each direction, with additional auxiliary turning lanes. It is sign posted at 70 kilometres per hour.
Tower Road	Tower Road is a north-south local road that connects Henry Lawson Drive to Link Road and Bankstown Airport. It is generally a two-lane undivided road with aeronautical industry/golf course on both sides.
Auld Avenue	Auld Avenue is an east-west dead-end local road that connects Henry Lawson Drive to sporting fields to the west. It is generally a two-lane undivided road with on-street parking on both sides.

### 6.6.2.1.2 Key intersections

The intersections that are within or surrounding the REF proposal area are detailed in Table 6-22.

Table 6-22: Summary of key intersections within the study area

Intersection	Layout
Henry Lawson Drive/Tower Road	<ul style="list-style-type: none"> <li>Signalised T-Intersection. Roundabout at Tower Road located within 30m east of intersection.</li> <li>Access to Tower Road from Henry Lawson Drive northbound carriageway via right turn short lane. Access from southbound carriageway via a through-left full-length lane.</li> <li>Access from Tower Road to Henry Lawson Drive via full length (30m) dedicated left and right turn lanes.</li> </ul>
Henry Lawson Drive/ Newbridge Road/ Milperra Road	<ul style="list-style-type: none"> <li>Signalised 4-way intersection with all turning movements permitted.</li> <li>Left turns on all approaches are single slip lanes protected by median islands. Two left turn slip lanes are provided on the south approach of Henry Lawson Drive.</li> <li>Right turns on all approaches are on single dedicated right turn short lanes. Two right turn lanes are provided on Henry Lawson Drive north approach.</li> </ul>
Henry Lawson Drive/Auld Avenue	<ul style="list-style-type: none"> <li>Priority T-intersection with one lane approach/exit on all legs, except for Henry Lawson Drive northbound exit lane expanding to two lanes after the intersection.</li> <li>All turning movements permitted. Auld Avenue eastbound onto Henry Lawson Drive controlled by Give Way sign.</li> </ul>
Henry Lawson Drive/Keys Parade	<ul style="list-style-type: none"> <li>Signalised T intersection for access to/from Flower Power complex and Henry Lawson Drive.</li> <li>Access to Flower Power complex from Henry Lawson Drive northbound carriageway via a right turn short lane. Access from southbound carriageway via a protected short left turn slip lane, with left turn permitted on red.</li> <li>Access from Flower Power complex to Henry Lawson Drive northbound via dedicated right turn lane. Access to southbound carriageway via a protected left turn slip lane.</li> </ul>

### 6.6.2.1.3 Road traffic volumes and intersection performance

The existing (2019) traffic and intersection performance of intersection within and surrounding the REF proposal area has been modelled to provide the existing scenario of the proposal area.

Intersection operational performance is evaluated by assessing the intersection turning volumes, vehicle delays and LoS. LoS is a measure used to determine the effectiveness of intersection operation and is commonly used to analyse intersections by categorising traffic flow conditions. Table 6-23 shows the standard LoS criteria for intersection operation.

Table 6-24 details the modelling results of the existing intersections within and surrounding the REF proposal area.

Table 6-23: Level of Service criteria for intersections

Level of Service	Average delay per vehicle (s/veh)	Traffic signals, roundabout
A	<14	Good operation
B	15 to 28	Good with acceptable delays & spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts requires other control mode
F	>70	Unsatisfactory with excessive queuing

Table 6-24: Existing traffic volumes and intersection performance

Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Volume (Vol)	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive/Milperra Road	6,052	112	F	6,296	112	F	6,615	152	F	6,819	199	F
Henry Lawson Drive/Tower Road	2,935	18	B	3,046	26	B	2,984	70	E	3,142	49	D
Henry Lawson Drive/Auld Avenue	1,880	11	A	2,056	13	A	2,119	25	B	2,192	29	C
Henry Lawson Drive/Keys Parade	1,725	3	A	1,857	5	A	1,981	12	A	2,120	6	A

Henry Lawson Drive/Tower Road performs at an overall good LoS B during both AM peak hours and LoS E and D during the PM peak hours. The poor performance in the PM peak can be attributed to a pinch point along the north approach exit which results in vehicles merging from two lanes to one. This extends into queues stretching beyond the Tower Road intersection. Additionally, Tower Road approach provides access to retail shops, which generates more traffic during the PM peaks.

Henry Lawson Drive/Milperra Road/Newbridge Road performs at an overall LoS F for both AM and PM peak periods, though has noticeably worse delay during the PM peak period

Poor performance of the intersections can be partly attributed to:

- Right turn bay along the east approach is typically full during both peaks, with heavy vehicles filling up the bay space readily.

- During the pm peak, dual right turn along the north approach is typically full and queues back upstream along Henry Lawson Drive
- The left turn slip from Newbridge Road is heavily utilised during the am peak and is constrained by the short storage length, which measures 60 metres from the stop line.

Henry Lawson Drive/Auld Avenue performs at an overall LoS A during the AM Peak, and slightly worse during the PM peak at LoS B and C. The performance of this intersection is good overall due to the low demand from Auld Avenue during the peak period.

## 6.6.2.2 Freight

### 6.6.2.2.1 Heavy vehicle numbers

A majority of Sydney's freight task is undertaken by road. Henry Lawson Drive is an important route for freight and industrial type business operations that connects surrounding large industrial areas of Milperra, Revesby, Chipping Norton and Moorebank, which are made up of warehouses, manufacturing, storage, and logistics businesses. As such, there are many approved B-Double routes through the area (shown in Figure 6-8). As a result, a range of vehicles including heavy vehicles travel throughout the local road network. The proportion of heavy vehicles during the peak periods along Henry Lawson Drive is high compared to the average of four per cent across the Sydney urban road network (refer Table 6-25).

Table 6-25: Average weekday heavy vehicle volumes

Midblock	7-9 AM		4-6 PM	
	Volumes	%	Volumes	%
Henry Lawson Drive north of Newbridge Road/Milperra Road intersection	587	12	412	8
Henry Lawson Drive south of Newbridge Road/Milperra Road intersection	422	11	303	8

### 6.6.2.2.2 Access and routes

Figure 6-8 shows the approved B-Double routes for vehicles up to 26 metres in length on the road network surrounding the study area, based on the Transport Restricted Access Vehicles map.

This shows that the study area is well serviced by roads suitable for heavy vehicles, including Henry Lawson Drive, Newbridge Road, Milperra Road, and Ashford Avenue.

### 6.6.2.3 Crash data analysis

Crash data was extracted from the past 10 years from the Transport Crash Link database for Henry Lawson Drive, Milperra Road and Newbridge Road across an area similar to the study area.

The crash history is summarised in Section 2.1.2.

The crash history data shows an average of 12.6 crashes and 9.7 casualties per year within the study area. Rear end crashes make up the majority of crashes (53.2 per cent) followed by lane changing (9.5 per cent) and opposing vehicles turning (15.9 per cent). The data also shows most crashes occur within 10 metres of the intersection (65.9 per cent). Most of the crashes occurred during the AM and PM peak periods during the weekdays.



#### **6.6.2.4 Public transport**

##### **6.6.2.4.1 Rail network**

There is no rail network within the study area. The nearest train stations are East Hills station, about four kilometres to the south, and Liverpool Station, about five kilometres to the west.

##### **6.6.2.4.2 Bus network**

The study area is serviced by a single bus route, the M90 which runs from Liverpool to Burwood. Bus stops are located along Milperra Road and Newbridge Road.

#### **6.6.2.5 Active transport**

##### **6.6.2.5.1 Pedestrian infrastructure**

Existing pedestrian footpaths and shared paths across the study area is substantial, including existing pathways for pedestrians along:

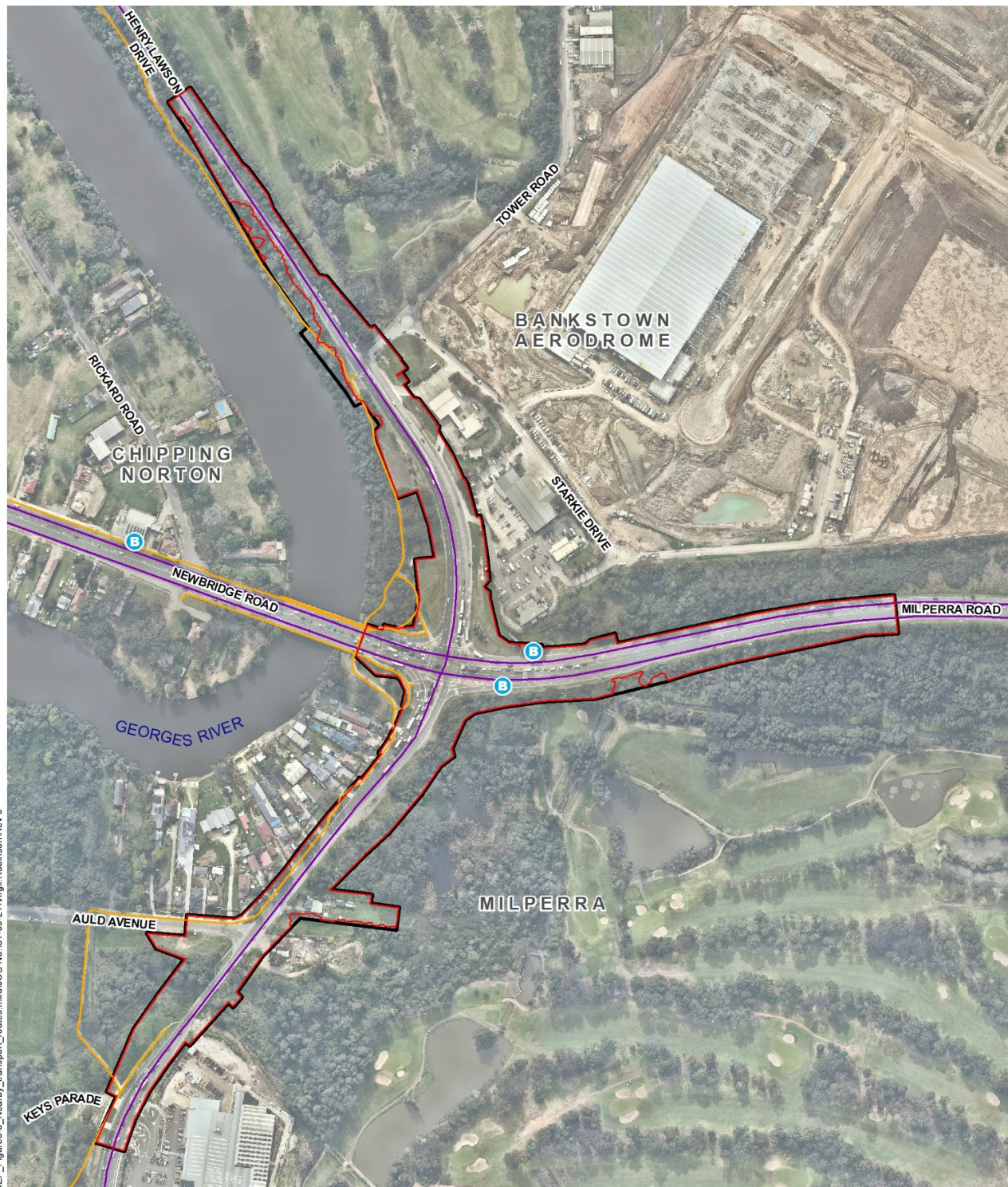
- Northbound carriageway of Henry Lawson Drive south of its intersection with Newbridge Road.
- Either side of Newbridge Road
- Pedestrian pathway along Georges River to the north of the Newbridge Road bridge
- Bridge crossing along Henry Lawson Drive south of Auld Avenue has a footpath along the northbound carriageway that is of substandard width.
- Local roads within the residential streets within the study area.

##### **6.6.2.5.2 Cyclist infrastructure**

Henry Lawson Drive is well-serviced by cycling infrastructure, with an off-road shared path along its northbound carriageway. Likewise, Newbridge Road is serviced by an off-road shared path along its eastbound carriageway. Milperra Road, however, is not serviced by dedicated cyclist infrastructure.



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- REF proposal area
- Overall proposal boundary
- Approved B-Double routes
- B M90 Bus stop
- Bicycle network**
- Shared Path (Off road facility type - shared with pedestrians)

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Henry Lawson Drive Stage 1A **Review of Environmental Factors**  
Projection: GDA 1994 MGA Zone 56

FIGURE 6-8: Nearby transport routes



### **6.6.3 Potential impacts**

The following section details the impacts of the proposal on traffic and transport during both construction and operation.

#### **6.6.3.1 Construction**

##### **6.6.3.1.1 Impact on network performance**

The proposal would generate light and heavy vehicle movements on the road network surrounding the proposal associated with delivery or removal of construction materials and equipment and construction worker movements to and from the construction footprint. Construction could result in up to an additional 60 heavy vehicles and 70 light vehicles on the surrounding road network per day during peak construction. The construction traffic for delivery or removal of construction materials and equipment would generally be staged throughout the day. The construction workers would arrive and leave site at the start and end of each shift.

The construction footprint is well serviced by roads suitable for heavy vehicles. Therefore, impacts on local roads surrounding the proposal are expected to be limited to short sections of local roads required to access the construction zones. In particular the use of the roundabouts at Nancy Ellis Leebold Drive and the intersection of Ashford Avenue and Bullecourt Avenue, for construction vehicles to turn around.

A SIDRA assessment was performed, comparing road performance in 2023 with and without construction vehicles. The assessment showed that due to their low overall volumes compared to existing traffic volumes on the roads, construction vehicles had no material impact on the performance of intersections within surrounding road network. The construction haulage routes are shown in Figure 6-7.

#### **Impact on road access**

The majority of construction works are being undertaken in the road reserve and on/ adjacent to the roads of Henry Lawson Drive, Milperra Road and Newbridge Road. Side roads such as Tower Road and Auld Avenue would also be affected by construction works. These roads would remain operational during construction. However, there may be a need for temporary lane closures at times during the construction period.

In addition, as sections of the upgrade are completed, traffic switches would be put in place to shift traffic onto new sections of the road to enable works on existing pavement to be completed. Traffic management controls such as speed limit reduction would also be enforced near worksites. All impacts to the road network would be undertaken in accordance with a ROL to be obtained from the Traffic Management Centre. Access for emergency vehicles would be maintained at along these roads.

##### **6.6.3.1.2 Impact on property access**

Access to properties would be maintained during construction. However, access may need to be disturbed on a short-term basis. It is expected that the following property accesses may be affected by construction works:

- Access to commercial properties along southbound carriageway of Henry Lawson Drive between Tower Road and Milperra Road (ALDI, BP Truckstop) maybe be temporarily affected as widening works encroaches on existing access points. Alternate access routes are available along Starkie Drive.
- Access to residential properties to the west of Henry Lawson Drive between Newbridge Road and Auld Avenue maybe be temporarily affected as widening works encroaches on existing access points. Access to these properties would be maintained by the contractor, though it may involve detours and increase in travel times.

- Access to Flower Power from Henry Lawson Drive southbound may be minimally affected by widening works. Northbound access to Flower Power is not expected to be directly affected as it is outside of scope of works.

Landowners and occupiers would be consulted by the construction contractor about any potential access impacts prior to the commencement of construction and methods to minimise impacts.

### 6.6.3.1.3 Impact on public transport

Bus routes M90 operate along Newbridge Road/Milperra Road in both directions (shown in Figure 6-8). Access for pedestrians and to public transport would be maintained around the construction site during construction. There are two bus stops within the construction area would be temporarily relocated to allow for safe access.

### 6.6.3.1.4 Impact on active transport

Detours for pedestrian/cyclist access would be implemented within the proposal area and alternative arrangements managed through signage and wayfinding. In particular, the following routes may be affected, as they lie within the zone of construction works:

- Existing shared path along northbound Henry Lawson Drive north of Keys Parade
- Existing shared path along northbound Henry Lawson Drive between Auld Avenue and Milperra Road
- Existing shared path along Georges River near Tower Road.

The shared path network is shown in Figure 6-8 . Pedestrian and cyclist access across the Henry Lawson Drive/Milperra Road/Newbridge Road intersection would be maintained during the construction period. However, some detours may be required at times.

## 6.6.3.2 Operation

### 6.6.3.2.1 Impact on network performance

A microsimulation model of the study area was created to identify the operational impact of the proposed upgrades on intersections, travel times, and network statistics in the study area for the years 2026 and 2036, compared to a do-minimum scenario.

Modelling showed that at intersections within the study area all showed significant improvements in delay and volume throughput due to capacity improvements, even though the operating LoS sometimes remained the same.

LoS results for the Do Minimum 2026 and 2036 scenarios are shown in Table 6-26 and Table 6-27. LoS results for the Proposal 2026 and 2036 scenarios are shown in Table 6-28 and Table 6-29.

Table 6-26: Level of service results for Do Minimum 2026 scenarios

Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive/Milperra Rd	6,341	240	F	6,072	509	F	6,646	245	F	6,277	374	F
Henry Lawson Drive/Tower Rd	2,784	29	C	2,432	54	D	2,791	111	F	2,275	93	F
Henry Lawson Drive / Auld Avenue	2,105	66	E	1,947	82	F	2,201	80	F	2,145	99	F



Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive / Keys Pde	2,088	32	C	1,867	181	F	2,173	135	F	2,163	117	F

Table 6-27: Level of service results for Do Minimum 2036 scenarios

Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive / Milperra Rd	6,361	297	F	6,195	572	F	6,580	265	F	6,429	314	F
Henry Lawson Drive / Tower Rd	2,892	59	E	2,543	105	F	3,019	121	F	2,890	134	F
Henry Lawson Drive/Auld Avenue	2,146	54	D	1,941	76	F	2,201	80	F	2,145	99	F
Henry Lawson Drive/Keys Pde	2,120	29	C	1,863	314	F	2,081	252	F	2,056	243	F

Table 6-28: Level of service results for Proposal 2026 scenarios

Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive/Milperra Rd	6,949	77	F	7,267	131	F	7,247	163	F	7,478	191	F
Henry Lawson Drive/Tower Rd	3,214	26	B	3,452	39	C	3,530	81	F	3,514	88	F
Henry Lawson Drive/Auld Avenue	2,219	17	B	2,415	32	C	2,421	47	D	2,515	30	C
Henry Lawson Drive/Keys Pde	2,206	12	A	2,316	17	B	2,442	57	E	2,509	16	B

Table 6-29: Level of service results for Proposal 2036 scenarios

Intersection	AM Peak 7-8			AM Peak 8-9			PM Peak 4-5			PM Peak 5-6		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Henry Lawson Drive/Milperra Rd	7,210	98	F	7,413	201	F	7,273	201	F	7,339	225	F
Henry Lawson Drive/Tower Rd	3,235	26	B	3,392	54	D	3,571	87	F	3,586	81	F
Henry Lawson Drive/Auld Avenue	2,341	26	B	2,499	65	E	2,567	66	E	2,498	70	F
Henry Lawson Drive/Keys Pde	2,325	11	A	2,446	78	F	2,583	42	D	2,550	51	D

### Henry Lawson Drive/Milperra Road

The modelling shows:

- The intersection would still operate at los F under the operation scenario for both 2026 and 2036 during both peak periods.
- There is a reduction in delay and an increase in the volume capacity of the intersection. The 2026 7-8 AM peak, delay has reduced from 240s down to 77s. Volume throughput has also increased from 6341 to 6949 vehicles which shows the intersection is able to accommodate more traffic.
- The 2026 8-9AM shows delays improving from 509s to 131s and also volume throughput increases.
- In 2036, delays have improved from 297s to 98s in the 7-8AM and from 572s to 201s in the 8-9AM. Likewise, improvements in delay can also be seen during the PM peak periods.

The delay improvement of the intersection can be factored by the addition of a dual right turn along from Milperra Road into Henry Lawson Drive.

### Henry Lawson Drive/Tower Road

The modelling shows:

- The intersection remains at los B during the 7-8AM and improves from los D to los C during 8-9AM in 2026.
- In 2036, the 7-8AM improves from los E to los B and the 8-9AM improves from los F to los D. The PM peak shows the intersection performing at los F however with improvements in overall delay.
- In 2026, delay is reduced from 121s to 87s (4-5PM) and remains at 88s during the 5-6PM.
- In 2036, delay is further reduced from 121s to 87s (4-5PM) and 134s to 81s (5-6PM). Volume throughput of the intersection has also increased across all peak periods.

The improvements in delay and volume throughput of the intersection can be seen coming from the capacity improvements of the Tower Road leg with the addition of a dual right turn bay and a dedicated left turn slip which helps during the PM peak periods as more traffic exits from the development.

### Henry Lawson Drive/Auld Avenue

The modelling shows:

- Under the do minimum scenario for 2026, Henry Lawson Drive/Auld Avenue would operate at LoS E/F in the AM peak and LoS F during the PM peak.
- Similar LoS can be seen in 2036 do minimum.
- Under the proposal scenario, the 2026 modelling shows the intersection performing at LoS B/C during the AM peak and LoS D/C during the PM peak.
- By 2036, the intersection performs at LoS B/E during the AM peak and LoS E/F during the PM peaks.

The poor performance under the do minimum scenario is attributed to the high delays from traffic turning in and out of Auld Avenue as a result of congestion along Henry Lawson Drive.

The improvement in performance is a result of the intersection layout changes from a T junction with all movements to a left in left out arrangement.

### Other intersections in the road network

For the other intersections included in the road model, the assessment found that overall the proposal would have a positive impact on the surrounding road network. Improvements during the AM and PM peaks would be anticipated at Henry Lawson Drive/Keys Parade as result of less queue spill back from Henry Lawson Drive/Milperra Road. Minor improvements in delay can be seen along Henry Lawson Drive/Haig Avenue and Henry Lawson Drive/Rabaul Road. Both intersections are located north of Tower Road where the midblock capacity remains at a single lane in each direction. The intersection performances along Milperra Road/Murray Jones Drive and Milperra Road/Ashford Ave remains relatively unchanged for future AM and PM peaks under both scenarios.

#### **6.6.3.2.2 Impact on property access**

The increased footprint of the road network in the proposal area is likely to impact local road and property access during operation. Landowners and occupiers would be consulted about any potential access impacts prior to the commencement of construction and/or operation.

Currently around 10 properties between Milperra Road and Auld Avenue have driveway frontage onto Henry Lawson Drive and has access to/from both north and southbound carriageways.

The proposal includes a raised concrete median along this section of Henry Lawson Drive, which would make driveway access left in left out only (from the northbound lanes). Property owners wishing to access their driveway from the southbound carriageway of Henry Lawson Drive would need to turn around at the Keys Parade intersection or detour elsewhere onto the network (possibly via Milperra Road, Ashford Avenue, Bullecourt Avenue then back onto Henry Lawson Drive northbound).

Additionally, widening of Henry Lawson Drive may cause some of these properties to experience a reduction of setback space between their property fence and the road. Properties which previously relied on this space to perform vehicle turnarounds so that they could enter live traffic in a forward direction, would now be required to reverse into live traffic to access Henry Lawson Drive.

Access to the commercial properties between Tower Road and Milperra Road would not have any impacts to access. Access to the fast food and ALDI supermarket would change from a left slip lane arrangement to a driveway access, but this would not have an adverse impact on patrons.

Driveway access to residential properties is being considered in detailed design. Sight distances, setbacks and gradients will be designed in accordance with the Australian Standards, Austroads Road Design Guides, RMS Supplements and Canterbury Bankstown Council Standard Drawings.

#### **6.6.3.2.3 Impact on public transport**

The westbound bus jump start lane along Milperra Road would be removed as part of the upgrade of the intersection. As a result, this would remove the bus signal phasing which would improve the efficiency of the intersection for all vehicles along all approaches.

The bus stop located on the Milperra Road westbound carriageway would be relocated out of the left turn lane about 20 metres from where it is currently located. This would require the bus to merge out of the left turn lane into the Milperra Road. The operation of the proposal would not result in any changes to public bus services.

As part of the proposal, a new shared path would also be constructed to the relocated bus stop.

#### **6.6.3.2.4 Impact on active transport**

As a part of the proposal, pedestrian accessibility and safety would be improved through new and upgraded infrastructure. This includes:

- A new footpath on the eastern side Henry Lawson Drive between Tower Road and Milperra Road which would support foot traffic to the new retail proposed within the Bankstown Airport Redevelopment.
- A new pedestrian footpath would also be provided on both sides along Milperra Road to provide a formal connection between the bus stops and pedestrian crossings at the Henry Lawson Drive intersection.
- Upgrade of the existing footpath along the western side of Henry Lawson Drive between Keys Parade and Newbridge Road from narrow footpath to a 3.0 wide shared path (including provision of shared path facilities on the new bridge south of Auld Avenue).

Pedestrian and cyclist movements along the Georges River would be maintained with the existing pedestrian pathway along the Georges River north of Newbridge bridge slightly realigned to accommodate the larger footprint of the upgraded Henry Lawson Drive/Tower Road intersection. This pathway would still connect to the existing pedestrian crossing at Tower Road. Impacted pathways would be re-instated to concrete in accordance with the proposal's urban design plan.

#### **6.6.3.2.5 Impact on road safety**

Whilst no dedicated road safety upgrades have been undertaken in the preferred option, the increased intersection capacity and smoother operation of the network in general is expected to significantly improve road safety. Additionally, the following intersection upgrades are expected to improve road safety:

- Henry Lawson Drive/Tower Road
  - Provision of additional right turn bays would increase turn storage capacity and reduce risk of road blockage and rear end collision.
  - Conversion of left turn exit lane from Tower Road into slip lane would improve safety of that turn.
- Henry Lawson Drive/Milperra Road/Newbridge Road
  - Additional right turn bays and extension of existing right turn bays would increase storage capacity and reduce risk of road blockage and rear end collisions
- Henry Lawson Drive/Auld Avenue
  - Conversion of intersection into a left-in left-out reduces risk of vehicles turning into incoming traffic.



## 6.6.4 Safeguards and management measures

Safeguards and management measures for traffic and transport impacts are presented in Table 6-30.

Table 6-30: Safeguards and management measures for impacts to traffic and transport

Impact	Environmental safeguard	Responsibility	Timing
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport for NSW Traffic Control at Work Sites Manual (RMS, 2020) and QA Specification G10 Control of Traffic (Transport, 2020). The TMP will include:</p> <ul style="list-style-type: none"> <li>• Confirmation of haulage routes</li> <li>• Measures to maintain access to local roads and properties</li> <li>• Construction traffic control plans outlining site-specific traffic control measures (including signage) to manage and regulate traffic movement</li> <li>• Measures to maintain pedestrian and cyclist access (with the implementation of a Vehicle Movement Plan)</li> <li>• Requirements and methods to consult and inform the local community of impacts on the local road network</li> <li>• Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads</li> <li>• A response plan for any construction traffic incident</li> <li>• Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic</li> <li>• Monitoring, review and amendment mechanisms.</li> </ul> <p>The TMP will ensure the following:</p> <ul style="list-style-type: none"> <li>• Alternative routes for active transport users will be clearly identified by signage and the use of traffic controllers where required.</li> <li>• Property access will be maintained where feasible and reasonable and property owners will be consulted in advance of work starting that may temporarily restrict or control access.</li> <li>• Public transport providers and users will be notified in advance of any changes to bus stop locations through signage at the existing bus stops on Milperra Road.</li> <li>• Canterbury Bankstown Council will be consulted of any detours in accordance with the Traffic Management Plan and the Community Liaison Plan.</li> </ul>	Contractor	Pre-construction/during Construction
Traffic impacts	Further traffic modelling will be carried out during detailed design based on detailed construction methods and traffic staging. Traffic modelling will assess the potential traffic impacts from detailed design and identify whether any additional mitigation measures or traffic control measures will be required.	Transport	Detailed design

Impact	Environmental safeguard	Responsibility	Timing
	Further investigations on the layout of the Auld Avenue intersection will be undertaken during detailed design, including traffic monitoring and design options to identify the most optimal layout for this intersection. Any change in the layout will be based on balancing a range of issues including road safety and road network performance, as well as considering any future opportunities for broader connectivity.		
Impact on bus stops or routes	Temporary and permanent bus stop relocation will be discussed with the relevant bus operator.	Transport/ Contractor	Pre-construction
Construction traffic	Heavy vehicle movements to be minimised during peak traffic periods (i.e. not between 7.15 and 8.15 am or 4.45 and 5.45 pm), where practical.	Contractor	During Construction
Traffic management measures	Any temporary traffic diversions, clearways and lane closures for work carried out will be implemented in accordance with Transport Management Centre (TMC) and Canterbury Bankstown Council requirements.	Contractor	During Construction
Parking	Off-road parking for construction vehicles will be provided within the ancillary facility and construction areas.	Contractor	Construction
Damage to local roads	Any damage to the local road network identified to be caused by construction vehicles for the proposal will be remediated by the contractor to be similar to the existing road condition.	Contractor	Construction
Access	Driveway access to residential properties will be designed in greater detail in detailed design. Sight distances, setbacks and gradients will be designed in accordance with the Australian Standards, Austroads Road Design Guides, RMS (Transport) Supplements and Canterbury Bankstown Council Standard Drawings.	Transport/ Contractor	Detailed design/Pre-construction

## 6.7 Noise and vibration

A Noise and Vibration Impact Assessment (Aurecon, 2021) was prepared for the overall proposal. This section summarises the impacts of the overall proposal due to the integrated nature of the REF and EIS proposal. The assessment is provided in Appendix J.

### 6.7.1 Methodology

#### 6.7.1.1 Construction

The methodology for assessing construction noise involved:

- Assessment of potential construction noise impacts to sensitive receivers within around 600 metres of the proposal, based on the construction methodology identified in the REF.
- Predicted noise levels were compared against applicable assessment criteria (including evaluation of exceedances), in line with the requirements of the Transport's Construction Noise and Vibration Guideline (RMS 2016) and NSW EPA ICNG. Appropriate control measures have also been considered in accordance with Transport's Noise Mitigation Guidelines (RMS 2015).
- A qualitative discussion of potential noise impacts from construction traffic on haulage routes.

- A vibration impact assessment based on typical safe working distances for vibration-intensive equipment and identification of locations where receivers may be within the safe working distance for structural and human comfort impacts. Identification of consideration for any vibration management measures have been identified.

### **6.7.1.2 Operational**

The methodology for assessing operational noise involved:

- Noise monitoring and concurrent traffic counts at two locations across the proposal area. Baseline noise levels were recorded over a minimum of seven consecutive days. The concurrent automatic traffic counts established existing traffic volumes and characteristics over this period. The traffic data would also be used to validate the predictive noise model.
- Following the noise survey, project noise catchment areas, representing groups of sensitive receivers of similar background noise and similar level of impact from the proposal, were established to then determine the most appropriate noise assessment criteria.
- Noise modelling was done using SoundPlan v8.1 software, with reference to Transport's Noise Criteria Guideline (RMS 2015) requirements. This model incorporated terrain, receiver locations, proposal geometry (existing and proposed design) and traffic data for the operational assessments. The computational acoustic model has been validated with noise monitoring with concurrent traffic counts. Details of the modelling parameters and inputs are provided in the Noise and Vibration Impact Assessment in Appendix J0.
- The noise impact assessment for operational traffic noise was undertaken in accordance with the Transport guidelines for noise impact assessments. An assessment of operational noise impacts included the assessment of the following scenarios:
  - Year of opening: 2026, without upgrade
  - Year of opening: 2026, with upgrade
  - 10 years after opening: 2036, without upgrade
  - 10 years after opening: 2036, with upgrade.
- Noise predictions for each scenario for all sensitive receivers within 600 metres of the proposal and assessment of level of impact. This included maximum noise level predictions and predictions of sleep disturbance impacts, where relevant.
- Identification of the need and type of noise management measures considered feasible.

The future operational traffic volumes for the road traffic noise assessment were obtained from Transport traffic modelling. These volumes were calibrated against the Matrix traffic monitoring data undertaken in 2020.

### **6.7.2 Existing environment**

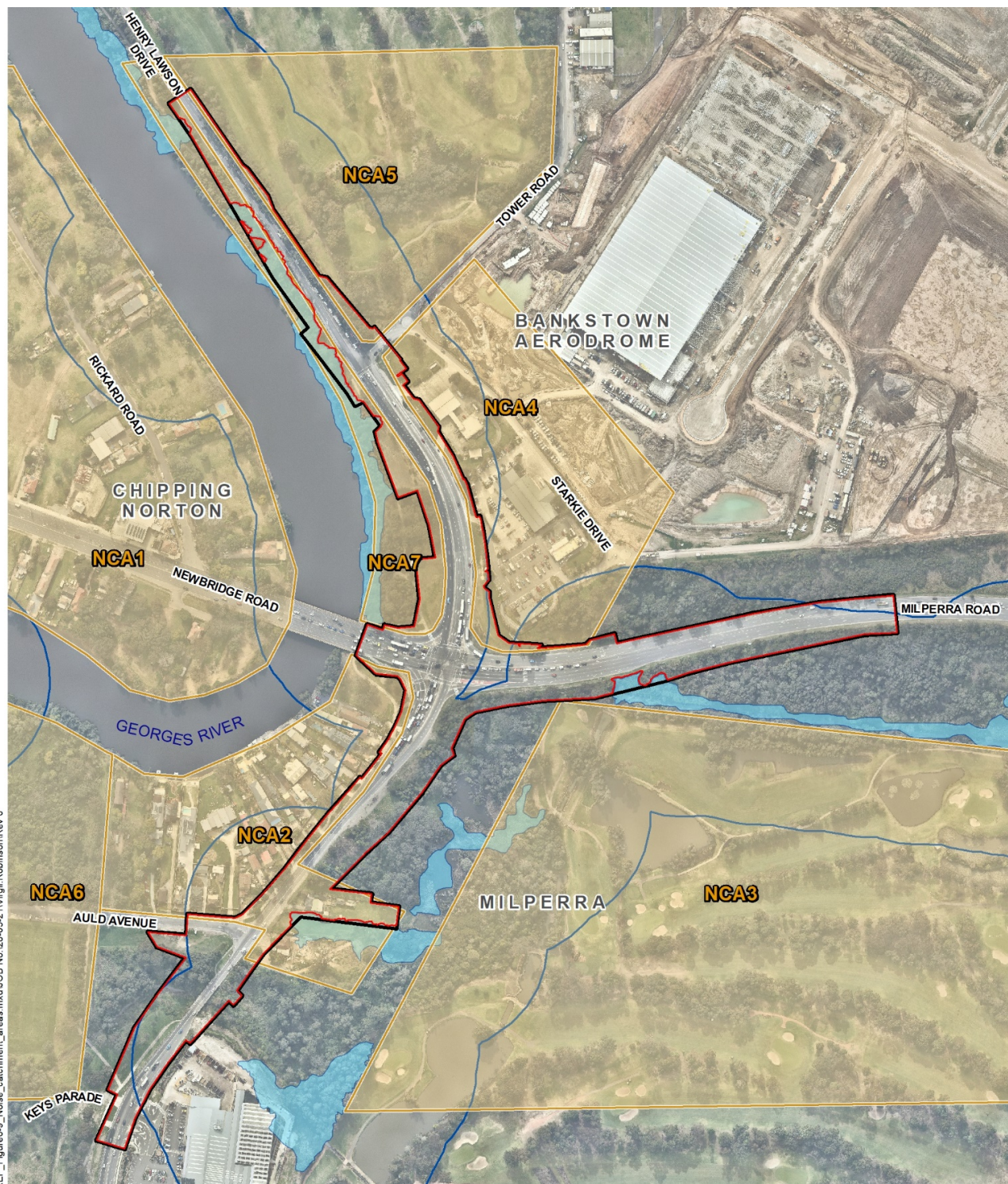
The area surrounding the overall proposal has been divided up into Noise Catchment Areas (NCAs) as shown in Figure 6-9. These NCAs are based on similar land use and similar location. Each of the NCAs has been described in Table 6-31.

Table 6-31: Noise Catchment Area Descriptions

NCA	Description
NCA 1	<p>The noise catchment area contains residential receivers. The NCA is not directly adjacent to the construction footprint or Henry Lawson Drive. Sensitive receivers in NCA 1 are directly adjacent to Newbridge Road, which is outside the REF proposal area. Receivers are also exposed to noise from Henry Lawson Drive, where noise can travel across the Georges River.</p> <p>Traffic along Newbridge Road could be affected by the overall proposal and is required to be assessed relative to the receivers within the NCA.</p> <p>NCA 1 is located across the river, west of the REF proposal area.</p>
NCA 2	<p>The noise catchment area contains residential receivers directly adjacent to the construction footprint as well as adjacent to the widening of the Henry Lawson Drive. Sensitive receivers within the NCA would be affected by the change in operational road traffic noise and the construction noise and vibration of the proposal.</p> <p>NCA 2 is located within and adjacent to the south west of the REF proposal area.</p>
NCA 3	<p>The noise catchment area contains recreational open space, which would be affected by construction and operational noise and vibration induced by the proposal.</p> <p>NCA 3 is located to the south east of the REF proposal area.</p>
NCA 4	<p>The noise catchment area contains commercial receivers.</p> <p>NCA 4 is located within and adjacent to the north east of the REF proposal area.</p>
NCA 5	<p>The noise catchment area contains recreational open space, which would be affected by construction and operational noise and vibration induced by the proposal.</p> <p>NCA 5 is located within and adjacent to the north east of the REF proposal area.</p>
NCA 6	<p>The noise catchment area contains recreational open space, which would be affected by construction and operational noise and vibration induced by the proposal</p> <p>NCA 6 is located to the west of the REF proposal area.</p>
NCA 7	<p>The noise catchment area contains recreational open space, which would be affected by construction and operational noise and vibration induced by the proposal</p> <p>NCA 7 is located within and adjacent to the north west of the REF proposal area.</p>



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- REF proposal area
- Overall proposal boundary
- Coastal Wetlands
- Coastal Wetlands Proximity Area
- Noise catchment areas

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Projection: GDA 1994 MGA Zone 56

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**FIGURE 6-9: Noise catchment areas**



Long term unattended noise monitoring was conducted at two residential receivers; one in NCA 1 and one in NCA 2. Long term unattended noise monitoring was conducted between the 16th of September 2020 and the 28th of September 2020. The results of the noise monitoring at the locations are detailed in Table 6-32.

Table 6-32: Measured Existing Ambient (dBL<sub>Aeq</sub>) and Background Noise Levels (dBL<sub>A90</sub>)

Location	Ambient Noise Level, dBL <sub>Aeq</sub>			Background Noise Level, dBL <sub>A90</sub>		
	Day	Evening	Night	Day	Evening	Night
40 Rickard Rd, Chipping Norton	60.3	57.0	54.7	53.1	51.5	40.7
392 Henry Lawson Drive, Milperra	64.5	60.8	59.0	51.9	47.4	40.7

### 6.7.3 Criteria

#### 6.7.3.1 Construction

##### 6.7.3.1.1 Recommended standard hours

The ICNG (NSW DECC 2009) generally applies to the management of construction noise in NSW. This guideline provides recommendations on standard construction hours and construction noise management levels (NMLs).

##### 6.7.3.1.2 Construction noise management levels

The construction noise criteria are defined as Noise Management Levels (NMLs). The NMLs represent a noise level that, if exceeded, would require management measures including the following:

- Reasonable and feasible work practices
- Contact with residences to inform them of the nature of works to be carried out, the expected noise levels and durations and contact details.

The ICNG sets the NMLs for residential receivers as well as other receivers. Table 6-33 and Table 6-34 are extracted from the ICNG, and derive the NMLs for residential receivers as well as other land uses applicable for the overall proposal.

Table 6-33: Noise Management Levels at residential receivers

Time of Day	Noise Management Level, dBL <sub>Aeq</sub> (15 min) <sup>1</sup>
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A) Highly noise affected 75dB(A)
Outside recommended standard hours (OOHW) <sup>3</sup>	Noise affected RBL + 5dB(A)

<sup>3</sup> OOHW Period 1 (Day) – Saturdays 7am to 8am and 1pm to 6pm; Sundays and public holidays 8am to 6pm.

OOHW Period 1 (Evening) – Monday to Saturday 6pm to 10pm.

OOHW Period 2 – Monday to Saturday 10pm to 7am; Sundays and public holidays 6pm to 8am.

Table 6-34: Noise Management Levels at other land uses

Land use	Noise Management Level, dBL <sub>Aeq</sub> (15 min) <sup>1</sup>
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Commercial premises	External noise level 70 dB(A)

#### 6.7.3.1.3 Construction traffic noise criteria

The ICNG does not outline specific guidelines surrounding construction traffic noise requirements. Construction related traffic noise objectives are sorted through the CNVG. The CNVG states that if a quantitative assessment is required then the objectives should be based upon the RNP.

With respect to the RNP, an initial screening of the additional construction traffic is required to evaluate whether the noise levels would increase more than 2dBA.

This initial screening would involve the comparison of the construction induced traffic and the current traffic volumes on Henry Lawson Drive, Milperra Road and Newbridge Road.

#### 6.7.3.1.4 Construction sleep disturbance

Construction noise during the night-time period (10pm to 7am), has the potential to disturb people's sleep patterns. Guidance in the ICNG references further information in the NSW EPA Road Noise Policy (RNP) that discusses criteria for the assessment of sleep disturbance.

The RNP suggests a screening level of L1(1min) dB(A), equivalent to the RBL + 15 dB. Where this level is exceeded, further analysis is required, as detailed in section 5.4 of the RNP:

- Maximum internal noise levels below 50 – 55 dB(A) would be unlikely to result in people's sleep being disturbed
- If the noise exceeds 65 – 70 dB(A) once or twice each night, the disturbance would be unlikely to have any notable health or wellbeing effects.

A sleep disturbance screening criterion of RBL+15 dB was adopted for this assessment. Where this level is predicted to be exceeded, assessment against the maximum external noise limit of 65 dBLA<sub>max</sub> was considered to determine all feasible and reasonable safeguards.

#### 6.7.3.2 Project construction noise criteria

Based on the noise management levels for residential receivers and other sensitive receivers, the specific noise management levels for the proposal are detailed in Table 6-35.

Table 6-35: NCA specific Noise Management Levels

NCA	Assessment period	Noise Management Level, dBLA <sub>eq</sub> (15 min)
NCA 1	Day (Standard Hours)	63
	OOHW Period 1 (Day)	58
	OOHW Period 1 (Evening)	57
	OOHW Period 2 (Night)	46

NCA	Assessment period	Noise Management Level, dBLAeq (15 min)
NCA 2	Day (Standard Hours)	62
	OOHW Period 1 (Day)	57
	OOHW Period 1 (Evening)	52
	OOHW Period 2 (Night)	46
NCA 3	Day (Standard Hours) – Golf Course	External noise level - 65 dB(A)
NCA 4	When in use – Commercial	External noise level – 70 dB(A)
NCA 5	Day (Standard Hours) – Golf Course	External noise level - 65 dB(A)
NCA 6	Day (Standard Hours) – Recreation	External noise level - 65 dB(A)
NCA	Day (Standard Hours) – Recreation	External noise level - 65 dB(A)

#### 6.7.3.2.1 Construction vibration criteria

Human comfort criterion is detailed in Section A.3.1 of the CNVG, which references Assessing Vibration - a technical guideline (DECC, 2006) provides guidance on disturbance to human occupants of buildings as a result of vibration. This document provides criteria which have been based on the British Standard BS 6472-1992, Evaluation of human exposure to vibration in buildings (1-80Hz).

British Standard BS 7385 recommends vibration limits for transient vibration judged to give a minimal risk of vibration induced damage to affected buildings.

#### 6.7.3.3 Operation

##### 6.7.3.3.1 Operational traffic noise criteria

The NSW Road Noise Policy (RNP) is used to assess and manage potential noise impact from new and redeveloped road proposals. The RNP identifies the potential noise impacts for new roads (i.e. new road infrastructure where there is no road) or redeveloped road (widening or upgrade of existing road infrastructure).

Should the criteria be exceeded, then feasible and reasonable management measures should be considered in accordance with the Noise Mitigation Guidelines.

The proposal is deemed to be a redevelopment of the existing arterial roads of Henry Lawson Drive and Milperra Road. Noise criteria for redeveloped road is extracted from the RNP for sensitive receivers is applicable (for this proposal, residential and open space). No other sensitive receivers are present in the surrounding proposal area.

Relevant criteria are detailed in Table 6-36 and Table 6-37.



Table 6-36: RNP Criteria for redevelopments of existing arterial roads for residential and non-residential land uses

Road Category	Type of project/land use	Assessment Criteria (dBA)	
		Day (7am – 10 pm)	Night (10 pm – 7 am)
Freeway/Arterial/ Sub-Arterial Roads	Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	L <sub>Aeq</sub> (15hr) 60 (External)	L <sub>Aeq</sub> (9hr) 55 (External)
Freeway/Arterial/ Sub-Arterial Roads	Open Space (Active Use) These spaces include, <ul style="list-style-type: none"> <li>• Bankstown Golf Course</li> <li>• Georges River Golf Course</li> <li>• Georges River Trail walk</li> <li>• Vale of Ah Reserve</li> <li>• Vale of Ah Dog Park</li> </ul>	L <sub>Aeq</sub> (15hr) 60 (External)	-

Table 6-37: RNP Relative increase criteria for residential land uses

Road Category	Type of project/land use	Assessment Criteria (dBA)	
		Day   (7am – 10 pm)	Night (10 pm – 7 am)
Freeway/Arterial/ Sub-Arterial Roads	New road corridor/ redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic L <sub>Aeq</sub> (15hr) + 12 (External)	Existing traffic L <sub>Aeq</sub> (9hr) + 12 (External)

Of the two relevant criteria for residential lands uses, the controlling criterion is the criterion with the greatest exceedances.

As the proposal area may be already exposed to road traffic noise exceeding the applicable road traffic noise criteria, a comparison of the No Build and Build scenarios must be undertaken to determine the difference in noise levels. Should the difference be less than 2 dB, then noise mitigation is not required to be considered, in accordance with Transport's Noise Mitigation Guidelines (RMS 2015).

#### 6.7.4 Potential impacts

##### 6.7.4.1 Construction

Construction is expected to commence in early 2023 and is forecast to extend over a 2 year period.

Construction works are proposed to be undertaken during both standard recommended hours and OOHW for the proposal.

OOHW would be required to minimise disruptions to the road network. The main works that would be required to occur out of hours would include:

- Intersection works at the Milperra Road/ Henry Lawson Drive and Tower Road/ Henry Lawson Drive intersections
- Auld Avenue bridge upgrade works.

Widening and Pavement works would also occur at night and hence it has been assessed for sleep disturbance in this assessment.

The construction scenarios required for the REF proposal have been detailed in Table 6-38.

Table 6-38 REF proposal construction scenarios and associated sound power levels

Scenarios	Indicative equipment/machinery	Scenario total sound power levels <sup>4</sup>	
		L <sub>Aeq</sub>	L <sub>AMax</sub>
Preliminary works	Vacuum truck, light vehicles, bogie tipper truck	112	118
Utility works	Vacuum truck, light vehicles, backhoe/ excavator, concrete saw, daymaker, generator, crane, whacker plate, compactor, bogie tipper truck, jumping jack	119	125
Building and fencing removal	Light vehicle, vacuum truck, excavator, rigid truck, handheld tools, hammer drill, crane, bogie tipper truck	118	123
Earthworks	Excavator, grader, light vehicles, bogie tipper truck, rigid truck, backhoe/ excavator, loader, profiler, truck and dog, vacuum truck, water cart, road sweeper, daymaker, generator	120	124
Widening and pavement works	Trencher, trucks, hand held tools, angle grinder, backhoe/ excavator, vacuum truck, paver and asphalt finisher, compactor, vibratory roller, concrete saw, concrete pump, concrete agitators, line marking machine, road sweeper, water cart, daymaker, generator, vibratory roller, jumping jack, grader, crane	123	128
Bridge and drainage works	Hand held tools, angle grinder, underbore directional drill, vacuum truck, bored piling rig, rigid truck, truck and dog, light vehicle, concrete saw, concrete pump, concrete agitators, road sweeper, water cart, hiab crane, daymaker, vibratory roller, water truck, asphalt paver, grader, crane, large capacity crane	123	127
Pedestrian pathway, intersection crossings and shared path works	Handheld tools, angle grinder, vacuum truck, rigid truck, excavator, road sweeper, water cart, concrete saw, concrete pump, concrete agitators, water truck, whacker plate, crane, daymaker, generator	121	126
Landscaping and finishing works	Grader, bobcat, trucks, handheld tools, compactor, trencher, light vehicle, bogie tipper truck, crane, whacker plate, front loader	120	125
Removal of ancillary facilities and site rehabilitation	Light vehicle, excavator, trucks, bobcat, handheld tools, crane, bogie tipper truck	114	121

Construction noise impacts from the overall proposal are predicted to exceed the proposal Noise Management Levels (NMLs) for all Noise Catchment Areas (NCAs), during both the construction standard hours and out-of-hours work (OOWH) periods, for all construction scenarios.

<sup>4</sup> \*Sound Power Levels of equipment were sourced from the following documents:

EPA NSW, (2009) *Interim Construction Noise Guideline*

Construction Noise and Vibration Guidelines (CNVG) (Transport, 2016)

British Standard 5228: Part 1 (2009 including amendment 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise*

Exceedance of the highly noise affected management level of 75 dBA was predicted for the following receivers/NCAs:

- Six receivers within NCA 1 during the Bridge and Drainage works construction scenario, and
- Most receivers along Henry Lawson Drive and Auld Avenue in NCA 2 during all construction scenarios.

In general, the proposal NMLs are predicted to be exceeded for most sensitive receivers within proximity of the proposal, for all proposed construction scenarios. Specific details of the construction impacts on each NCAs is detailed in Table 6-39.

Table 6-39 Construction noise assessment

NCA	Construction noise predictions
NCA 1	<p>Construction noise impacts to the receivers within NCA 1 are expected to exceed the proposal NMLs during both the recommended standard hours and out-of-hours work periods without mitigation. During standard hours, exceedances of the NMLs are experienced along Rickard Road for all construction scenarios. Receivers along Newbridge Road would also experience exceedances of the standard hours noise levels for Widening and Pavement Works and Bridge and Drainage Works, while during out-of-hours work periods the majority of the receivers within the NCA exceed the NMLs. Exceedance of the highly noise affected management level is also predicted for six receivers in this NCA for the Bridge and Drainage works construction scenario.</p> <p>Less noise intrusive construction scenarios such as Preliminary Works and Removal of ancillary facilities and site rehabilitation met the NMLs for properties far west along Newbridge Road for standard hours of work. These receivers had sufficient setback distances from the construction footprint. However, for other construction scenarios such as the Widening and Pavement Works as well as Bridge and Drainage Works, exceedances of up to 30 dB are predicted for the nearest affected receivers, given their proximity to the construction footprint. The highly noise affected noise management level is expected to be exceeded for properties within 100 metres of the construction footprint, that includes a number of receivers in this NCA.</p>
NCA 2	<p>The receivers within NCA 2 experience exceedances of the NMLs for both standard working hours as well as OOWH. The highly affected noise management level was exceeded for most of the receivers for all of the construction activities. This is due to most receivers within NCA 2 being adjacent to or within 100 metres of the construction footprint.</p>
Open Space (NCA 3, 5, 6 and 7)	<p>The open space receivers within NCA 3, 5, 6 and 7 experience exceedances of the NMLs for both standard working hours as well as for OOWH for all construction activities. As is the case for NCA 2, the two golf courses and the Georges River Walking Trail are both adjacent to the construction footprint and there is no setback distance from the construction activity. The Vale of Ah Reserve and Vale of Ah Dog Park are setback at least 200 metres from the construction footprint and do comply with the NMLs for several of the construction activities.</p>
Commercial properties (NCA 4)	<p>The commercial receivers located in NCA 4 include the BP, Wild Bean Café, ALDI, the Hungry Jacks and the KFC. These commercial properties all exceed the NMLs for all construction activities due to their proximity to the construction works.</p>

It should be noted that construction work would be done progressively along the alignment, so that one group of receivers would not be exposed to such noise levels for that whole period. Further investigation would be required by the construction contractor to ascertain when NMLs may be exceeded and for what periods of time.

Noise mitigation of construction activities is recommended for the proposal.

#### 6.7.4.1.1 Sleep disturbance assessment

As some construction works would be required to occur outside the recommended standard hours of work, a sleep disturbance assessment was undertaken to determine the level of construction noise impact to surrounding residences. Activities associated with the Widening and Pavement Works construction scenario are expected to generate the highest levels of noise on site, and hence to forecast worst-case noise impacts, this scenario was assumed to occur during the OOHW period, with noise levels of  $>65\text{dBL}_{\text{Amax}}$  predicted for all residential receivers in NCA 1 and 2. Construction scheduling would be revised during the detailed design stage and if necessary, further assessment of construction noise impacts would be undertaken.

Given the potential for exceedance of the proposal NMLs (noise affected and highly noise affected) and sleep disturbance awakening limits, noise mitigation measures would be implemented in accordance with the *RMS Construction Noise and Vibration Guideline 2016* (CNVG).

#### 6.7.4.1.2 Construction traffic noise assessment

Construction traffic noise impacts associated with temporary additional traffic generation on the surrounding public road network was also assessed, by comparing the daily predicted construction induced traffic volumes with the existing traffic volumes (traffic counts provided by Matrix Traffic). The additional construction traffic on the surrounding road network would not increase existing noise levels by more than 2 dB, which represents a minor impact that is barely perceptible.

#### 6.7.4.1.3 Construction vibration assessment

There is potential for structural damage and human discomfort caused by construction vibration on surrounding residential receivers when vibratory roller operations are conducted within 100 metres of structures. The most affected sensitive receivers from vibration of the vibratory roller are the properties immediately adjacent Henry Lawson Drive, between Auld Avenue and Newbridge Road. These properties are both exposed to vibration levels affecting the building as well as human comfort. Given the proximity of the proposal footprint to receivers in NCA 2 and 4, vibration mitigation measures have been recommended, including identifying minimum working distances provided with respect to the contractors Construction Noise and Vibration Management Plan (CNVMP)

#### 6.7.4.2 Operation

Operational road traffic noise during the day and night-time periods were predicted for the future Build and No Build assessment scenarios for the opening year (2026) as well as 10 years after opening (2036). The assessment considered future traffic growth from surrounding developments.

Operational noise levels were considered across the study area, but particularly in NCA 1 and NCA 2, due to the presence of residential receivers. Both groups of receivers are already in proximity to Henry Lawson Drive and Newbridge Road and experience high levels of existing road traffic noise.

NCA 1 would be predicted to have a slight increase in noise levels in the No Build and Build Scenarios for both day and night periods in 2026 and 2036 scenarios. These increases are up to 1 dBA, which is not perceptible to the human ear.

NCA 2 would experience a slight improvement in the predicted noise levels, with most sensitive receivers experiencing a slight decrease in noise levels between the No Build and Build scenarios in both 2026 and 2036 scenarios for both day and night periods. The general improvement in predicted noise levels for NCA 2 is most likely due to the shift of the southbound lane on Henry Lawson Drive further east. However, for the sole residential property to the east of Henry Lawson Drive (443 Henry Lawson Drive), there is an increase of up to 1 dBA between the No Build and Build Scenarios for both day and night periods, due to the traffic lanes shifting closer to this receiver.



In summary, the maximum changes in noise levels between the No Build and Build scenarios is between a reduction of 2 dBA up to an increase in 1 dBA for all assessed receivers. This is not a noticeable change in road traffic noise levels and is below the relative increase criterion of 2 dB between the No Build and Build scenarios.

Several sensitive receivers do exceed the acute Noise Mitigation Guideline (NMG) criteria (when project noise levels are added to existing traffic noise levels). As such, mitigation measures need to be considered. The receivers in NCA 2 are directly adjacent to Henry Lawson Drive and are subsequently more likely to be affected by heavy vehicle traffic pass-bys. As receivers in NCA 2 exceed the NMG criteria due to proposal roads, these properties are eligible for noise mitigation. Noise mitigation measures were considered and at-property mitigation was preferred. For reasons of location, limited space and the need to maintain access to residential properties, other noise mitigation options such as quiet pavement surfaces and noise mounds/barriers were unsuitable. There are eleven receivers that are eligible for noise mitigation for operational road traffic noise based on the NMG, located within NCA 2.

Properties in NCA 1 exceeding the NMG noise criteria with respect to Newbridge Road are not eligible for noise criteria as Newbridge Road is not a project road that is being redeveloped as part of the REF proposal.

#### **6.7.4.2.1 Maximum noise level assessment**

A qualitative assessment was undertaken for maximum road traffic noise levels along Henry Lawson Drive. The RNP identifies that:

- Max Internal noise levels below 50 – 55 dBA are unlikely to cause awaking
- One of two noise events per night, with maximum internal noise levels of 65 – 70 dBA are not likely to affect health and wellbeing significantly.

The RNP recommends the methodology for the assessment of maximum noise levels be based upon the ENMM, Practice Note III.

The Practice Note details to undertake the following:

- Evaluate whether maximum noise impacts will reduce or increase for the design year.
- On the basis of this evaluation, take account of maximum noise levels when prioritising, selecting and designing noise control measures.

At this point in time, a qualitative assessment of maximum noise levels is undertaken due to the limited data acquired during long-term noise monitoring. Due to the high levels of heavy vehicle traffic along the corridor, this approach assumes that heavy vehicle traffic and high noise levels are strongly correlated, especially for receivers adjacent to Henry Lawson Drive south of Milperra Road. For this qualitative assessment, NCA 2 has specifically been assessed as receivers are adjacent to Henry Lawson Drive and are exposed to heavy vehicle pass-bys which have been assumed to generate noise levels greater than 65 dBA.

As the receivers in NCA 2 are directly adjacent to Henry Lawson Drive, they are more likely to be affected by heavy vehicle traffic pass-bys.

It is assumed that existing sleep disturbance impacts occur for receivers in NCA 2 with a number of heavy vehicle pass-bys during the night period. As the location of NCA 2 is close to the Milperra Road and Henry Lawson Drive intersection, interrupted traffic flow of acceleration and de-acceleration of heavy vehicles is very likely. As there is an increase in heavy vehicles numbers for all future scenarios it is assumed that there will be an increase in potential sleep disturbance events.

While the proposal shifts Henry Lawson Drive southbound traffic further away from receivers, the northbound lanes shifts marginally closer to receivers along Henry Lawson Drive. This could have an increase in the number of maximum noise levels exceedances.

### 6.7.5 Safeguards and management measures

Safeguards and management measures for noise and vibration impacts are presented in Table 6-40.

Table 6-40: Safeguards and management measures for impacts to noise and vibration

Impact	Environmental management measure	Responsibility	Timing
Construction noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will be prepared in accordance with the Construction Noise and Vibration Guideline (Roads and Maritime 2016) NSW EPA Interim Construction Noise Guideline and identify:</p> <ul style="list-style-type: none"> <li>• All potential significant noise and vibration generating activities associated with the activity</li> <li>• A construction noise assessment on final proposed construction staging and scheduling</li> <li>• A monitoring program to assess performance against the noise and vibration criteria</li> <li>• Additional mitigation measures, beyond standard measures, for receivers within NCA 1 and 2</li> <li>• Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</li> <li>• Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</li> </ul>	Contractor	Pre-construction / during Construction
Out of hours work	<p>Out of hours works will be undertaken in accordance with the Construction Noise and Vibration Guideline (Roads and Maritime 2016). This includes:</p> <ul style="list-style-type: none"> <li>• Offer respite and/or restricted construction hours where noise intensive works are planned over extended periods, especially where they occur outside of standard hours. This may include moving the construction work front to different areas so that sensitive receivers are not impacted for longer than two consecutive days</li> <li>• No more than two consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same NCA over any 7-day period, unless otherwise negotiated with affected receivers.</li> </ul>	Contractor	During Construction
Out of hours work	Noisiest activities should be limited to standard construction hours, where practicable	Contractor	During Construction
Noise and vibration	<p>All sensitive receivers (eg local residents) likely to be affected will be notified at least 5 working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> <li>• The proposal</li> <li>• The construction period and construction hours</li> <li>• Contact information for project management staff</li> </ul>	Contractor	During Construction

Impact	Environmental management measure	Responsibility	Timing
	<ul style="list-style-type: none"> <li>Complaint and incident reporting</li> <li>How to obtain further information.</li> </ul>		
Noise and vibration	<p>A register of most affected noise and vibration sensitive receivers (NVSRs) will be kept on site and maintained. The register will include the following details for each NVSR:</p> <ul style="list-style-type: none"> <li>Address of receiver</li> <li>Category of receiver (e.g. Residential, Commercial etc.)</li> <li>Contact name and phone number.</li> </ul> <p>The register is to be included as part of the Proposal's Community Liaison Plan or similar document and maintained in accordance with the requirements of this plan.</p>	Contactor	During Construction
Noise and vibration	Source controls will be employed to minimise noise impacts, such as using noise screens and mufflers, maximising offset distance, and orienting plant away from sensitive receivers.	Contractor	During Construction
Noise and vibration	The selection of plant and machinery will consider noise emissions, operated to reduce maximum noise levels, maintained regularly and turned off when not in use	Contractor	During Construction
Operational road traffic noise	Implement at-property noise mitigation treatments as early as feasible in the construction program.	Transport/ Contractor	Pre-construction/ Construction

## 6.8 Aboriginal cultural heritage

The potential impacts on Aboriginal heritage during construction and operation of the proposal have been assessed as part of the *Henry Lawson Drive – Hume Highway to M5 upgrade Aboriginal Cultural Heritage Assessment* (Kelleher Nightingale Consulting Pty Ltd, 2020), provided in Appendix C.

### 6.8.1 Methodology

A CHAR and associated consultation was undertaken in accordance with the following guidelines:

- Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime 2011)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (Department of Environment Climate Change and Water 2010)
- Guide to investigating, assessing, and reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH 2010a).

The CHAR has been prepared in accordance with Stage 3 of the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation. Preparation of the CHAR has included:

- Aboriginal community consultation in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
- An Aboriginal archaeological test excavation program undertaken in accordance with the Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales and Roads and Maritime's PACHCI.

- Archaeological test excavation was undertaken across ten of the 12 sites and the PADs identified within the Henry Lawson Drive and Milperra Road road corridors. This was undertaken to fulfil recommendations of the Stage 2 PACHCI assessment (undertaken in 2018).

The methodology for the Aboriginal cultural heritage assessment included:

- A study area for covering the length of the Henry Lawson Drive Upgrade Project. This included the 7.5 kilometre section of Henry Lawson Drive between the M5 Motorway at Milperra and the Hume Highway at Lansdowne and to a one kilometre section of Milperra Road between the intersection of Henry Lawson Drive and the intersection of Ashford Road.
- Searches of the Aboriginal Heritage Information Management System (AHIMS) to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area
- Other Commonwealth and State registers, databases and the Bankstown LEP were also searched for any known Aboriginal sites in the vicinity of the heritage study area. No additional Aboriginal archaeological sites or Aboriginal heritage items were recorded on these databases within study area or in the vicinity.
- A review of previous archaeological investigations undertaken in the vicinity of the study area and along the Georges River foreshores. Previous archaeological investigations had generally taken the form of archaeological field surveys and test excavations for proposed commercial, industrial and residential development projects.
- Archaeological test excavations were carried out by Kelleher Nightingale Consulting and field representatives of registered Aboriginal parties in July 2019 as recommended by the PACHCI Stage 2 assessment and in accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Roads and Maritime PACHCI. The test excavations were used to confirm the level of significance of the site and to identify potential management measures.
- Consultation with the Aboriginal community about the overall proposal has been carried out in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW, 2010) and the PACHCI and is detailed in Section 5.2.
- Identification of potential impacts of the overall proposal on Aboriginal heritage items and values and where required, identification of management measures.

Separate to this a Stage 1 PACHCI walkover was undertaken in March 2021 for one potential construction compound site on Auld Avenue, which was not captured in the Aboriginal heritage cultural assessment. No Aboriginal cultural heritage potential was identified as part of this assessment.

## **6.8.2 Existing environment**

### **6.8.2.1 Land use history**

The proposal study area (incorporating the overall proposal area) and surrounding region are known to have been important to and extensively used by past Aboriginal people. Early colonial interest in the area led to interactions between the British and the local Aboriginal people relatively soon after the arrival of the British in Australia. Aboriginal people's use of the region is well documented with historical figures associated with the Georges River including Pemulwuy, his son Tedbury and Kogi. The Aboriginal community who lived along Salt Pan Creek played an important role in the activism of the 20th Century and members of the contemporary Aboriginal community continue to experience connection with the area through cultural and family associations.



Archaeological evidence indicates that the area has been subject to Aboriginal occupation for at least the last 5,000 years. Archaeological sites near the study area comprise open artefact scatters, culturally modified trees, PADs and isolated artefacts. Within the wider region, a large number of midden sites and rock shelters with art or occupation deposits have also been identified. The spatial distribution of archaeological sites in the region is highly influenced by proximity to the aquatic and adjacent terrestrial resources along the Georges River and its tributaries.

#### **6.8.2.2 Landscape context**

The proposal study area is located in an area of relatively low relief unlike the steep sandstone banks of the Georges River to the east and west. The area is also in close proximity to fresh water resources in the upper reaches of the Georges River and Prospect Creek in addition to estuarine resources. The preservation of Aboriginal archaeological sites has been found to be highly influenced by geology, soil landscapes, fluvial activity and ground surface disturbance.

#### **6.8.2.3 Database searches**

A search of the AHIMS database was conducted on 26 September 2019 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area. The AHIMS search results showed 33 Aboriginal sites recorded in or near the study area, twelve of which are located within the study area and four of which are located within the overall proposal area.

The results of the database searches were reflective of the findings of the PACHCI Stage 2 site survey undertaken across the study area. The sites located within the proposal area consist of one open artefact site (HLD Site 5 (IF)), two PADs (HLD PAD 5 and HLD PAD 6) and one Aboriginal Resource and Gathering with associated PAD (HLD Resource Zone 1 with PAD).

The search results are attached as part of Appendix C.

#### **6.8.2.4 Archaeological test excavation**

An archaeological survey for the overall proposal was undertaken as part of the PACHCI Stage 2 assessment and identified three Aboriginal artefact sites with associated areas of PAD, two isolated artefacts and seven areas of PAD. The assessment also identified one of the areas of PAD, HLD Resource Zone 1 + PAD, as a potential resource gathering area. The assessment recommended a program of archaeological test excavation be undertaken in areas that were assessed as having potential for Aboriginal archaeological objects. The purpose of this was to “further inform an understanding of the archaeological potential of the study area and provide measures to manage or mitigate impact arising from the proposal” (GML 2018: 69)

Within the proposal area, the test excavation program confirmed no Aboriginal objects or further archaeological potential was found at HLD PAD 5, HLD PAD 6 and HLD Zone 1 + PAD. These areas were found to be low lying and variably disturbed by past land use activities, and do not constitute Aboriginal archaeological sites.

HLD Site 5 (IF) was an isolated artefact recorded during the PACHCI Stage 2 archaeological survey by GML in 2018. One silcrete artefact was located within an open depression within the southern verge of Milperra Road, approximately 400m east of the intersection with Henry Lawson Drive. The PACHCI Stage 2 confirmed that there was no further archaeological potential as there is no likelihood for any intact natural soils to be present. HLD Site 5 (IF) is shown in Figure 6-10.



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- REF proposal area
- Overall proposal boundary
- Potential Archaeological Deposit
- Isolated Artefact

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A **Review of Environmental Factors**

FIGURE 6-10: Aboriginal heritage items



### 6.8.3 Potential impacts

#### 6.8.3.1 Construction

The entirety of the proposal area would be impacted by construction and associated work. One Aboriginal archaeological site would be impacted by the REF proposal and details are provided in Table 6-41.

Table 6-41: Impact to Aboriginal archaeological sites within the proposal area

Site name	AHIMS ID	Description	Significance	Type / Degree of Harm	Consequence of Harm
HLD Site 5 (IF)	45-5-5125	Isolated artefact within a disturbed context	Low	Direct/total	Total loss of value

Suitable recommendations for the identified impact to the site have been developed based on the environmental context and condition, background research, and consultation with stakeholders. An Aboriginal Heritage Impact Permit (AHIP) is required for impact to land and identified sites/objects prior to the commencement of pre-construction or construction activities associated with the proposal that would affect the site.

#### 6.8.3.2 Operation

No impacts to Aboriginal heritage would occur during the operation of the proposal.

### 6.8.4 Safeguards and management measures

Safeguards and management measures for Aboriginal heritage are presented in Table 6-42.

Table 6-42: Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Aboriginal heritage impact permit (AHIP)	An AHIP will be sought prior to construction for HLD Site 5 (IF).	Transport/ Contractor	Detailed design / construction
Aboriginal heritage – unexpected finds	<i>The Standard Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction
Additional Aboriginal heritage impacts	Any further impacts proposed beyond those assessed in this REF or beyond the proposal area must be subject to further assessment and consultation with Aboriginal stakeholders, consistent with the process in this report.	Transport/ Contractor	Detailed design/ Construction

## 6.9 Non-Aboriginal heritage

The potential impacts on non-Aboriginal heritage during construction and operation of the proposal have been assessed as part of the *Non-Aboriginal Heritage Statement of Heritage Impact – Henry Lawson Drive Upgrade Stage 1a* (Aurecon, 2021), provided in Appendix K.

### 6.9.1 Methodology

A Statement of Heritage Impact (SOHI) has been prepared to assess the non-Aboriginal heritage impacts of the overall proposal. The SOHI has been prepared in accordance with the methodology outlined in this section. The report draws upon a previous SOHI prepared to inform the strategic phase of the overall proposal (*Henry Lawson Drive (M5 to Hume Highway) Strategic Phase Statement of Heritage Impact*, prepared by GML Heritage for RMS 2018).

The following tasks have been undertaken to inform this report:

- Review of applicable statutory heritage lists within the REF and EIS proposal areas, including:
  - The State Heritage Register (SHR)
  - Local heritage items (as included on Schedule 5 of relevant LEPs)
  - State Agency Section 170 registers
  - The National Heritage List (NHL)
  - The Commonwealth Heritage List (CHL).
  - The NSW National Trust Register (non-statutory list)
- Review of heritage reports and studies previously prepared for relevant items and areas within the REF and EIS proposal areas
- Identification of the heritage items within the area with the potential to be affected by the REF and EIS proposal, either through direct impacts and/or impacts on visual setting
- Identification of heritage items that are likely to be physically impacted, or those that have a direct frontage to the REF and EIS proposal areas. For these items and areas, the following structure has been employed:
  - Statements of significance (drawn from existing heritage listings)
  - An assessment of the heritage impact of the REF and EIS proposals on the heritage significance of each of the affected heritage items.
- Evaluation of the historical archaeological potential associated with various phases of history within the overall proposal boundary based on the following:
  - Consideration of the physical evidence observed at the sites
  - Identified areas of previous disturbance
  - Historical information about the development and occupation of the sites
  - Previous archaeological assessments and excavations.
- Field survey of the REF proposal areas to inspect listed heritage items and potential archaeological sites and to identify potential heritage items that may be affected by the Proposal, undertaken by Aurecon Senior Heritage Specialist Emma McGirr
- Desktop research and historical research to inform the impact assessment and historical overview sections, including review of relevant primary sources, archive materials, past reports and papers and Conservation Management Plans (where applicable).
- Review of the overall proposal concept design

Geospatial Information Systems (GIS) was used as the tool for collating the applicable heritage listings across the overall proposal area, with data drawn from heritage registers.



## 6.9.2 Existing environment

The proposal is located to the east of the Georges River and surrounding recreational and riparian areas. There are areas of coastal wetlands surrounding the proposal area associated with the Georges River which contribute to the local character of the overall proposal area.

The overall proposal area extends across the Milperra suburb and the Bankstown Airport site.

Milperra makes up the largest portion of the overall proposal area, and is characterised by light industrial development with the airport interspersed with parkland, natural waterways, and recreational areas surrounded by mid to late 20th Century residential developments. There are no heritage items near the overall proposal in this area.

The suburb of Bankstown Aerodrome is roughly thirty kilometres southwest of Sydney which makes up the other half of the proposal area. The suburb was gazetted in May 1994 and is the location of the Bankstown Airport. There are two heritage items in the vicinity of this area: the Bankstown Airport Traffic Control Tower and Bankstown Aerodrome.

The most substantial and noticeable landscape features in the locality of the overall proposal boundary is the Georges River, which runs nearly parallel with the current alignment of Henry Lawson Drive. Other landscape features include a number of small bushland corridors and nature strips which line Henry Lawson Drive to the east, and Milperra Road to the north and south, providing buffer zones from the thoroughfares to the extensive Bankstown Golf Course and the Bankstown Airport. There are also two large recreational parks on the western side of the Drive, Gordon Parker Reserve and the Vale of Ah Reserve, which both are bounded by bushy vegetation to the east and the Georges River to the west.

### 6.9.2.1 Heritage listed items

Heritage items within the overall proposal area listed in Table 6-43 and Figure 6-11. Items are generally ordered by statutory listing level.

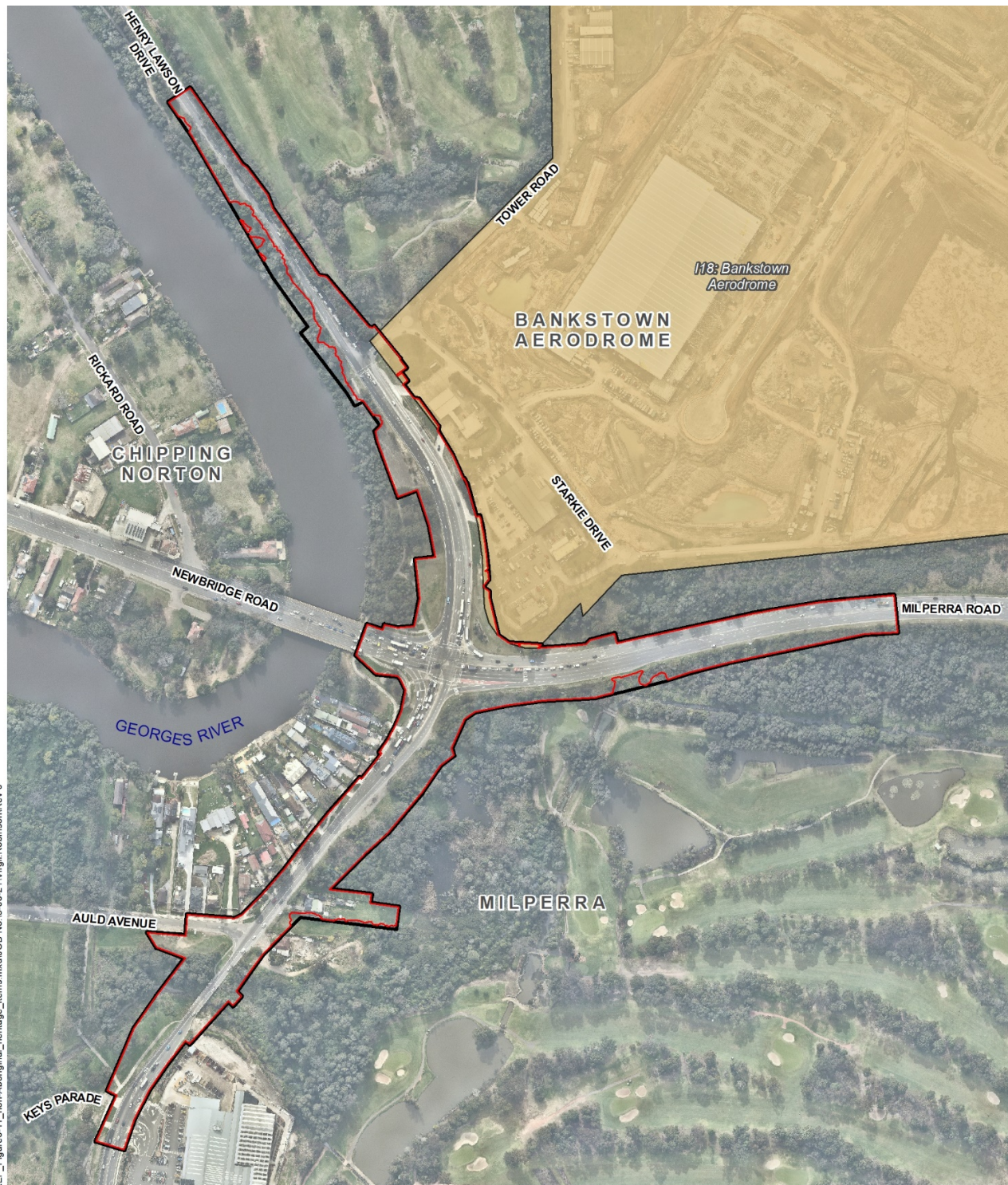
Table 6-43: Listed heritage listed items within the overall proposal area

Register listing	Item name	Address	Significance
Commonwealth Heritage List Place ID: 106118	Bankstown Airport Traffic Control Tower	Tower Road, Bankstown Airport	Commonwealth
Bankstown LEP 2015 Item number: I18	Bankstown Airport	345 Marion Street, Georges Hall, NSW 2198	Local

There are two further heritage items that are located near but not impacted by the overall proposal boundary. This includes:

- Milperra Soldier Settlement (former) (item number I29) locally listed on the Bankstown LEP 2015
- The Avenue of Trees (item number 22) is locally listed on the Liverpool LEP 2008, located in Riverside Park in Chipping Norton.

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- REF proposal area
- Overall proposal boundary
- Local heritage item

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m

Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 6-11: Non-Aboriginal heritage items



### 6.9.2.2 Historical archaeology potential

The assessment does not provide a detailed review of all potential archaeological resources across the entire corridor. It uses the information gathered from existing sources to determine where the key archaeological resources may exist within the localised areas of the proposed excavation, particularly in the REF proposal area.

The overall proposal boundary falls within a road corridor which has undergone large changes since its construction in the 1930s, and later widening projects in the late 1960s and 1970s. According to the preliminary SOHI prepared by GML (2018) for the early stages of this proposal, the past construction of existing roads has posed a moderate to high level of archaeological disturbance to the area and that modifications to the landscape including cutting culverts in the terrain and levelling the ground for the road surface has led to **low to nil** potential for historic archaeology in the overall proposal area.

### 6.9.3 Potential impacts

#### 6.9.3.1 Construction

A summary of the impacts within the REF proposal area are included in Table 6-44.

Table 6-44: Summary of non-Aboriginal heritage impacts within the REF proposal area

Heritage Item	Proposal	Summary of impacts
Bankstown Airport Traffic Control Tower Commonwealth Heritage List Place ID: 106118	Outside of the REF proposal area	This item would not be directly impacted as it is located just to the north outside of the REF and EIS Proposal areas on and near Tower Road. <b>Impact grading: N/A</b>
Bankstown Airport Bankstown LEP 2015 Item number: I18	Within REF proposal area: Widening Henry Lawson Drive from two to four lanes Removing the dedicated left-turn slip lane into the ALDI and fast-food area and access being retained via a standard property driveway Constructing a new footpath between Tower Road and Milperra Road to connect with the existing bus stop	The Proposal would have no adverse heritage impacts on the LEP listed curtilage near Tower Road, off Henry Lawson Drive and near the left-hand turn on to Milperra Road at the Henry Lawson Drive and Milperra Road intersection. Although the curtilage of the Airport extends over Starkie Drive and the associated slip lanes from Henry Lawson Drive into the existing buildings, as well as over the surrounding complexes and landscaping near the Milperra Road and Henry Lawson Drive intersection, the area is non-significant and the buildings/landscaping are contemporary. Widening works in this area would not impact the overall heritage significance of the Airport. <b>Impact grading: Neutral</b>

#### 6.9.3.2 Historical archaeological impacts

Assessment of potential archaeological impacts for the REF proposal area is detailed in Table 6-45.

Table 6-45: Summary of potential impacts to historical archaeology

REF proposal feature	Findings
Adjusting drainage including lengthening culverts	<p>These works are not expected to have any historic heritage impacts however they have the potential to disturb historical archaeological deposits outside of the REF proposal area. The GML preliminary SOHI (2018) identified low archaeological potential within the REF proposal area. This includes the potential historic archaeology associated with the unidentified airport building located on historic aerials. Potential for any associated remains of the unidentified airport building are unlikely to be intact and would be ephemeral.</p> <p>Ground and soil disturbance within the REF proposal area, particularly around the identified potential archaeological items, has been heavily disrupted. Infrastructure associated with the construction of Henry Lawson Drive in the 1970s, including embankments, nature strips, retail spaces and slip lanes have all contributed to low potential for any archaeological remains.</p>
Relocating utilities (including electrical, gas, water and telecommunications)	<p>These works are not expected to have any historical archaeological impacts however they have the potential to disturb potential historic archaeological deposits surrounding the REF proposal area.</p> <p>The GML preliminary SOHI (2018) identified low archaeological potential within the REF proposal area. This includes the potential historic archaeology associated with the unidentified airport building located on historic aerials. Potential for any associated remains of the unidentified airport building are unlikely to be intact and would be ephemeral.</p> <p>Ground and soil disturbance within the proposal area, particularly around the identified potential archaeological items, has been heavily disrupted. Infrastructure associated with the construction of Henry Lawson Drive in the 1970s, including embankments, nature strips, retail spaces and slip lanes have all contributed to low potential for any archaeological remains.</p>

### 6.9.3.3 Operation

The operational phase of the REF proposal would have ongoing neutral impacts on the Bankstown Airport. The road widening works would result in the slight encroachment on the Airport's curtilage, however this area is non-significant, and the buildings and landscape are contemporary. No further impacts to either built or archaeological potential would result from the operation of the proposal.

### 6.9.4 Safeguards and management measures

Safeguards and management measures for non-Aboriginal heritage impacts are presented in Table 6-46.

Table 6-46: Safeguards and management measures for impacts to non-Aboriginal heritage

Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal heritage – general	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage.	Contactors	Pre-construction



Impact	Environmental safeguards	Responsibility	Timing
Non-Aboriginal heritage – unexpected finds	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that an unknown or potential Non-Aboriginal object/s, including skeletal remains, is found during construction. The construction workforce will be inducted and trained in the procedure. The procedure applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction

## 6.10 Landscape character and visual impacts

The potential visual impacts during construction and operation of the overall proposal have been assessed as part of the *Henry Lawson Drive Upgrade – Stage 1A: Urban Design Landscape Character and Visual Impact Assessment* (Tract, 2021), provided in Appendix L.

### 6.10.1 Methodology

The methodology adopted for the assessment is consistent with Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment – EIA NO4 (Transport, 2020).

The assessment differentiates between:

- Landscape character assessment – the overall impact of a project on an area’s character and sense of place; and
- Visual assessment – the proposal’s impacts on views.

#### 6.10.1.1 Landscape character assessment

To assess landscape character, the local context of the site was divided into several unique units to assist in understanding the local context and the impacts of the proposal. These include defining landscape character zones (LCZ) which are zones of similar spatial or character properties, and the analysis of changes to these LCZ’s as a result of the proposal.

Landscape character is defined as “*The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place*” (Roads and Maritime 2018). The purpose of dividing the proposal area into LCZs is to ensure the impacts assessed are representative for each zone. Impacts of the proposal to landscape character were assessed in terms of impacts to LCZs and the impact ranked in terms of sensitivity to change.

#### 6.10.1.2 Visual impact assessment

The visual impact assessment involved identifying an estimated visual catchment through desktop analysis and ground truthing to ascertain the theoretical area from where the proposal would be visible. This assessment considered factors such as landform, direction of travel or direction of the view, built structures and vegetation. This area is known as the visual catchment or visual envelope.

Viewpoints were chosen to represent a range of views, including views from residential properties, public buildings and spaces, heritage items, businesses and the existing road corridor. The visual impact of the proposal was assessed by considering the sensitivity of the view and the magnitude of change to the view as a result of the proposal.

### 6.10.1.3 Landscape character and visual assessment matrix

To quantify impacts on landscape character and the visual amenity, the qualities of sensitivity and magnitude were assessed.

Sensitivity refers to the qualities of the area, the number and type of receivers, and how sensitive the existing character of the setting is to the proposed change. For example, a pristine natural environment would be more sensitive to change than a built up industrial area.

Magnitude refers to the nature of the proposal. For example, a large interchange would have a very different impact on landscape character than a localised road widening in the same area” (Roads and Maritime 2018).

Table 6-47 summarises the ranking of the assessment of the two criteria and how they are combined to provide an overall impact assessment.

Table 6-47: Landscape character and visual impact assessment matrix

<b>Sensitivity \ Magnitude</b>		<b>Magnitude</b>			
		<b>High</b>	<b>Moderate</b>	<b>Low</b>	<b>Negligible</b>
<b>Sensitivity</b>	<b>High</b>	High Impact	High-Moderate	Moderate	Negligible
	<b>Moderate</b>	High-Moderate	Moderate	Moderate-Low	Negligible
	<b>Low</b>	Moderate	Moderate-Low	Low	Negligible
	<b>Negligible</b>	Negligible	Negligible	Negligible	Negligible

### 6.10.2 Existing environment

A review of the physical and social context of the overall proposal was undertaken to understand the present context and attributes of place to be able to determine the potential impact of the overall proposal, and a sunset of this, being the REF proposal area.

#### 6.10.2.1 Regional context

The overall proposal is located within the Canterbury Bankstown LGA, located around 20 kilometres southwest of Sydney CBD.

Henry Lawson Drive and Milperra Road are the main roads which form the major intersection and location of the overall proposal area. Henry Lawson Drive provides a link north to the Hume Highway and residential employment communities in and around Parramatta, while providing a southern link to the M5 Motorway. Milperra Road forms a link to the eastern suburbs of Sydney and west to Liverpool while connecting communities and employment centres.

Henry Lawson Drive presents a unique road corridor as its corridor responds to the general alignment of the Georges River. This natural asset has influenced and shaped the character of the corridor.

### 6.10.2.2 Project area context

The character of Henry Lawson Drive varies as its relationship to the river varies. However generally, the road has a strong landscape settling which is evident at the proposal site.

South of the Milperra Road intersection beyond the overall proposal area, the Henry Lawson Drive corridor is further away from the river's edge and responds to the urban context. The corridor is well vegetated, consisting of avenues of trees that have been structured and planted. The planted trees flank the road corridor to create a separation between the residential development located adjacent to the road.

North of the Milperra Road intersection, the character changes as the road is closely aligned with the Georges River. In this location, a more naturalistic character is provided, creating a strong sense of enclosure and connection to the natural environment. This character is reinforced by the adjoining land uses which include open space and parkland.

Similar to Henry Lawson Drive, the connecting section of Milperra Road also presents with this landscape frontage.

Other key elements within or near the proposal area include:

- Commercial/Industrial Infrastructure
  - Two industrial/commercial precincts exist to the north and south of the intersection, both on the eastern side.
  - North of the intersection comprises a range of uses, including a petrol station, fast food outlets and ALDI Supermarket. The built form is single storey and independent structures.
  - South of the intersection is commercial complex that includes the Flower Power nursery development. It is elevated above Henry Lawson Drive and has multiple commercial outlets within the single large-scale warehouse type development
- Residential development
  - A localised section of residential development is located west of Henry Lawson Drive and south of Milperra Road, presenting a varied composition of forms and materials.
  - Dwellings are free standing of one or two storeys height.
- Utility services
  - Electricity supply and street lighting
  - Telecommunications
  - Gas
  - Water and sewer services and infrastructure.

### 6.10.2.3 Topography, drainage and vegetation

The landform and hydrology are interconnected with the area, being alluvial plain of the Georges River.

The general elevation along the overall proposal alignment ranges between 0 – 5 metres above sea level, reflecting its position on the floodplain of the Georges River. The floodplain lies between ridges to the east and west of the alignment and define the shallow river valley of the Georges River at this point. The proposal area is defined by two distinct precincts divided by a small rise which passes through the intersection. This rise covers much of the airport lands and crosses the intersection and extends through into the residential precinct to the south. To either side of this, land is less than five metres above sea level.

The Georges River at this location is tidal and comprises brackish waters where fresh and saltwater mix. Mangroves can be seen extending along the foreshore. The low lying and flood prone landscape has influenced both the land uses and vegetation that occurs within the precinct and is a key determinate of the overall character of the precinct.

The overall proposal is situated mostly within alluvial woodland, a vegetation community which forms part of the river-flat eucalypt forest.

#### **6.10.2.4 Landscape character zones**

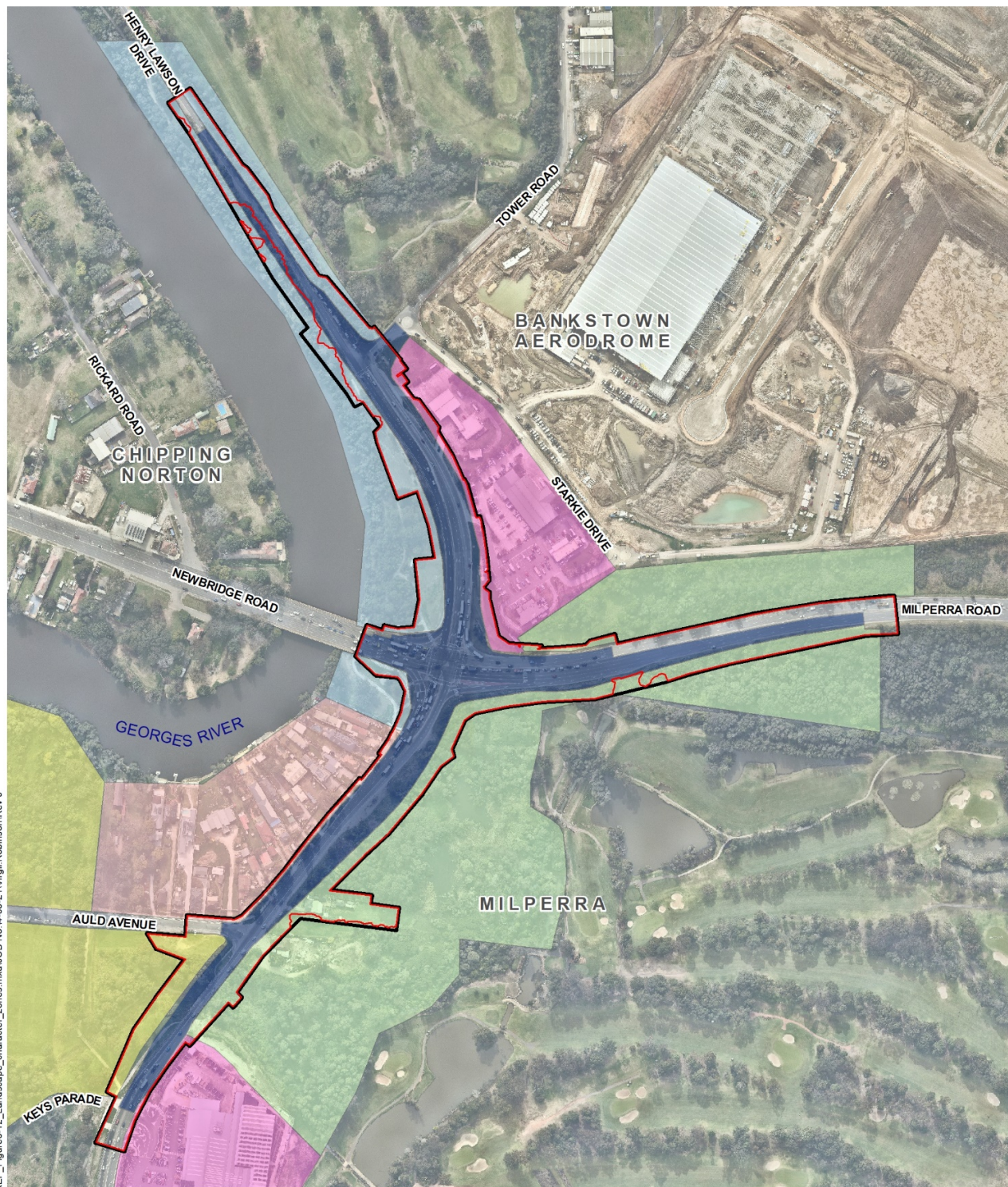
The purpose for identifying different landscape character types or zones was to assess levels of sensitivity and to provide a description of each zone, giving the overall proposal its context and interface.

Figure 6-12 and Table 6-48 illustrates the distribution of the different character zones in relation to the proposal. The following six landscape character zones were identified within the proposal area:

- LCZ1 – River frontage
- LCZ2 – Swampland
- LCZ3 – Residential
- LCZ4 – Commercial (comprising of two localities, LCZ4a and LCZ4b)
- LCZ5 – Road corridor
- LCZ6 – Open space



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- REF proposal area
- Overall proposal boundary
- Landscape Character Zones**
- LCZ1 - River Frontage
- LCZ2 - Swamp land
- LCZ3 - Residential
- LCZ4 - Commercial
- LCZ5 - Road Corridor
- LCZ6 - Open Space

Source: Aurecon, TfNSW, Spatial Services, Nearmap



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0 50 100m



Projection: GDA 1994 MGA Zone 56



Henry Lawson Drive Stage 1A **Review of Environmental Factors**

**FIGURE 6-12: Landscape character zones**





Table 6-48: Landscape character zones

LCZ	Location	Description
 LCZ1 – River Frontage	Located just south of the northern leg of Henry Lawson Drive/Milperra Road intersection and extends to the approach to Georges Hall. Located predominately west of Henry Lawson Drive it straddles the alignment north of Tower Road.	This location is characterised by well-established vegetation along the Georges River, including areas of protected coastal wetlands.
 LCZ2 – Swampland	Located along Milperra Road, to the east of Henry Lawson Drive and wraps around into Henry Lawson Drive on its eastern side, extending to Auld Avenue Bridge.	In Milperra Road, this zone marks a transition from the Milperra industrial area and the beginning of a precinct linked to the Georges River. Both sides of the alignment are well vegetated and present a natural corridor experience that provides a screen to development beyond the road alignment, particularly the Bankstown Aerodrome approximately 100 metres beyond the corridor. Within Henry Lawson Drive, the planting dominates the eastern edge of the corridor and screens the Bankstown Golf Course.

LCZ	Location	Description
 <p>LCZ3 – Residential</p>	<p>Located on the southern leg of the intersection on the western side of Henry Lawson Drive.</p>	<p>This residential zone is characterised by a row of detached dwellings, of differing form (single and two storey dwellings), setback and materials. This reflects adjustments made to properties in anticipation of a future widening which is evident in the cadastral boundaries of these properties.</p>
 <p>LCZ4 – Commercial</p>	<ul style="list-style-type: none"> <li>• LCZ4a is located southbound on Henry Lawson Drive at the intersection of Henry Lawson Drive and Milperra Road</li> <li>• LCZ4b is south of Auld Avenue bridge adjacent to Keys Parade</li> </ul>	<ul style="list-style-type: none"> <li>• LCZ4a comprises single storey commercial properties, including petrol station, fast food restaurant drive-throughs and a supermarket, with at grade car parking or forecourt to the front of the built form. The relationship between road and building changes when moving south with the last building elevated some 3m above the road at an elevated mound.</li> <li>• LCZ4b comprises a new commercial site comprising at grade carpark in front of a large warehouse style building frontage. Premises are elevated above the alignment and accessed from their own traffic light (Henry Lawson Drive and Keys Parade Intersection).</li> </ul>



LCZ	Location	Description
 <p>LCZ5 – Road corridor</p>	<p>The intersection of Milperra Road and Henry Lawson Drive provides a gateway to the Hume Highway, M5 Motorway, Liverpool and the eastern suburbs and introduces the Georges River to the road alignment in this area.</p>	<p>The present character is defined by the pavement of the corridor and the character of the precincts which adjoin it. The scale of the pavement varies from 7 to 8 lanes heading east west and 5 to 6 lanes heading north south respectively at the intersection of Milperra Road and Henry Lawson Drive. This transitions to 2 lanes (1 lane each way) north and south at the respective limits of the study and 6 lanes (3 each way) in Milperra Road.</p>
 <p>LCZ6 – Open space</p>	<p>Southern end of the REF proposal adjoining the western edge of Henry Lawson Drive and extends to the river's edge.</p>	<p>This area is characterised by open grassland among clusters of canopy trees. In some areas, there are formalised floodlit playing areas and in others it is more natural in character. A small tributary (Milperra Drain) drains through the park land west to the river. The channel is tree lined and crossed by both the existing road bridge and a pedestrian bridge.</p>



#### **6.10.2.4.1 Visual receptors and viewpoints**

The experience of viewers varies according to the duration, field of view and nature of exposure to the proposal. In assessing the visual impact, the visual range has been considered to be the most effective distance where a viewer can be influenced by changes in traffic movement and discern individual details such as signage and planting elements. This distance varies in relation to the topography and effectiveness of screening vegetation, however the quality of detail in the landscape typically deteriorates rapidly for distances greater than 200 metres.

Typically, the viewpoints have considered the impact of those looking over the proposal. Of the adjoining observers, it is the residential users who would be the most sensitive to change. These are generally the primary viewpoint assessed. In some instances, other viewpoints, other viewers (including the road user) have been considered.

The visual catchment of the proposal is well defined due to the topography of the site and clear barriers to sightlines including vegetation and built form.

The following ten individual viewpoints were identified within the overall proposal area (refer Figure 6-13) to understand the visibility within the site:

- VP1 – Milperra Road
- VP2 – Henry Lawson Drive
- VP3 – Henry Lawson Drive/Newbridge Road
- VP4 – Henry Lawson Drive (residential)
- VP5 – Auld Avenue
- VP6 – Henry Lawson Drive – Auld Avenue Bridge
- VP7 – Henry Lawson Drive (commercial)
- VP8 – Georges River
- VP9 – Tower Road
- VP10 – Henry Lawson Drive (River edge)

The location and physical attributes of each of the viewpoints are defined within Table 6-49.



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- REF proposal area
- Overall proposal boundary
- Viewpoint
- ↔ View direction

Source: Aurecon, TfNSW, Spatial Services, Nearmap



1:5,250  
0 50 100m



Projection: GDA 1994 MGA Zone 56

## Henry Lawson Drive Stage 1A Review of Environmental Factors

FIGURE 6-13: Visual impact assessment plan



Table 6-49: Viewpoints

Viewpoints	Description
	VP1 is located around 70 metres from the intersection of Henry Lawson Drive and Milperra Road, providing a view looking west along Milperra Road. As seen in the image, to the left is established swampland vegetation that adjoins the corridor and defines its character. To the right is the transition to a turfed verge and commercial precinct.
	VP2 is located on the crossing island on the southwest corner of Henry Lawson Drive and Newbridge Road, looking towards the commercial precinct. The view shows traffic on Milperra Road and cars southbound on Henry Lawson Drive, dominated by the intersection itself. In the background, the advertising and signage of the commercial precinct is evident.

## Viewpoints

## Description



VP3 – Henry Lawson Drive/Newbridge Road

VP3 is taken from the shared path that connects Henry Lawson Drive and Newbridge Road to the shared path running along the Georges River. The foreground of the view is dominated by the grass and shared path, and the background is swampland forest.



VP4 – Henry Lawson Drive (residential)

VP4 is taken from the shared path which connects users to Georges River path further north and to the parkland space to the south. The view overlooks the residential properties on the western side and shows the large setback between properties, shared path and Henry Lawson Drive.



## Viewpoints

## Description



VP5 – Auld Avenue

VP5 is from Auld Avenue looking north along Henry Lawson Drive and to the swampland vegetation located east and beyond the Bankstown Golf Course.



VP6 – Henry Lawson Drive – Auld Avenue Bridge

VP6 is from Henry Lawson Drive looking south towards the existing Auld Avenue Bridge, illustrating the existing bridge and the location of the proposed bridge to the right.

## Viewpoints

## Description



VP7 – Henry Lawson Drive (commercial)

VP7 is located about 170 metres to the south of Tower Road and shows the existing relationship between Henry Lawson Drive and the access into the commercial precinct. The foreground illustrates a garden bed between the access road the property boundary. In the background a turfed verge transitioning to a mound is evident.



VP8 – Georges River

VP8 is from shared path adjacent to the Georges River looking north along Henry Lawson Drive. The view is dominated by riverside vegetation, including coastal wetlands. The vegetation provides a park-like setting to the shared path as well as screening to Henry Lawson Drive.



## Viewpoints

## Description



VP9 – Tower Road

VP9 is from a crossing on Henry Lawson Drive and shows the view from road users heading south at the Tower Road/Henry Lawson Drive intersection. The background is dominated by commercial properties and their signage on the left and the various access points for each business.



VP10 Henry Lawson Drive (River edge)

VP10 is from Henry Lawson Drive heading south between Georges River Golf Course and Georges River. It is taken about 100 metres north of the Tower Road intersection and illustrates the extent of vegetation screening, and the visual buffer along both the Georges River Golf Course and the Georges River.

### **6.10.3 Potential impacts**

#### **6.10.3.1 Construction**

General construction activities would result in temporary visual impacts on views nearby. These include the movement and operation of various machinery, light and heavy vehicles, and the erection of temporary structures such as fencing, lighting and construction compound sites. Visual impacts would be experienced due to clearance of vegetation, excavations and earthworks and the presence of construction areas including ancillary facilities and plant and equipment. The greatest impact would be to residential properties that overlook the construction site due to their prolonged exposure.

The potential impacts would be temporary as construction would take about 2 years to complete. The magnitude of impact would depend on the stage of construction and the location of the work along the alignment. It is expected that the greatest visual amenity impacts would occur when works are being undertaken south of the Milperra Road, the use of the Henry Lawson Drive ancillary construction site and the Auld Avenue site.

There are no anticipated residual landscape or visual impacts resulting from the construction phase of the proposal. Contractors would be required to rehabilitate all work sites prior to and at the end of the construction period. Landscape and visual impacts may arise from these rehabilitation works and would be most evident during the first year of operation. Visual impacts may vary depending on final construction methods and staging identified in later design stages.

#### **6.10.3.2 Operation**

##### **6.10.3.2.1 Landscape character assessment**

Six landscape character zones address and define the landscape character of the road corridor within the proposal. These zones have been assessed as part of the landscape character study and consider areas both within and beyond the proposal area. The summary of the landscape character impact assessment is presented in Table 6-50.



Table 6-50: Landscape character impact assessment summary

Character definition	Sensitivity	Magnitude	Overall impact rating
LCZ1 – River frontage	<p>High</p> <p>The existing landscape is well vegetated along the river's edge, providing views to the Georges River for users of the shared path and respite from the hustle and bustle of the adjoining major road and urban development. It is a scenic backdrop to the corridor which is highly sensitive to change.</p>	<p>High</p> <p>The proposal is anticipated to impact this character zone along the immediate edges of Henry Lawson Drive in this location. To the south of Tower Road existing vegetation is largely retained and provides a buffer zone between Henry Lawson Drive and the Georges River, whereas to the north, the road formation extends out from its existing footprint impacting existing vegetation. The extent of work and its impact on the overall character means the magnitude is considered high.</p>	<p>High</p> <p>The upgrade would affect the existing vegetation, including areas of Coastal Wetlands, aligning Henry Lawson Drive. The overall impact is considered high based on the sensitivity of the space and quantity of vegetation likely to be impacted by the works.</p>
LCZ2 – Swampland	<p>High</p> <p>The landscape is densely vegetated, providing screening to the elements beyond the corridor and a scenic outlook along Milperra Road, contrasting with the industrial/commercial character experienced on the approach to this section of the corridor. The close proximity of this zone with Bankstown Airport makes the established vegetation significant in helping the road user feel safe while driving along Milperra Road. As an underdeveloped section of the corridor, it has a high sensitivity to change.</p>	<p>Moderate</p> <p>The proposal sees an expansion in the footprint of the intersection of Milperra Road with Henry Lawson Drive. Vegetation is to be removed and formation widened to accommodate additional turning lanes. This would see the impact of a small portion of this character zone on the south eastern corner of the intersection with much of the remaining area not being impacted. The impact has been assessed as moderate.</p>	<p>Moderate to High</p> <p>The upgrade is expected to have a material impact on the landscape character as the proposal impacts the south eastern corner of the intersection resulting in the clearance of much of the vegetation. The overall impact has been assessed as moderate to high.</p>
LCZ3 – Residential	<p>Moderate</p> <p>As the residential properties have frontages overlooking Henry Lawson Drive, they are both accustomed to the presence of a road but also sensitive to changes associated with the road. Re-definition of boundaries appears to be occurring as does the realignment of house frontages. Sensitivity to change is consequently considered moderate.</p>	<p>High</p> <p>Scale of works would see the extent of works extend beyond the current road footprint and into the large setback, including the shifting and realignment of the shared path. It would also see widening to the east.</p>	<p>Moderate to High</p> <p>Impacts on the character zone are considered moderate to high due to the proximity of properties to Henry Lawson Drive, loss of vegetation and the scale of proposed road upgrade and associated infrastructure.</p>

Character definition	Sensitivity	Magnitude	Overall impact rating
		The scale of change requires redefinition of front boundaries and in some cases, would bring the boundary close to the house. These changes would see the loss of much of the vegetation within these residential frontages or the streetscapes. The magnitude of change is considered high.	
LCZ4 – Commercial	<p>Low</p> <p>The commercial properties are set back from the road, with parking located to the front. A large, grassed verge separates Henry Lawson Drive from the boundary. As a commercial precinct, it is reliant on passing traffic for trade and so exposure to the road is critical for consideration. The sensitivity of this precinct to the proposal is consequently considered low.</p>	<p>Low</p> <p>The extent of works would see Henry Lawson Drive widened into the grass verge expanding the pavement footprint and reducing the bugger between the roads and commercial properties. The distance of commercial property frontages from the proposed works means it is unlikely the character would see significant change. Elements of vegetation screening and access provisions would change, however the magnitude of change to the overall character of the precinct is considered low.</p>	<p>Low</p> <p>The proposal would see the grassed verge reduced, however due to the separation of the commercial properties from Henry Lawson Drive, it is anticipated the commercial zone would largely retain its existing context.</p>
LCZ5 – Road corridor	<p>Moderate</p> <p>The corridor is heavily congested and dominated by the road itself. The proposal would enhance the operation of the intersection which would be evident to the key users of the space, the road user, and would impact the overall character of the space. The sensitivity to this change is considered moderate.</p>	<p>Moderate</p> <p>The corridor sees an expansion in overall footprint by doubling the width in certain locations. This sees a large intersection expanded to a larger intersection. The magnitude of this change is considered moderate as the viewers perspective is still of a large scale intersection.</p>	<p>Moderate</p> <p>The overall impact of the intersection is considered moderate based upon the impact of the expansion on the road users experience and overall retention of the corridor as a major road intersection.</p>
LCZ6 – Open Space	<p>High</p> <p>The zone currently provides a well-maintained landscaped area which allows for passive and active recreational activities. As such, the sensitivity of users is expected to be high as the focus is on the amenity and setting of the open space.</p>	<p>Low</p> <p>The extent of works would impact existing vegetation along the creek line and remove a portion of the park along its interface with the road. Despite the loss of parkland and trees, the scale of the open space means that it still presents in a similar manner to the existing.</p>	<p>Moderate</p> <p>The parkland zone would be affected by the widening of the road and construction of the new bridge, resulting in a loss of open space and vegetation cover. The impact of these works is likely to be limited to the area of the bridge and Auld Avenue with most of the site to</p>

Character definition	Sensitivity	Magnitude	Overall impact rating
		The magnitude of change is consequently considered low.	the west largely unaffected. The impact of the proposal is subsequently considered moderate.

### 6.10.3.2.2 Visual impact assessment

Ten viewpoints were identified within or near to the proposal area and are summarised within Table 6-51.

Table 6-51: Viewpoint impact assessment summary

Viewpoint	Sensitivity	Magnitude	Overall impact rating
VP1 – Milperra Road	<p>Moderate</p> <p>The view is from a user of the bus stop, the view is defined by the road corridor with turfed verges, user sensitivity would be limited as focus is on the road corridor and the operation of the intersection. The view is softened by vegetation on northern and southern verge providing a contrast to the road corridor whilst providing shade to those at the bus stop. Sensitivity is considered to be moderate reflecting its natural interface and oversight by commuters.</p>	<p>Moderate</p> <p>The scale of change for the intersection would see an expansion both to the right and left of the image. To the right the extent of grass verge would be reduced and replaced by paving including a turning lane and footpath. To the left the strong vegetation buffer around Bankstown Golf Course would be cut back and the pavement widened, despite the widening a vegetation backdrop is still maintained. The overall scale of the intersection would be increased by 50%. The scale of this change is consequently considered moderate.</p>	<p>Moderate</p> <p>The overall visual impact of the proposal at VP1 is considered moderate due to the scale and change caused by the expansion of the footprint and sensitivity of the viewer including public transport users and motorists passing through the corridor.</p>
VP2 – Henry Lawson Drive	<p>Low</p> <p>Those experiencing this view are transitory motorists. The focus of this user group at this point, due to the scale and congestion experienced, would be on the operation and movements within the intersection. Sensitivity to change is consequently assessed as low.</p>	<p>Low</p> <p>The configuration of the intersection would see an expansion to the north-east. Expansion of the intersection is unlikely to have a significant impact on the view of the road user, so the magnitude is considered low.</p>	<p>Low</p> <p>The overall impact of the proposal at VP2 is considered low due to the transitory nature of the viewer, the current level of development and the focus of the user.</p>

Viewpoint	Sensitivity	Magnitude	Overall impact rating
VP3 – Henry Lawson Drive/Newbridge Road	<p>Moderate</p> <p>The viewer at this location is a pedestrian or cyclist passing through the corridor. This slower rate of transit increases the focus of the view and with that their sensitivity to change. The user has experienced a park like setting which is transitioning to a developed and active interface. Their sensitive is consequently considered to be moderate.</p>	<p>Moderate</p> <p>Changes to this view would occur as the shared path alignment would be modified and some of the turf removed to allow for footpaths and expansion of the road corridor.</p> <p>The backdrop would also experience changes as it is cut back by an expansion of the road corridor in the southern leg of the intersection. This is expected to remain a vegetated backdrop but set further back and of a lower scale. The overall change in character is considered moderate.</p>	<p>Moderate</p> <p>Overall impact of the VP3 is considered moderate reflecting an active transport view and the expansion of infrastructure within the view. Additional care would need to be taken with the design here to minimise impact and enhance overall visual outcome for all users.</p>
VP4 – Henry Lawson Drive (residential)	<p>Moderate</p> <p>The sensitivity of this view is based upon the residents within these properties who have frontages facing Henry Lawson Drive and those on the shared path. Both users have the time to react to setting. Both residential and shared path users are accustomed to the busy road yet would be sensitive to increases in traffic movement and changes in vehicle composition. Both users are considered to have moderate sensitivity to change.</p>	<p>High</p> <p>The impact on the residents would be high as they would see the buffer between the property boundary and road corridor reduced, the increase in pavement within the corridor. The scale of the change would see the realignment of the northbound lane which would shift and realign the shared path to the west, reducing the setback from the shared path to the property boundary and the expense of landscape verge and front yards.</p>	<p>Moderate to High</p> <p>VP4 is considered to have a moderate to high impact based upon the scale of change caused by the development of the proposal and the proximity of residences.</p>
VP5 – Auld Avenue	<p>Moderate</p> <p>This view is based on the sensitivity of a transitory user of the shared path. The sensitivity is considered moderate based on the reconfiguring of the traffic lanes and widened footprint, which has the potential to change the overall character due to the scale of the change.</p>	<p>High</p> <p>The magnitude is considered high due to the extent of pavement proposed comprising:</p> <ul style="list-style-type: none"> <li>• A concrete median would be installed to separate the north and southbound lanes</li> <li>• The realignment of the northbound lane to accommodate the new northbound bridge.</li> <li>• Expansion of south bound lanes to the east through the incorporation of a turning and merge lane from milperra road increasing footprint</li> <li>• 3.5m shared path to the western edge of the corridor</li> </ul>	<p>Moderate to High</p> <p>VP5 is considered moderate to high based on the extent of change expected along the corridor, the widened footprint and addition of a concrete median all increasing the hardscape of the corridor.</p>



Viewpoint	Sensitivity	Magnitude	Overall impact rating
		The expansion in the road corridor through the increase in pavement is considered to have a high impact.	
VP6 – Henry Lawson Drive – Auld Avenue Bridge	<p>Moderate</p> <p>This view is based on a transitory view of a vehicle approaching the bridge and occurs at the intersection of Auld Avenue. The focus of the user is on the road. The landscape character is relatively consistent beyond the road corridor and so the sensitivity for changes is considered moderate.</p>	<p>Moderate</p> <p>The magnitude is considered moderate based upon the road corridor doubling in width to the west with the construction of a new bridge and the integration of a concrete median to separate the two carriageways. Vegetation is expected to be heavily impacted by the proposal which would affect the user's experience. These changes however are localised and within the context, would be moderated by the surrounding landscape.</p>	<p>Moderate</p> <p>The overall impact for VP6 is considered moderate due to the expected removal of vegetation and the expansion of the corridor to make space for the new bridge.</p>
VP7 – Henry Lawson Drive (Commercial)	<p>Low</p> <p>This view is from a pedestrian walkway along an unpaved verge aligning Henry Lawson Drive, but could also be a vehicle travelling south along Henry Lawson Drive. The experience of the environment is shaped by the existing road and so sensitivity has been assessed as low.</p>	<p>Moderate</p> <p>The magnitude is assessed as low to moderate based on the scale of change expected from the expansion of the road footprint, the garden bed would need to be removed to allow for the additional southbound lane and pedestrian footpath. The proposed alignment is anticipated to align with the commercial properties boundary which limits opportunities for revegetation and softening of the frontage to these properties.</p>	<p>Moderate to Low</p> <p>The scale of works would see the garden bed removed and to allow for construction of a traffic lane and pedestrian footpath. At present, there is no pedestrian footpath on this side of Henry Lawson Drive. The impact is considered from the point of view of transitory traffic and is considered to have low impact on these users.</p>
VP8 – Georges River	<p>High</p> <p>This view is from a user on the shared path, overlooking vegetation that provides separation and screening to Henry Lawson Drive. The sensitivity of this view is considered high based on the existing context and susceptibility to notice change caused by the changing of the landscape.</p>	<p>High</p> <p>The scale of works anticipated, including fill batters which expand the footprint of the formation, is likely to cause the removal of vegetation immediately aligning Henry Lawson Drive. Due to the extent of works proposed and the affect this would have on the users' experience, the magnitude is considered high.</p>	<p>High</p> <p>VP8 is considered to have a high rating based on the scale of change proposed, most evident in the loss of vegetation and screening of the road alignment, and the affect this would have on the users experience in this location.</p>

Viewpoint	Sensitivity	Magnitude	Overall impact rating
VP9 – Tower Road	<p>Low</p> <p>This view is from a pedestrian crossing the street but could be a transitory vehicle travelling south. In both instances the user is transitory and their focus is not primarily on the context of the road. Sensitivity consequently has been assessed as low.</p>	<p>Moderate</p> <p>The magnitude is considered low reflecting the existing context of the view, which is dominated by pavement and hardscape elements and the expansion of this into the grass verge. The turfed verges would be removed to allow for the expended footprint of the road, driveways and access points would be retained. The users would experience significant change as pavement replaces grass in most instances. Centrally, adjoining the second street sign, the stand of trees would be removed as the dominant context of pavement would be expanded.</p>	<p>Moderate to Low</p> <p>VP9 is considered moderate to low based on the context of the existing view retaining similar qualities of large pavement elements and access to commercial properties to that of the existing which is not anticipated to affect the transitory users experience.</p>
VP10 – Henry Lawson Drive (River edge)	<p>High</p> <p>The view is from Henry Lawson Drive and is from the perspective of a transitory vehicle travelling south. This view is unique as it features a strong vegetated edge along both sides of the corridor, with vegetation up to the edge of the road. This provides a scenic corridor where the tree canopy arches over the road. The sensitivity is considered high based on the expected impacts on existing character</p>	<p>High</p> <p>Any works immediately beyond the existing corridor would impact the vegetation which would affect the character of the view. Batters extend several metres into both verges which would impact the existing canopy and park like setting of the Rivers edge. The impact is consequently considered high.</p>	<p>High</p> <p>VP10 is considered to have a high rating as the scale of the works would see existing vegetation removed, and road width expanded, affecting the existing character of the view and creating a new experience for road users.</p>

#### 6.10.4 Safeguards and management measures

Safeguards and management measures for landscape and visual impacts are presented in Table 6-52.

Table 6-52: Safeguards and management measures for visual impacts

Impact	Environmental management measure	Responsibility	Timing
Visual amenity and urban design	<p>Urban design development of the proposal will continue through to detailed design for the overall proposal. Urban design will be integrated into project development processes.</p> <p>The following policy/guidelines will guide future design development of the proposal:</p> <ul style="list-style-type: none"> <li>• Transport Urban Design Policy (Beyond the Pavement)</li> <li>• Transport Urban Design Guidelines.</li> </ul> <p>The urban design objectives, principles and concept design strategy presented in the urban design report for the REF proposal will form the basis for future design development and consultation with stakeholders.</p>	Transport	Detailed design
Earthworks and landscape character	Integrate earthworks with adjoining landform to avoid sharp transition in profile through the adoption of appropriate grades, where possible.	Transport	Detailed design
	Stabilise and progressively revegetate exposed ground as works progress to limit erosion and visual impacts through early integration with surrounding vegetation.	Contractor	During construction
Revegetation	Plants used in revegetation will be consistent with existing communities, including riparian vegetation, and support the existing landscape character. Revegetation will use local provenance material and proposed tree species which provide canopy cover and minimise urban heat effects.	Transport	Detailed design
Tree management and removal	Any tree removal or pruning will be undertaken by a qualified specialist and in accordance with AS4970: 2009: Protection of Trees on Development Sites (Standards Australia, 2009) and AS4373:2007: Pruning of Amenity Trees and WorkCover Amenity Tree Industry Code of Practice 1998.	Contractor	Pre-construction / Construction
Minimise road furniture and signage	Provide minimum signage requirements and limit structural elements to provide an open and permeable setting.	Transport	Detailed design
Lighting	Minimise lighting and potential for light spill	Transport	Detailed design
	Minimise night works and provide lighting which minimises light spill	Contractor	During construction
View management	Provide visual screening to minimise the visual impact in areas identified as moderate or high impact	Transport	Detailed design/ During Construction

Impact	Environmental management measure	Responsibility	Timing
Visual amenity and ancillary facilities	The layout of the ancillary facility sites will be designed to minimise visual amenity impacts. The design will consider: <ul style="list-style-type: none"> <li>Screening of boundaries facing sensitive receivers or views</li> <li>Careful placement of structures and buildings to maintain viewpoints or provide additional screening of site activities</li> </ul>	Contractor	Pre-construction/ Construction
	The ancillary facilities will be maintained, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Pre-construction/ Construction
	Ancillary facility sites and temporary construction areas will be progressively restored to at least their pre-construction conditions or in accordance with Landscaping Plans, when no longer required.	Contractor	During construction

## 6.11 Socio-economic

The potential socio-economic impacts during construction and operation of the overall proposal have been assessed as part of the *Henry Lawson Drive Upgrade– Stage 1A: Socio-economic Impact Assessment* (Aurecon, 2021), provided in Appendix M.

### 6.11.1 Methodology

This socio-economic impact assessment has been prepared for a ‘moderate’ level assessment (as per Transport’s *EIA-N05 Environmental Impact Assessment Practice Note – Socio-economic Assessment* (Transport, 2020)). The moderate level of assessment is used as it reflects the scale and magnitude of potential impacts to the socio-economic environment. The assessment includes:

- Review of statutory planning and legislative requirements, including a review of existing State and local government strategies relevant to the social and economic environment of the study areas such as the Local Strategic Planning Statements (LSPS), Community Strategic Plans and Local Environment Plans (LEPs). This includes a review of the NSW South District Plan (Greater Sydney Commission).
- A site visit was undertaken on 15 July 2020 between 10am to 2pm to understand the existing environment. This involved:
  - A walk through of the REF proposal area to understand potential direct impacts of the proposal.
  - Driving around the surrounding area (Milperra, Georges Hall and Condell Park) to understand potential indirect impacts was undertaken.

Description of the existing socio-economic environment of the study areas to establish the baseline, including:

- Analysis of key population and demographic indicators, including data from the *2016 ABS Census of Population and Housing*.
- Analysis of existing data and information on local business and industry, employment and income, and dwelling characteristics.



- Review of existing social infrastructure and community features near to the proposal including recreation uses, educational facilities, places of worship, public transport and walking and cycling facilities.
- Analysis of existing consultation feedback gathered by Transport to date for this proposal (such as the Henry Lawson Drive Early Concept Design Consultation Report, July 2020) and other nearby proposals.
- Identification and assessment of the potential socio-economic impacts of the proposal's construction and operation on local amenity and community values, social infrastructure, business, land use and property impacts (such as temporary and permanent property access impacts and perceived economic impacts associated with property acquisition), access and connectivity.
- Measures to avoid, minimise and manage potential construction and operation impacts on the socio-economic environment and maximise potential benefits of the proposal
- The impact assessment has been prepared in accordance with the methodology of assessing impacts based on sensitivity and magnitude to determine potential significance of impacts prescribed in the Transport *EIA-N05 Environmental Impact Assessment Practice Note – Socio-economic assessment (2020)*.

In the socio-economic assessment, the direct study area focused on residents, stakeholders and facilities closest to the overall proposal. The REF proposal area is located in the direct study area, which includes the road corridor and the areas surrounding the road corridor, including residences on the western side of the Georges River.

The socio-economic study area covers indirect impacts which would be based on a 400-metre buffer from the overall design. People who are not within the direct impact area but who would interact with the overall proposal area, either by driving, using the bus stops or the shared use paths are considered to be subject to indirect impacts

The broader study area includes the following Statistical Areas:

- Panania - Milperra - Picnic Point
- Condell Park
- Bass Hill - Georges Hall
- Chipping Norton – Moorebank.

The broader study area used in this assessment contributes to developing the context of the existing environment and has been compared against the Liverpool City LGA, City of Canterbury Bankstown LGA and Greater Sydney. The investigation of these areas outside of the direct and indirect impact areas is important to understand the range of services, facilities and lifestyle of the community.

The impact assessment has been prepared in accordance with the methodology of assessing impacts based on sensitivity and magnitude to determine potential significance of impacts prescribed in the Transport *EIA-N05 Environmental Impact Assessment Practice Note – Socio-economic assessment (2020)*. This includes:

- Identification and analysis of likely changes to existing socio-economic conditions of the direct study area during construction and operation
- Determination of the significance of likely impacts, based on the sensitivity and magnitude of the impacts
- Sensitivity refers to the qualities of the receptor which influence its vulnerability to change and capacity to adapt.
- Magnitude refers to the scale, duration, intensity and scope of the overall proposal including how it would be constructed and operated.

The impact grading matrix utilised to assess the level of significance for potential negative impacts is shown in Table 6-53.

Table 6-53: Grading matrix to assess the level of significance

Sensitivity \ Magnitude		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

### 6.11.2 Existing environment

The socio-economic characteristics of the broader study area can be summarised as follows:

- There were 77,671 people living in the broader study area in 2016, which accounts for 1.6 per cent of the Greater Sydney population. There was a higher proportion of people aged 14 years or younger in the broader study area, City of Canterbury Bankstown LGA and Liverpool City LGA, compared to Greater Sydney. The broader study area also had the highest proportion of people aged 65 years or older.
- The Aboriginal and Torres Strait Islander population within the broader study area was 1.1 per cent in 2016, this was above the City of Canterbury Bankstown LGA (0.7 per cent) but below the Liverpool City LGA and Greater Sydney (1.5 per cent).
- The broader study area had the lowest proportion of overseas born residents at 31 per cent, compared to the City of Canterbury Bankstown LGA (44 per cent), Liverpool City LGA (41 per cent) and Greater Sydney (37 per cent). This may reflect less cultural diversity in the broader study area or historic migration patterns (Profile id, 2016) with varying clusters of overseas born people living across the City of Canterbury Bankstown and Liverpool City LGAs.
- The population of City of Canterbury Bankstown LGA is expected to increase by up to 41.2 per cent between 2016 and 2040. This is relatively consistent with the growth expected in the Greater Sydney Region which is expected to grow by around 51.5 per cent. The Liverpool City LGA is expected to increase significantly (108.2 per cent), which may be attributed to anticipated high rates of development, including the rezoning of 25 hectares in the Liverpool centre for the creation of Sydney's "third CBD".
- Employment in health care and social assistance; construction; and retail trade comprised the highest proportion of the work force in the broader study area, City of Canterbury-Bankstown and Liverpool City LGAs. The high number of construction workers may be attributed to current growth and development within Western Sydney, providing more opportunities and a higher demand for construction related jobs. Similarly, the higher levels of employment in health care and social assistance and retail trade, may be attributed to the proximity to the hospitals located just outside of the broader study area (Bankstown-Lidcombe Hospital and Liverpool Hospital) and the urban centres located throughout, which are comprised of small to large commercial areas.
- In 2016, vehicle ownership in the broader study area ranged between 1.8 – 2 vehicles per dwelling, with 6.5 per cent of dwellings having no motor vehicles. In comparison, 11.1 per cent of dwellings within the Greater Sydney Region did not have any motor vehicles. The high vehicle ownership in the broader study area may be reflective of the needs of the residents within the area, the reliance on private motor vehicles and lack of public transport choice for residents.

### **6.11.2.1 Social infrastructure**

There are a number of social infrastructure facilities located within the broader study area, including the Gordon Parker Reserve, Vale of Ah Reserve, Bankstown Golf Course, Georges River Golf Course and the Crosscurrents – Georges River Art Walk. It is likely that the local community use Henry Lawson Drive and connecting streets to access these social infrastructure facilities.

### **6.11.2.2 Areas of community interest**

Within communities, there are areas that hold value and are appreciated by the community. This includes local spaces, gathering areas, roadside memorials and other places that are visited by the community. There are the following three primary areas of community value that are located within the direct study area:

- Georges River
- Crosscurrents - Georges River Art Walk' Camoufleur' artwork and Trail Markers
- Roadside memorial on Milperra Road.

### **6.11.2.3 Access and connectivity**

The following travel patterns were identified from the review of ABS data:

- City of Canterbury Bankstown had relatively high proportions of people commuting to work by train and the bus compared to the broader study area and Liverpool City LGA.
- the preferred method of travel to work in the broader study area, Liverpool City LGA, City of Canterbury Bankstown LGA and Greater Sydney was travel to work by car (as driver). The broader study area and Liverpool City LGA had the highest portion of residents overall.
- travel to work by train was the second most used method of travel to work in the broader study area, Liverpool City LGA, City of Canterbury Bankstown LGA and Greater Sydney. This is likely to be due to the additional public transport facilities located throughout both LGAs including train and bus services.

Other key transport features of relevance include:

- Main roads within the direct study area, which include Henry Lawson Drive, Milperra Road, Newbridge Road, Auld Avenue, and Tower Road
- Public transport through the socio-economic study area is primarily through buses. The M90 – Burwood to Liverpool bus route traverses Milperra Road/Newbridge Road, directly through the direct impact area.
- The direct study area consists of a mix of shared use paths (used by both pedestrians and cyclists) and on-road cycling facilities.
- Henry Lawson Drive is an important route for freight and industrial type business operations.

### **6.11.2.4 Community values**

Understanding the values of a community is fundamental to identify what is most important for residents for quality of life and wellbeing and provides context and insight into how the community may perceive impacts of the overall proposal.

The Liverpool City Council's CSP and the City of Canterbury Bankstown Council's CSP are used to inform the community values for this assessment as they have been developed recently and informed by extensive community consultation. Both the Liverpool City Council and the City of Canterbury Bankstown Council's CPS highlight the importance of investing in active transport and good infrastructure to increase connectivity and accessibility.

### 6.11.2.5 Land use and zoning

Regarding the existing land use, the Henry Lawson Drive road corridor is a highly developed urban environment, south west of the Sydney CBD. Most of the overall proposal is mapped as SP2 – Infrastructure. Henry Lawson Drive is zoned as SP2 – Infrastructure, as a key connection for traffic moving between the Hume Highway, Milperra Road /Newbridge Road and the M5 Motorway. Georges River is zoned W1 - Natural Waterways.

Henry Lawson Drive is zoned as SP2 – Infrastructure, as a key connection for traffic moving between the Hume Highway, Milperra Road /Newbridge Road and the M5 Motorway.

Georges River is zoned W1 - Natural Waterways. Land adjacent to the Georges River is zoned as RE1 – Public Recreation. There is a range of open space and recreational activities including the Georges River Golf Course, Gordon Parker Reserve, Vale of Ah field, Bankstown Golf Club.

The eastern side of Henry Lawson Drive, north of Milperra Road is also zoned SP2 – Infrastructure and is comprised of the Bankstown Airport. The airport includes three runways and a variety of ancillary services.

The area south of Milperra Road is largely zoned as RE2 – Private Recreation and R2 – Low Density Residential. There are a range of industrial services within the area, comprised of warehouses and industrial activities, however these are further east in the broader study area.

### 6.11.2.6 Property

Property within the direct study area is owned by:

- Transport
- Canterbury Bankstown Council
- The Crown (crown land)
- Private owners such as residents and businesses.

There is one property within the direct study area that is subject to the NSW Government's *Floodplain Management Program* to implement voluntary purchase schemes, located on the eastern side of Henry Lawson Drive near the intersection with Auld Avenue. The necessary property acquisition for the REF proposal is described in Section 3.6.

### 6.11.3 Potential impacts

#### 6.11.3.1 Construction

The REF proposal is expected to have some adverse impacts during the construction phase, including:

- **Property and land use impacts**, such as property acquisition for residences, businesses and public spaces. One full residential property acquisition would be required on the eastern side of Henry Lawson Drive (just north of the Auld Avenue/Henry Lawson Drive intersection) and some residential strip acquisition required on the western side (between Auld Avenue and Newbridge Road). Property acquisition can result in varying impacts to land owners and occupiers, with some people being more vulnerable to impacts than others. In addition, two small portions of land that are part of the Bankstown Golf Course and the Georges River Golf Course would also be acquired. This is not expected to impact the operation of the golf courses as acquisition would be located close to the edge of both properties.



- **Changes in access and connectivity for all road users** as a result of construction traffic impacts, delays around construction areas and temporary alternate traffic arrangements. In particular, changes in access at Auld Avenue and along the shared user path on Henry Lawson Drive would impact residents and the broader community that use these areas during construction. The temporary relocation of bus stops may affect accessibility during construction, however access would be maintained.
- **Changes in access and connectivity for businesses** on Henry Lawson Drive, resulting in impacts to businesses between Tower Road and Milperra Road and businesses within the Flower Power Complex. Businesses that operate over 24-hour periods, or outside of hours periods such as the BP Truckstop service station and Wild Bean Café, KFC Milperra and Hungry Jack's Burgers Milperra may experience impacts to business movements and customer access. This is likely to occur during the implementation of alternative traffic arrangements during these out of hours work periods. Similarly, freight deliveries at the Flower Power Complex outside of standard hours may also experience impacts during construction as a result of delays and alternative traffic arrangements.
- **Impacts to social infrastructure** where people may experience changes to noise, air quality and visual environment particularly when using parks and the Georges River, particularly recreational users of the Georges River and people using Gordon Parker Reserve and undertaking the Crosscurrents – Georges River Art Walk. The construction of the REF proposal would not directly impact the operation of most facilities within the socio-economic study area but may have indirect impacts on the usage as a result of visual, noise and air quality impacts associated with construction. This could reduce some resident and visitor enjoyment of social infrastructure and public spaces.
- **Impacts to community values and amenity.** During construction there would be impacts to community values and amenity in the form of noise, visual and air quality impacts for residents, businesses, services and social infrastructure. The highest impacts would be during construction activities that use noise or vibration intensive equipment. During works outside standard construction hours at the Henry Lawson Drive/Milperra Road/Newbridge Road intersection noise intensive activities could result in some potential sleep disturbance or discomfort for residential receivers. This can have an adverse impact on the health and wellbeing of residential receivers, particularly if construction periods occur for long periods of time.
- Potential impacts associated with vegetation removal would result in visual impacts to surrounding receivers, and impact the liveability of the direct study area, particularly surrounding the Georges River and coastal wetland areas which are valued by community. Revegetation would be undertaken prior to the completion of construction.
- Consultation undertaken for the proposal indicated that safety is highly valued by the community. Construction activities such as the use of ancillary facilities located on the floodplain, earthworks and the construction of the bridge may have the potential to adversely impact safety. Impacts to flood evacuation routes, construction worker safety and residences as a result of flooding have been considered in the development of the design.
- **Potential traffic and amenity cumulative impacts** which could occur as a result of works being located near the Bankstown Airport Redevelopment, proposed Riverlands Residential Development and other road projects that form part of the Henry Lawson Drive Upgrade Program of works, including the EIS proposal. Amenity impacts are expected for projects closer to the REF proposal such as the Bankstown Airport Redevelopment, with traffic impacts expected to occur as a result of projects within the broader study area such as the Moorebank Intermodal Terminal project and other stages of the Henry Lawson Drive Program of works. These projects are expected to result in increased traffic demand, with large freight vehicles using the direct study area for access.

### 6.11.3.2 Operation

During the operation of the proposal socio-economic impacts include:

- Some changes in land use in the road corridor, including areas that were previously vacant or vegetated land alongside Henry Lawson Drive, Milperra Road and Newbridge Road would now form part of the road footprint. This potentially would impact the community who value nature and the environment. As these areas are part of the road corridor without formal connections to the pedestrian network, most of them are not frequently used by the public. The vegetated corridor between the Georges River and Henry Lawson Drive is the exception, which features the shared user path along the Georges River. Land use changes from the vegetated corridor to the roadway in this area may impact the amenity of pedestrians using the pathway and surrounding area temporarily as vegetation re-establishes. As most land use changes would occur close to the road corridor, impacts are not expected to be substantial. The land use changes would facilitate improved connections through the direct study area, which are likely to positively contribute to the community who value movement and connectivity. Construction of new footpaths and relocated bus stops would improve pedestrian connectivity at the Henry Lawson Drive/Milperra Road/Newbridge Road intersection. This may provide greater incentive for the community to use public transport through better access opportunities.
- Improvements in access and connectivity from increased travel efficiency for local road users, through the provision of greater capacity which would provide benefits for future growth and development within the broader study area. New turning arrangements at Auld Avenue (left in/left out) to reduce the risk of vehicles turning into oncoming traffic and also improve the performance of the intersection. This would result in changes to access, with residents in Auld Avenue and people that use Gordon Parker Reserve and the Vale of Ah Reserve needing to approach the intersection northbound on Henry Lawson Drive. This may require traffic to alter their path of travel to get to Auld Avenue, using other roads including local roads to access the intersection. This could vary from between 400 metres (using Keys Parade as a turn-around point) to four kilometres (using Milperra Road, Ashford Avenue and Bullecourt Avenue) depending on route choice. Changes in access may be inconvenient for people that use Auld Avenue, which may impact the usage to the reserves.
- Benefits to commercial operations and businesses within and travelling through the direct study area through increased road capacity and improved travel times.
- Changes in community values and amenity including slight beneficial noise impacts to residences located to the west of Henry Lawson Drive, with noise levels to decrease slightly as the travel lanes move to the east. Noise levels to the golf courses on the east of Henry Lawson Drive would slightly increase. However, it is noted that these changes are very minor and would not be perceptible. Permanent property acquisition would bring the road corridor closer to some residents on Henry Lawson Drive that have been subject to strip acquisition. This could result in reduced visual amenity as Henry Lawson Drive would occupy a larger road footprint. The widened footprint would further contribute to the built environment impacting on community values.
- The single full property acquisition of the residential property on the eastern side of Henry Lawson Drive would be subject to future Council flood mitigation planning requirements to mitigate potential flood impacts. Discrete flooding impacts during operation are likely to occur for residents and businesses within the socio-economic study area. Impacts are expected to be localised with slight increases to existing flood levels during flooding events. Mitigation, including further analysis during detailed design, would be implemented to avoid safety impacts during construction and would include flood evacuation procedures being implemented during a flood event.
- Revegetation would occur throughout the direct study area to improve the visual aesthetic of the upgrade.

Table 6-54 outlines the socio-economic factors and potential impacts of the activities to be undertaken in the REF proposal areas.

Table 6-54: Socio-economic factors and potential impacts of the REF proposal

Aspect	Impact (with mitigation)	Sensitivity	Magnitude	Overall
Construction				
Access and connectivity	<ul style="list-style-type: none"> <li>Property access would be maintained during construction; however access would be impacted due to construction traffic and alternative traffic arrangements. This would include access to properties on Henry Lawson Drive and Auld Avenue.</li> <li>Construction traffic, slower speeds around construction areas and the installation of temporary traffic arrangements may result in traffic delays.</li> <li>Access to social infrastructure facilities within the direct impact area would be impacted during construction, including access to Gordon Parker Reserve and Vale of Ah Reserve and Dog Park accessed via Auld Avenue. Chipping Norton Scout Group and Vale of Ah Reserve may experience delays in road access during construction.</li> <li>The temporary relocation of bus stops may impact public transport users, particularly the elderly and less mobile.</li> <li>Businesses on the northern side of the Henry Lawson Drive/Milperra Road/Newbridge Road intersection would need to use Starkie Drive and Tower Road for access during some intersection work required for the REF proposal.</li> <li>The informal parking area on Auld Avenue close to the intersection of Auld Avenue/Henry Lawson Drive would not be available during construction, which may impact visitors and patrons of Gordon Parker Reserve during busy periods.</li> <li>Access for the emergency services would be maintained.</li> <li>The temporary closure or adjustment of pathways and shared user connections may affect accessibility and some resident and visitor enjoyment of public spaces in the direct study area.</li> </ul>	High	Moderate	High-moderate
Social infrastructure	<ul style="list-style-type: none"> <li>Potential impacts to the community enjoyment and attractiveness of facilities during construction.</li> <li>Access and amenity impacts (including noise and visual impacts from construction) at the Auld Avenue/Henry Lawson Drive intersection and use of ancillary site 4 may impact patronage to Gordon Parker Reserve.</li> <li>The shared user pathway which also hosts the Crosscurrents – Georges River Art Walk would be impacted during construction as a result of the widening work, embankment work, utilities work and installation of road furniture. Visual and noise impacts as well as access and connectivity impacts would be experienced by commuters.</li> <li>Access to social infrastructure in the broader study area accessed via Henry Lawson Drive may be impacted as a result of increased travel time due to increased traffic and potential delays around construction areas.</li> </ul>	Moderate	Moderate	Moderate
Business and commercial	<ul style="list-style-type: none"> <li>There would be amenity impacts in the form of noise and visual impacts for businesses closest to the REF proposal, particularly at the BP Truckstop and Wild Bean Café, ALDI Supermarket, KFC Milperra and Hungry Jack's Burgers Milperra, some which operate outside of standard working hours.</li> </ul>	Moderate	Moderate	Moderate

Aspect	Impact (with mitigation)	Sensitivity	Magnitude	Overall
	<ul style="list-style-type: none"> <li>The presence of plant and equipment may restrict views to businesses and associated business signage, including the business signage to be relocated on Henry Lawson Drive near Tower Road.</li> <li>Freight drivers and heavy vehicles with time-crucial deliveries may be impacted by traffic delays and detours around construction sites.</li> </ul>			
Amenity and community	<ul style="list-style-type: none"> <li>Sensitive receivers near the REF proposal would experience the most impacts to amenity in the form of noise, visual and air quality impacts.</li> <li>Potential sleep disturbance and higher impacts during noisy works.</li> <li>Vegetation removal and for the upgrade would reduce the visual amenity of the direct study area.</li> <li>Potential impacts to the community's use of public recreational greenspace, impacting liveability and wellbeing.</li> <li>Some of the property acquisition required for the REF proposal would be on land identified in an Aboriginal land claim, which could result in an actual or perceived reduction of cultural value of this area.</li> <li>The roadside memorial located on the southern side of Milperra Road near the existing bus stop would be impacted during construction.</li> </ul>	High	Moderate	High-moderate
Property	<ul style="list-style-type: none"> <li>Most residential property acquisition would be limited to strip acquisition at the front of properties, with one residential property fully acquired for use as an ancillary facility on Henry Lawson Drive.</li> </ul>	Moderate	Low	Moderate-low
Land use changes and development	<ul style="list-style-type: none"> <li>Change in land use for areas required for ancillary facilities and construction activities during construction. This includes areas closest to the REF proposal including the residential property on the eastern side of Henry Lawson Drive.</li> <li>Changes in land use for the shared user pathway and vegetated corridor between the Georges River and Henry Lawson Drive, from a recreational space/active transport connection to an area of construction activity</li> </ul>	Low	Low	Low
<b>Operation</b>				
Access and connectivity	<ul style="list-style-type: none"> <li>Increased travel efficiency for local road users by allowing for greater traffic capacity at key intersections</li> <li>Construction of new footpaths and relocated bus stops to improve pedestrian connectivity at the Henry Lawson Drive/Milperra Road/Newbridge Road intersection.</li> <li>Access to Auld Avenue when travelling south along Henry Lawson Drive would be removed, resulting in increased movements and potential strain on the surrounding network as disrupted users disperse through the surrounding area.</li> </ul>	High	Moderate	High-moderate
Social infrastructure	<ul style="list-style-type: none"> <li>Improved movement and travel times as a result of increased capacity on Henry Lawson Drive would improve connectivity to services and social infrastructure</li> <li>Intersection improvements could also assist in emergency response time to the nearby NETS Ambulance Service, Sydney HEMS Base and Bankstown-Lidcombe Hospital</li> </ul>	High	Moderate	High-moderate



Aspect	Impact (with mitigation)	Sensitivity	Magnitude	Overall
	<ul style="list-style-type: none"> <li>The vegetated corridor between the Georges River and Henry Lawson Drive would be reduced due to the road footprint encroaching on this area, resulting in minor noise increases.</li> <li>The change in access to Auld Avenue may impact patronage to Gordon Parker Reserve and Vale of Ah Reserve due to the changed access requirements at Auld Avenue.</li> <li>A bio-retention basin would be placed in the road verge in front of the 'Camoufleur' artwork that would affect visibility of the artwork by road users.</li> </ul>			
Business and commercial	<ul style="list-style-type: none"> <li>The REF proposal would provide benefits to commercial operations and businesses within and travelling through the direct study area through increased road capacity and improved travel times.</li> <li>Businesses at the Henry Lawson Drive/Milperra Road/Newbridge Road intersection may experience some slight increases in noise (reduced amenity) due to the road corridor being closer to their premises</li> <li>Businesses on the eastern side of Henry Lawson Drive between Tower Road and Milperra Road, and businesses further east including the Bankstown Golf Course and industrial businesses on Ashford Avenue in Milperra may experience slightly increased flooding impacts during the operation of the proposal. This could lead to damages, safety impacts and stress for business owners and employees.</li> </ul>	Low	Low	Low
Amenity and community	<ul style="list-style-type: none"> <li>Slight decrease in road traffic noise levels close to receivers, particularly those located on the western side of Henry Lawson Drive. This is expected to have a positive impact on the amenity of this area for residences that currently experience noise impacts.</li> <li>The REF proposal would increase the infrastructure footprint within the direct study area, which may adversely impact the natural and vegetated character of the area which is highly valued by the community.</li> <li>The REF proposal would have beneficial outcomes for road users through the improvement of movement, capacity and connections for all road users and active transport.</li> <li>The REF proposal could result in slight flooding impacts during operation. This could lead to stress/anxiety for residents close to flood prone areas, in particular residents that have not been subject to flooding events previously. This would impact community values associated with safety.</li> </ul>	Moderate	Moderate	Moderate
Property	<ul style="list-style-type: none"> <li>Changes to property access along the REF proposal, including residential properties along the western side of Henry Lawson Drive as a result of the widened road footprint.</li> <li>Access to businesses north of the Henry Lawson Drive/Milperra Road/Newbridge Road intersection would be changed to a driveway entrance from Henry Lawson Drive, rather than the previous slip lane arrangement.</li> <li>There would be no further property acquisition during operation of the REF proposal.</li> </ul>	Low	Low	Low
Land use changes and development	<ul style="list-style-type: none"> <li>Some changes in land use in the road corridor, including areas that were previously vacant or vegetated land alongside Henry Lawson Drive, Milperra Road and Newbridge Road which would now form part of the road footprint.</li> </ul>	Low	Low	Low

#### 6.11.4 Safeguards and management measures

Table 6-55 provides a summary of the safeguards and management measures that are recommended for the proposal based on the assessment of potential socio-economic impacts.

Table 6-55 Environmental management measures for socio-economic impacts

Potential impact	Mitigation measure	Responsibility	Timing
Property acquisition requirements including private and crown land acquisition	Land acquisition will occur in accordance with the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Transport	Pre-construction
Community impacts during construction including noise, visual and access impacts	<p>A Community Liaison Plan (CLP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CLP will include (as a minimum):</p> <ul style="list-style-type: none"> <li>• Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions</li> <li>• Contact name and number for complaints.</li> </ul> <p>The CLP will be prepared in accordance with:</p> <ul style="list-style-type: none"> <li>• Transport's stakeholder engagement tool kit</li> <li>• Transport's Stakeholder and Community Engagement Policy 2019</li> </ul>	Contractor	Pre-construction/ during construction
Community consultation during detailed design and construction, property impacts as a result of temporary access changes and property acquisition	<p>Transport will continue to consult with the community, recreational groups, businesses and other stakeholders until the completion of the overall proposal. Discussions will include:</p> <ul style="list-style-type: none"> <li>• Changes to the overall proposal as a result of detailed design, the nature and timing of construction works</li> <li>• Mitigation measures for residents, stakeholders and people using the overall proposal</li> <li>• Mitigation measures for noise, traffic, access and visual impacts.</li> </ul>	Transport/ Contractor	Detailed design/ pre-construction/ during construction
Potential impacts on Aboriginal Heritage and areas of significance	Transport will continue to consult with Local Aboriginal Land Councils during detailed design phase to minimise impacts to both the acquired land and adjacent Aboriginal claim land.	Transport	Detailed design/ pre-construction
Social infrastructure impacts including access and amenity impacts	Operators of the Georges River Golf Course and Bankstown Golf Course, public transport providers as well as Council in reference to Gordon Parker Reserve, Vale of Ah Reserve and the vegetated corridor between the Georges River and Henry Lawson Drive will be consulted and informed regarding construction activities to mitigate any impacts during busy periods and events at these facilities.	Contractor	Pre-construction/ construction

Potential impact	Mitigation measure	Responsibility	Timing
Temporary relocation of the roadside memorial	The roadside memorial on the southern side of Milperra Road will be temporarily relocated during construction in consultation with the stakeholders who have made the memorial. Access to the relocated roadside memorial would be maintained for pedestrians during construction.	Transport/ Contractor	Pre-construction /construction
Business signage during construction to mitigate access and potential loss of passing trade impacts	Opportunities for the temporary installation of signage on approach to Tower Road for access to businesses will be investigated. Wayfinding and the location of signage during construction will be based on the construction staging and where room is available.	Transport/ Contractor	Pre-construction /construction
Consultation with emergency services to maintain access	Continued consultation with emergency services to understand access requirements so that access can be maintained during construction, particularly during works at the Tower Road/Henry Lawson Drive intersection	Transport/ Contractor	Detailed design/ construction

## 6.12 Air quality

Air quality criteria used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects. Emissions from construction equipment and vehicles using the highway have the potential to impact on local air quality. The most significant emissions produced from motor vehicles are:

- Oxides of nitrogen (NO<sub>x</sub>)
- Carbon monoxide (CO)
- Particulate matter (PM<sub>10</sub>).

Construction activities would also generate dust and other particulate matter. There are various classifications of particulate matter, with NSW EES providing assessment criteria for:

- Total suspended particulates
- Particulate matter (PM<sub>10</sub> and PM<sub>25</sub>)
- Deposited dust.

### 6.12.1 Existing environment

There are no EES air quality monitoring stations in the overall proposal area. The overall proposal is located in the middle of two EES air quality monitoring stations including Liverpool (about eight kilometres away) and Chullora (about 11 kilometres away).

Air quality data from Liverpool from the NSW Annual Compliance Report 2019<sup>5</sup> showed:

- Nitrogen dioxide: the site met performance standards and goals
- Carbon monoxide: the site met performance standards and goals

<sup>5</sup> [NSW Annual Compliance Report 2019](#)

- Particulate matter: the site did not meet performance standards and goals, with 28 exceedance days and an annual mean of 27.7 µg/m<sup>3</sup>.

Air quality data from Chullora from the NSW Annual Compliance Report 2019 showed:

- Nitrogen dioxide: the site met performance standards and goals
- Carbon monoxide: the site met performance standards and goals
- Particulate matter: the site met performance standards and goals.

A search of National Pollutant Inventory for the City of Canterbury Bankstown LGA identified Bankstown Airport as the nearest source of air pollution (with the ANZSIC Class of Mineral, Metal and Chemical Wholesaling [332]).

As the REF proposal is near existing high volume roads and airport, the air quality would be currently impacted, however, the air quality data from the surrounding air quality monitoring stations shows that performance standards and goals are generally being met. This is with the exception of particulate matter at the Liverpool monitoring station.

Motor vehicles on Henry Lawson Drive and the surrounding road network are a significant local source of air pollutant emissions. Higher emissions would be experienced during periods of traffic congestion.

Rainfall data for the study area was obtained from the closest Bureau of Meteorology station located at the Milperra Bridge (station number 66168). This rain gauge indicates that the annual average rainfall is 638.32 millimetres, with March receiving the highest average monthly rainfall.

As the Milperra Bridge station does not have data on temperature, temperature data was obtained from the next nearest station at Bankstown Airport (station number 66137). This station indicates that the annual mean maximum temperature is 23.4 degrees. The warmest months are December to February, with mean maximum temperatures during these months ranging from 23.8 to 32.3 degrees. The coolest month is July with a mean temperature of 17.4 degrees.

## **6.12.2 Assessment of potential impacts**

### **6.12.2.1 Construction**

Construction of the REF proposal may have short-term localised impacts on air quality from:

- Clearing of vegetation (as recognised in Section 6.1.3, the REF proposal would directly impact on 1.69 hectares of native vegetation, 0.3 hectares of exotic/landscape plantings and about 8.93 hectares of weeds/exotics – non-native vegetation with no or limited native vegetation)
- Stripping, stockpiling and managing of topsoil
- Earthworks and excavation leading to the creation of airborne dust, especially in dry and windy conditions
- Road sub-grade preparation and road pavement work
- Transport and handling of soil and materials to and from the REF proposal area
- Use of construction vehicles and their associated exhaust fumes
- Spray painting of the road for line marking
- Demolition activities.

Potential air quality impacts during construction would be predominantly associated with the generation of dust. The settlement of dust may impact upon properties located near the overall proposal. Substantial dust generation could result in health impacts to nearby receivers. Air quality impacts from dust generation are considered to be minor as they would be limited to the construction phase only and would be minimised through the implementation of the safeguards and management measures outlined below.



Machinery and other construction vehicles emit exhaust fumes. The impact of these emissions would be limited to the duration of the construction phase. Odours may be generated during the application of asphalt and line marking. However, the construction period would be temporary and there would be no long-term odour impacts for nearby receivers. Operation of machinery and other construction vehicles would be undertaken to meet the relevant criteria. Overall, potential air quality impacts during construction would be short-term and minor, provided appropriate safeguards and management measures are implemented.

### 6.12.2.2 Operation

During operation, air quality impacts are not expected to worsen from the existing situation.

The upgrade of Henry Lawson Drive would have a higher capacity than the existing road, potentially resulting in increased traffic use and emissions. However, the road upgrade would assist in reducing traffic congestion due to its higher capacity. Travel speeds across the network improve and greater traffic movement through the network would result from a reduction in congestion and queuing. Higher emissions generally occur during periods of traffic congestion – so a reduction in congestion should also result in reduced vehicle emissions.

In addition, the impacts on air quality in relation to the clearance of vegetation would be partially offset through revegetation works to be delivered via a landscape plan.

Recent commitments and strategies made by the NSW Government and Transport for NSW would also result in long-term improvements in air quality around highly trafficked areas. Transport for NSW's Future Transport 2056 Strategy and Future Energy Action Plan 2020-2025 contributes to NSW Government Climate Change Policy Framework's goal of net zero emissions by 2050. The successful implementation of the Action Plan and achieving the objectives and targets of the overarching Policy and Strategy would likely improve air quality in and around the proposal area in the long-term.

### 6.12.3 Safeguards and management measures

Safeguards and management measures provided below would be implemented to minimise potential air quality impacts (shown in Table 6-56).

Table 6-56 Environmental management measures for air quality impacts

Potential impact	Environmental management measure	Responsibility	Timing
General air quality impacts	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include:</p> <ul style="list-style-type: none"> <li>• Identification of potential risks/impacts due to the work/activities as dust generation activities</li> <li>• Management measures to minimise risk of dust generation</li> <li>• A process for monitoring dust on-site</li> <li>• A process for altering management measures as required and reprogramming construction activities if the safeguards and management measures do not adequately restrict dust generation.</li> </ul>	Contractor	Pre-construction/ During construction
Dust emissions	Work will cease when levels of visible airborne dust become excessive.	Contractor	During construction

Potential impact	Environmental management measure	Responsibility	Timing
Dust emissions	Works that disturb vegetation, soil or stockpiles will not be carried out during strong winds (over 40 km/h) when this may affect receivers (visibility on roads; dust and debris near recreational areas residences and commercial premises).	Contractor	During construction
Dust emissions	Stockpiled materials will be covered stabilised or stored in areas not subject to high wind.	Contractor	During construction
Dust emissions	All trucks will be covered when transporting material to and from the site.	Contractor	During construction

## 6.13 Hazard and risk

General environmental hazards and risks associated with the construction and operation of the proposal have been addressed and mitigated in other sections or are relatively minor and do not require special consideration in this chapter. This includes the consideration of hazards and risks such as flooding or contamination that have been addressed in earlier chapters. The number of environmental management measures relating to minimising environmental hazards and risks is largely covered by the proposed preparation and implementation of various plans such as:

- CEMP
- Acid Sulfate Soil Management Plan
- Construction Soil and Water Management Plan
- Contaminated Land Management Sub-Plan
- Unexpected Finds Protocol (UFP)
- Construction Flood Management Sub-Plan
- Construction Work Health and Safety (WHS) Plan
- Site specific emergency spill plan.

This section identifies those risks and hazards that have not been captured elsewhere. This includes bushfire risk and airport operations hazard and risks during construction and operation phases of the REF proposal.

### 6.13.1 Methodology

#### 6.13.1.1 Bushfire hazard

The following tasks were undertaken to understand the exiting environment and to identify potential impacts associated with bushfire hazard:

- A review of bushfire prone land mapping
- A review of existing land uses in the study area based on desktop review of spatial data and aerial photography
- A review of potential impacts on access for emergency services during construction and operation of the project
- Consultation with NSW Rural Fire Service.

### 6.13.1.2 Airport operation hazard

The following tasks were undertaken to understand the existing environment and to identify potential hazards and risks associated with the nearness of the proposal area to Bankstown Airport:

- A review of the Bankstown Airport Master Plan
- A review of Obstacle Limitation Surface (OLS) mapping
- Consultation with Sydney Metro Airports.

### 6.13.2 Existing environment

#### 6.13.2.1 Bushfire

Within and to the south of the Henry Lawson Drive and Milperra Road/Newbridge Road intersection, the overall proposal area is largely mapped as being within a vegetation buffer on the bushfire prone area land mapping. The buffer area illustrates land that directly adjoins bushland prone to bushfires and are the areas in which developments and people would most likely be affected by a bushfire burning in the adjacent land. Land within the REF proposal on Milperra Road, and the southern side of Henry Lawson Drive are located within the council mapped 'Bushfire Prone Land'<sup>6</sup>.

With reference to the NSW Rural Fire Service online search tool to 'check if you're in bushfire prone land', land within the REF proposal on Milperra Road, and the southern side of Henry Lawson Drive are within parcels of land identified as within a designated bushfire prone area<sup>7</sup>. It is noted that the online tool does not recognise the road corridor as a 'property'. Land to the north of the Henry Lawson Drive and Milperra Road/Newbridge Road intersection is not included on the bush fire prone area land mapping.

Areas of vegetation within the Bankstown Golf Course located to the south of Milperra Road and to the east of Henry Lawson Drive is mapped as Vegetation Category 1 land. Vegetation Category 1 is considered to be the highest risk for bush fire and is given a 100 metre buffer.

Land within the proposal area to the south of the Henry Lawson Drive road bridge south of Auld Avenue is mapped as Vegetation Category 2. Vegetation Category 2 is considered to be a lower bush fire risk than Category 1 and Category 3, but higher than the excluded areas. This vegetation category is given a 30 metre buffer.

#### 6.13.2.2 Bankstown Airport

The overall proposal is located close to Bankstown Airport.

Bankstown Airport is situated on 313 ha of land and has three parallel runways, several apron areas, a small passenger terminal and a business park, home to more than 160 businesses. The airport has numerous fixed-wing and helicopter flying schools and also caters to charter and private business flights, freight, aeromedical services, recreational flights, aircraft maintenance businesses, private aircraft and emergency services.

Bankstown Airport is not under curfew, operating 24/7 (with some circuit training restricted to certain hours).

On reviewing the existing Bankstown Airport Obstacle Limitation Surface (OLS) mapping, the overall proposal area (including REF proposal areas) is not located within the OLS. The OLS is located NW to SE along the runways. The OLS (edge of the transition surface) is around 400 metres away from the east of the REF proposal area.

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<sup>6</sup> <https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address>

<sup>7</sup> [Check if you're in bush fire prone land - NSW Rural Fire Service](#)

The Planning for Bush Fire Protection (PBP) 2006 identifies development standards for designing and building on bushfire prone land in New South Wales. A road upgrade is not a class of development that requires a bushfire assessment under the PBP. However, through consultation with Rural Fire Service NSW, they have requested that the overall proposal considers the bushfire risk.

### **6.13.3 Potential impacts**

#### **6.13.3.1 Bushfire**

##### **6.13.3.1.1 Construction**

As the REF proposal area would be partially located within and near bushfire prone land, the REF proposal has the potential to increase bushfire risk in the study area from accidental ignition from the use of mobile equipment, fuels and chemicals during construction. The removal of vegetation in the construction area would also reduce the risk of bushfire occurring.

Measures to mitigate and manage bushfire would be developed and included as part of a site-specific bushfire management plan within the proposal CEMP for the REF proposal. Temporary ancillary facilities and construction infrastructure would generally be less sensitive to bushfire than permanent facilities, given the temporary nature of the construction compounds and the absence of critical infrastructure within the compounds.

Temporary ancillary facilities and construction infrastructure would generally be less sensitive to bushfire than operational facilities, given the temporary nature of the construction compounds and the absence of critical infrastructure within the compounds.

Temporary construction compounds would be maintained in a tidy and orderly manner to minimise potential fuel loads should they be affected by fire.

Construction activities involving flammable materials and ignition sources would be managed to ensure that the potential for fire is minimised. High risk construction activities such as welding and metal work would be subject to a risk assessment on total fire ban days and restricted or ceased as appropriate.

Construction personnel would be inducted into the requirement to operate safely to minimise risk of fire. During construction, there would be impacts on roads in and adjacent to the construction footprint including reduced speed limits and modified arrangements. This may delay response times and/or access for emergency services including fire crews, in the event of a bushfire. It is recommended that a bushfire management plan is prepared.

Road reserves are extremely important in bushfire management. They provide access for firefighting operations, can provide a containment line or firebreak, and are a route of escape in the event of an evacuation. The REF proposal would not obstruct the road reserves during construction. It will therefore continue to be able to perform as an evacuation route.

##### **6.13.3.1.2 Operation**

The REF proposal is not expected to be a significant bushfire hazard during operation as ongoing vegetation management activities by Transport along the road corridor.

The REF proposal would result in the removal of vegetation, providing additional buffer area between bushfire risk areas and the adjoining areas. This would reduce the risk of bushfire, allowing for better containment.

Access for emergency services would be improved by the operation of the proposal.



### 6.13.3.2 Airport operation hazards

#### 6.13.3.2.1 Construction

The overall proposal is located outside the OLS and would not intrude into the OLS. It is considered that construction equipment for the proposal would not infringe or impact the OLS. No crane over 50 metres would be required.

Given to the close proximity to the airport, the proposal may have the following potential impacts during construction:

- Construction lighting producing light spill in the direction of incoming aircraft
- Dust production causing visibility issues in the airspace surrounding the airport
- Risk of wildlife strikes due to attraction of wildlife to areas near airport operations.

The CEMP would include measures that would mitigate potential impacts to the operations of the airport. As Bankstown Airport operates 24/7, the CEMP would also include measures to mitigate potential impacts of lighting used during construction. Lighting would be angled downwards to ensure no glare is exposed towards incoming aircraft, causing a distraction to pilots.

#### 6.13.3.2.2 Operation

The REF proposal is unlikely to impact on aviation risks during operation.

### 6.13.4 Safeguards and management measures

Safeguards and management measures for hazard and risk are presented in Table 6-57.

Table 6-57 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Bushfire risk	The CEMP will include a bushfire management plan prepared in accordance with the <i>Planning for Bush Fire Protection 2019 (Rural Fire Service 2006)</i> . Measures to be implemented to manage bushfire risk include: <ul style="list-style-type: none"><li>• Monitoring of weather and local bushfire ratings</li><li>• Consultation requirements for community notifications in the event of a bushfire</li><li>• Maintaining equipment in good working order</li><li>• Ensuring plant and equipment are fitted with appropriate spark arrestors, where practicable</li><li>• Ensuring site workers are informed of the site rules including designated smoking areas and putting rubbish in designated bins.</li><li>• Obtaining hot work permits and implementing total fire bans as required</li><li>• Implementing adequate storage and handling requirements for potentially flammable substances in accordance with the relevant guidelines.</li></ul>	Contractor	Pre-construction/ Construction
Consultation with emergency services	Consultation with emergency services, including the Rural Fire Service and Fire and Rescue NSW to: <ul style="list-style-type: none"><li>• Ensure emergency access is maintained during construction</li><li>• Co-ordinate any bush fire emergency actions as outlined in the project's Bushfire Management Plan.</li></ul>	Contractor	Construction

## 6.14 Waste management

Transport is committed to ensuring the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the Waste Avoidance and Resource Recovery Act 2001. These resource management hierarchy principles, in order of priority are:

- Avoidance of unnecessary resource consumption in operations, maintenance, construction and management
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

By adopting the above principles, Transport aims to efficiently reduce resource use, reduce costs, and reduce environmental harm in accordance with the principles of ESD.

### 6.14.1 Potential impacts

The REF proposal has the potential to generate waste from the following activities:

- Vegetation clearance including native, exotic and noxious species
- Topsoil removal for embankments and removal of soil for road widening
- Utility adjustments.

Waste streams likely to be generated during construction of the overall proposal include:

- Excess spoil –material generated by the REF and overall proposal would be reused on site in areas of fill with the exception of any unsuitable material. The only spoil which would be removed from site is material which is deemed unsuitable for reuse on site
- Green waste as a result of vegetation clearing. Noxious weed material would be separated from native green waste. Green waste would either be mulched and reused on site or sent to a composting facility
- Roadside materials (eg fencing, guide posts and guard rails)
- Packaging and general waste from staff (eg lunch packaging, portable toilets)
- Chemicals and oils
- Waste water from wash-down and bunded areas
- Redundant erosion and sediment controls.

Unsuitable fill material and all other wastes would be classified in accordance with the NSW EPA Waste Classification Guidelines (2014) and disposed of at an appropriately licenced facility. Final waste classification is required once the volumes of waste requiring offsite disposal during construction are confirmed.

There would be only minimal generation of waste from the construction of the REF proposal.

## 6.14.2 Safeguards and management measures

Safeguards and management measures for waste management are presented in Table 6-58.

Table 6-58: Safeguards and management measures for waste impacts

Impact	Environmental management measure	Responsibility	Timing
Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"><li>• Measures to avoid and minimise waste associated with the project</li><li>• Classification of wastes and management options (re-use, recycle, stockpile, disposal)</li><li>• Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</li><li>• Procedures for storage, transport and disposal</li><li>• Monitoring, record keeping and reporting.</li></ul> <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Transport for NSW Land</i> (Transport for NSW, 2014) and relevant Transport for NSW Waste Fact Sheets.</p>	Contactor	Pre-construction
Waste	<p>A Material Re-use and Management Plan (MRMP) will be prepared to:</p> <ul style="list-style-type: none"><li>• Identify strategies to avoid, reduce, reuse and recycle all materials</li><li>• Identify the type, classify and estimate volumes of all materials to be generated and used</li><li>• Identify storage, treatment, transport and disposal options and pathways</li></ul>	Transport	Detailed design

## 6.15 Cumulative impacts

The incremental effect of multiple sources of impact (past, present and future) are referred to as cumulative impacts (Contant and Wiggins, 1991, Council on Environmental Quality, 1978). Cumulative impact assessment considers a Proposal within the context of other past, present and likely future sources of impact. This is necessary to identify any impacts associated with the Proposal that may have an additive effect or interaction with impacts from other activities within the locality to the extent that the overall (cumulative) impact becomes significant when it would not otherwise have been significant.

### 6.15.1 Study area

The REF proposal forms part of the overall proposal, as shown in Figure 1-2. The REF proposal is subject to approval under Division 5.1 of the EP&A Act and has been assessed in this REF. The EIS proposal located within areas mapped as coastal wetlands under the Coastal Management SEPP is subject to approval under Part 4 of the EP&A Act and has been assessed in an EIS.

Other developments and projects that are located near the overall proposal have been included when considering cumulative impacts (refer Section 6.15.3). Developments and projects have been considered where either the construction or operation phases of the projects would overlap with the REF proposal and result in cumulative impacts.

## 6.15.2 Other projects and developments

The other projects and developments which have been identified as relevant when considering the cumulative impacts are:

- The EIS proposal of the Henry Lawson Drive Stage 1A project (in planning stage)
- Henry Lawson Drive and Rabaul Road intersection upgrade (in construction readiness stage)
- Flower Power complex: at Keys Parade intersection immediately south of the overall proposal area (now operational), but incorporated into traffic modelling 'future' scenarios
- Widening of Milperra Drain within Bankstown Golf Course (in construction)
- Bankstown Airport redevelopment (in construction).
- Milperra Road and Murray Jones Drive intersection upgrade (as part of the Bankstown Airport redevelopment by Bankstown Airport Ltd) (in planning).
- Tower Road and Henry Lawson Drive intersection upgrade (as part of the Bankstown Airport redevelopment by Bankstown Airport Ltd) (in planning).
- Riverlands subdivision (in planning).

## 6.15.3 Potential impacts

### 6.15.3.1 Cumulative impacts from projects

#### 6.15.3.1.1 Biodiversity

The potential cumulative biodiversity impacts as a consequence of the construction and operation of the REF proposal are discussed here within the context of the existing environment, present and likely future impacts.

Residential and infrastructure development in the locality in historic and recent times has led to extensive vegetation clearing in the locality and at the catchment scale. Remaining remnant vegetation/habitat has also been affected by a variety of disturbance mechanisms, including clearing of undergrowth, altered fire regimes, feral animals and weed invasion. This habitat loss and disturbance has resulted in the local extinction of a number of species which are less tolerant of habitat loss and disturbance (e.g. woodland birds and small mammals) and an increased risk of extinction to a number of vegetation communities.

Isolated remnant populations of disturbance-sensitive threatened species in such a landscape may be susceptible to local extinction due to seemingly small reductions in habitat area or quality, if the habitat is near the lower limit in size or quality necessary to support a viable population and a critical threshold is reached.

In assessing the cumulative impact of a REF proposal, it is important to consider whether the additive effects of multiple projects and proposals may cause such a critical threshold to be reached for any threatened biodiversity affected.

The following projects and proposals are underway or planned in the locality, which impact on biodiversity values that are likely to be impacted by the current REF proposal, resulting in a cumulative impact. Information has been sourced where it is publicly available:

- Bankstown Airport Redevelopment South West Precinct (in construction)
  - Clearing of 3.5 ha of native vegetation
  - Habitat for Grey-headed Flying Fox, Green and Golden Bell Frog, seven Microchiropteran Bats, Swamp Harrier, Little Eagle, Square-tailed Kite, Eastern Osprey, Varied Sittella, Dusky Woodswallow, Scarlet Robin and Flame Robin



- SIMTA Intermodal Facility (in construction):
  - Clearing of 1.23 hectares of native vegetation
- Milperra Drain Widening (in construction)
  - 0.83 hectares of River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions
  - 0.15 hectares of Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Glenfield Waste Services Materials Recycling Facility (in planning):
  - 9.5 hectares of critically endangered Cumberland Plain Shale Woodland and Shale Gravel Transition Forest
  - Five threatened bat species recorded
- Riverlands subdivision – Milperra (in planning):
  - 0.54 hectares River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions
  - 0.48 hectares Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
  - Southern Myotis
  - Green and Golden Bell Frog
- Henry Lawson Drive – EIS proposal for Stage 1A (in planning)
  - 0.02 hectares of Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
  - 0.02 hectares River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South-east Corner bioregions
  - 0.21 hectares Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions
  - Threatened species including Large Bent-winged Bat, Little Bent-winged Bat, Swift Parrot and Southern Myotis

The REF proposal's removal of 1.69 hectares of native vegetation and habitats would represent an incremental increase to impacts on biodiversity associated with past, present and future projects and proposals within the locality. This incremental increase is considered unlikely to significantly exacerbate impacts on biodiversity such that the critical threshold would be reached.

Cumulative impacts to Freshwater Wetlands on Coastal Floodplains threatened ecological community from the REF proposal and the EIS proposal would have direct impacts on the Freshwater Wetlands on Coastal Floodplains listed as Vulnerable under the BC Act. The combined impact of the proposal would be the direct removal of 0.09 hectares of PCT 781: Coastal Freshwater Lagoons of the Sydney Basin and South East Corner to coastal wetlands.

Cumulative impacts to Freshwater Wetlands on Coastal Floodplains are discussed in the Hydrology, flooding and coastal processes section.

Indirect impacts on biodiversity from noise, dust, light and contaminant pollution are likely to result from activities associated with both the REF and EIS proposals and likely result in incremental cumulative effects. The environmental safeguards and mitigation measures would minimise the potential for cumulative effects.

#### **6.15.3.1.2 Aboriginal cultural heritage**

Cumulative impacts to Aboriginal cultural heritage can result in substantial or total loss of any remaining cultural heritage in an area. This is through the loss of artefacts, sites or knowledge.

The cumulative contribution of the REF proposal on Aboriginal cultural heritage is minor as only a single isolated find would be impacted. The contribution of the EIS proposal is negligible as there are no known Aboriginal heritage sites within the proposed disturbance footprint.

Another seven sites would be subject to total and direct harm from potential future upgrade of sections of the Henry Lawson Drive corridor. Most of these sites are considered to have low significance while two sites have moderate significance. Archaeological mitigation would be required for future upgrade projects where cultural heritage exists, should future transport planning and development occur. The timing of this is uncertain.

#### **6.15.3.1.3 Non-Aboriginal heritage**

The REF proposal includes minor encroachment upon the heritage curtilage of the LEP listed Bankstown Aerodrome on the northern side of the Newbridge Road and Milperra Road intersection. However, the impact would only have a neutral impact to the heritage item. In combination with the heritage impacts associated with the Bankstown Airport Redevelopment, the cumulative contribution of the REF and EIS proposal is considered minor.

#### **6.15.3.1.4 Contamination and soil quality**

The contamination and soil quality impacts relating to the REF proposal have been considered with an understanding of the existing site constraints through the desktop review which highlighted potential issues from nearby sites. It is considered that there is an overall beneficial impact when considering the REF proposal in addition to the surrounding major projects as all projects would manage and/or rehabilitate any known contamination issue.

For example:

- The Flower Power complex had historical indications of elevated CoPC including methane and Landfill Gas (LFG) concentrates. As it has been constructed, it is reasonable to assume the site has been remediated.
- As part of the Bankstown Airport Redevelopment numerous contaminated soil investigations were undertaken and identified potential contaminants including benzo pyrene, PFAS and asbestos. However, no remediation was required, but ongoing monitoring and investigation would take place.

The cumulative impact from the overall proposal includes similar impacts to the REF proposal, noting that the REF proposal involves impacts from a greater scale of construction activities. Compared to the EIS, the REF does have the added risk of asbestos in fill material and a greater scale of soil disturbing activities. At this time, it is estimated around 184 cubic metres of spoil may be produced but this does not include spoil produced from bridge piles (to be confirmed during detailed design).

#### **6.15.3.1.5 Hydrology, flooding and coastal processes**

The flood modelling assessment included the local terrain changes from the recently completed Flower Power complex and additional survey of Milperra Drain near Henry Lawson Drive and the proposed Henry Lawson Drive/ Tower Road intersection upgrade by Bankstown Airport Ltd. These terrain changes formed part of the pre-proposal conditions. The Milperra Drain Widening project and Bankstown Airport redevelopment did not form part of pre-proposal conditions, and were considered as part of future cumulative impacts. These impacts include:

- According to the *Milperra Drain Widening Review of Environmental Factors* (Cardno, 2018), the widening of Milperra Drain would result in a reduction in the depth of flooding at a number of properties along Ashford Avenue and Milperra Road. No increases in flood levels attributable to the widening works are identified. With safeguards, the overall proposal would have only a minor impact on flood behaviour in Milperra Drain. The overall proposal would not adversely affect the benefits of the Milperra Drain widening (ie. reductions in flood levels).

- The Bankstown Airport Masterplan 2019 includes a Flooding and Stormwater Management Strategy that was developed by Bankstown Airport Limited (BAL) in consultation with Canterbury Bankstown Council. This was to manage the flooding impacts from the Bankstown Airport redevelopment. The Strategy includes the provision of detention basins to mitigation impacts on flood behaviour in the receiving drainage lines. With these safeguards, the overall proposal would have only a minor impact on flood behaviour. As such, the cumulative impacts of the overall proposal together with the Bankstown Airport development would also be minor.

The combination of the overall proposal, the Bankstown Airport redevelopment, Flower Power complex, Milperra Drain widening and the intersection upgrade of Tower Road and Henry Lawson Drive would only have a minor drainage and flooding impact on Milperra Drain. Ongoing consultation with Canterbury Bankstown Council would occur during detailed design to assess potential impacts of the REF proposal and to consider emerging hydrology and flooding issues.

It is therefore expected that the overall proposal would not adversely affect the reductions in flood levels in Milperra Drain that are attributable to the widening works within the Bankstown Golf Course.

Given the minor nature of the impacts that are attributable to the overall proposal near Tower Road and Murray Jones Drive, it is expected that the cumulative impacts of these projects in combination with the Tower Road upgrade and the Milperra Road and Murray Jones Drive intersection upgrade would also be minor in nature.

No cumulative impacts on flood behaviour are expected to occur from the Henry Lawson Drive and Rabaul Road intersection upgrade and the Riverlands subdivision as it is located in an area of the Georges River floodplain that is remote from the overall proposal.

Regarding coastal processes<sup>8</sup>, both the REF proposal and the EIS proposal would have direct impacts on the Freshwater Wetlands on Coastal Floodplains threatened ecological community listed as Vulnerable under the BC Act as detailed in the biodiversity section. The key potential operational impacts associated with the proposal on Freshwater Wetlands on Coastal Floodplains relate to changes to hydrology and geomorphology due to increases in impermeable surfaces. The flood assessment also considered aspects that could occur in combination of one another leading to cumulative effects. However, the BAR and BDAR concludes that environmental safeguards and mitigation measures would be implemented to minimise the impacts of both the REF and EIS proposal, and a site specific Erosion and Sediment Control Plan (ESCP) will be prepared and implemented as part of the Construction Soil and Water Management Plan.

#### **6.15.3.1.6 Land use and development**

The overall proposal would have a minimal change to land use in the area. While most of the proposal would be constructed within the existing road corridor, there would be some strip acquisition and change of land use along the Henry Lawson Drive and Milperra Road corridors. Impacts would be related to the mostly partial property acquisition. There are three full property acquisitions being one residential property which would result in a land use change as well as two properties currently partially being used as road corridor and recreation land. As such, these properties would only have a partial change in land use.

Other major projects in the area would have a greater impact on surrounding land use. The Bankstown Airport redevelopment would result in the land use change from airport operational land to commercial development. The Riverlands development would result in a land use change in a large parcel of land along the Georges River from recreational to residential development.

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<sup>8</sup> The flooding assessment included consideration of coastal processes such as tidal conditions, flow velocities (and therefore scour potential and sedimentation), and effects of sea level rise and climate change.

As such, cumulatively, the REF proposal would only contribute a minor impact to land use change in the area.

#### **6.15.3.1.7 Groundwater**

Potential cumulative impacts may include reduced recharge as a result of increased area of impervious surfaces. Increased groundwater and soil salinity may also be a result of stormwater to groundwater interactions.

The key potential cumulative impacts include:

- Interception of ASS or PASS: Infiltration through PASS or ASS would potentially leach acids into the groundwater resource which is shared by the EIS proposal. However, these are to be managed by following Guidelines for the Management of Acid Sulphate Materials 2005 (RMS, 2005) and the CEMP of this proposal.
- Accidental spills or leaks of chemicals, oils and greases that, if not managed appropriately, could contaminate the groundwater.
- Impacts on groundwater from the piling works at the Auld Avenue bridge duplication, and the impacts from a greater scale of construction activities.
  - Piling is considered to present a minimal risk to GDEs and coastal wetlands within the REF extents based on the proposed methodology.
  - Despite the low risk, piling activities will be closely monitored. In addition, although aquifer drawdown is not proposed, if groundwater dewatering must occur for the overall proposal, then further information and approvals will be required.

The cumulative impact from the overall proposal includes similar impacts to the REF proposal, noting that the REF proposal involves impacts from a greater scale of construction activities.

When considering the REF proposal in addition to the surrounding major projects, this REF proposal is not of a nature that would draw upon the groundwater aquifer as a water supply. Impacts on groundwater would therefore be via interactions during excavations. The contribution of the REF proposal to cumulative impacts is expected to be minor and short term during the construction period.

#### **6.15.3.1.8 Surface water**

During construction, potential negative impacts to water quality of the sensitive receiving environments could arise if construction of future developments were to occur concurrently with the proposal.

Given the current status of surrounding projects, it is expected that the main civil earthworks and surface infrastructure for the Bankstown Airport redevelopment, the Milperra Drain widening and the Tower Road/ Henry Lawson Drive intersection would be completed before the REF proposal commences construction in early 2023. If occurring concurrently, in a worst case scenario, the potential impacts would likely include increases in water quality parameters such as TSS, TDS and turbidity due to the disturbance or removal of groundcover and bulk earthworks. However, the safeguards and mitigation measures for the REF proposal would be sufficient to avoid and manage the proposal's cumulative contribution to water quality impacts.

During operation, the overall proposal could contribute to the cumulative water quality impacts on the Georges River with other surrounding projects and proposals. Each project and proposal would be expected to manage water quality within the sub-catchments of their development and in accordance with the objectives of the Coastal Management SEPP and the Greater Metropolitan Regional Environmental Plan No 2 – Georges River Catchment. The overall proposal aims to have a neutral cumulative contribution to water quality parameters that include gross pollutants, total nitrogen, total phosphorus and TSS.

The safeguards and mitigation measures identified for the REF and EIS proposals would be sufficient to achieve a neutral cumulative contribution. This would include further investigations for stormwater quality controls in the broader sub-catchments in consultation with Canterbury Bankstown Council.



### **6.15.3.1.9 Traffic and transport**

The traffic modelling for the overall proposal used a broader road network as the study area to capture expected future traffic generation from proposed future land use changes. Forecasted traffic volumes adopted for the REF proposal therefore include the Bankstown Airport Redevelopment, Flower Power complex and the proposed Riverlands subdivision. Traffic modelling results are detailed in Section 6.6.3.

### **6.15.3.1.10 Noise and vibration**

The noise and vibration impacts of the REF proposal have been summarised in Section 6.7.4. The main impacts on sensitive receivers would be during construction, in particular night-time periods. The REF proposal is expected to commence construction in early 2023. By this time, the projects and proposals that have common sensitive receivers to the REF proposal are expected to be complete, including Bankstown Airport Redevelopment and the intersection upgrades of Tower Road/ Henry Lawson Drive and Milperra Road/ Murray Jones Drive. Therefore cumulative construction impacts of the REF proposal in combination with these other projects and proposals are not expected to occur.

The Riverlands subdivision is located some distance away from the noise catchment areas and sensitive receivers impacted by the REF proposal. As a result, cumulative impacts are considered unlikely from the combination of these proposals.

The cumulative impact of both the REF and EIS proposals would not be greater than the REF proposal itself, noting that the EIS proposal has limited noise and vibration impacts as there are no sensitive receivers within the EIS proposal areas.

During operation, predicted noise impacts have been based on future forecasted traffic volumes that include the Bankstown Airport Redevelopment, Flower Power complex and the proposed Riverlands subdivision. On this basis, the proposed noise mitigation for several sensitive receivers (refer Section 6.7.5) addresses the cumulative contribution of traffic noise from these other projects and proposals.

### **6.15.3.1.11 Socio-economic**

Cumulative impacts could occur during construction if other projects are constructed concurrently or in close timing with the overall proposal. It is expected that the overall proposal would commence construction soon after the completion of surrounding projects, including the Bankstown Airport Redevelopment and the intersection upgrades of Tower Road/Henry Lawson Drive and Milperra Road/Murray Jones Drive.

This would mean the community would experience construction activity in the local area for an extended period of time of about five years. Cumulative impacts from construction would be in the form of reduced amenity and traffic disruptions. Potential consultation and construction fatigue for local communities and stakeholders could also be experienced. The magnitude of the cumulative impacts due to concurrent construction projects are moderate, resulting in the level of significance being moderate.

During operation, the overall proposal is not expected to make a substantial negative contribution to cumulative impacts in combination with other projects and proposals. Design development of the REF proposal has included expected demand and growth from surrounding developments and land uses. The overall proposal is needed to support these other projects and proposals once they are constructed and in operation. The sensitivity of the community to cumulative socio-economic impacts is negligible. The magnitude of the cumulative impacts (amenity, access, land use changes, social infrastructure and businesses) during operation is negligible, resulting in the level of significance being negligible.

#### **6.15.3.1.12 Air quality**

As the REF proposal is the larger component of the overall proposal, it substantially contributes to the construction air quality impacts of the overall proposal.

The cumulative impact from the overall proposal includes similar impacts to the REF proposal, noting that the REF proposal involves impacts from a greater scale of construction activities.

There is potential for cumulative impacts relating to dust generation, during construction of the REF proposal along with the construction of the surrounding development. With incorporation of safeguards, the proposal would have only a minor impact in terms of cumulative dust generation.

The overall proposal would have the larger cumulative contribution to air emissions from transport, once operational. In the long-term this is expected to reduce if the implementation of Transport for NSW's Future Transport 2056 Strategy, Future Energy Action Plan 2020-2025 and NSW Government Climate Change Policy is successful. It is also noted that the overall proposal would be catering for future demand that would be driven by surrounding development, not by the road in itself.

#### **6.15.3.1.13 Risk/hazard**

The REF proposal involves a greater land area of bushfire risk which requires consideration and management.

The cumulative impact from the overall proposal would otherwise be similar as the EIS proposal impacts relating to risk/hazard (bushfire risk and Airport operations) would be adequately managed. There is limited bushfire risk from the other major developments and therefore there would not be a cumulative impact. The increased capacity from the REF proposal, however, could assist the traffic generating developing development evacuate during times of bushfire or flood emergencies.

The surrounding developments also would not have impacts on the airport operations.

With the incorporation of safeguards, the proposal would only have a minor impact in terms of cumulative impacts relating to risk/hazards.

#### **6.15.3.1.14 Waste management**

The REF proposal involves a greater amount of waste generation which requires consideration and management. There would be waste generated from the other projects, however, they have similar safeguards in place. For example, Bankstown Airport Redevelopment have stated that any demolition waste would, where practicable, be recycled at Bankstown Airport. The Bankstown Airport Contractor will also prepare a detailed waste management plan. In terms of operational waste, Bankstown Airport have an Operational Environmental Management Plan that will include waste management procedures for the site. A Waste Management Plan was also prepared for the Riverlands subdivision, as part of their development application.

The cumulative impact from the overall proposal would otherwise be similar as the EIS proposal impacts relating to waste would be adequately managed.

With the incorporation of safeguards, the REF proposal would only have a minor impact in terms of cumulative impacts relating to waste.

#### 6.15.4 Safeguards and management measures

Safeguards and management measures for hazard and risk are presented in Table 6-59.

Table 6-59: Safeguards and management measures for cumulative impacts

Impact	Environmental management measure	Responsibility	Timing
Cumulative impacts	<p>Ongoing consultation will be undertaken between Proponents and construction contractors of surrounding projects to identify the potential for cumulative impacts to occur should construction occur concurrently with the overall proposal.</p> <p>Co-ordination of traffic management controls will be considered to minimise cumulative traffic impacts, particularly during peak holiday periods.</p> <p>Co-ordination of out of hours work will be considered to minimise cumulative noise impacts to sensitive receivers and to ensure respite periods are achieved for sensitive receivers.</p>	Transport/ Contractor	Detailed design/ Pre-construction/ Construction

## 7 Environmental management

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### 7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the overall proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the overall proposal.

A CEMP will be prepared to describe the safeguards and management measures identified for the overall proposal. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment Manager prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the : QA Specification G36 – *Environmental Protection (Management System)*, QA Specification G38 – *Soil and Water Management (Soil and Water Plan)*, QA Specification G40 – *Clearing and Grubbing*, QA Specification G10 – *Traffic Management*.

The Contractor's CEMP as required under QA Specification G36 will identify the monitoring requirements during construction of the overall proposal which will include but not be limited to: monitoring of water quality upstream and downstream of construction works, noise monitoring, vibration monitoring, and other required monitoring to respond to community complaints. The following Transport environmental inspection and incident reporting procedures will be followed during construction:

- Transport for NSW's Environmental Inspection Procedure
- Transport for NSW's Environmental Incident Procedure.

In the long term, the asset will be put into the Transport asset and maintenance system and would be subject to periodic maintenance inspections, including inspections of operational water quality controls and undertaking any required maintenance.

### 7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures identified in Chapter 6 are consolidated to form a single set of measures and these are summarised in Table 7-1.



Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>General</b>				
GEN1	Minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. It is also the responsibility of the Contractor to provide a copy of the CEMP to Canterbury Bankstown Council for review.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> <li>• Any requirements associated with statutory approvals</li> <li>• Details of how the project will implement the identified safeguards outlined in the REF</li> <li>• Issue-specific environmental management plans</li> <li>• Roles and responsibilities</li> <li>• Communication requirements</li> <li>• Induction and training requirements</li> <li>• Procedures for monitoring and evaluating environmental performance, and for corrective action</li> <li>• Reporting requirements and record-keeping</li> <li>• Procedures for emergency and incident management</li> <li>• Procedures for audit and review.</li> </ul> <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor / Transport	Pre-construction / during construction
GEN2	Notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five working days prior to commencement of the activity.	Contractor / Transport	Pre-construction
GEN3	Environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> <li>• Threatened species habitat</li> <li>• Unexpected finds procedure</li> <li>• Adjoining residential areas requiring noise awareness, behavioural practices and mitigation measures.</li> </ul>	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>Biodiversity</b>				
B1	Removal of native vegetation and habitat features/ Removal of threatened species habitat	<p>Native vegetation and habitat removal will be minimised through detailed design processes in particular, to minimise impacts on Hollow-bearing trees, <i>Callistemon linearifolius</i> and Threatened Ecological Communities, where possible, with consideration to:</p> <ul style="list-style-type: none"> <li>• Placement of embankments and adopting alternative options such as retaining walls to minimise the construction footprint.</li> <li>• Ground survey locations of hollow bearing trees, <i>Callistemon linearifolius</i> and <i>Acacia pubescens</i> for inclusion onto design plans and integration into constructability assessments.</li> </ul>	Transport	Detailed design
B2	Removal of native vegetation and habitat / Removal of threatened plants	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	Prior to construction
B3	Removal of native and non-native vegetation and habitat/ Injury and mortality of fauna	Vegetation and habitat removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
B4	Removal of native vegetation and habitat	Native vegetation will be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011) and the landscaping plans for the proposal.	Contractor	During construction
B5	Removal of native vegetation and habitat/ Wildlife corridors and connectivity	The unexpected species find procedure under Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (RTA 2011) will be implemented if TECs or threatened fauna, not assessed in the biodiversity assessment, are identified in the REF proposal area.	Contractor	During construction
B6	Removal of native vegetation and habitat / Impacts to habitat in human made structures	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
B7	Impacts to habitat in human made structures	Develop options for providing microbat roosting habitat during detailed design processes for culvert structures particularly for the Southern Myotis ( <i>Myotis macropus</i> ).	Transport	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
B8	Microbat survey and habitat	<p>A targeted microbat survey of structures within the footprint and proposed for removal or modification would be undertaken in accordance with 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH, 2018b), prior to construction or as soon as feasible prior to disturbance.</p> <p>If threatened microbats are detected, a Microbat Management Plan will be developed as part of the Construction Environment Management Plan and implemented by a suitably qualified bat specialist. A copy of the Microbat Management Plan would be submitted to Canterbury Bankstown Council for review</p>	Contractor	Pre-construction and during construction
B9	Removal of native vegetation/Aquatic impacts/Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011). This will include demarcating riparian exclusions zones to protect aquatic habitats and riparian zones where works are not required.	Contractor	During construction
B10	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
B12	Indirect impacts on native vegetation and habitat	The Landscaping Plan and the Construction Flora and Fauna Management Plan, the latter comprising a Weed Management Sub-Plan will be prepared in accordance with the DPI Office of Water Guidelines for Vegetation Management Plans on Waterfront Land (2012).	Contractor	Pre-construction
B13	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).	Contractor	During construction
B14	Indirect impacts on native vegetation and habitat	<p>Shading and artificial light impacts will be minimised where practicable taking into account minimum luminescence requirements for:</p> <ul style="list-style-type: none"> <li>• Safety when constructing during the night-time period</li> <li>• An urban road as outlined in the Australian Standards through detailed design.</li> </ul>	Transport/ Contractor	Detailed design/ during construction
B15	Impacts to habitat in non-native vegetation	<p>Habitat will be replaced or re-instated in accordance with:</p> <ul style="list-style-type: none"> <li>• Urban design landscaping plans which will include revegetation with local native vegetation species, suitable for the riparian zone considering vegetation species that adopts existing communities and landscape character, and uses local provenance.</li> <li>• Guide 5: Re-use of woody debris and bushrock</li> </ul>	Transport/ Contractor	Detailed design/ during construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011).</li> <li>Canterbury Bankstown Council will be consulted with at the detailed design stage in regard to the selection of vegetation species in the landscaping plans.</li> </ul>		
B16	Injury and mortality to fauna - vehicle strike	<p>Opportunities to minimise road-kill will be identified in the design process with consideration to:</p> <ul style="list-style-type: none"> <li>Available space.</li> <li>Avoid creating features too close to the roadside that would attract fauna to the roadside.</li> <li>Using landscaping techniques to create suitable buffers and to separate any potential attracting features from the roadside.</li> <li>A roadside planting palette that does not intentionally attract fauna to the roadside.</li> </ul>	Transport	Detailed design
B17	Aquatic impacts	<p>Aquatic habitat will be protected in accordance with:</p> <ul style="list-style-type: none"> <li>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011)</li> <li>Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013)</li> <li>Acid Sulfate Soil Management Plan</li> <li>Construction Soil and Water Management Plan.</li> </ul>	Contractor	During construction
B18	Aquatic impacts	<p>Consider detailed design refinements and constructability options that ensure that fish passage is not blocked during construction of the new Auld Avenue bridge.</p> <p>During construction, in stream works to construct the Auld Avenue bridge will ensure that fish passage is not blocked.</p>	Transport / Contractor	Detailed design/ During construction
B19	Aquatic impacts	<p>Consultation with NSW DPI Fisheries Regional Conservation Manager will be undertaken to discuss the best approach to construction works within aquatic habitats and riparian zones. This will also help identify whether any trees to be removed for the proposal can be used to re-sag waterways.</p>	Contractor	Pre-construction
B20	Removal of riparian vegetation, and impacts to GDEs	<p>Consider detailed design refinements and constructability options that minimise removal of riparian vegetation. This includes ensuring any access to the waterway, if required, minimises the removal of riparian vegetation and is restricted to the minimum amount of bank length required for the construction activity.</p>	Transport	Detailed design



No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>Further consideration of minimising direct impacts to riparian vegetation and GDEs will be undertaken during detailed design and construction.</p> <p>Relevant approvals and permits must be obtained prior to removal of mangroves.</p>		
<b>Hydrology, flooding and coastal processes</b>				
H1	Construction and management of ingress, changes to surface water flows and scour	<p>A Construction Soil and Water Management Plan will be prepared to guide construction methods in implementing the following measures in accordance with Blue Book (Managing Urban Stormwater, Soils and Construction Volume 2D Main Road construction):</p> <ul style="list-style-type: none"> <li>Intercepting clean water flows from areas upslope of the REF proposal areas and diverting it in a controlled manner whether through or around the construction work areas to avoid or minimise mixing of 'clean' water flows with 'dirty' sediment-laden runoff from work areas.</li> <li>Minimise the potential for scour by implementing surface stabilisation, scour protection measures and energy dissipation measures</li> <li>Implement a 'wet weather' Erosion and Sediment Control Plan that includes stabilisation of exposed earthworks prior to the onset of heavy rainfall or predicted flooding.</li> </ul> <p>In addition, changes to surface water flows (volume and velocity) will be minimised by:</p> <ul style="list-style-type: none"> <li>Detailed design of drainage infrastructure that provides sufficient capacity and energy dissipation controls.</li> </ul>	Transport/ Contractor	Detailed design/ Pre-construction
H2	Site facilities and flood emergency management within ancillary sites, management of adverse flood impacts on neighbouring properties	<p>The CEMP will include a Construction Flood Management Plan Sub-Plan. This Sub-Plan will include details and procedures to minimise the potential for construction activities to adversely impact on flood behaviour in neighbouring properties.</p> <p>Measures to manage residual flood impacts will include:</p> <ul style="list-style-type: none"> <li>Staging construction to limit the extent and duration of temporary works on the floodplain</li> <li>Ensuring construction equipment and materials are removed from floodplain areas at the completion of each work activity or should a weather warning be issued of impending flood producing rain</li> <li>Providing temporary flood protection to properties identified as being at risk of adverse flood impacts during any stage of construction of the proposal</li> <li>Developing flood emergency response procedures to remove temporary works during periods of heavy rainfall.</li> </ul> <p>For the ancillary facilities located within the floodplain, a Construction Flood Management Sub-Plan will include the following additional components:</p> <ul style="list-style-type: none"> <li>Limit the extent of works located in floodway areas</li> </ul>	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>• A procedure to monitor weather conditions (existing and forecast conditions), including minor rain events, local weather warnings and river water level data</li> <li>• A communication protocol to disseminate warnings to construction personnel of impending flood producing rain or predicted flooding in the Georges River and actions required to make construction areas stable and safe.</li> <li>• An evacuation plan for construction personnel should a severe weather warning or flood alert for the Georges River be issued.</li> </ul>		
H3	Material storage and stockpiling within ancillary sites	<p>The storage of hazardous material in ancillary facilities located within the floodplain will be confined to areas that are not subject to flooding during a 1% AEP extent or either:</p> <ul style="list-style-type: none"> <li>• Stored in a manner that prevents their mobilisation during times of flood</li> <li>• Be removed from the floodplain when minor rain events are predicted to inundate storage areas and at the onset of a flood.</li> </ul> <p>The Construction Flood Management Sub-Plan will define the flood immunity criteria (including consideration of inundation from minor rain events) for material storage and stockpile areas proposed to be located on land that is inundated during a 1% AEP event.</p> <p>Erosion and sediment (ERSED) controls are to be installed around ancillary facilities located within the floodplain to reduce the risk of sediment runoff. These ERSED controls are to be integrated into any exclusion zone or property boundary demarcation.</p>	Contractor	Pre-construction/ Construction
H4	Management of adverse flood impacts on neighbouring properties	<p>A detailed hydrologic and hydraulic (flood) assessment will be undertaken during detailed design to assess the impacts of the REF proposal on flood behaviour and the associated measures which are required to mitigate those impacts.</p> <p>Subject to the flood assessment during detailed design a detailed ground survey (including floor levels of buildings) may need to be undertaken in affected areas to determine whether the proposal would increase flood damages in adjacent development (i.e. in properties where there is a potential for increases in peak flood levels for events up to 1% AEP in magnitude).</p>	Transport	Detailed design
H5	Management of adverse flood impacts on the existing environment	<p>During detailed design, the following measures will be implemented to manage adverse flood impacts:</p> <ul style="list-style-type: none"> <li>• The road alignment will be further refined to minimise the increase in road levels and peak flood levels compared to pre-proposal conditions.</li> <li>• Works within the floodplain will be designed to minimise adverse impacts on surrounding development for flooding up to the 1% AEP event in magnitude.</li> </ul>	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>Incorporate measures that are aimed at mitigating its impact on flood behaviour in properties where existing buildings would experience above-floor inundation during floods up to the 1% AEP event.</li> <li>The provision of scour protection and energy dissipation measures will be included in order to mitigate the localised increases in flow velocities at the outlets that are to be upgraded, relocated or new stormwater drainage systems.</li> </ul>		
H6	Bridge construction	<p>In order to construct the central pier for the new Auld Avenue bridge, a temporary working platform may be located across part of the main channel of Milperra Drain that is frequently inundated by flow. The temporary working platform will be designed and constructed to manage the potential for scour and transport of material into Milperra Drain, while maintaining passage for floodwater through the construction site.</p> <p>Consider detailed design refinements to temporary working platforms that may be required on the overbank of Milperra Drain to construct the new bridge that minimise the impact on the in-bank area of the watercourse.</p> <p>The contractor will use clean rock fill for the construction of the temporary working platforms.</p>	Transport/ Contractor	Detailed design/ Construction

#### Surface water

SW1	Construction surface water quality	<p>The Concept Design Erosion and Sedimentation Strategy will be reviewed and updated during detailed design. The Strategy will be based on detailed design construction staging plans and construction methodologies. The Strategy will be revised in accordance with Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom 2004) and 2D (main road construction) (DECC 2008) and Transport's Environmental Management of Construction Dewatering (RTA 2011).</p> <p>A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Construction Soil and Water Management Plan. These Plans will further develop the Construction Erosion and Sediment Control Strategy developed in detailed design and be consistent with the above guidelines of the 'Blue Book' (Landcom, 2004, DECC 2008 and RTA 2011).</p> <p>The ESCP will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</p>	<p>Transport</p> <p>Contractor</p>	<p>Detailed design</p> <p>Pre-construction/ Construction</p>
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No.	Impact	Environmental safeguards	Responsibility	Timing
SW2	Contamination of surface water	The refuelling and maintenance of plant and equipment will be undertaken in a designated sealed bunded area at ancillary facilities, where possible.	Contractor	During construction
SW3	Contamination of surface water	Vehicle wash downs and concrete washouts will be carried out within designated sealed bunded areas at construction ancillary facilities, or carried out off-site.	Contractor	During construction
SW4	Contamination of surface water	Regular visual water quality checks (include for turbid plumes and hydrocarbon spills or slicks) will be carried out when working in or near waterways.  Construction water quality monitoring will be undertaken upstream and downstream of the REF proposal to ensure that controls and site practices are effective at maintaining current water quality conditions. Monitoring will be undertaken in accordance with the Guideline for Construction Water Quality Monitoring (RTA, undated).	Contractor	During construction
SW5	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will include measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport and EPA).	Contractor	Pre-construction/ During construction
SW6	Accidental spill	Emergency spill kit will be kept on site at all times. Spill kits will be located at all ancillary facilities and main construction work areas. All staff would be made aware of the location of the spill kit and trained in its use.	Contractor	Construction
SW7	Stormwater runoff and water quality of the Georges River and Milperra Drain	The Concept Design Operational Water Quality Strategy will be reviewed and updated during detailed design to achieve the operational water quality objective and identify additional opportunities in the wider sub-catchments to reduce total nitrogen loads to Georges River and Milperra Drain, in consultation with Canterbury Bankstown Council. The Operational Water Quality Strategy will consider Transport's Water Sensitive Urban Design Guidelines (RMS 2017) and potential impacts of proposed water quality controls to the surrounding area.	Transport	Detailed design
<b>Groundwater</b>				
G1	Disturbance to GDEs	Where disturbance cannot be avoided, appropriate mitigation measures will be adopted to prevent impacts outside of the required areas of disturbance. This may include use of physical barriers, boundary demarcation and signage to prevent intrusion of contractors and equipment into sensitive areas, and ongoing monitoring to ensure disturbance footprints do not extend outside of set boundaries	Contractor	Construction



No.	Impact	Environmental safeguards	Responsibility	Timing
G2	Groundwater dewatering during excavation	<p>In the event that groundwater/ aquifer dewatering must occur to lower the groundwater table and reduce or prevent groundwater ingress into excavations, then potential impacts on GDEs must be quantitatively assessed prior to dewatering along with appropriate management measures and documented in a site dewatering management plan.</p> <p>Quantitative assessment must include assessment of the magnitude and duration of drawdown and whether impacts are likely to adversely affect the habitat conditions and ecological communities within the GDEs.</p> <p>Relevant approvals and permits must be obtained prior to groundwater/ aquifer dewatering.</p>	Contractor	Construction
G3	Shallow excavations within the topsoil and fill materials for embankments	A Construction Soil and Water Management Plan, Construction Flora and Fauna Management Plan and a Clearing and Grubbing Plan will include mitigation measures and procedures to identify further opportunities to minimise direct impacts to GDEs.	Contractor	Pre-construction/ Construction
G4	Mobilisation of acid sulfate soils	<p>An Acid Sulfate Soil Management Plan (ASSMP) will be prepared and implemented to manage PASS or ASS exposed from excavations of soils between 2 and 4 metres, changes to groundwater levels and stockpiling.</p> <p>The ASSMP will be informed by the results of the Detailed Site Investigation that will include the identification of presence and extent of ASS/PASS, particularly around the proposed bridge duplication works over Milperra Drain near Auld Avenue.</p>	Contractor	Pre-construction/ Construction
G5	Groundwater contamination, piling and excavations	<p>A site contamination management plan (CMP) will be prepared and implemented in the event that contaminated groundwater is encountered during construction activities, this should be completed before construction occurs.</p> <p>During construction any intercepted groundwater, including piling works, should be managed under the project CEMP to mitigate risks associated with the potential mobilisation or release of contamination to the groundwater, improper storage and disposal of intercepted groundwater.</p> <p>A baseline groundwater monitoring program of the overall proposal area will be undertaken during detailed design.</p>	Contractor	Pre-construction/ During construction
G6	Groundwater levels and contamination – piling and excavations	Regular inspection of pile borings will be carried out to identify any occurrence of light non-aqueous phase liquids (LNAPL), oils, staining, or odours and to prevent any accumulation of potential contamination within pile borings.	Contractor	Pre-construction/ During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>Soils</b>				
S1	Risk of contamination from APECs	A Detailed Site Investigation should be undertaken near the APECs showing a moderate risk of COPCs at concentrations above the Tier I screening values. The scope of the DSI should be detailed in a Sampling Analysis and Quality Plan (SAQP) which should include collection of soil, groundwater and landfill gas samples near moderate risk APECs. The scope of the DSI should be in accordance with the NEPM 2013 and analytical results compared to the applicable Tier I screening values in Schedule B2 of the NEPM 2013.	Transport	Detailed design
S2	Contamination from onsite filling	<p>Analytical results from any spoil requiring off-site disposal will be sorted in accordance with:</p> <ul style="list-style-type: none"> <li>NSW EPA Waste Classification Guidelines Parts 1 to 4 and Addendum 1.</li> </ul> <p>If natural soil is disturbed, it may meet the definition of Excavated Natural Material and the analytical data will be compared to the concentrations and requirements with:</p> <ul style="list-style-type: none"> <li>ENM Resource Recovery Order and Exemption under the Protection of Environmental Operations (Waste) Act 2000.</li> </ul>	Contractor	During construction
S3	Risk of potentially impacted soil migrating	<p>A Contaminated Land Management Sub-Plan will be prepared and implemented as part of the CEMP. This will address the risk of potentially impacted soil migrating from site during construction and include standard practices for dust suppression, and erosion and sedimentation control. Other controls in the Contaminated Land Management Sub-Plan will include:</p> <ul style="list-style-type: none"> <li>An Unexpected Finds Protocol (UFP) and the Construction Work Health and Safety (WHS) Plan will include a UXO risk assessment and any management measures.</li> <li>Mitigation of the risk that contaminated groundwater is encountered during construction activities. During construction any intercepted groundwater will be managed under the CEMP to mitigate risks associated with the potential mobilisation or release of contamination to the groundwater, improper storage and disposal of intercepted groundwater.</li> <li>Monitoring of excavations for volatile gases that may be present as a result of hydrocarbon contamination, which may pose a risk to human health and built environment.</li> <li>Proper use of work health and safety (WHS) equipment and monitoring of works where asbestos or other contamination is identified.</li> <li>Response plan if accidental major spills and leaks occur detailing remediation steps necessary to reduce impact to nearby coastal wetlands and GDEs.</li> </ul>	Contractor	Pre-construction
S4	–Unexploded Ordnance	Prior to any ground disturbance directly west of the Bankstown Aerodrome property boundary, a risk assessment will be undertaken to determine the likelihood of UXO being present and the required management measures to mitigate the risk.	Transport/ Contractor	Detailed design/ Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>Traffic and transport</b>				
T1	Traffic Management Plan	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport for NSW Traffic Control at Work Sites Manual (RMS, 2020) and QA Specification G10 Control of Traffic (Transport, 2020). The TMP will include:</p> <ul style="list-style-type: none"> <li>• Confirmation of haulage routes</li> <li>• Measures to maintain access to local roads and properties</li> <li>• Construction traffic control plans outlining site-specific traffic control measures (including signage) to manage and regulate traffic movement</li> <li>• Measures to maintain pedestrian and cyclist access (with the implementation of a Vehicle Movement Plan)</li> <li>• Requirements and methods to consult and inform the local community of impacts on the local road network</li> <li>• Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads</li> <li>• A response plan for any construction traffic incident</li> <li>• Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic</li> <li>• Monitoring, review and amendment mechanisms.</li> </ul> <p>The TMP will ensure the following:</p> <ul style="list-style-type: none"> <li>• Alternative routes for active transport users will be clearly identified by signage and the use of traffic controllers where required.</li> <li>• Property access will be maintained where feasible and reasonable and property owners will be consulted well in advance of work starting that may temporarily restrict or control access.</li> <li>• Public transport providers and users will be notified in advance of any changes to bus stop locations through signage at the existing bus stops on Milperra Road.</li> <li>• Canterbury Bankstown Council will be consulted of any detours in accordance with the Traffic Management Plan and the Community Liaison Plan.</li> </ul>	Contractor	Pre-construction/ during Construction
T2	Traffic impacts	Further traffic modelling will be carried out during detailed design based on detailed construction methods and traffic staging. Traffic modelling will assess the potential traffic impacts from detailed design and identify whether any additional mitigation measures or traffic control measures will be required.	Transport	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		Further investigations on the layout of the Auld Avenue intersection will be undertaken during detailed design, including traffic monitoring and design options to identify the most optimal layout for this intersection. Any change in the layout will be based on balancing a range of issues including road safety and road network performance, as well as considering any future opportunities for broader connectivity.		
T3	Impact on bus stops or routes	Temporary and permanent bus stop relocation will be discussed with the relevant bus operator.	Transport/ Contractor	Pre-construction
T4	Construction traffic	Heavy vehicle movements to be minimised during peak traffic periods (i.e. not between 7.15 and 8.15 am or 4.45 and 5.45 pm), where practical.	Contractor	During Construction
T5	Traffic management measures	Any temporary traffic diversions, clearways and lane closures for work carried out will be implemented in accordance with Transport Management Centre (TMC) and Canterbury Bankstown Council requirements.	Contractor	During Construction
T6	Parking	Off-road parking for construction vehicles will be provided within the ancillary facility and construction areas.	Contractor	During Construction
T7	Damage to local roads	Any damage to the local road network identified to be caused by construction vehicles for the proposal will be remediated by the contractor to be similar to the existing road condition.	Contractor	During Construction
T8	Access	Driveway access to residential properties will be designed in greater detail in detailed design. Sight distances, setbacks and gradients will be designed in accordance with the Australian Standards, Austroads Road Design Guides, RMS (Transport) Supplements and Canterbury Bankstown Council Standard Drawings.	Transport/ Contractor	Detailed design / Pre-construction
<b>Noise and vibration</b>				
N1	Construction noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will be prepared in accordance with the Construction Noise and Vibration Guideline (Roads and Maritime 2016) NSW EPA Interim Construction Noise Guideline and identify:</p> <ul style="list-style-type: none"> <li>• All potential significant noise and vibration generating activities associated with the activity</li> <li>• A monitoring program to assess performance against the noise and vibration criteria</li> <li>• Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</li> <li>• Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</li> </ul>	Contractor	Pre-construction / during Construction



No.	Impact	Environmental safeguards	Responsibility	Timing
N2	Out of hours work	<p>Out of hours works will be undertaken in accordance with the Construction Noise and Vibration Guideline (Roads and Maritime 2016). This includes:</p> <ul style="list-style-type: none"> <li>• Offer respite and/or restricted construction hours where noise intensive works are planned over extended periods, especially where they occur outside of standard hours. This may include moving the construction work front to different areas so that sensitive receivers are not impacted for longer than two consecutive days</li> <li>• No more than two consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same NCA over any 7-day period, unless otherwise negotiated with affected receivers.</li> </ul>	Contractor	During Construction
N3	Out of hours work	Noisiest activities should be limited to standard construction hours, where practicable.	Contractor	During Construction
N4	Noise and vibration	<p>All sensitive receivers (eg local residents) likely to be affected will be notified at least 5 working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> <li>• The proposal</li> <li>• The construction period and construction hours</li> <li>• Contact information for project management staff</li> <li>• Complaint and incident reporting</li> <li>• How to obtain further information.</li> </ul>	Contractor	During Construction
N5	Noise and vibration	<p>A register of most affected noise and vibration sensitive receivers (NVSRs) will be kept on site and maintained. The register will include the following details for each NVSR:</p> <ul style="list-style-type: none"> <li>• Address of receiver</li> <li>• Category of receiver (e.g. Residential, Commercial etc.)</li> <li>• Contact name and phone number.</li> </ul> <p>The register is to be included as part of the Proposal's Community Liaison Plan or similar document and maintained in accordance with the requirements of this plan.</p>	Contractor	During Construction
N6	Noise and vibration	Source controls will be employed to minimise noise impacts, such as using noise screens and mufflers, maximising offset distance, and orienting plant away from sensitive receivers.	Contractor	During Construction
N7	Noise and vibration	The selection of plant and machinery will consider noise emissions, operated to reduce maximum noise levels, maintained regularly and turned off when not in use.	Contractor	During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
N8	Operational Road Traffic Noise	An operational noise and vibration management plan will be prepared and implemented. The plan would further develop reasonable and feasible mitigation strategies reducing identified noise impacts.	Transport	Post Construction
<b>Aboriginal heritage</b>				
A1	Aboriginal heritage impact permit (AHIP)	An AHIP will be sought prior to construction for HLD Site 5 (IF).	Transport/ Contractor	Detailed design/ During construction
A2	Aboriginal and Non-Aboriginal heritage – unexpected finds	The Standard <i>Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that an unknown or potential Aboriginal and/or Non Aboriginal object/s, including skeletal remains, is found during construction. The construction workforce will be inducted and trained in the procedure. The procedure applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	During construction
A3	Additional Aboriginal heritage impacts	Any further impacts proposed beyond the proposal area must be subject to further assessment and consultation with Aboriginal stakeholders, consistent with the process in this report	Transport/ Contractor	Detailed design/ during construction
<b>Non-Aboriginal heritage</b>				
NA1	General	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage.	Contractor	Detailed design/ pre-construction
<b>Landscape character and visual impacts</b>				
V1	Visual amenity and urban design	Urban design development of the proposal will continue through to detailed design for the overall proposal, of which a portion includes the REF Proposal. Urban design will be integrated into project development processes.  The following policy/guidelines will guide future design development of the proposal: <ul style="list-style-type: none"> <li>• Transport Urban Design Policy (Beyond the Pavement)</li> <li>• Transport Urban Design Guidelines.</li> </ul>	Transport	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		The urban design objectives, principles and concept design strategy presented in the urban design report for the REF and EIS proposals will form the basis for future design development and consultation with stakeholders.		
V2	Earthworks and landscape character	Integrate earthworks with adjoining landform to avoid sharp transition in profile through the adoption of appropriate grades, where possible.	Transport	Detailed design
V3	Earthworks and landscape character	Stabilise and progressively revegetate exposed ground as works progress to limit erosion and visual impacts through early integration with surrounding vegetation.	Contractor	During construction
V4	Revegetation	Plants used in revegetation will be consistent with existing communities, including riparian vegetation, and support the existing landscape character. Revegetation will use local provenance material and proposed tree species which provide canopy cover and minimise urban heat effects.	Transport	Detailed design
V5	Tree management and removal	Any tree removal or pruning will be undertaken by a qualified specialist and in accordance with AS4970: 2009: Protection of Trees on Development Sites (Standards Australia, 2009) and AS4373:2007: Pruning of Amenity Trees and WorkCover Amenity Tree Industry Code of Practice 1998.	Contractor	Pre-construction / Construction
V6	Minimise road furniture and signage	Provide minimum signage requirements and limit structural elements to provide an open and permeable setting.	Transport	Detailed design
V7	Lighting	Minimise lighting and potential for light spill.	Transport	Detailed design
V8	Lighting	Minimise night works and provide lighting which minimises light spill.	Contractor	During construction
V9	View management	Provide visual screening to minimise the visual impact in areas identified as moderate or high impact.	Transport	Detailed design/ During Construction
V10	Visual amenity and ancillary facilities	The layout of the ancillary facility sites will be designed to minimise visual amenity impacts. The design will consider: <ul style="list-style-type: none"> <li>• Screening of boundaries facing sensitive receivers or views</li> <li>• Careful placement of structures and buildings to maintain viewpoints or provide additional screening of site activities</li> </ul>	Contractor	Pre-construction/ Construction
V11	Visual amenity and ancillary facilities	The ancillary facilities will be maintained, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Pre-construction/ Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
V12	Visual amenity and ancillary facilities	Ancillary facility sites and temporary construction areas will be progressively restored to at least their pre-construction conditions or in accordance with Landscaping Plans, when no longer required.	Contractor	During construction
<b>Socio-economic</b>				
SE1	Property acquisition requirements including private and crown land acquisition	Land acquisition will occur in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.	Transport	Pre-construction
SE2	Community impacts during construction including noise, visual and access impacts	<p>A Community Liaison Plan (CLP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CLP will include (as a minimum):</p> <ul style="list-style-type: none"> <li>• Mechanisms to provide details and timing of proposed activities to affected residents, broader community, recreational groups, businesses and other stakeholders including changed traffic and access conditions</li> <li>• Contact name and number for complaints.</li> </ul> <p>The CLP will be prepared in accordance with:</p> <ul style="list-style-type: none"> <li>• Transport's stakeholder engagement tool kit</li> <li>• Transport's Stakeholder and Community Engagement Policy 2019</li> </ul>	Contractor	Pre-construction/ During construction
SE3	Community consultation during detailed design and construction, property impacts as a result of temporary access changes and property acquisition	<p>Transport will continue to consult with the community, recreational groups, businesses and other stakeholders until the completion of the overall proposal. Discussions will include:</p> <ul style="list-style-type: none"> <li>• Changes to the overall proposal as a result of detailed design, the nature and timing of construction works</li> <li>• Mitigation measures for residents, stakeholders and people using the overall proposal</li> <li>• Mitigation measures for noise, traffic, access and visual impacts.</li> </ul>	Transport and Contractor	Detailed design/ Pre-construction/ During construction
SE4	Potential impacts on Aboriginal Heritage and areas of significance	Transport will continue to consult with Local Aboriginal Land Councils during detailed design phase to minimise impacts to both the acquired land and adjacent Aboriginal claim land.	Transport	Detailed design/ Pre-construction
SE5	Social infrastructure impacts including	Operators of the Georges River Golf Course and Bankstown Golf Course, public transport providers as well as Council in reference to Gordon Parker Reserve, Vale of Ah Reserve and the vegetated corridor between the Georges River and Henry Lawson Drive will be consulted and	Contractor	Pre-construction/ During Construction



No.	Impact	Environmental safeguards	Responsibility	Timing
	access and amenity impacts	informed regarding construction activities to mitigate any impacts during busy periods and events at these facilities.		
SE6	Temporary relocation of the roadside memorial	The roadside memorial on the southern side of Milperra Road will be temporarily relocated during construction in consultation with the stakeholders who have made the memorial. Access to the relocated roadside memorial would be maintained for pedestrians during construction.	Transport	Pre-construction /construction
SE7	Business signage during construction to mitigate access and potential loss of passing trade impacts	<p>Opportunities for the temporary installation of signage on approach to Tower Road for access to businesses will be investigated.</p> <p>Wayfinding and the location of signage during construction will be based on the construction staging and where room is available.</p>	Transport/ Contractor	Pre-construction /construction
SE8	Consultation with emergency services to maintain access	Continued consultation with emergency services to understand access requirements so that access can be maintained during construction, particularly during works at the Tower Road/Henry Lawson Drive intersection.	Transport/Contractor	Detailed design/ construction
<b>Air quality</b>				
AQ1	General air quality impacts	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include:</p> <ul style="list-style-type: none"> <li>• Identification of potential risks and impacts from dust generating activities</li> <li>• Management measures to minimise risk of dust generation</li> <li>• A process for monitoring dust on-site</li> <li>• A process for altering management measures as required and reprogramming construction activities if the safeguards and management measures do not adequately reduce dust generation.</li> </ul>	Contractor	Pre-construction/ During Construction
AQ2	Dust emissions	Dust generating work will cease when levels of visible airborne dust become excessive.	Contractor	During construction
AQ3	Dust emissions	Works that disturb vegetation, soil or stockpiles will not be carried out during strong winds (over 40 km/h) when this may affect receivers (visibility on roads; dust and debris near recreational areas residences and commercial premises).	Contractor	During construction
AQ4	Dust emissions	Stockpiled materials will be covered stabilised or stored in areas not subject to high wind.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ5	Dust emissions	All trucks will be covered when transporting material to and from the site.	Contractor	During construction
<b>Risk / hazard</b>				
R1	Risk/hazard – Bushfire risk	<p>The CEMP will include a bushfire management plan prepared in accordance with the Planning for Bush Fire Protection 2019 (Rural Fire Service 2006). Measures to be implemented to manage bushfire risk include:</p> <ul style="list-style-type: none"> <li>• Monitoring of weather and local bush fire ratings</li> <li>• Consultation requirements for community notifications in the event of a bushfire</li> <li>• Maintaining equipment in good working order</li> <li>• Ensuring plant and equipment are fitted with appropriate spark arrestors, where practicable</li> <li>• Ensuring site workers are informed of the site rules including designated smoking areas and putting rubbish in designated bins.</li> <li>• Obtaining hot work permits and implementing total fire bans as required</li> <li>• Implementing adequate storage and handling requirements for potentially flammable substances in accordance with the relevant guidelines.</li> </ul>	Contractor	Pre-construction/ During Construction
R2	Risk/hazard - Consultation with emergency services	<p>Consultation with emergency services will be undertaken, including the Rural Fire Service and Fire and Rescue NSW to:</p> <ul style="list-style-type: none"> <li>• Ensure emergency access is maintained during and after construction</li> <li>• Co-ordinate any bush fire emergency actions as outlined in the project's Bushfire Management Plan.</li> </ul>	Contractor	During Construction
<b>Waste</b>				
W1	Waste - Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> <li>• Measures to avoid and minimise waste associated with the project</li> <li>• Classification of wastes and management options (re-use, recycle, stockpile, disposal)</li> <li>• Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</li> <li>• Procedures for storage, transport and disposal</li> <li>• Monitoring, record keeping and reporting.</li> </ul> <p>The WMP will be prepared taking into account the Environmental Procedure - Management of Wastes on Transport for NSW Land (Transport for NSW, 2014) and relevant Transport for NSW Waste Fact Sheets.</p>	Contractor	Detailed design / pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
<b>Cumulative impacts</b>				
CU1	Cumulative – Cumulative impacts	Ongoing coordination and consultation will be undertaken between the proposal contractors and other developments in the area to make sure cumulative traffic impacts are appropriately assessed and managed particularly during peak holiday periods.	Contractor	Pre-construction/ During Construction

## 7.3 Licensing and approvals

The table below outlines the relevant licences and other approval requirements needed to construct and operate the REF proposal.

As recognised in Section 7.2, relevant approvals and permits must be obtained prior to groundwater/aquifer dewatering if they are required. It is noted that there is the potential to need an Aquifer Interference Approval or a water access licence if dewatering is required of a certain scale and further quantitative assessments will be carried out in order to clarify this need. The approvals process for these operates under the WM Act. In addition, on the basis that there are no areas of significant archaeology, including the area identified around the unknown structure in the 1948 historical aerial in the Bankstown Airport curtilage, no heritage approvals or excavation permits are required for the REF proposal.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Fisheries Management Act 1994 (s205)</i>	Permit to remove marine vegetation, such as mangroves from the Minister for Agriculture and Western NSW.	Prior to start of the activity.
<i>National Parks and Wildlife Act 1974 (s90)</i>	Aboriginal heritage impact permit from the Chief Executive of OEH.	Prior to start of the activity.
Roads and works permits	All impacts to the road network would be undertaken in accordance with a Road Occupancy Licence (ROL) to be obtained from the Traffic Management Centre.	Pre-construction



## 8 Sustainability

The Transport for NSW's environment and sustainability policy (2020) provides strategic direction to fulfil 'a duty to undertake our activities in the interest of the greater good, moving beyond compliance, and being a genuine leader in environment and sustainability performance'.

The Policy provides a clear commitment 'to delivering transport which contributes to economic prosperity and social inclusion in an environmentally responsible and sustainable manner, consistent with the Future Transport Strategy 2056'.

Supporting the policy is the Technical Guide: Sustainability in infrastructure design and construction (Roads and Maritime Services 2016) that sets out sustainability objectives relevant to roads, maritime and transport projects. Table 8-1 details the sustainability themes and objectives of the Technical Guides and describes how the overall proposal meets those objectives.

Table 8-1: Technical Guide Sustainability in infrastructure design - governing sustainability objectives

Sustainability theme	Sustainability objective	Proposal response
Energy management	To minimise energy use and reduce greenhouse gas emissions without compromising the delivery of services to our customers.	<p>Transport's G36 Environmental Protection specifications for construction will require contractors to demonstrate energy-efficient and time-efficient methods for handling and transporting materials and operation of plant. This would typically include reducing idling time, reducing the length of haulage routes by sourcing material locally and considering using a sustainable energy alternative for temporary lighting during night-work. This would minimise energy use and reducing greenhouse gas emissions during construction of the proposal.</p> <p>During operation, the proposal would reduce delay times and congestion, thereby reducing idling time and consumption of fuels in vehicles. Ongoing energy consumption for the proposal would be for street lighting. Street lighting will use energy efficient luminaires (e.g. LED technology) in accordance with Transport's Luminaires for Road Lighting Specification TSI-SP-041.</p>
Resource use and waste management	To minimise the use of non-renewable resources and minimise the quantity of waste disposed to landfill.	<p>The cut and fill earthwork requirements for this proposal are relatively minor. Transport's detailed design process under specification PS311 Environment Design and Compliance involves the development of a Material Re-Use and Management Plan to identify strategies of 'avoid', 'reduce', 'reuse' and 'recycle' materials.</p> <p>The proposal would also rehabilitate the existing pavement, rather than removing it to go to landfill. Re-use of other 'waste' materials could include reusing vegetation cleared on site in mulch or for re-snagging waterways.</p>
Climate change resilience	To design and construct transport infrastructure to be resilient to climate change impacts.	<p>Flooding impacts associated with climate change and sea level rise have been assessed during the preparation of this REF. Potential impacts have been identified (refer Section 6.2.3) and these will be further investigated during detailed design with consideration of road levels and the surrounding existing and proposed terrain levels (refer Section 6.3.4).</p> <p>Revegetation of the road corridor will be undertaken in accordance with Landscaping Plans. These plans will identify tree species suitable to provide canopy cover to minimise urban heat effects (refer Section 6.10).</p>

Sustainability theme	Sustainability objective	Proposal response
Pollution control	To minimise noise, land and water pollution from construction, operation and maintenance activities.	<p>The overall proposal would result in noise impacts and has identified potential land and water pollution risks. However, Section 6 describes the proposed management measures that will be implemented to minimise noise, land and water pollution from the proposal.</p> <p>At property noise attenuation treatments will be offered to a number of residential properties that are eligible for operational noise mitigation. Detailed design would also undertake a contaminated sites Detailed Site Investigation to identify presence and extent of potential soil and water contaminants and acid sulfate soils and what further remediation or measures would be required for the proposal. Operational water quality treatments will be further investigated during detailed design in accordance with Transport's Water Sensitive Urban Design guidelines and in consultation with Council.</p>
Air quality	To minimise the air quality impacts of road projects and support initiatives that aim to reduce transport related air emissions.	<p>Air emissions as a result of energy consumption is discussed above under 'energy management'. Dust generation is common during construction and dust suppression management measures will be implemented by the construction contractor so that they comply with Transport's G36 Environmental Protection specifications.</p> <p>The overall proposal also provides for active and public transport in accordance with Transport for NSW's draft Providing for Walking and Cycling in Transport Projects Policy. The proposal would re-establish and extend the existing shared use paths and provide appropriate access to existing bus stops in the study area.</p>
Biodiversity	To improve outcomes for biodiversity by avoiding, minimising or offsetting the potential impacts of road and maritime projects on plants, animals and their environments.	<p>The development of the design has avoided and minimised impacts on threatened biodiversity, by largely remaining within the existing road infrastructure corridor. Road widening is also proposed in areas that minimise impacts on coastal wetlands and threatened biodiversity (refer Sections 2.5 and 6.1.3). Ongoing design development will further investigate potential opportunities to reduce direct footprint impacts (refer Section 6.1.4). Residual impacts on threatened biodiversity will be offset (refer Section 6.1.5).</p>
Heritage	To ensure cultural heritage is conserved and managed according to its heritage significance and that that it contributes positively to awareness of the past.	<p>Aboriginal cultural heritage has been assessed in consultation with Aboriginal representatives. The proposal will have a minor impact and will require an AHIP for the direct impact on a single isolated artefact find. Urban design principles and objectives for the proposal include the acknowledgment and response to Aboriginal values and places in the broader landscape; and for the consideration of interpretation of the heritage areas along the corridor (refer Section 2.4.2).</p>
Liveable communities	To provide high quality urban design outcomes that contribute to the liveability of communities in NSW.	<p>Urban design has been integrated into the design development of the proposal and will continue through the detailed design process. Appendix L includes the Urban Design report for the concept design. The proposal also includes improved active transport links for the community. The provision of new footpaths to connect the bus stops on Milperra Road to the Henry Lawson Drive/Milperra Road/Newbridge Road intersection would improve connectivity for public transport users.</p>

Sustainability theme	Sustainability objective	Proposal response
		<p>Transport is aware of community concerns from residents affected by proposed changes to the Henry Lawson Drive/ Auld Avenue intersection and the proposed new median along Henry Lawson Drive that would prevent some turning movements into and out of property driveways. Further investigation to identify and assess alternatives to the Henry Lawson Drive/ Auld Avenue intersection is being undertaken during detailed design. Access to properties is also being considered in relation to sight distances, setbacks and gradients in accordance with the Australian Standards, Austroads Road Design Guides, RMS (Transport for NSW) Supplements and Council Standard Drawings. Transport will continue consultation with affected residents on these potential impacts during detailed design.</p>
Sustainable procurement	To procure goods and services and construction that over their lifecycle deliver value for money and contribute to the environmental, social and economic wellbeing of the community.	<p>Sustainable procurement will be carried out adopting the following initiatives:</p> <ul style="list-style-type: none"> <li>• All tendered procurement would include non-price selection criteria that assesses relevant sustainability and social procurement measures.</li> <li>• Implementing the Aboriginal Participation in Construction Policy.</li> <li>• Where possible, procuring from small and medium-sized enterprises Aboriginal business and Australian Disability enterprises.</li> <li>• Monitoring the supply chain to identify and address issues related to poor labour practices.</li> <li>• Supporting local suppliers to minimise haulage distances of construction material when feasible.</li> </ul>

## 9 Project justification

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This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

### 9.1 Justification

The REF proposal forms the majority of the overall Henry Lawson Drive Stage 1A proposal.

The overall proposal, is considered to be consistent with a number of strategies and plans including:

- Premier's Priorities
- Future Transport Strategy 2056
- State Infrastructure Strategy 2018-2038: Building Momentum
- Greater Sydney Region Plan: A Metropolis of Three Cities.

The overall proposal would meet the key strategic objectives within the above strategies and plans (refer Section 2.2 for further detail).

The overall proposal is needed to:

- Alleviate congestion along the corridor that causes frustrating and costly delays for all road users across spreading peaks
- Address a road environment contributing to a high rate of casualty crashes
- Support growth in the area from large scale development in and around Milperra and the Bankstown Airport.

Without the overall proposal, Henry Lawson Drive would remain in its current state, with increasing congestion, particularly at intersections, and substantially increasing travel times, particularly during peak periods. Although the performance of the main intersection of Newbridge Road/ Henry Lawson Drive/ Milperra Road, in terms of LoS, would remain the same (LoS of F), the overall proposal would provide additional capacity and reduce delays, and would help alleviate congestion along the corridor that causes frustrating and costly delays for all road users across spreading peaks. The existing road environment also contributes to a high rate of casualty crashes. The overall proposal would assist in improving road safety through the increased intersection capacity and smoother operation of the network in general, as well as the provision of appropriate shoulder width and an increased median width to separate opposing travel lanes.

In addition, there are three large-scale traffic generating developments proposed around the overall proposal area that would increase traffic demand on Henry Lawson Drive and could exacerbate the existing congestion issues. The improvements to traffic flow, connectivity and safety for pedestrians and cyclists from the overall proposal would therefore support these developments by providing sufficient capacity.

Therefore, while the overall proposal has several potential adverse impacts the following benefits would be experienced:

- The overall proposal is aligned with government strategies and policies, has social, economic and environmental benefits, and is deliverable.
- It is located in the 'fast-growing city' of Sydney and is also nearby/connects to the M5 Motorway, which is linked to priority initiatives such as the A3 and A6 corridor capacity and Heathcote Road capacity and safety.



- There would be increased travel efficiency for local road users, through the provision of greater capacity which would provide benefits for future growth and development within the broader study area.
- There would be benefits to commercial operations and businesses within and travelling through the direct study area through increased road capacity and improved travel times.
- The provision of new footpaths to connect the bus stops on Milperra Road to the Henry Lawson Drive/Milperra Road/Newbridge Road intersection would improve connectivity for public transport users.
- Motorists, active transport users, businesses, freight operators and buses would benefit from the increased road capacity which would reduce pressure on the local road network and make it easier for people to move around.

The overall proposal, forming part of the broader Henry Lawson Drive Upgrade would also ease existing traffic issues between the M5 Motorway and Hume Highway and improve freight access to surrounding areas and to the M5 Motorway and the Hume Highway. It is expected that once all four stages of the Henry Lawson Drive upgrade program are online the average network speed is likely to increase as well as a decrease in average vehicle delay in comparison to the base scenario benefiting the overall performance of the Henry Lawson Drive corridor.

However, community consultation undertaken as part of the proposal identified community concern around the changed layout of the Auld Avenue intersection. During detailed design, the intersection layout will be further investigated to confirm the optimal layout in consideration of network performance, road safety requirements and as well as considering any future opportunities for broader connectivity.

While there would be some environmental impacts from the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects of improving safety and freight efficiency are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

## 9.2 Objects of the EP&A Act

The objects of the EP&A Act provide a framework within which the justification of the proposal can be considered. A summary of this assessment is provided in Table 9-1.

Table 9-1: Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	<p>The overall proposal is needed to ensure that Henry Lawson Drive, which is a major metropolitan transport and freight route, remains a functional and improved route in the future.</p> <p>The proposal would increase capacity and reduce intersection delays, thereby improving movement and connectivity along the Henry Lawson Drive corridor. Although the performance of the main intersection of Newbridge Road/ Henry Lawson Drive/ Milperra Road, in terms of Level of Service, would remain the same (LoS of F), the additional traffic volume throughput and reduced delays would improve the existing congestion issues which is frustrating for local road users and people travelling, and results in amenity impacts relating to noise, visual, air quality and safety. There would also be economic flow on benefits to economic productivity and growth for freight carriers and vehicles travelling to the industrial precincts in the broader study area, in addition to benefits for existing and future businesses in the surrounding area (such as Bankstown Airport).</p>

Object	Comment
	<p>However, it is recognised that there would be some short-term socio-economic impacts during construction (due to the necessary acquisition of properties and amenity impacts).</p> <p>The overall proposal has been designed where possible to minimise impacts on the environment and the community. A number of safeguards and management measures would be implemented to minimise any environmental impacts associated with the overall proposal.</p>
<p>1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</p>	<p>Ecologically sustainable development has been considered throughout the proposal, with the legislative context of ecological sustainable development considered in section 4 and the impact of the overall proposal and the REF proposal is considered in detail in section 8.2.1. An options process was also undertaken for the proposal that has considered a range of constraints (refer Section 2.5) as well as feedback from the community during early consultation activities (refer Section 5).</p> <p>The risks of encountering existing ASS and contamination in groundwater are deemed to be 'Moderate – High'. As such taking a conservative approach, further investigations are proposed as part of detailed design to sample and test soils and water, thereby gaining a better understanding of the risk. Outcomes of further investigations would be considered as part of detailed design constructability assessments and the construction contractor's construction environmental management plans.</p> <p>Mitigation measures are proposed to be implemented to minimise direct and indirect impacts including potential water quality impacts. This includes preparation of a Construction Soil and Water Management Plan, Construction Flora and Fauna Management Plan and a Clearing and Grubbing Plan to identify further opportunities to minimise direct impacts to GDEs.</p>
<p>1.3(c) To promote the orderly and economic use and development of land.</p>	<p>The overall proposal is required to cater for the safe and efficient movement of people and goods along Henry Lawson Drive, and to support the nearby large-scale traffic generating development.</p>
<p>1.3(d) To promote the delivery and maintenance of affordable housing.</p>	<p>This object is not relevant to the REF and overall proposal.</p>
<p>1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.</p>	<p>Construction of the overall proposal would require the removal of vegetation. These impacts have however been minimised where possible and offsets will be provided where impacts could not be mitigated. The potential impacts on vegetation, threatened species, population and ecological communities are discussed in Section 6.1. Native vegetation would be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects (Roads and Traffic Authority, 2011) and the REF and overall proposal's Landscaping Plans.</p> <p>The REF proposal areas are considered to pose a risk of encountering ASS, varying from low risk to high risk. Without suitable management measures, disturbance of ASS is considered to present a moderate to high potential impact to groundwater. Piling at the Auld Avenue Bridge area has the potential to mobilise and intersect any contamination that may exist in groundwater within the area.</p>
<p>1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).</p>	<p>The REF proposal would impact on one Aboriginal archaeological site (HLD Site 5 (IF)) and the construction phase of the REF proposal would have ongoing neutral impacts on the non-Aboriginal heritage item, the Bankstown Airport. An AHIP will be sought prior to construction for HLD Site 5 (IF). An unexpected finds procedure would be put in place during construction should any sites/items be identified.</p>

Object	Comment
1.3(g) To promote good design and amenity of the built environment.	The urban design and the landscape concept for the overall proposal has been developed to achieve an integrated outcome that helps fit the overall proposal as sensitively as possible into its context and to minimise the impacts of the overall proposal on the existing landscape character of the surrounding area. Mitigation measures would be implemented in the detailed design stage to ensure that the design objectives are realised. Activities within the REF proposal would also directly support improved connectivity and safety for pedestrians and cyclists through the provision of pedestrian and shared paths. Progressive landscaping will be undertaken throughout the construction, and Landscaping Plans will include revegetation with local native vegetation species, suitable for the riparian zone. During construction and operation there would be impacts on amenity and community values. These are discussed in Section 6.13. Adverse amenity impacts during construction and operation would be mitigated through a range of mitigation measures.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	This object is not relevant to the REF and overall proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	This object is not relevant to the REF and overall proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Section 5 outlines the community and stakeholder consultation carried out during various stages of the proposal. This REF will be placed on display and further consultation will be carried out with the community if the proposal is determined to proceed.

## 9.2.1 Ecologically sustainable development

ESD is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

### 9.2.1.1 The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (refer Section 2). Evaluation and assessment of alternative options have aimed to reduce the risk impacts on the environment and society through considering biodiversity impacts and property impacts.

Stakeholder consultation considered issues raised by stakeholders and a range of specialist studies were undertaken for key issues to provide accurate and impartial information to assist in the evaluation of options. The concept design of the overall proposal (and the REF proposal) has sought to minimise impacts on the amenity of the study area while maintaining engineering feasibility and safety for all road users.

A number of safeguards have been proposed to minimise potential impacts and to respond to stakeholder concerns and areas of scientific uncertainty. These safeguards include the commitment to carry out a Detailed Site Investigation to sample and test soil and water in areas of concern, which would inform constructability assessments and the CEMP; and to further investigate and evaluate intersection options for Auld Avenue/ Henry Lawson Drive. These would be implemented during detailed design. Other safeguards are identified by the REF and these would be implemented during construction and operation of the overall proposal. No safeguards have been postponed as a result of lack of scientific certainty. A CEMP would be prepared before construction starts. This requirement would ensure the overall proposal achieves a high-level of environmental performance. No safeguards and management measures would be postponed as a result of a lack of information.

### **9.2.1.2 Intergenerational equity**

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The REF proposal (as part of the overall proposal) would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The REF proposal (as part of the overall proposal) would ensure that road and traffic conditions within the overall proposal area would not continue to worsen in the future design year of 2036. The key risks of 'do nothing' are that:

- Congestion would worsen along the corridor causing frustrating and costly delays for all road users across spreading peaks
- Poor driver behaviour would occur in an unforgiving road environment which would contribute to a high rate of casualty crashes
- Traffic demand from nearby future developments would not be accommodated with the existing road capacity.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower road condition which could involve substantial increases in travel times due to a lack of alternative routes. Section 2 also highlights the lack of options for the REF proposal due to the need to work within the existing road environment, which is very constrained due to the surrounding urban environment.

### **9.2.1.3 Conservation of biological diversity and ecological integrity**

As stated earlier, the REF and overall proposal has been designed to limit the removal of native vegetation and TEC's where practical. A thorough assessment of the existing biodiversity environment was undertaken to identify and manage any potential impacts of the REF proposal on local biodiversity. It is acknowledged that the REF proposal would result in impacts on biodiversity, largely due to the 1.69 hectares removal of vegetation that is the habitat to several native plant communities, TECs, flora and fauna species. The BAR determined that the REF proposal is unlikely to lead to a significant impact on threatened species, populations, ecological communities or their habitats, and a referral of this proposal for consideration as a controlled action under the EPBC Act is not required.

It is noted that residential and infrastructure development in the locality in historic and recent times has led to extensive vegetation clearing in the locality and at the catchment scale. Remaining remnant vegetation/habitat has also been affected by a variety of disturbance mechanisms, including clearing of undergrowth, altered fire regimes, feral animals and weed invasion. This habitat loss and disturbance has resulted in the local extinction of a number of species which are less tolerant of habitat loss and disturbance (e.g. woodland birds and small mammals) and an increased risk of extinction to a number of vegetation communities.



#### **9.2.1.4 Improved valuation, pricing and incentive mechanisms**

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things.

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a proposal, including air, water, land and living things.

The REF has examined the environmental consequences of the REF proposal and identified safeguards and management measures to manage the potential for adverse impacts. The requirement to implement these safeguards and management measures would result in an economic cost to Transport. Some of these measures include:

- Further investigations into the presence and extent of ASS and contamination in soils and water
- Further investigations and options analysis of the Auld Avenue intersection.
- Replacement or re-instated of revegetation with local native vegetation species
- Urban design and landscaping, including visual screening within impact areas identified as moderate or high impact.
- Biodiversity offsetting
- Provision of operational water quality controls, scour protection and energy dissipation measures
- Investigating the potential for microbat habitat in proposal structures and implementing these where possible
- Construction water quality monitoring would be undertaken upstream and downstream of the REF proposal to ensure that controls and site practices are effective at maintaining current environmental values
- Use of clean rock fill for the construction of the temporary working platforms
- Temporary relocation of a roadside memorial on the southern side of Milperra Road
- Ongoing consultation with the community and stakeholders through detailed design and construction phases

The implementation of safeguards and management measures would increase both the capital and operating costs of the REF proposal (as part of the overall proposal). This signifies that environmental resources have been given appropriate valuation. The concept design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the overall proposal is being developed with an environmental objective in mind.

## 10 Conclusion

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The REF proposal that forms part of the Henry Lawson Drive Upgrade Stage 1A is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to MNES listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on biodiversity, flooding, aquatic and terrestrial GDEs, landscape character and visual, and social/economic considerations. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also increase capacity to alleviate congestion and provide additional capacity to address future development and would improve the road environment to assist in the reduction of safety incidents. On balance the proposal is considered justified and the following conclusions are made.

### 10.1 Significance of impact under NSW legislation

The REF proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The REF proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required for the REF proposal.

Under the provisions of the Coastal Management SEPP, some activities of the overall proposal fall within coastal wetlands and are deemed designated development. For these activities, an EIS has been prepared and should be read in conjunction with this REF. The EIS is subject to assessment under Part 4 of the EP&A Act and consent is required from Council. The REF proposal together with the EIS proposal make up the 'overall proposal'.

### 10.2 Significance of impact under Australian legislation

The REF proposal is not likely to have a significant impact on MNES or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Agriculture, Water and the Environment is not required.

## 11 Certification

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This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.



Lucia Coletta

Associate Aurecon

Australasia

Date: 15/7/2021

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.



Alex Lyle

Project Development Manager

Infrastructure & Place, Development– Central River & Eastern Harbour City

Date: 2/8/2021

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# Terms and acronyms used in this REF

Term/Acronym	Description
AEP	Annual exceedance probabilities
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
APECs	Areas of Potential Environmental Concern
ARI	Average recurrence interval
ASS	Acid sulfate soil
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016 (NSW)
BOS	Biodiversity Offset Scheme
Biosecurity Act	NSW Biosecurity Act 2015
Bankstown LEP	Bankstown Local Environmental Plan 2015
BAR	Biodiversity Assessment Report
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CHAR	Aboriginal cultural heritage assessment report
CLP	Community Liaison Plan
CoPC	Contaminants of potential concern
CSM	Conceptual Site Model
DCP	Bankstown Development Control Plan 2015
DGV	Derived Guideline Value
DPIE	Department of Planning, Industry and Environment
EES	Environment, Energy and Science (former Office of Environment and Heritage), within the DPIE
EIA	Environmental impact assessment
EIS	Environmental impact statement – Henry Lawson Drive Upgrade Stage 1A environmental impact statement. The EIS assesses the EIS proposal.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPA	NSW Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.

Term/Acronym	Description
EPL	Environment protection licence
ERSED	Erosion and sediment
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GLALC	Gandangara Local Aboriginal Land Council
Henry Lawson Drive upgrade program	A four-stage plan to upgrade the 7.5 kilometre length of Henry Lawson Drive between the M5 South Western Motorway, Milperra, and Hume Highway, Lansdowne.
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
ICNG	Interim Construction Noise Guideline
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
GDEs	Groundwater dependent ecosystems
GIS	Geospatial Information Systems
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local government area
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
MNES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OOHW	Out-of-hours works
Overall proposal	The Henry Lawson Drive Upgrade Stage 1A proposal: the upgrade of a 1.3 kilometre length of Henry Lawson Drive Upgrade between Keys Parade, Milperra, to Tower Road, Bankstown Aerodrome, include an upgrade of 480 metres along Milperra Road. The REF proposal and the EIS proposal combined form the overall proposal.
PACHICI	Aboriginal Cultural Heritage Assessment Consultation and Investigation assessment
PAD(s)	Potential Archaeological Deposit(s)
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PFAS	Per and Poly-Fluoroalkyl Substances
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PSI	Preliminary Site Investigation



Term/Acronym	Description
Roads and Maritime	NSW Roads and Maritime Services, now known as Transport for NSW
REF	Review of Environmental Factors - Henry Lawson Drive Upgrade Stage 1A review of environmental factors (this document)
ROL	Road Occupancy Licence
SAII	Serious and Irreversible Impacts
SAQP	Sampling Analysis and Quality Plan
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
Coastal Management SEPP	State Environmental Planning Policy (Coastal Management) 2018
SIS	State Infrastructure Strategy 2018-2038: Building Momentum
SOHI	Non-Aboriginal Heritage Statement of Heritage Impact
SPR	Source-pathway-receptor
TECs	Threatened Ecological Communities
TRH	Total Recoverable Hydrocarbons
Transport	Transport for NSW
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW
UXO	Unexploded ordnance
VOCs	Volatile organic compounds
WM Act	Water Management Act 2000
WQO	Water quality objectives

## Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

## Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
<p>a) Any environmental impact on a community?</p> <p>The proposal would result in the following environmental impacts on the community:</p> <ul style="list-style-type: none"> <li>improved road safety and network reliability during operation</li> <li>potential noise and vibration impacts to surrounding sensitive receivers during construction and operation of the proposal</li> <li>traffic delays and increased travel time during the construction of the proposal</li> <li>temporary disruption to active transport and public transport facilities during construction</li> <li>removal of vegetation during construction</li> </ul>	<p>Long-term minor negative impacts</p> <p>Short term moderate negative impacts</p>
<p>b) Any transformation of a locality?</p> <p>The proposal is unlikely to result in any broadscale transformation of a locality as it would not change the current land use within the proposal footprint. However, one property would be acquired to the east of Henry Lawson Drive for use as part of the proposal and ancillary facility. This property would be stabilised and returned to Canterbury Bankstown Council upon completion for recreational use, rather than residential use as it is currently.</p>	<p>Long-term positive impact</p>
<p>c) Any environmental impact on the ecosystems of the locality?</p> <p>The proposal would result in the removal of 1.69 hectares of native vegetation (EEC) that would result in a reduction of threatened species habitat in the proposal area. In addition, 23 individual of the threatened species <i>Callistemon linearifolius</i> would be impacted.</p> <p>Safeguards and mitigation measures have been proposed in section 6.1.4, to manage and minimise these impacts where possible.</p>	<p>Long term minor negative impact</p>
<p>d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>The proposal would result in a temporary reduction in the aesthetic and recreational quality of the area during the construction phase in the form of noise and visual impacts.</p> <p>The proposal may also result in temporary reduction environmental quality due to vegetation clearing and water quality/drainage impacts during construction. Safeguards and mitigation measures have been proposed to manage and minimise these impacts where possible.</p>	<p>Short term minor negative impact</p>
<p>e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The REF proposal would be partially located on land that forms part of the locally listed Bankstown Aerodrome heritage item. However, the area impacted has previously been developed into commercial development and has limited to no heritage value.</p>	<p>Nil</p>

Factor	Impact
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The proposal would result in the removal of 1.69 hectares of native vegetation (EEC) that would result in a reduction of threatened species habitat in the proposal area.</p> <p>Safeguards and mitigation measures have been proposed in section 6.1.4, to manage and minimise these impacts where possible.</p>	Long term minor negative impact
<p>g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposal may result in a potential for wildlife injury or mortality throughout the construction phase due to vehicle and equipment movements within the proposal area. However, this would not be a major impact or endanger any species.</p>	Short term minor negative impact
<p>h) Any long-term effects on the environment?</p> <p>The proposal would result in loss of vegetation due to the works, however this would not result in a significant impact to the environment.</p>	Long term minor negative impact
<p>i) Any degradation of the quality of the environment?</p> <p>Providing the mitigation measures outlined in this REF are implemented (refer to Section 7.2), the proposal is not expected to result in noticeable degradation of the quality of the environment.</p>	Nil
<p>j) Any risk to the safety of the environment?</p> <p>By improving the road environment as part of the proposal could result in increased safety for road users through provision of additional turning lanes and shoulders.</p>	Long term major positive impact
<p>k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposal would not result in a reduction in the range of beneficial uses of the environment.</p>	Nil
<p>l) Any pollution of the environment?</p> <p>Providing the mitigation measures outlined in this REF are implemented (refer to Section 7.2), the proposal is not expected to result in any pollution of the environment.</p>	Nil
<p>m) Any environmental problems associated with the disposal of waste?</p> <p>The proposal is not likely to cause environmental problems associated with the disposal of waste. Standard mitigation measures have been proposed in Section 7.2.</p>	Nil
<p>n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>The proposal is not likely to result in increased demands on resources which are or are likely to become in short supply.</p>	Nil
<p>o) Any cumulative environmental effect with other existing or likely future activities?</p>	

Factor	Impact
Cumulative impacts could occur due to a number of other developments occurring at a similar construction timeframes as the REF proposal. This could include cumulative impacts around amenity and traffic disruption.	Short term minor negative impact
During operation, in conjunction with other infrastructure projects along Henry Lawson Drive, would result in cumulative positive traffic impacts.	Long term minor positive impact
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Nil
The proposal would not impact on coastal processes or hazards, including those under projected climate change conditions.	



# Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment.

A referral is not required for proposed actions that may affect nationally listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a) Any impact on a World Heritage property?	Nil
b) Any impact on a National Heritage place?	Nil
c) Any impact on a wetland of international importance?	Nil
d) Any impact on a listed threatened species or communities? The proposal would result in the removal of 1.29 hectares of native vegetation that is listed as either endangered or critically endangered that would result in a reduction of threatened species habitat in the proposal area. Threatened species listed under the EPBC Act that could use this habitat include: <ul style="list-style-type: none"> <li>• Swift parrot</li> <li>• White-bellied sea eagle</li> <li>• White-throated Needle-tail</li> <li>• Grey-headed flying fox</li> </ul> In addition, 23 individual of the threatened species <i>Callistemon linearifolius</i> (vulnerable under the EPBC Act) would be impacted. Safeguards and mitigation measures have been proposed in Section 6.1.4, to manage and minimise these impacts where possible.	Minor direct and indirect impacts may occur for listed threatened species. No significant impact on threatened species would occur from the proposal, provided appropriate safeguards and management measures are implemented.
e) Any impacts on listed migratory species? The proposal would result in the removal of native vegetation that is habitat for threatened species listed under the EPBC Act, including the migratory species White-throated Needle-tail.  White-throated Needle-tail – 1.17 Ma, m Grey-headed flying fox- 1.17 V	Minor impacts. No significant impact on threatened species would occur from the proposal, provided appropriate safeguards and management measures are implemented.
f) Any impact on a Commonwealth marine area?	Nil
g) Does the proposal involve a nuclear action (including uranium mining)?	Nil
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

## Appendix B

### Statutory consultation checklists

# Infrastructure SEPP

## Certain development types

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	N		ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	N		ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	N		ISEPP cl. 95A

## Development within the Coastal Zone

Issue	Description	Yes / No / NA	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	N		ISEPP cl. 15A

Note: See interactive map here: <https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management>. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

## Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	Y	Canterbury Bankstown Council	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	N		ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	N		ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water?	N		ISEPP cl.13(1)(d)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	N		ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	N		ISEPP cl.13(1)(f)

## Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	N		ISEPP cl.14

## Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent?	Y	Canterbury Bankstown Council	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	Y	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government.

## Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	N	Environment, Energy and Science, DPIE	ISEPP cl.16(2)(a)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	N	Environment, Energy and Science, DPIE	ISEPP cl. 16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the <i>Marine Estate Management Act 2014</i> ?	N	Department of Planning, Industry and Environment	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	N	Property NSW	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	N	Rural Fire Service	ISEPP cl.16(2)(f)
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	N	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	N	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	N	Mine Subsidence Board	ISEPP cl. 16(2)(i)



## Appendix C

### Technical working paper: Aboriginal Cultural Heritage Assessment

## Appendix D

Technical working paper: BAR

# Appendix E

## Technical working paper: Flooding and hydrology

# Appendix F

Technical working paper: Surface water

# Appendix G

## Technical working paper: Groundwater



# Appendix H

## Technical working paper: Preliminary site investigation

# Appendix I

## Technical working paper: Traffic and transport

# Appendix J

## Technical working paper: Noise and vibration

## Appendix K

### Technical working paper: Non-Aboriginal Heritage Statement of Heritage Impact

## Appendix L

Technical working paper: Landscape character and visual impact assessment



# Appendix M

## Technical working paper: Socio-economic

