

Review of Environmental Factors

Tripoli Way Extension

8201612601

Prepared for
Shellharbour City Council

1 February 2022



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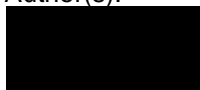
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Document Information

Prepared for	Shellharbour City Council
Project Name	Tripoli Way Extension
File Reference	Report 002 Ver 0 - REF Tripoli Way Extension.docx
Job Reference	8201612601
Date	1 February 2022
Version Number	Rev 0

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Job title: Environmental Engineer

Effective Date 1/02/2022

Approved By:

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Job title: Senior Planner

Date Approved 1/02/2022

Name: 

Job title: Manager, Infrastructure

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0	01/02/2022	Final issue to client	DAF, MB, CB, SP, KJ, ZW, NP	NP

Executive Summary

The project

Shellharbour City Council (Council) propose to develop the Tripoli Way Extension (TWE), which would traverse and extend the existing Tripoli Way and The Expressway alignment running parallel and to the north of Tongarra Road/Illawarra Highway (the project). The project would encompass the full length and surrounding area of the existing Tripoli Way and continue east to link into Terry Street/Illawarra Highway and west to link into Tongarra Road/Illawarra Highway at the intersection with Broughton Avenue.

The intent of the project is to help alleviate traffic impacts through the Albion Park Township, as a result of predicted traffic growth along Tongarra Road, both from background traffic and current and future land development in the local area, including Calderwood, Tullimbar and Albion Park.

The TWE was conceived as early as the 1960's, as evidenced by the land zoning shown in the 'Illawarra Planning Scheme, 1961'. Since this time the alignment has undergone some minor amendments, however the intent remains which is to alleviate traffic congestion through Albion Park Town Centre by diverting traffic to the northern periphery of the township.

Need for the project

Council required master planning services from McGregor and Coxall to prepare the *Albion Park Town Centre Plan 2014* (Shellharbour City Council, 2014) with the objective of creating a vibrant, inclusive, safe, attractive, connected, convenient, accessible and commercially successful Town Centre. The *Albion Park Town Centre Plan 2014* outlines the desired future for Albion Park and the formalisation of the Town Centre. The Illawarra Highway is the main arterial road running directly through the town centre of Albion Park. Currently, major residential development west of Albion Park in Tullimbar and Calderwood have led to a progressively worsening congestion through the town centre.

The construction of the TWE located along the northern periphery of the Albion Park Town Centre offers the potential to significantly relieve traffic levels along Tongarra Road, enabling opportunities to implement verge and streetscape improvements and help alleviate traffic congestion.

Transport for NSW (TfNSW) has recently completed construction of an extension of the M1 Princes Motorway between Yallah and Oak Flats to bypass Albion Park Rail, also known as the Albion Park Rail bypass. The bypass completes the 'missing link' for a high standard road between Sydney and Bomaderry. It now provides easy access to Dapto, Albion Park and Oak Flats. The Albion Park Rail bypass now better connects the Illawarra Highway and further to the TWE and helps with attaining the project goals and justifications. The Albion Park Rail bypass design and connecting ramps were developed through an extensive optioneering, stakeholder consultation and design development process which identified key considerations of the project objectives described below.

Project objectives

The objectives of the TWE are to:

- > Increase traffic flow efficiency
- > Provide a carriageway that is not inundated during a storm event up to and including the 20 year ARI flood event
- > Provide reliable travel times
- > Increase the level of service of intersections
- > Improve road safety
- > Minimise private property acquisition
- > Minimise impacts on existing utilities
- > Minimise environmental impacts.

Options considered

The TWE was identified by Council in 1961 as a long-term strategic plan to manage traffic impacts associated with the growing regional population. The project will reduce congestion on the Illawarra Highway through Albion Park and has been identified in Council's Section 94 Contributions Plan since 1993. The TWE

alignment and design has been refined and modified throughout the lifecycle of this project and those design alternatives have also been addressed. The resulting options and design variations included:

- > Do nothing
- > TWE

Design options considered for the design of the TWE alignment include:

- > Illawarra Highway / Broughton Avenue / Tripoli Way intersection design
- > Moles Street / Tripoli Way intersection design
- > Tripoli Way alignment options in the vicinity of the Albion Park Butter Factory (former) and Tulkeroo.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. Clause 94 of ISEPP permits 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.

As the proposal is for a road and is to be carried out by Shellharbour City Council, development consent is not required and it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This Review of Environmental Factors (REF) fulfils the requirements of Section 5.5 of the EP&A Act and has been prepared in accordance with Clause 228 of the *Environmental Planning and Assessment Regulation 2000*.

Environmental impacts

Flooding

An assessment was undertaken to assess the potential flooding impacts associated with the development of the TWE. The study found that the TWE was likely to have limited flooding impacts, with the project to utilise much of the existing drainage network within existing road reserves and the development or realignment of infrastructure. Based on the design criteria, the road should be flood immune in the 20 year average recurrence interval (ARI) event. Flood impact mapping showing the difference in the existing and proposed flood elevation has been calculated to demonstrate that there are no adverse hydraulic impacts due to the TWE. Overall impacts to trafficability from the project would be positive for the area, especially during the 100 year ARI flood event with reductions in hazard categories reduced for the entire project.

Noise

Construction of the project is expected to occur over a period of 12 months. Construction activities would impact a number of residential receivers along the alignment during non-standard construction hours, primarily caused by the proximity of the dwellings to the construction works. Those impacted receivers are not expected to be highly noise affected due to implementation of the recommended mitigation measures. Operational noise impacts of the TWE have been predicted to exceed the acceptable criteria levels in the year 2041, for 147 residential receivers. This is due to the TWE traversing a built-up location in close proximity to residents. The values are based on current and future traffic modelling, and have assumed a worst-case scenario for receivers. Noise impacts will be reduced to acceptable levels through Council's adoption of 'at property' noise mitigation measures.

Biodiversity

The project will not significantly impact threatened species, populations or ecological communities. The majority of the project footprint exists within the location of exotic grassland, which provides limited foraging or habitat value to threatened species, populations or ecological communities. The proposed project design has minimised impacts to native vegetation, and where impacts are likely to occur, they are limited to highly disturbed vegetation. Implementation of appropriate mitigation measures will further reduce the impacts of the project. No hollow bearing trees are to be removed and the habitat available to fauna will largely remain unchanged, with the exception of the removal of canopy trees. The overall impact to biodiversity of the project will not be significant and will be effectively managed through implementation of mitigation measures.

Traffic

As result of the TWE there would be a significant increase in traffic along The Expressway and Tripoli Way thereby impacting the nearby residences, however the significant improvements within the overall traffic network as a result of the TWE would be of significant benefit to the local community as a whole. In addition,

the detailed design phase would consider opportunities to minimise traffic impacts on nearby residence where possible.

The TWE would contribute to an efficient and functional road network. The TWE would assist in meeting the increased demand of road users as future development and land use changes in the Calderwood area occur. The project would also reduce congestion within the surrounding road network and improve safety for motorists, pedestrians and cyclists. The Traffic Impact Assessment modelling suggests that the intersection upgrades and TWE will significantly improve the operational performance for the majority of key intersections. Likely traffic impacts during the construction phase of the TWE include an increase in heavy vehicle traffic movements, potential disruption to property access and minor traffic delays.

Air Quality

An Air Quality Assessment modelling the impacts of the project construction and operation demonstrated that the concentrations of NO₂, PM₁₀, and PM_{2.5} are expected to be well below the relevant NSW Environmental Protection Authority (NSW EPA) air quality assessment criteria. Construction activities that generate dust are unlikely to present a significant impact to nearby sensitive receivers. A series of mitigation measures for construction works have been provided that would further minimise any impacts. It is recommended that an Air Quality Management Plan be developed and implemented for the duration of construction of the project, including but not limited to the mitigation measures recommended in this report.

Contamination

Through completion of a Preliminary Site Investigation (PSI) it was found that nine potential areas of contamination exist within the project Study Area. A detailed assessment of each area would be required prior to construction to determine the suitability of soils within each area to remain on-site under the proposed land use. These detailed assessments and subsequent mitigation methods adopted to avoid any significant impacts, if required, will be provided as an addendum to this document.

Potential contamination during operation would be limited to potential surface water run-off that may contain low level hydrocarbon impact, which is typical of normal vehicle operation (minor leaks of lubricants and fuels, maintenance practices, spills or accidents).

Laboratory testing confirmed that soils beneath the Study Area are slightly to moderately acidic with several exceedances of Acid Sulfate Soils Management Advisory Committee Potential Acid Sulfate Soils (ASSMAC PASS) Indicator Values and Action Criteria for Titratable Peroxide Acidity (TPA) and Titratable sulfidic acidity (TSA). The soils assessed did not contain sulphides and sulfidic ores, suggesting that the acidity present may not be attributed to Acid Sulfate Soils. Whilst the acidity present in soil may not be attributable to Acid Sulfate Soils, it is recommended that a management plan be prepared prior to the commencement of earthworks and construction. The management plan should be prepared in consideration of the ASSMAC Guidelines (ASSMAC 1998) and should be included as a sub-plan of the broader project construction.

Visual Amenity

Once operational the project would result in localised impacts to visual amenity in almost all areas of the alignment. Due to much of the existing western extent being rural landscape, the TWE will have a visual impact on existing residents bordering the Illawarra Highway at Tullimbar and the future residents at Calderwood Valley. Residents in the middle portion of the alignment will be visually impacted by a four-lane road running adjacent to their front or rear boundaries. Landscape and visual impacts to the eastern extents of the Study Area will be seen from the existing Illawarra Highway/Terry Street intersection as well as traffic flow running north/south on the Illawarra Highway. Users of the Albion Park Showground may also experience a change in visual amenity due to the position of the final intersection at the eastern extent of the alignment. A landscape plan has been developed for the TWE and will help alleviate much of the visual impacts associated with its development, ensuring the overall impact would not be significant.

Aboriginal Heritage

Following field surveys, it was found that there are three Potential Archaeological Deposit (PAD) areas within the Study Area. One Aboriginal item was identified within the Study Area – Tulkeroo ISO, which consists of a basalt ground edge axe located within the historical property of 'Tulkeroo' and the Albion Park Butter Factory. The survey revealed that large parts of the Study Area had been subject to significant ground disturbance, such as the initial vegetation removal and construction of roads and residential dwellings throughout the Study Area. The identification of three PAD sites within the Study Area and the finding of an Aboriginal item requires Council to acquire an Aboriginal Heritage Impact Permit (AHIP) prior to any excavation works on the site. It is also recommended that an Aboriginal Cultural Heritage Assessment be conducted prior to the commencement of works in association with the AHIP.

Historic Heritage

The works will involve significant impacts to the Albion Park Butter Factory (former). Options for the TWE alignment to avoid direct impacts to this heritage item were investigated and deemed not feasible by Council.

The Statement of Heritage Impact (Biosis) concluded that the proposed works will result in significant direct physical impacts to the heritage listed former Albion Park Butter Factory, as well as to the area of high archaeological potential beneath and surrounding the structure. The removal of the Albion Park Butter Factory (Former) would have a significant and detrimental effect on the heritage significance of the item as a whole, and represents a considerable loss to Shellharbour's local heritage for future generations.

The proposed works will also result in direct physical impacts to the area of high archaeological potential beneath and surrounding the structure. Due to the heritage significance of the the Albion Park Butter Factory (former) and adjacent related heritage item 'Tulkeroo' the impacts that would occur as a result of the works are considered significant.

The primary recommendation of the SOHI is to avoid impacts to Tulkeroo and the Albion Park Butter Factory (former) and areas of high and moderate archaeological potential through further design development. As Council has determined that alternative options to avoid or minimise impacts to the former Butter Factory are not feasible, the report recommended the following measures where impacts cannot be avoided:

- > Minimise indirect impacts to Tulkeroo and the heritage item setting
- > Archival recording
- > Reassessment of the heritage item's heritage and curtilage significance
- > Archaeological investigation required prior to works for areas of High potential (at Butter Factory building site) for which a Section 140 permit will be required.

All other heritage listed items within and in close proximity to the Study Area have been assessed and are likely to be only visually impacted by the development.

Socio-economic

The project has strong socio-economic benefits primarily associated with reduced traffic within the Albion Park Town Centre. Reduced traffic would lessen congestion, while improving safety, amenity and aesthetic outcomes, as well as creating ease of parking and access to local businesses. These impacts would benefit the local community and visitors alike. The TWE is therefore expected to have positive implications for the future health and wellbeing within the community.

Utilities

Potential impacts to existing utilities was considered as part of the conceptual design of the TWE. The treatments of safeguards must be confirmed at the detailed design phase of the project to ensure any impact on local services are mitigated.

Waste

Impacts associated with waste are mainly attributed to the construction of the TWE. Waste streams that are likely to be produced during construction include green waste, road material, general construction litter, waste oils and redundant erosion and sediment controls. Once operational, and given the extent of the works, additional operational wastes generated above the existing waste levels are expected to be negligible.

Airport Environment

The TWE is in relatively close proximity to the Shellharbour Airport and as such an understanding of the Airport environment is essential to the environmental assessment. The National Airports Safeguarding Framework aims to:

- > Improve community amenity by minimising aircraft noise-sensitive developments near airports including through the use of additional noise metrics and improved noise disclosure mechanisms
- > Improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety related issues.

The framework currently consists of nine guidelines which the development of the TWE were reviewed against. Impacts to the Airport environment are considered unlikely, however a review of the detailed design and detailed construction methodology is needed prior to construction. The project would not impact upon

the Obstacle Limitation Surfaces (OLS) of Shellharbour Airport. Any structures must remain below 52 metres Australian Height Datum (AHD) to avoid infringing the OLS. All structures associated with the project would be below 52 m AHD.

Justification and conclusion

Following detailed investigation and traffic modelling, the proposed TWE design offered the best outcomes for the Albion Park Town Centre. This was principally achieved through a reduction in traffic congestion in the Albion Park Town Centre and enabling a more efficient use of the locality. In reducing traffic movements and congestion in this area the project would facilitate further economic development of the Albion Park Town Centre.

The design as articulated through this REF and provided in **Appendix B**, is considered to best meet the project objectives, while addressing environmental aspects. **Chapter 6** of this REF provides an assessment of the impacts of the project in accordance with Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and **Appendix A** specifically responds to the factors for consideration under Clause 228.

A number of potential environmental impacts from the project have been avoided or reduced during the concept design development and options assessment. Potential environmental impacts would be minimised through the implementation of mitigation measures summarised in Section 7 of this REF.

The project is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994*. Therefore, a Species Impact Statement is not required. The project is also unlikely to affect Commonwealth land or have an impact on any Matters of National Environmental Significance.

The works will involve significant impacts to the Albion Park Butter Factory (former). Options for the TWE alignment to avoid direct impacts to this heritage item were investigated and deemed not feasible by Council.

This REF identifies that the potential environmental impacts are not likely to be significant, with the exception of the impact to the locally-listed heritage item (the former Albion Park Butter Factory) as it is located within the road alignment.

This REF references the Statement of Heritage Impact which considered the impact to heritage sites within the Study Area and the vicinity. The statement concluded that “*due to the heritage significance of Tulkeroo and the Albion Park Butter Factory (former), the impacts that would occur as a result of the works are considered significant.*”

Having regard to the significant potential impacts to the Albion Park Butter Factory it is necessary for an environmental impact statement (EIS) to be prepared for assessment of the project, and prior to issue of approval of the project from the relevant determining authority under Division 5.1, of the EP&A Act should the assessment be deemed satisfactory.

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Glossary of Terms

The table below provides a glossary of key terms and acronyms used within this document.

Term or Acronym	Definition
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
APRb	Albion Park Rail bypass
ASS	Acid Sulfate Soil
BoM	Bureau of Meteorology
BC Act	<i>Biodiversity Conservation Act 2016</i>
Biosecurity Act	<i>Biosecurity Act 2015</i>
CAA	Controlled Activity Approval
CEMP	Construction Environmental Management Plan
cm	Centimetres
Council	Shellharbour City Council
dB	Decibels
DECC	Department of Environment and Climate Change
DPI	NSW Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EES	Department of Planning, Industry and Environment – Environment, Energy and Science
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPA	Environment Protection Agency (NSW)
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
FM Act	<i>Fisheries Management Act 1994</i>
GIS	Geographic Information Systems
ICNG	Interim Construction Noise Guideline
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
km	Kilometres
Km/hr	Kilometres per hour
L	Litres
LGA	Local Government Area
m	Metres
mm	Millimetres
MNES	Matters of National Environmental Significance
MRFS	Macquarie Rivulet Flood Study
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NSW	New South Wales
OEH	Office of Environment and Heritage

Term or Acronym	Definition
PAEC	Potential Area of Environmental Concern
PEMP	Project Environmental Management Plan
PM	Particulate matter
PMF	Probable maximum flood
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PSC	Prestressed Concrete
Rd	Road
RMS	Roads and Maritime Services
Roads Act	<i>Roads Act 1993</i>
REF	Review of Environmental Factors
SEPP SRD	<i>State Environmental Planning Policy – (State and Regional Development) 2011</i>
SES	State Emergency Service
SIS	Species Impact Statement
SOHI	Statement of Heritage Impact
SSI	State Significant Infrastructure
SWMP	Soil and Water Management Plan
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TMP	Traffic Management Plan
WHS Act	<i>Work Health and Safety Act 2011</i>
WM	<i>Water Management Act 2000</i>
%	Percent

1 Introduction

1.1 Background

Shellharbour City Council (Council) propose to develop the Tripoli Way Extension (TWE), which would traverse and extend the existing Tripoli Way and The Expressway running parallel and to the north of Tongarra Road/Illawarra Highway (the project). The project encompasses the full length of the existing Tripoli Way, connecting with Tongarra Road/Illawarra Highway at the intersection with Broughton Avenue at the western extent and continuing east to connect with Terry Street/Illawarra Highway. The footprint of the project boundary is shown below in **Figure 1-1** along with the regional setting and surrounding land uses.

The primary function of the project will be to alleviate the impacts of traffic growth along Tongarra Road, ease traffic congestion within the Albion Park town centre, increase the safety of roads within Albion Park and provide a valuable addition to the transport network.

The TWE was conceived as early as the 1960's, as evidenced by the land zoning shown in the 'Illawarra Planning Scheme, 1961'. Since this time the alignment has undergone some minor amendments, however the intent remains consistent which is to alleviate traffic congestion through the Albion Park Town Centre.

Council have been accumulating funding for the project through developer Section 94 (now Section 7.11) contributions since 1993 with the project being a key piece of infrastructure associated with the development of Calderwood Valley and Tullimbar residential subdivisions located west of Albion Park.

The project will be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) with Council being both the proponent and the determining authority.

Council have engaged Cardno to develop this Review of Environmental Factors (REF) to assess the environmental impacts associated with the works and to identify any mitigation measures to be employed to ensure potential impacts are prevented or minimised.

1.1.1 Key features of the project

The REF study area and construction footprint are shown in **Figure 1-2**. Key design features of the TWE project are shown in **Figure 1-3** and **Figure 1-4** and include:

- > Two lanes from Broughton Avenue to Calderwood Road
- > Four lanes from Calderwood Road to Terry Street
- > Addition of a second leg on the southern and northern approach on Hamilton Road to the intersection with TWE
- > Addition of a second leg on the southern approach on Calderwood Road to the intersection with TWE
- > Central kerb type barrier for the majority of the length of Tripoli Way to prevent right turn movements for safety purposes, except at intersections
- > Three signalised intersections
- > Broughton Avenue and Illawarra Highway will remain a roundabout for the short term (with potential upgrade by others in future)
- > A bridge over Hazelton Creek
- > Moles Street will be converted to a left in/left out give way arrangement to allow direct access to the TWE
- > A widened embankment from Broughton Avenue to Hazelton Creek Bridge to allow future widening to four lanes
- > Total road length of approximately 1,975m.

1.1.2 Site context

The project is located approximately 120km south of Sydney in the town of Albion Park. Albion Park is a suburb situated in the Macquarie Rivulet Valley and is nestled to the east of the Illawarra Escarpment.

The project would traverse rural landscapes, residential areas and existing road networks and would cross Hazelton Creek twice, which is a tributary of the Macquarie Rivulet.

The Study Area is surrounded by the features described below, which are also shown on **Figure 1-1** and **Figure 1-2**:

- > North: The Macquarie Rivulet – a perennial river that is listed under Environmentally Sensitive Land under the Shellharbour Local Environmental Plan 2013 (LEP)
- > East: The Illawarra Highway, Frazers Creek and Boles Meadow. Boles Meadow is listed as Environmentally Sensitive Land under the Shellharbour LEP. The current construction activities of the Albion Park Rail bypass
- > South: Low to medium density residential development of the Albion Park area and Tongarra Road
- > West: Hazelton Creek, rural landscape and the Calderwood Valley residential development.

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by Cardno on behalf of Council. For the purposes of these works, Council is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the works and assessment of environmental impacts have been undertaken in the context of Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The REF has been prepared to fulfil the requirements of Section 5.5 of the EP&A Act. The findings of the REF would be considered when assessing:

- > Whether the project is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement (EIS) to be prepared
- > The provisions of Part 7 of the *Biodiversity Conservation Act 2016* (BC Act) and Part 7A of the *Fisheries Management Act 1994* that relate to the operation of the EP&A Act in connection with the terrestrial and aquatic environment as required by Section 1.7 of the EP&A Act.

Location Plan

TRIPOLI WAY EXTENSION PROJECT

Legend

- Study Area
- Railway Station (NSW SS)
- Railway (NSW SS)
- Major Road (NSW SS)
- Local Road (NSW SS)
- Major Watercourse (NSW SS)
- 5km Buffer
- LGA Boundary
- Land Use (ABS 2016)**
- Other
- Commercial
- Education
- Hospital/Medical
- Industrial
- Parkland
- Primary Production
- Residential
- Water

FIGURE 1-1

1:80,000 Scale at A3



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-06-22 | Project: 8201612601
Coordinate System: GDA1994 MGA Zone 56
Map: 82016126-GS-054-FinalLocationPlan.mxd 03



Study Area

TRIPOLI WAY EXTENSION PROJECT

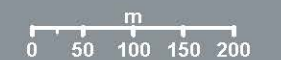
Legend

- Study Area (20.20 ha)
- Construction Footprint (14.47 ha)
- Proposed Road Alignment
- Proposed Stormwater Network
- Watercourse (NSW SS)
- Potential Ancillary Facility
- Cadastre (NSW SS, 2019)



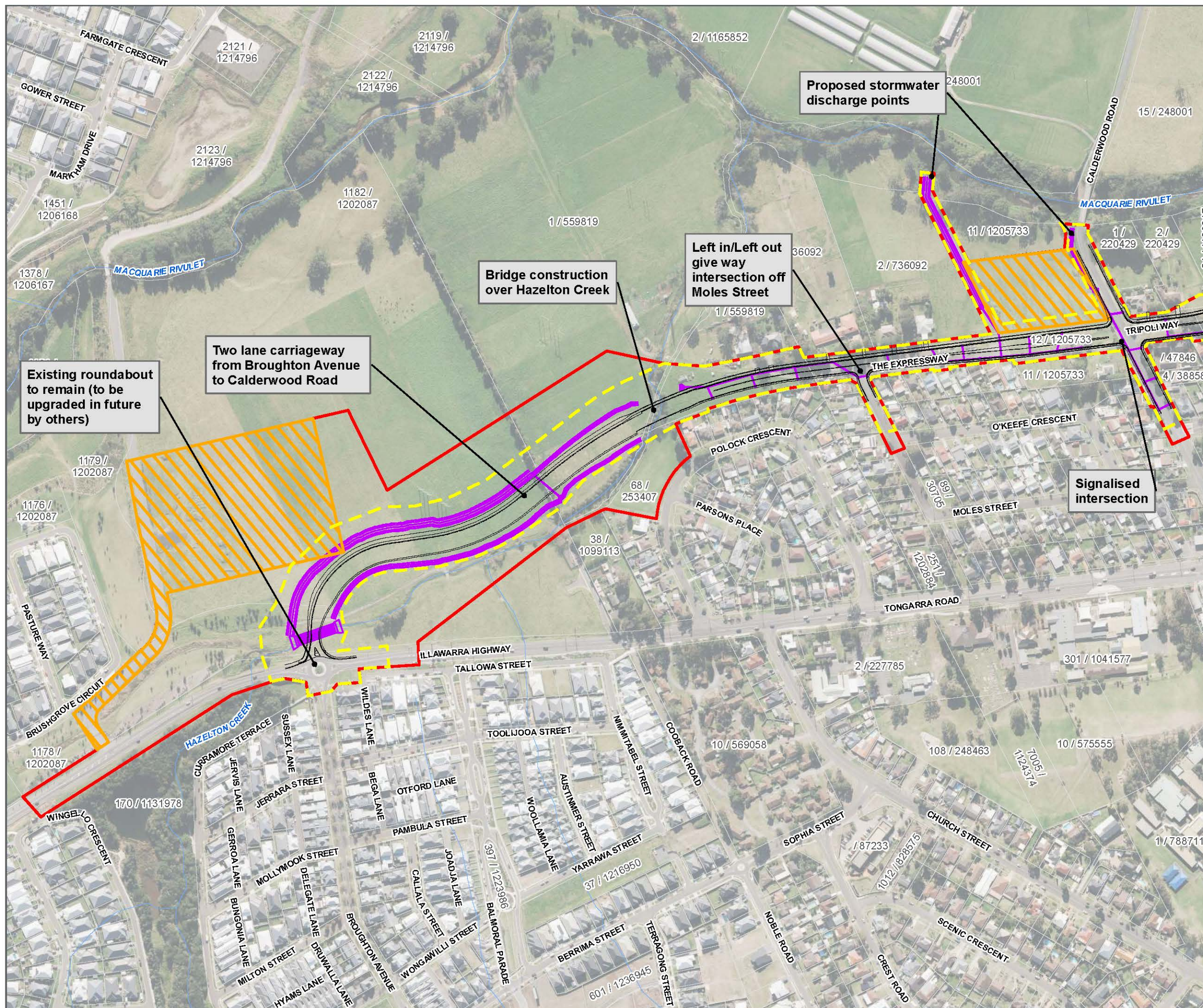
FIGURE 1-2

1:7,500 Scale at A3



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2021-07-22 | Project: 8201612601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82016126-GS-053-FinalStudyArea.mxd 04
Aerial imagery supplied by Metromap (July, 2020)



Key Features West

TRIPOLI WAY EXTENSION PROJECT

Legend

- Study Area
- Proposed Road Alignment
- Proposed Stormwater Network
- Watercourse (NSW SS)
- Construction Footprint (14.47 ha)
- Potential Ancillary Facility

FIGURE 1-3

1:4,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
 Date: 2021-08-13 | Project: 8201612601
 Coordinate System: GDA 1994 MGA Zone 56
 Map: 82016126-GS-058-KeyFeaturesWest.mxd 03
 Aerial imagery supplied by Metromap (July, 2020)

Key Features East

TRIPOLI WAY EXTENSION PROJECT

Legend

- Study Area
- Proposed Road Alignment
- Proposed Stormwater Network
- Watercourse (NSW SS)
- Construction Footprint (14.47 ha)
- Potential Ancillary Facility

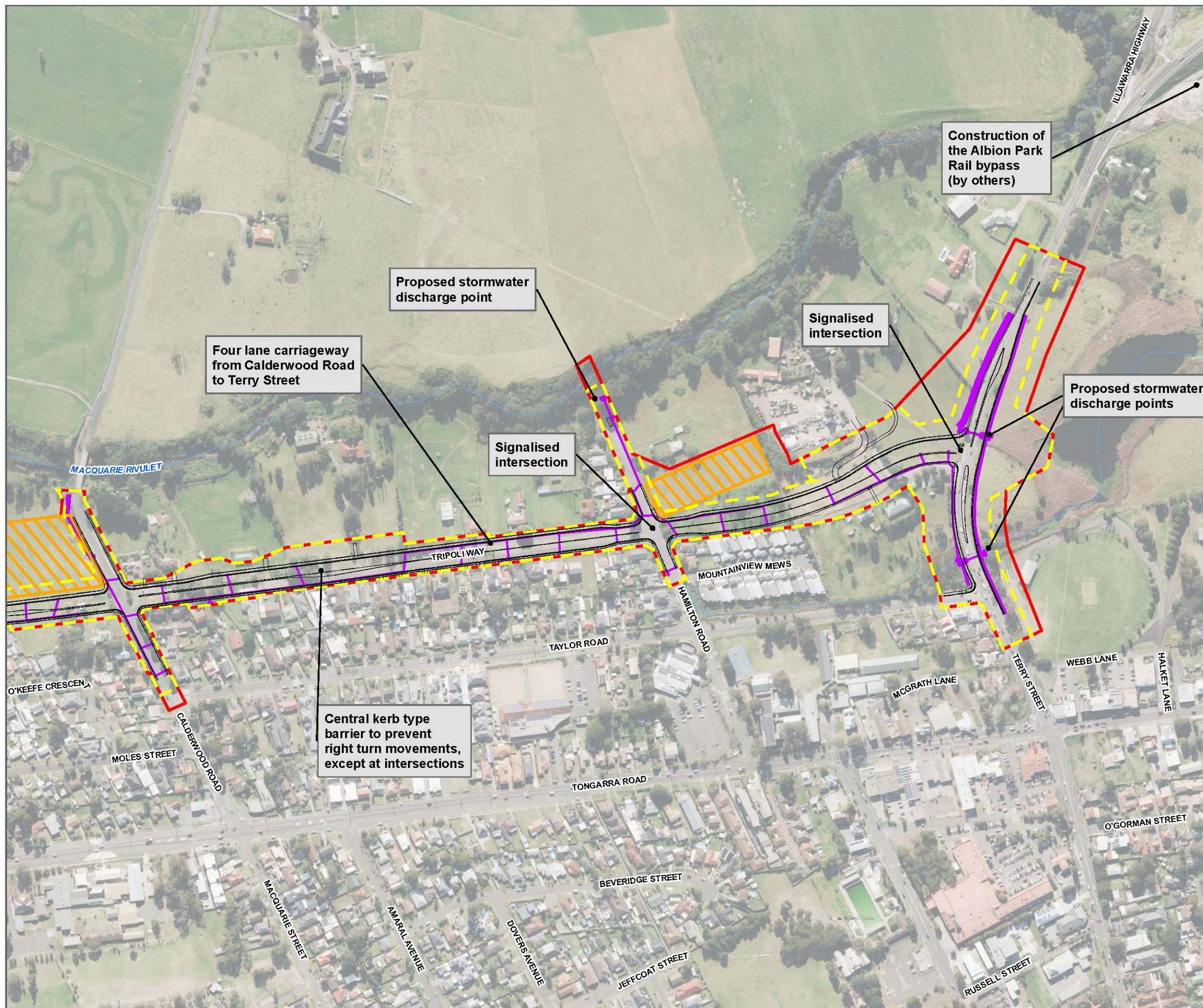
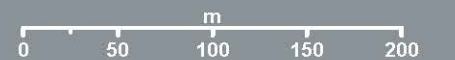


FIGURE 1-4

1:4,000 Scale at A3



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2021-08-13 | Project: 8201612601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82016126-GS-059-KeyFeaturesEast.mxd 03
Aerial imagery supplied by Metromap (July, 2020)

2 Project justification

2.1 Strategic need for the project

Council engaged master planning services from McGregor and Coxall to prepare the *Albion Park Town Centre Plan 2014* (Shellharbour City Council, 2014) with the objective of creating a vibrant, inclusive, safe, attractive, connected, convenient, accessible and commercially successful Town Centre.

The Illawarra Highway is the main arterial road running directly through the town centre of Albion Park. Currently, major residential developments west of Albion Park, including the Tullimbar and Calderwood subdivisions, have led to progressively worsening traffic congestion through the town centre.

The construction of the TWE along the northern periphery of the Albion Park Town Centre offers the potential to significantly relieve traffic impacts along Tongarra Road, enabling opportunities to implement verge and streetscape improvements and help alleviate traffic congestion. These improvements will lead to the creation of a Town Centre that better aligns with that described in the *Albion Park Town Centre Plan 2014*.

The population of the Shellharbour Local Government Area (LGA) is forecasted to grow by approximately 28% from a population of 74,391 in 2020 to a population of 94,877 in 2041 (Profile i.d. 2020). The population increases are mainly attributed to the current and future residential developments at Shell Cove, Shell Heights, Tullimbar and Calderwood. 20-

The TWE is a critical piece of infrastructure that will alleviate traffic pressures through Albion Park, noting that the residents of the Calderwood and Tullimbar subdivisions currently utilise the Illawarra Highway / Tongarra Road to access the regional centres of Wollongong and Shellharbour. With continued urban development to the west of Albion Park, traffic congestion is expected to worsen on existing road infrastructure.

2.1.1 Strategic planning and policy framework

State Infrastructure Strategy 2018-2038: Building Momentum

The State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018) is a 20 year strategy that aims to improve NSW's economic prosperity and global competitiveness while meeting the challenges of population growth and remaining a great place to live and work.

The TWE would deliver on key objectives stated within the State plan, including:

- > *Coordinated investment in growth areas across transport, health, education and water ensures we prioritise the creation of new places and neighbourhoods*
- > *We can support population growth while maintaining local amenity.*

With increased development in Albion Park and the newly created fringe suburbs of Calderwood and Tullimbar, the TWE project would have a significantly positive benefit on residents and commuters alike. The strategy also identifies the value of well-developed road networks in regional centres and towns.

NSW Future Transport Strategy 2056

The NSW Future Transport Strategy 2056 (NSW Government 2018) is an overarching strategy, supported by a suite of plans to achieve a 40-year vision for the NSW transport system. The plan identifies a 'hub and spoke' network of services for regional areas to provide better connections between communities and improved access to regional cities and centres.

The project would meet a number of key outcomes outlined throughout the Future Transport Strategy including reducing travel times and improving the safety of our roads. The project would alleviate congestion and allow for a safe commute to adjoining major highways.

NSW Road Safety Plan 2021

The NSW Road Safety Plan 2021 (NSW Government 2018) features targeted and proven initiatives that will help NSW progress towards the goal of reducing road-related fatalities by 30 per cent by 2021. The Plan is a priority for the Government to improve road safety, addressing key trends, behaviours and the types of

crashes occurring on NSW roads. This project would provide a safe environment for pedestrians and commuters within the Albion Park Town Centre by alleviating traffic congestion.

Transport for NSW, Connecting to the future – 10 year blueprint

Connecting to the Future 10 year Blueprint outlines Transport for NSW ambitions and strategic priorities for the next 10 years to support the NSW Future Transport Strategy 2056. The Blueprint identifies a framework to deliver strategic priorities and ambitions, structured around four primary outcomes:

1. For customers: connecting our customers' whole lives
2. For communities: successful places
3. For the people of NSW: strong economy and quality of life
4. For the people of Transport for NSW: thriving people doing meaningful work.

The project supports the framework identified by delivering a necessary link within the transport system in order to provide safe and seamless journeys for people entering and leaving the Albion Park area. The project may also facilitate an improvement in the economic efficiency of the Albion Park Town Centre due to an alleviation of traffic congestion.

Illawarra Regional Transport Plan (Transport for NSW, 2014)

This plan identified the strategic action to undertake projects to improve the capacity of major road infrastructure such as the Illawarra Highway and the Princes Highway. The works would occur to road infrastructure connecting to the Illawarra Highway and is consistent with the objectives of this plan.

2.1.2 Albion Park Rail bypass

The Princes Highway is the main north–south transport corridor linking Sydney and Wollongong to the NSW south coast and north-eastern Victoria. The highway is an important commuter, freight, bus and tourist route for the south coast. The section of the highway between Yallah and Oak Flats is also used as a local route for areas such as Albion Park, Albion Park Rail, Oak Flats, Yallah and Dapto.

Transport for NSW (TfNSW) has recently completed an extension of the M1 Princes Motorway between Yallah and Oak Flats to bypass Albion Park Rail, also known as the Albion Park Rail bypass. The bypass completes the 'missing link' for a high standard road between Sydney and Bomaderry. It now provides easy access to Dapto, Albion Park and Oak Flats. The bypass reduces travel times for through and local traffic, improves the reliability of journeys through greater flood immunity and provides more consistent driving conditions. It also diverts a substantial proportion of through traffic onto the new motorway, reducing traffic volumes on the A1 Princes Highway through Albion Park Rail. This bypass would improve local amenity and access, and reduce other traffic related impacts such as noise for nearby residents.

The Albion Park Rail bypass was identified as an NSW Major Project and is integral to the alleviation of traffic congestion experienced on the Princes Highway in Albion Park Rail. This major road infrastructure project has always been essential to the development of the TWE as it allows increased traffic volumes from the Albion Park and surrounds to access the Albion Park Rail bypass whilst reducing congestion.

The preferred design option for the Albion Park Rail bypass identified a southbound exit ramp and a northbound entry ramp connecting to the Illawarra highway to allow road users in Albion Park direct access to the Albion Park Rail bypass. The Albion Park Rail bypass will have a meaningful connection to the Illawarra Highway and further to the TWE and will help with attaining the project goals and justifications. The Albion Park Rail bypass design and connecting ramps were developed through an extensive optioneering, stakeholder consultation and design development process which identified key considerations of the project objectives described below.

2.2 Existing road infrastructure

Tripoli Way, in its existing form, is a local road providing access to a number of low-density residential dwellings situated between Calderwood Road and Hamilton Road in Albion Park. The road runs in a general east/west direction and consists of two distinct sections separated by a residential lot. The western portion is accessed off Calderwood Road and extends 65m east. The eastern portion is accessed off Hamilton Road and extends approximately 455m west as shown in **Figure 2-1**. The road is currently disconnected from any major road and is accessible only by Hamilton Road.

The Expressway is a minor access road servicing a relatively small number of residents. It is predominately undefined with no kerb and guttering and is approximately 200m in length adjoining to Moles Street.

The Illawarra Highway is Albion Park's main arterial road allowing for commuters to connect to the Princes Highway running east-west through Albion Park. The road is primarily a single lane and multi directional with varying speed limits. Through and adjacent to the Study Area, the posted speed limit for the Illawarra Highway is 50km/h. The Illawarra Highway is broken up at the signalised intersection with Terry Street running southbound. This intersection is on the south eastern extents of the Study Area and will play a key role in traffic management and traffic impacts. The Illawarra Highway runs roughly parallel to the development before heading northbound at the Terry Street intersection towards the Princes Highway.

Terry Street runs in a north-south direction through Albion Park with the majority of the alignment as a single lane arterial road with varying speed limits. As Terry Street continues north to merge with the Illawarra Highway, the road becomes a single lane multi directional road that connects with the Princes Highway.

Existing Roads and Infrastructure

TRIPOLI WAY EXTENSION PROJECT

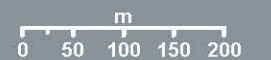
Legend

- Study Area
-  Bus Stop (TfNSW, 2018)
- Local Road (NSW SS)
- Watercourse (NSW SS)
- Construction Footprint (14.47 ha)
- Potential Ancillary Facility



FIGURE 2-1

1:7,500 Scale at A3



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2021-08-19 | Project: 8201612601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82016126-GS-055-ExistingRoadsInfrastructure.mxd 03
Aerial imagery supplied by Metromap (July, 2020)

2.3 Project objectives

The primary objective of the project is to alleviate traffic impacts through the Albion Park Town Centre. In addition, the project aims to:

- > Increase traffic flow efficiency
- > Provide a carriageway that is not inundated during a storm event up to and including the 20 year ARI flood event
- > Provide reliable travel times
- > Increase the level of service of intersections
- > Improve road safety
- > Minimise private property acquisition
- > Minimise impacts on existing utilities
- > Minimise environmental impacts.

2.4 Options considered

Alternative options have been considered and reviewed prior to deciding on the accepted alignment and TWE. The TWE alignment has been refined and modified throughout the lifecycle of this project and those alternatives have also been addressed. The resulting options studied included:

1. Do Nothing

The 'do nothing' option consists of maintaining the current traffic conditions recognised in Albion Park Town Centre. The current network experiences heavy congestion at busy commuting times with traffic volumes expected to increase along the Illawarra Highway as development in Tullimbar and Calderwood continues to grow. It is likely that congestion and traffic queuing in Albion Park Town Centre will continue to increase causing greater delays for commuters. The Albion Park Town Centre has been strategically identified by Council to develop and provide a varying amount of services to residents and visitors. The current congestion issues and accessibility of the town centre would not allow for the local town centres predicted social and economic performance to be fulfilled.

2. Tripoli Way Extension

The TWE was identified by Council in 1961 as a long-term strategic plan to manage the growing population. The project will reduce congestion on the Illawarra Highway through Albion Park, and has been identified in Council's Section 94 Contributions Plan since 1993. The corridor for the proposed alignment was first identified by Council as the preferred route in 1961 and remains generally consistent with the project design, utilising existing roads including Tripoli Way and the Expressway. The surrounding land use of the alignment in 1961 was predominantly rural residential, and whilst the density of dwellings has increased since 1961, the alignment is located at the northern periphery of Albion Park and will interfere with a relatively limited number of existing dwellings.

The TWE is a key strategic piece of road infrastructure for the increased efficiency of the local road network and is required to help alleviate traffic congestion in the Albion Park Town Centre. It would also enable commuter's easier access to the Albion Park Rail bypass and the regional centres of Wollongong and Shellharbour. The design and alignment of the TWE has been refined over this period and alternatives are discussed below in **Section 2.4.1**.

Ultimately, Council decided that the option to progress with the TWE was the best option based on the rationale discussed above.

2.4.1 Design alternatives

Illawarra Highway / Broughton Avenue / Tripoli Way intersection

An existing single lane roundabout currently services the Illawarra Highway and Broughton Avenue. As part of the design refinement, intersection design alternatives were considered, including the following:

- > Upgrading to a dual lane entry roundabout to service TWE
- > Installation of signalised intersection

- > Retention of the single lane roundabout to service TWE.

Ultimately, Council decided to move forward with the retention of the existing single lane roundabout, however, it is acknowledged that a required upgrade of the intersection is planned to be undertaken by others in the future.

Moles Street / Tripoli Way intersection

Various iterations of the Moles Street intersection were considered as part of the progression of the traffic data analysis. The following options were considered for the Moles Street intersection:

- > Closing off Moles Street to become a cul-de-sac which would not allow traffic direct access to the TWE
- > Installation of a signalised intersection to allow traffic on Moles Street direct access to the TWE
- > Conversion of the street finish to a left in/left out give way arrangement to allow direct access to the TWE.

Following consideration and analysis of traffic data and road design constraints, the most appropriate option for the Moles Street / Tripoli Way intersection is a left-in, left-out access to and from Tripoli Way.

Tripoli Way / Albion Park Butter Factory (former) and Tulkeroo

Alternative alignments were considered to avoid direct impacts to the former Albion Park Butter Factory (disused). The alternative alignments included bypassing the Albion Park Butter Factory to the north, passing through private properties to the east of the Albion Park Butter Factory and then reconnecting to Tripoli Way as shown in Figure 2-2 and Figure 2-3.

The report “*Tripoli Way Extension Update*” dated 1 October 2019 prepared for Shellharbour City Council’s Executive Leadership Team aimed to “inform...of the progress to date of the TWE project...and to seek endorsement to proceed with the overarching concept design.” This report included a range of matters but also included high level consideration of an alternative alignment (Option 2) and the proposed alignment (Option 1). The report found significant flooding impacts (and associated mitigation required) for Option 2, and as such an additional alternative alignment (Option 3) was investigated (as shown in Figure 2-3). Option 3, while having lesser flooding impacts, would require the demolition of two properties and would not meet previous Council Resolutions (understood to be in the context of the report as impacts to the community, principally construction impacts).

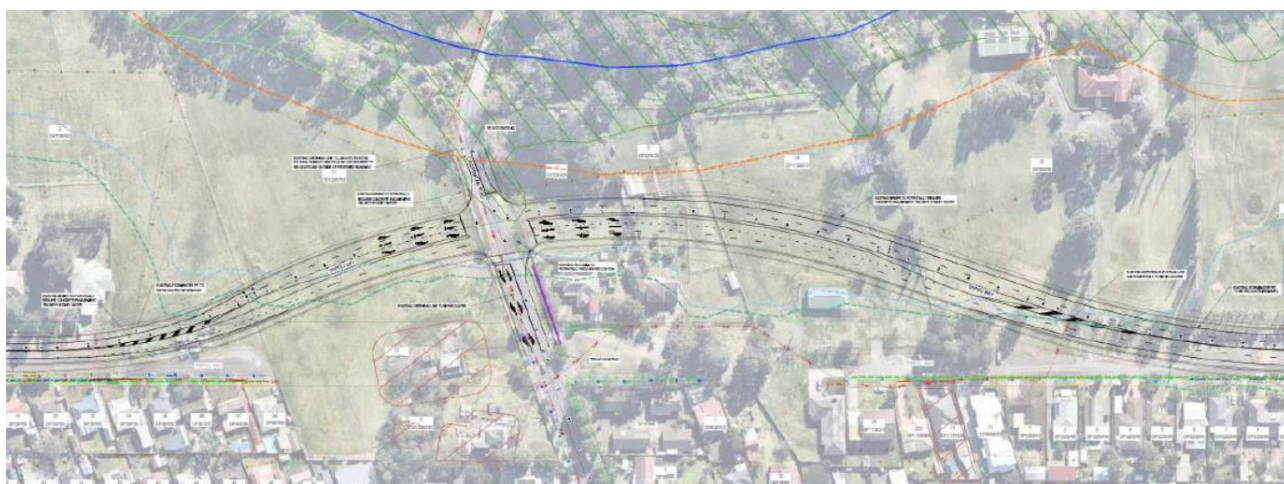


Figure 2-2 Alternative alignment (Option 2)



Figure 2-3 Alternative alignment (Option 3)

Following consideration of these options, Council's Executive Leadership Team resolved at the meeting of 1 October 2019 to endorse the proposed overarching concept design presented in the report (Option 1), which would require significant impacts to the Albion Park Butter Factory building.

A comparison of the key criteria between the original proposed alignment (Option 1), and the alternative alignment (Option 2), is provided in **Table 2-1** below. **Table 2-1** was prepared by Cardno to present key data for the purposes of this REF (based on the 50% design), and was not included/considered in the 2019 Council Executive Leadership Team endorsement referenced above.

Table 2-1 Alignment options comparison summary

Alignment Options Comparison Summary		
Item	Option 1 (proposed alignment)	Option 2 (alternative alignment)
Property acquisition area required	7,383m ²	14,192m ²
Pavement works	15,564m ²	15,992m ²
Utility reticulation protection/relocation		
Potable water	490m, 7 water valves/pits	57m
Wastewater	128m, 2 sewer manholes	233m
Electrical	573m, 14 electrical poles	255m, 4 electrical poles
Telecommunications	198m, 12 communications pits	124m, 1 communications pit
Ecology and Flooding constraints		
Riparian corridor	0m ²	66m ²
Endangered Ecological Communities (NPWS 2002)	0m ²	607m ²
20year flood extents (MACQUARIE RIVULET FLOOD STUDY, WMA WATER 2017)	0m ²	12,472m ²
100 year flood extents (MACQUARIE RIVULET FLOOD STUDY, WMA WATER 2017)	973m ²	14,948m ²

Considerations for the alternative alignments (Options 2 and 3) to avoid significant impacts to the former Butter Factory building include; the matters included in **Table 2-1**: issues raised within the Council Executive Leadership Team endorsement, in addition to the following key constraints:

- > Area of property acquisition and demolition
- > Area of proposed pavement construction
- > Ecology and flooding
- > Structural elements and adequacy of the Albion Park Butter Factory building.

Based on the above, Council's Executive Leadership Team endorsed the proposed alignment (Option 1) which would include significant impacts to the Albion Park Butter Factory building. Further detail on the heritage impacts associated with significant impacts to the former Albion Park Butter Factory building is included in **Section 6.9**.

3 Proposed development

3.1 The project

The project would see the upgrade and extension of the existing Tripoli Way alignment to connect arterial roads, Terry Street (Illawarra Highway) and Tongarra Road (Illawarra Highway), without passing through the Albion Park Town Centre. The TWE encompasses the full length of these existing access roads and extends them east to link into the future Albion Park Rail bypass and west into Tongarra Road (Illawarra Highway) at the roundabout intersection with Broughton Avenue. The extension would be through a majority of undeveloped rural properties and the design aims to have a limited impact on existing residential lots.

The project will include the following general design features:

- > Significant road widening of the existing Tripoli Way to allow four (4) travel lanes (two in each direction) for the section of the Tripoli Way east of Calderwood Road
- > The section of the Tripoli Way west of Calderwood Road would consist of two (2) travel lanes (one in each direction) and incorporate a bridge and culverts to cross the existing Hazleton Creek at two locations
- > Addition of a second leg on the southern and northern approach on Hamilton Road to the intersection with TWE
- > Addition of a second leg on the southern approach on Calderwood Road to the intersection with TWE
- > A 2.5m shared path on the northern side of the alignment, a 1.5m footpath on the southern side for a section of the alignment, kerb and gutter, a minor and major stormwater drainage network and water treatment devices would also be installed as part of the upgrade
- > A bridge will be constructed for the TWE to cross the existing Hazleton Creek. The new bridge will have an overall span of approximately 52m and has been documented as a three span bridge in order to span the channel and maintain hydrological constraints
- > Three signalised intersections from Calderwood Road east to Terry Street, with potential for future signalisation of the Broughton Avenue intersection from existing roundabout.

The primary objective of the project is to alleviate traffic impacts through the Albion Park town centre. Population modelling indicates that the Shellharbour LGA is expected to grow 28% between 2020 and 2041. As such an upgrade to the local road network is required to proactively manage the current and future pressures on local roads.

3.2 Design

Figure 2-1 shows the extents of the Study Area and project footprint. A description of the concept design is provided below with the concept design plans included as **Appendix B**. The concept design will be further refined during the detailed design phase.

3.2.1 Design criteria

The key design criteria for the proposal is summarised in **Table 3-1**.

Table 3-1 Design features of the project

Design Constraint	Design Criteria	Design Criteria Source
Road hierarchy	Local Sub-arterial / Major collector	SCC Engineering Design Code – 0041 Geometric Road Design
Design speed	Design speed: 70km/h	SCC Engineering Design Code – 0041 Geometric Road Design
Posted Speed	Posted speed limit: 60km/h	SCC Engineering Design Code – 0041 Geometric Road Design
Road width	Traffic lane width: 3.5m Turning lane width: 3.5m Turning lane width at intersection: 3.2m	SCC Engineering Design Code – 0041 Geometric Road Design

Design Constraint	Design Criteria	Design Criteria Source
	Shoulder width: 3m	
Verge width	1.5m – 3.5m	Council Preference
Typical cross fall	3%	SCC Engineering Design Code – 0041 Geometric Road Design
Maximum super elevation	5%	Austroads Part 3 – Table 7.8
Pathway	Footpath width: 1.2m Shared path width: 2.5m	SCC Engineering Design Code – 0041 Geometric Road Design
Minimum horizontal radius		Austroads Part 3 – Table 7.6
- Desirable	161m	
- Absolute	107m	
Equivalent minimum K factor		Austroads Part 3 – Table 8.7 Austroads Part 3 – Figure 8.9
- Crest	K=19.1	
- Sag	K=13	
Design vehicle	Service vehicles (8.8m) Single unit truck/bus (12.5m)	Austroads Part 4 – Table 5.1
Maximum longitudinal grade	6%-8%	Austroads Part 3 – Table 8.3
Maximum longitudinal grade		SCC Engineering Design Code – 0041 Geometric Road Design
- Desirable	1%	
- Absolute	0.5%	
Desirable minimum Stopping Sight Distance (SSD)	102m	Austroads Part 3 – Table 5.5
Minimum vertical curve		SCC Engineering Design Code - 0041 Geometric Road Design
Desirable	50 m	
Absolute (to be applied at road junctions only)	20 m	
Maximum batters slope		Council Preference
- Cut	1:2 (V:H)	
- Fill	1:4 (V:H)	

3.2.2 Engineering constraints

The engineering constraints to the design and construction of the project include:

- > Existing utilities, drainage and associated structures
- > A tightly constrained corridor for construction between The Expressway and Terry Street with built structures directly on boundaries of the Study Area limiting horizontal alignment and vertical levels
- > Minimising property acquisition
- > Bridge design traversing Hazelton Creek
- > Retention of vegetation
- > Maintaining access to existing residential and commercial properties
- > Maintaining traffic flow during construction
- > Minimising flood impacts
- > Minimising impacts to built form including heritage items, where applicable
- > Minimising archaeological impacts.

3.2.3 Design features

3.2.3.1 Tripoli Way Extension

Concept design drawings for the TWE have been provided in **Appendix B**. The drawings outline the following for the project:

- > Locality Plan – Drawing C2001
- > General Arrangement Key Plan – Drawing C2004
- > General Arrangement Layout Plan – Drawing C2005 – Drawing C2013
- > REF Boundary Layout Plan – Drawing C2014 – Drawing C2015
- > Typical Road Cross Sections – Drawing C2030 – Drawing C 2033
- > Typical Civil Details- Drawing 2034
- > Road Long Sections – Drawing 2040 – Drawing 2045
- > Road Cross Sections – Drawing 2050 – Drawing 2070
- > Intersection Layout Plan – Drawing C2090 – Drawing C2094
- > Road Pavement Layout Plan – Drawing C2110 – Drawing 2118
- > Line Marking and Signposting Layout Plan – Drawing C2120 – Drawing C2128
- > Property Acquisition Layout Plan – Drawing C2130 – Drawing C2138
- > Service Layout Plan – Drawing C2140 – Drawing C2148
- > Vehicle Turning Path Layout Plan – Drawing C1250 – Drawing C1261
- > Bridge over Hazelton Creek General Arrangement – Drawing C2200 – Drawing C2201
- > Landscape Plan – Drawing L1000 – Drawing L1030

The figures provided in **Section 1.1.1** also provide a summary of the features described below.

3.2.3.2 Intersections

As part of the TWE, existing and proposed intersections will be developed or upgraded due to the construction of the new roadway. The following intersections and their design have been proposed with the TWE:

Illawarra Highway / Tongarra Road / Broughton Avenue / Tripoli Way

- > 4-approach roundabout control intersection with single lane arrangement at all approaches in 2026
 - Additional approach at northern side of Illawarra Highway / Tongarra Road / Broughton Avenue to connect TWE
- > Upgraded to a signalised 4-approach intersection in 2041
 - Dual traffic lanes at northern and southern approaches
 - Single traffic lane with additional shared through and left turn short bay at the eastern and western approaches along with a dedicated short right turn bay. Single lane exit lane with additional short 100m downstream merge lane.

Moles Street / Tripoli Way

- > Conversion of Moles Street to a left-in/left-out give-way arrangement (Moles Street giving way to Tripoli Way).

Calderwood Road / Tripoli Way

- > 4-approach traffic signal control intersection
- > Single traffic lane with additional shared through & left turn short bay at western approach along with dedicated short right turn bay. Single lane exit lane with additional short 150m downstream merge lane

- > Dual traffic lanes with additional short right turn bay at eastern approach. Dual lanes at eastern exit approach
- > Dual traffic lanes at northern and southern approaches.

Hamilton Road / Tripoli Way

- > 4-approach traffic signal control intersection
- > All movements are permissible. Note that the northern approach of Hamilton Road only serves eight dwellings and as such will have no effect on the intersection's performance.

Illawarra Highway / Terry Street / Tripoli Way

- > 3-approach traffic signal control intersection.
- > Dual traffic lanes at the northern approach, with an additional short lane dedicated for right turns. The middle lane is a shared through-and-right turn lane, and the outside lane allows for through movements only. Two lanes are provided for exit movements in the southbound direction.
- > Dual traffic lane at southern approach. Single lane exit lane with additional short 150m downstream merge lane.
- > Dual right turn traffic lanes with two additional short left turn bays at western approach. Dual exit lanes.

As requested by Council, this REF considers the traffic and noise impacts associated with an upgraded Broughton Ave / Illawarra Highway intersection in the year 2041 (i.e. a signalised, intersection rather than a roundabout). However, and as also requested by Council, this REF does not seek approval to construct the upgraded intersection, and instead only seeks approval for connection to the existing roundabout formation. The intent of this approach is to demonstrate the operational performance of what is expected to be the future road network, regardless of the future upgraded intersection being constructed by others.

3.2.3.3 Pedestrian and cyclist facilities

A 2.5m shared user path for active transport is proposed on the northern side of the alignment for the entire length of Tripoli Way between Broughton Avenue / Tongarra Road intersection and Terry Street. In addition, a 1.5m footpath is proposed on the southern side of the alignment from Hamilton Road to Moles Street.

3.2.3.4 Drainage

The design incorporates a system of formalised stormwater pit and pipe network and open swales to achieve a sufficient drainage capacity to cater for a 20-year average recurrence interval (ARI) storm event. The use of swales where practicable assists in reducing project cost and allows effective transmission of stormwater in lower sections of available grade.

Council requested that the amount of stormwater draining south along Hamilton Road is to be minimised as much as possible. A design was initially proposed with the section of Hamilton Road south of Tripoli Way draining against the grade to Macquarie Rivulet. However, due to the 20-year flood levels in the rivulet, this was not achievable. As a result, Tripoli Way is draining into the Macquarie Rivulet but the southern portion of Hamilton Road is draining south.

3.2.3.5 Bridge design

As shown in **Figure 1-3**, a bridge is required for the TWE to cross the existing Hazleton Creek towards the western extent of the works. The new bridge will have an overall span of approximately 52m and has been documented as a three span bridge in order to span the channel and maintain hydrological constraints. Standard pre-stressed concrete 18 metre beams will be required to achieve this span. However, reducing the overall thickness of the superstructure as much as feasibly possible should be considered in order to maintain vertical clearance required for flooding constraints.

In order to support the 16m trafficable roadway and 2.5m shared path, approximately 24 Prestressed Concrete (PSC) girders will be required. A typical reinforced concrete deck of minimum 200mm thick is recommended, capped with a 75mm thick layer of asphaltic concrete and sealed with a waterproofing membrane. A 6m approach slab is recommended to be installed from the back of the bridge abutment, incorporating the same cross section as the bridge deck.

3.2.3.6 Lighting

An indicative street lighting layout is being developed using design principles from *AS 1158.1.1 – Lighting for Roads and Public Spaces*, with Tripoli Way classified as having a V5 lighting subcategory under this standard.

Verge allocation assumptions in accordance with Endeavour Energy LDI0001 Section 5.1.4.2 and AS/NZS1158.1.3 Table B1:

- > Min 0.7m from a kerbed road and 1m at an intersection (outside of Zone 1)
- > Zone 2 and 3 with Zone 2 being Frangible – Impact Absorbing
- > Spacing (based on a carriageway width between 12m and 23m)

Street lights have been calculated at a maximum 55m spacing based on a 23m carriageway width using a mounting height of 10.5m with a 4.5m outreach and an 82 W LED luminaire. The lighting design is shown on sheets C2140-C2148 of the 100% concept design of the Tripoli Way Extension.

3.2.3.7 Landscape

Mass planted landscaping in the form of single trunked trees, small shrubs, grasses and groundcovers has been provided along the earthwork batters of the new road alignment. Proposed planting within 5m of a pedestrian pathway is shrubs, grasses and ground covers lower than 1m to encourage safety and surveillance. The main objectives of the landscaping design are to provide amenity, soften the appearance of the road and provide stability to the soil covering of the earthwork batters.

Plant species selected will be in accordance with Council's Development Control Plan planting guidelines.

3.3 Construction activities

3.3.1 Work methodology

It is anticipated that construction works will be completed over a 12-month period, however, it is noted that the duration is subject to change due to unforeseen circumstances and environmental conditions such as heavy and prolonged rainfall.

Construction activities will be guided by a Construction Environmental Management Plan (CEMP) developed by the principal contractor and the detailed work methodologies (to inform the CEMP) will be determined during detailed design and construction planning. The anticipated work methodology is described below noting that the order of activities may vary to suit the final construction staging plans, which will be determined by the construction contractor.

The following presents an overview of the likely construction activities required to deliver the project. This is a high-level overview based on the conceptual design. The final construction methodology, including the bulk earthworks strategy, material sources and traffic management for the project, would be determined during the detailed design and/or tender phase.

- > Completion of archaeological investigation for areas of high archaeological potential
- > Site establishment including the contractor's main compound and ancillary facilities
- > Installation of limit of works fencing and/or flagging
- > Installation of sediment and erosion controls
- > Installation of temporary water way crossings for Hazelton Creek
- > Install haul routes and gate access and egress to and from the project site
- > Clear, grub and mulch vegetation within the project footprint
- > Demolish existing structures
- > Archaeological monitoring of demolition and ground disturbance works
- > Relocate and/or protect the existing above ground and underground utilities
- > Strip topsoil and stockpile for later reuse
- > Commence consolidation of existing soft soils at the western and eastern extents of the project footprint by installation of vertical drains and preloading with fill

- > Import, place and compact engineering fill for the preloading of the soft soils
- > Establish piling pads for the new bridge over Hazelton Creek
- > Commence piling works, install pile reinforcement and pour concrete
- > Construct piers up from each pile and abutments
- > Construct headstocks
- > Lift planks into place
- > Install reinforcement for the bridge deck and approach slabs and pour concrete
- > Install precast concrete safety barriers including stitch pour with bridge deck
- > Install bridge railing
- > Install major transverse drainage structures
- > Earthworks to design subgrade level
- > Mill existing pavement and stockpile for reuse as select fill
- > Install subsoil drainage lines
- > Install kerb and gutter and longitudinal drainage structures
- > Install new utility conduits, pits and structures.
- > Install concrete pathways, kerb ramps, islands
- > Install traffic signal posts and lanterns
- > Construct new pavement and tie into existing
- > Install permanent safety barriers
- > Install asphaltic concrete wearing course
- > Install delineations and road pavement markings
- > Install roadside furniture
- > Landscaping
- > Site disestablishment.

3.3.2 Construction hours and duration

It is anticipated that construction will be largely carried out during standard construction working hours in accordance with the *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009):

- > Monday to Friday: 7am to 6pm
- > Saturday: 7am to 1pm
- > Sundays and public holidays: no work

To minimise disruption to daily traffic and disturbance to surrounding land owners and businesses, it will be necessary to carry out some work outside of the hours specified above. The following activities are likely to be undertaken outside standard construction hours:

- > Placement of asphalt
- > Intersection tie-in activities
- > Traffic signal installation
- > Some utility replacement works under existing road pavements
- > Line marking
- > Installation and adjustment of barriers and signage for construction zones.

Any work required outside of standard working hours will be in accordance with the *Interim Construction Noise Guideline* (DECC, 2009). Prior notification will be given to the community if any work is planned to be carried out outside standard construction hours and will be negotiated between the contractor and Council.

3.3.3 Plant and equipment

A range of plant and equipment will be used during construction. The final equipment and plant requirements will be determined by the construction contractor. An indicative list of plant and equipment is provided below:

- > Excavators
- > Graders
- > Concrete agitator trucks
- > Concrete pumps
- > Cranes
- > Elevated work platforms
- > Backhoes with trenching attachment
- > Dozer
- > Compactor
- > Profiler for milling existing pavement
- > Truck and trailers for import of fill
- > Water carts
- > Generators
- > Pumps and compressors
- > High pressure water gurney for green cutting concrete
- > Pneumatic scabbler
- > Vibratory rollers
- > Bored piling rig
- > Excavator with rock hammer attachment – unlikely
- > Front end loaders
- > Bobcats
- > Sweeper for cleaning up tracked mud
- > Kerb machine
- > Asphalt paver including shuttle buggy
- > Concrete paver
- > Rubber tyred roller
- > Mulcher
- > Chainsaw
- > Trucks
- > Light vehicles
- > Welders and angle grinders
- > Drilling rig
- > Haul trucks.

3.3.4 Traffic management and access

Construction of the project will generate heavy vehicle movements. These heavy vehicle movements will mainly be associated with:

- > Delivery of construction materials
- > Spoil and waste removal
- > Delivery and removal of construction equipment and machinery.

It is anticipated that construction vehicles would access the site via arterial roads wherever possible. Access will be via the Illawarra Highway, Calderwood Road and an existing haul road off the Calderwood Valley development site. Light vehicle movements would be required for the movement of construction personnel, including contractors, site labour force and specialist supervisory personnel.

A detailed traffic management plan will be prepared in accordance with the *Traffic Control at Work Sites Manual Version 5* (Transport for NSW, 2018) and approved by Council before implementation. The traffic management plan will provide details of the traffic management to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible.

Property access will be maintained as far as practicable throughout construction and there will be no disruption to bus services. Heavy vehicle movements on local roads will be minimised as far as possible and restricted to designated transport routes.

3.4 Ancillary facilities

Site ancillary facilities will include portable buildings with amenities (such as lunch facilities and toilets), secure and bunded storage areas for site materials, including fuel and chemicals, office space for on-site personnel, and associated parking.

Three potential ancillary facility locations have been identified in this REF for the project, which are illustrated in **Figure 3-1** and are detailed below:

- > Ancillary Site 1 – access via the Illawarra Highway in the western extents of the Study Area
- > Ancillary Site 2 – access via Calderwood Road
- > Ancillary Site 3 – access using pre-defined construction zone from Calderwood Road.

It should be noted that these are potential positions for ancillary facilities and the actual locations of the facilities will depend upon property access, project needs and environmental aspects. The exact locations will be determined during the detailed design phase of the project. The final ancillary sites will be selected with consideration of the following criteria:

- > Proximity to the construction footprint
- > Relatively flat ground that does not require substantial reshaping
- > In previously disturbed or vacant lands that do not require additional clearing of native vegetation and are low Aboriginal and non-Aboriginal archaeological potential
- > In plain view of the public to deter theft and illegal dumping.

It is noted that Ancillary Site 1 is partially within a flood plain. Ancillary sites are not to be established in flood prone areas unless an assessment is undertaken by the contractor with an appropriate flood management plan developed for approval by Council.

Should the construction contractor select alternative compound sites the above criteria would be used and would be subject to a separate environmental assessment and approval. This would likely come in the form of a Consistency Assessment presuming additional impacts would be relatively minor and consistent with the assessment in this REF.

Stockpile locations would be refined during the detailed design phase using the criteria set out in the *Stockpile Management Guideline* (EPA, 2017).

Ancillary sites will be securely fenced with temporary fencing. Signage will be erected advising the general public of access restrictions. Upon completion of construction, the temporary site compound, work areas and stockpiles will be removed, the site cleared of all rubbish and materials and rehabilitated.

Potential Ancillary Facilities

TRIPOLI WAY EXTENSION PROJECT

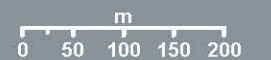
Legend

- Study Area
- Watercourse (NSW SS)
- Construction Footprint (14.47 ha)
- Potential Ancillary Facility



FIGURE 3-1

1:7,500 Scale at A3



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2021-08-12 | Project: 8201612601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82016126-GS-056-FinalAncillaryFacilities.mxd 03
Aerial imagery supplied by Metromap (July, 2020)

Lot and DP Number	Property Acquisition Area (m²)
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
Total Land Acquisition	56,699.30m²

4 Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (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, and includes provisions to ensure that the potential environmental impacts of a development are assessed and considered in the decision-making process. This proposal is subject to the environmental impact assessment and planning approval requirements of Division 5.1 of the EP&A Act.

Section 1.5 to the EP&A Act defines the meaning of “development”. Development is any of the following:

- “(a) the use of land,
- (b) the subdivision of land,
- (c) the erection of a building,
- (d) the carrying out of a work,
- (e) the demolition of a building or work,
- (f) any other act, matter or thing that may be controlled by an environmental planning instrument.”

In this case, the development is the carrying out of work, demolition and use of the land.

Section 1.5 states that carrying out development falls into several categories. The categories that apply to this project are:

- “(c) development that is an activity requiring environmental assessment under Division 5.1 before it is carried out by a public authority or before a public authority gives approval for the carrying out of the activity,”

Section 5.1 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities which do not require development consent under Part 4 of the EP&A Act. Shellharbour Council is a public authority. In accordance with Section 5.5 of the EP&A Act, Council, as the proponent and determining authority for the project, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the project.

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) defines the factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has a significant impact on the environment. **Chapter 6** of this REF provides an environmental impact assessment of the project in accordance with Clause 228 and **Appendix A** specifically responds to the factors for consideration under Clause 228.

Section 6.9 of this REF addresses non-Aboriginal heritage impacts. The Statement of Heritage Impact (SoHI) at **Appendix J** found that the impact on the heritage-listed former Albion Park Butter Factory is considered significant. This REF concludes that an EIS will need to be prepared and approval will need to be sought for the project from the relevant determining authority under Division 5.1 of the EP&A Act.

4.2 State Environmental Planning Policies

4.2.1 State Environmental Planning Policy (Infrastructure) 2007

The aim of the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) is to facilitate the effective delivery of infrastructure across the State through increased regulatory certainty and improved efficiency and flexibility in the location of infrastructure and service facilities while providing adequate stakeholder consultation.

Clause 94(1) of the ISEPP permits a public authority (as defined under the EP&A Act) to develop a road or road infrastructure facility without consent.

As the TWE would be defined as a road or road infrastructure facility carried out by Council, it would be assessed under Division 5.1 of the EP&A Act.

The project is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy (Coastal Management) 2018*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (State Significant Precincts) 2005*.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clause 17 provides exemptions from these consultation requirements. Clause 17(d) states that exempt development does not require consultation. Other consultation is discussed in **Section 5** of this REF.

4.3 Other relevant legislation

4.3.1 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and the declaration of TfNSW and other public authorities as roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads.

Part 1 of the Roads Act identifies objectives, with the following of relevance to this proposal:

To set out the rights of persons who own land adjoining a public road to have access to the public road

To establish the procedures for the opening and closing of a public road.

To provide for the declaration of Roads and Maritime Services and other public authorities as roads authorities for both classified and unclassified roads.

To confer certain functions (in particular, the function of carrying out road work) on Roads and Maritime Services and on other roads authorities.

To provide for the distribution of the functions conferred by this Act between Roads and Maritime Services and other roads authorities.

To regulate the carrying out of various activities on public roads.

Clause 61 (1)(b) states (our emphasis added):

“It is exclusively the function of RMS to make decisions as to what road work is to be carried out:

- b) on any other classified road in respect of which the carrying out of that kind of road work is, by virtue of an agreement or direction under this Division, the responsibility of RMS.”*

The Illawarra Highway, including the section known as Terry Street (at the point where the TWE will connect) and at the connection with Broughton Avenue, is a “classified road” and is classified as a State road.

Clause 75 under the Roads Act states (our emphasis added):

“A public authority may not carry out road work on a classified road, being work that involves:

- a) the deviation or alteration of the road, or*
- b) the construction of a bridge, tunnel or level crossing in the road, unless the plans and specifications for the proposed work have been approved by RMS.”*

Hence TfNSW (formally RMS) will need to approve the intersection design for the works at Illawarra Highway before Council can finalise the design details and determine/approve the project.

In addition, it is worth noting that Under Clause 76 of the Roads Act, Council will need to notify TfNSW of the works and take into account their feedback. Specifically, Clause 76 states as follows (our emphasis added):

“Roads authorities to notify RMS of proposal to carry out major road work

- 1) A roads authority may not carry out road work on a public road (being work that has an estimated cost of more than \$2,000,000 or such other amount as may be prescribed by the regulations) unless it has forwarded particulars of the proposed work to RMS at least 28 days before the commencement of the work.*
- 2) If it appears that the proposed work may affect the development, or further development, of a main road, tollway or transitway, RMS may, within that period of 28 days, require the roads authority:*
 - a) to give effect to specified amendments or alterations in the construction of the work, or*
 - b) to defer construction of the work for a specified period.”*

According to Clause 71 of the Roads Act “a roads authority may carry out road work on any public road for which it is the roads authority and on any other land under its control.”

The road upgrade is required to be undertaken in accordance with this Act.

Consultation requirements are discussed in **Section 5** of this report.

4.3.2 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) is concerned with all aspects of the conservation of heritage places and items. The statutory requirements within the Heritage Act protect historic buildings and places and include *'any place, building, work, relic, moveable object, which may be of historic, scientific, cultural, social, archaeological, natural or aesthetic value.'* The Heritage Act is administered by the Heritage Council, under delegation by the Heritage, Department of Premier and Cabinet (DPC). The Heritage Act is designed to protect both known heritage items (such as standing structures) and items that may not be immediately obvious (such as potential archaeological remains or 'relics').

The project works will result in the direct physical impact to the heritage listed Albion Park Butter Factory (Former), as well as to the area of high and medium archaeological potential beneath and surrounding the structure. Prior to any impacts to the area, an archaeological investigation including detailed archival recording would be undertaken to document the Albion Park Butter Factory (Former), its relationship with Tulkeroo and the wider setting of the heritage item. The impact to the areas of high and medium archaeological potential beneath and surrounding the Albion Park Butter Factory will require an excavation permit under Section 140 of the Heritage Act. No permit is required for work proposed in areas of low archaeological potential.

The construction phase of the project will indirectly impact visual scapes of Boles Meadow, Tulkeroo and the Albion Park Showground. Temporary fencing and shade cloth should be utilised to limit these indirect impacts where applicable. **Section 6.9** discusses the potential impacts to historic heritage items within and within the vicinity of the Study Area.

A permit under Section 60 of the Heritage Act is required for the works on a site listed on the State Heritage Register, except for that work which complies with the conditions for exemptions to the requirement for obtaining a permit. There are no items/conservation areas listed on the State Heritage Register within or within the vicinity of the Study Area.

Section 170 requires that culturally significant items or places managed or owned by Government agencies are listed on Departmental Heritage and Conservation Register. Statutory obligations for archaeological sites that are listed on a Section 170 Register include notification to the Heritage Council in addition to relic's provision obligations. There are no items/conservation areas listed on the Section 170 Register within or within the vicinity of the Study Area.

4.3.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for legal protection and management of National Parks estates and Aboriginal sites and objects in NSW and is administered by Heritage NSW branch of the Department of Planning, Industry and Environment (DPIE).

Section 6.8 discusses the potential for Aboriginal heritage items to be located within the extent of the works. An Aboriginal Heritage Impact Permit (AHIP) is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. Heritage NSW issues AHIPs under Part 6 of the NPW Act.

AHIPs should be prepared by a qualified archaeologist and lodged with the Heritage NSW. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the Heritage NSW for the processing of AHIPs, which is dependent on the estimated total cost of the development project. Where there are multiple sites within one Study Area (as in the case of the proposal) an application for an AHIP to cover the entire Study Area is recommended.

The Aboriginal Due Diligence report at **Appendix I** identifies three areas of archaeological potential for Aboriginal artefacts across the Study Area. The report recommends that an AHIP is required to impact the listed Aboriginal site, Tulkeroo ISO (AHIMS 52-5-0961) and an Aboriginal Cultural Heritage Assessment report (ACHA) is prepared to determine if subsurface Aboriginal sites are present and whether an AHIP application will be required. An AHIP must also be attained for excavation works within the identified archaeological potential areas within the Study Area.

Should the unexpected discovery of an Aboriginal artefact protected under the NPW Act be discovered during works then procedures would need to be in place such as an unexpected finds protocol.

There are no National Parks located on or near the project site.

4.3.4 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides for the declaration of prohibited matters including Terrestrial and Freshwater weeds at the state or local scale. Council is required to control any prohibited matters listed in Schedule 2 of the Biosecurity Act on land for which it is the local control authority.

A search of this database identified over 240 priority weeds in the South East some of which are likely to occur in the Study Area.

An occupier (other than a public authority or a local control authority) must take all reasonable steps to eradicate state prohibited weeds and comply with the requirements in the Biosecurity Act for a notifiable weed or restricted plants. Council is the local control authority for priority weeds in the Study Area.

A Biodiversity Assessment (**Appendix D**) was undertaken for the project and identified two listed Priority weed species *Lantana* (*Lantana camara*) and Fireweed (*Senecio madagascariensis*). A summary of findings is shown in **Section 6.3**.

4.3.5 Fisheries Management Act 1994

The *Fisheries Management Act 1994* protects key fish habitats by regulating the activities that can occur and where. A permit is required under Part 7 of the Fisheries Act for activities that involve dredging and reclamation work, temporarily or permanently obstruct fish passage, and/or harm marine vegetation.

The alignment and part of its construction footprint will require the crossing of Hazelton Creek, which is listed as Key Fish Habitat, in two locations. The alignment is also in close proximity to the Macquarie Rivulet which is also a Key Fish Habitat. It is recommended that the proposed creek crossings follow the fish passage guidelines for waterway crossings, *Why do fish need to cross the road?* (Fairfull and Witheridge 2003). Additionally, an appropriate sediment and erosion control plan should be in place during construction. The sedimentation plan should aim to minimise erosion during and post works which may enter the Macquarie Rivulet and Hazelton Creek.

During the construction phase, access across Hazelton Creek and the Macquarie Rivulet would be minimised for day to day movements, with access points to be determined within the CEMP along with the designed project impacts post-construction.

Stormwater discharge points will be developed as part of the project and will be discharged to the Macquarie Rivulet and Hazelton Creek.

A Part 7 *Fisheries management Act 1994* permit will be obtained by Council prior to any reclamation work.

4.3.6 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) protects threatened species, populations and ecological communities and their habitat in NSW. If threatened species, populations, ecological communities or their habitat could be impacted by the project, an assessment of significance must be completed to determine the significance of the impact, in accordance with Section 5A of the EP&A Act.

An impact assessment in accordance with Part 7.3 of the BC Act was undertaken by Ecoplaning to assess the potential impacts to threatened species and ecological communities that have the potential to occur in the area. Nine threatened fauna species were identified as having a moderate likelihood of occurrence within the Study Area as well as two endangered ecological communities which include:

- > Swamp Oak Floodplain Forest – listed as endangered under the BC Act
- > Freshwater Wetlands on Coastal Floodplains – listed as endangered under the BC Act.

These assessments found that it was unlikely that the project would cause significant impacts to the identified threatened species and communities.

The Biodiversity Values Map produced by DPE identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The map has been prepared under Part 7 of the BC Act and forms part of the Biodiversity Offsets Scheme Threshold which is one of the triggers for determining whether Biodiversity Offset Scheme (BOS) applies to any development. Areas of Hazelton Creek have been identified as 'Biodiversity Values'. As Council is the proponent for this project and is being assessed under Part 5 of the EP&A Act, entry into the BOS would not be required unless it is found that a significant impact to threatened species or ecological communities is likely to occur as a result of the project. The assessment conducted by Ecoplaning (see **Appendix D**) has determined that impacts would be minimal and therefore, a Biodiversity Development Assessment Report (BDAR) would not be necessary. A subsequent 'Test of

Significance' under the BC Act has also determined that a Species Impact Statement (SIS) would not be required for this project.

Ecological investigations have considered the requirements of Section 5A of the EP&A Act and concluded that the project would be unlikely to result in a significant impact on threatened species, populations, ecological communities or their habitat. Potential biodiversity impacts of the project are discussed further in **Section 6.3** and **Appendix D**.

4.3.7 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of water resources of the State. Clause 91 of the WM Act requires Controlled Activity Approval (CAA) for activities within 40m of waterfront land. The NSW Natural Resource Access Regulator issues the CAA.

Controlled activities under the WM Act apply to 'waterfront land' defined as all land within 40m of the highest bank of any river, lake or estuary. This would include work near Hazelton Creek and the Macquarie Rivulet. However, under Part 3 of the Water Management (General) Regulation 2018 public authorities are exempt from Clause 91 of the WM Act in relation to all controlled activities that it carries out in, on or under waterfront land and therefore do not need approval from the Natural Resources Access Regulator (NRAR). The condition to this regulation is that the activity does not cause any change in the course of the river and the activity has been assessed under the EP&A Act and found to not be likely to significantly affect the environment.

It is noted that while the current concept design for the project does not include the alteration of a watercourse, further consideration of the current bridge design over Hazelton Creek would need to be undertaken during the detailed design phase of the project. If during the detailed design phase of the project it is found that the course of Hazelton Creek would need to be altered, a CAA would be required.

A Vegetation Management Plan (VMP) is typically required as part of a CAA for any controlled activity undertaken on waterfront land. However, Council are exempt from this requirement. A Vegetation Management Plan has been developed for the purposes of this project by Ecoplaning and is included at **Appendix D**.

If the project requires large scale excavation, then groundwater may be intercepted during construction. If groundwater extraction/interference is required, an aquifer interference approval will be required for the work under Clause 91(3) of the WM Act. However, in accordance with Schedule 4 of the Water Management Regulation 2018, excavation required for the construction of a building, road or infrastructure for an authorised project is exempt from requiring an aquifer interference licence (within a maximum of 3 megalitres (ML) of groundwater).

Under Clauses 21 and 34 of the *Water Management (General) Regulation 2018* Council would not be required to obtain an 'access licence' or 'water use approval' for the use of water from a 'water source'.

4.3.8 Rural Fires Act 1997

The *Rural Fires Act 1997* (Rural Fires Act) provides prevention, mitigation and suppression of bush and other fires in Local Government Areas and other parts of the state that are constituted as rural fire districts and for the coordination of bush firefighting and bush fire prevention. An overall objective to protect people, infrastructure and the environment from damages related to bush fires and potential fire risk areas.

Council's "Bushfire Prone Land Map" does not identify the alignment as falling within Bush Fire Prone Land. Therefore, a bushfire assessment is not required to be prepared in accordance with Section 100B of the Rural Fires Act, Clause 44 of the *Rural Fires Regulation 2008*, and *Planning for Bush Fire Protection 2006* (NSW Rural Fire Service).

4.3.9 Crown Lands Management Act 2016

The *Crown Land Management Act 2016* (CLM Act) repealed the *Crown Lands Act 1989* on 1 July 2018. The CLM Act provides the legislative framework for the administration of land that is vested in the Crown in NSW. Ministerial approval is required to grant a 'lease, licence, permit, easement or right of way over a Crown Reserve'.

The intersection at Broughton Avenue and the Illawarra Highway needs to be transferred as part of Council's road infrastructure authority. The land that will be occupied by the Bridge over Hazelton Creek will also need to be acquired by Council prior to works commencing. If Council would like to start construction without formally acquiring the land, a Licence Application for Crown Land Use and occupation must be attained under the *Crown Lands Management Act 2016*.

Consultation with the NSW Department of Planning, Industry and Environment – Crown Lands is further discussed in **Section 5.2**.

4.3.10 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) focusses on environmental protection and provisions for the reduction of water, noise and air pollution and for the storage, treatment and disposal of waste. The POEO Act establishes the NSW environmental framework and determines whether an environmental protection licenses (EPL) are required. Schedule 1(35) of the POEO Act defines a rural road construction greater than 5km in length or the extraction or processing of more than 50,000 tonnes of material as a scheduled activity and thus requiring an EPL.

The project is less than 5km in length and is not likely to extract greater than 50,000 tonnes of material and does not constitute a scheduled activity and does not require a licence under the POEO Act.

4.3.11 Protection of the Environment Operations (Waste) Regulation 2014

The *Protection of the Environment Operations (Waste) Regulation 2014* provides for resource recovery exemptions that may be used without seeking approval from the EPA provided the waste generators, processors and consumer fully comply with the conditions.

The Resource Recovery Exemption: “excavated public road material exemption 2014” under Part 9, Clauses 91 and 92 of the *Protection of the Environment Operations (Waste) Regulation 2014*, is relevant to this project.

The exemption applies to excavated public road material that is, or is intended to be, applied to land within the road corridor for public road related activities including road construction, maintenance and installation of road infrastructure facilities.

The following conditions apply:

- > The excavated public road material can only be applied to land within the road corridor for public road related activities including road construction, maintenance and installation of road infrastructure facilities
- > The excavated public road material can only be stored within the road corridor at the site where it is to be applied to land
- > The excavated public road material cannot be applied to private land
- > The consumer must ensure that any application of excavated public road material to land must occur within a reasonable period of time after its receipt.

This exemption allows for the reuse of excavated public road material to be used as fill within the new alignment.

4.4 Local environmental plans

4.4.1 Shellharbour Local Environmental Plan 2013

The Study Area is located within the Shellharbour City Council LGA and therefore the Shellharbour Local Environment Plan 2013 (Shellharbour LEP) is the key land use planning document covering all development in the Shellharbour LGA. The Shellharbour LEP provides a number of statutory controls that apply to site.

Clause 2.7 to Shellharbour LEP states that the demolition of a building or work may be carried out only with development consent. The Butter Factory is a heritage item and there are no provisions in other EPIs which allow for demolition to be exempt or complying. Hence, the approval for the demolition of the Albion Park Butter Factory is being sought as part of the Part 5 REF process which is the subject of this report.

As shown in **Figure 4-1**, the Study Area contains land within Zones RU2, R2, SP2, RE1 and RU6. Details of the zones and how the project aligns with each zone’s objectives are provided below.

The **RU2 – Rural Landscape** zone includes the following objectives pursuant to the Shellharbour LEP:

- > To encourage sustainable primary industry production by maintaining and enhancing the natural resource base
- > To maintain the rural landscape character of the land
- > To provide for a range of compatible land uses, including extensive agriculture.

The **R2 – Low Density Residential** zone includes the following objectives pursuant to the Shellharbour LEP:

- > To provide for the housing needs of the community within low density residential environment
- > To enable other land uses that provide facilities or services to meet the day to day needs of residents.

The **SP2 – Infrastructure** zone includes the following objectives pursuant to the Shellharbour LEP:

- > To provide for infrastructure and related uses
- > To prevent development that is not compatible with or that may detract from the provision of infrastructure
- > To provide for key transport corridors.

The **RE1 – Public Recreation** zone includes the following objectives pursuant to the Shellharbour LEP:

- > To enable land to be used for public open space or recreational purposes
- > To provide a range of recreational settings and activities and compatible land uses
- > To protect and enhance the natural environment for recreational purposes.

The **RU6 – Transition** zone includes the following objectives pursuant to the Shellharbour LEP:

- > To protect and maintain land that provides a transition between rural and other land uses of varying intensities or environmental sensitivities
- > To minimise conflict between land uses within this zone and land uses within adjoining zones.

The provisions of the ISEPP override those of Shellharbour LEP with regard to permissibility. The development is identified as subject to Division 5.1 of the EP&A Act by ISEPP as described in **Section 4.2.1**.

The Shellharbour LEP contains schedules of heritage items that are managed by the controls in the Shellharbour LEP. The following items are within or within proximity to the Study Area:

- > Tulkeroo and Albion Park Butter Factory (former) (Item No. I001), 23 Calderwood Road, Albion Park, Lot 1 DP 910045. Local heritage item located within the Study Area
- > Boles Meadows (Item No. I138), 2105 Illawarra Highway, Albion Park, Lot 1001 DP 813443. Local heritage item located partly within the Study Area
- > Albion Park Showground (Item No. I301), Tongarra Road, Albion Park, Lot 1000 DP 813443. Local heritage item located partly within the Study Area
- > Weeping Golden Cypress (Item No. I228) 41B Tripoli Way, Albion Park, Lot 21 DP 1107336. Local heritage item located adjacent to the Study Area.

The following heritage items of local significance are within the broader vicinity of the Study Area:

- > St Andrews Presbyterian Church and tree (Item No. I012) 253 Tongarra Road, Albion Park, Lot 250 DP 1090226. Local heritage item located 100 m south of the Study Area
- > Albion Park School and headmaster's residence (Item No. I011). 154-156 Tongarra Road, Albion Park, Lot 1 DP 782244. Local heritage item located 45 m south of the Study Area
- > ES&A Bank (Former) (Item No. I010), 148 Tongarra Road, Albion Park, Lot 4 DP 703238. Local heritage item located 115 m south of the Study Area
- > All Saints Anglican Church and tree (Item No. I015), 253 Tongarra Road, Albion Park, Lot 2 DP 227785. Local heritage item located 200 m south of the Study Area
- > Anglican and Roman Catholic cemeteries (Item No. I014), 247-253 Tongarra Road, Albion Park, Lot 301 DP 1041577, Lot 2 DP 227785 and Lot 7004 DP 1124374. Local heritage item located 200 metres south of the Study Area. Note: the current property details for the heritage item are Lots 11 and 12, DP 1205733
- > Condon's Surgery (Item No. I208), 175 Tongarra Road, Albion Park, Lot 1 DP 1088776. Local heritage item located 200 m south of the Study Area

- > “Riversford” (Item No. I291), 2514 Illawarra Highway, Tullimbar, Lot 7 DP 259137. Local heritage item located 295 m west of the Study Area.

The nature and extent of potential impacts, and the mitigation and management measures required, are outlined further in **Section 6.9** of this report.

Shellharbour LEP Constraints

TRIPOLI WAY EXTENSION PROJECT

Legend

- Study Area
- Watercourse (NSW SS)
- Construction Footprint (14.47 ha)
- Zoning - Shellharbour City Council LEP, 2013 (DPE, Nov 2019)**
- B1 - Neighbourhood Centre
- B2 - Local Centre
- B4 - Mixed Use
- E2 - Environmental Conservation
- E3 - Environmental Management
- R1 - General Residential
- R2 - Low Density Residential
- R3 - Medium Density Residential
- RE1 - Public Recreation
- RE2 - Private Recreation
- RU1 - Primary Production
- RU2 - Rural Landscape
- RU6 - Transition
- SP1 - Special
- SP2 - Infrastructure
- DM - Deferred Matter
- Heritage - Shellharbour City Council LEP 2013 (DPE, Nov 2019)**
- Item - General
- Item - Landscape

FIGURE 4-1

1:7,500 Scale at A3

0 50 100 150 200
m



Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2021-08-13 | Project: 8201612601
Coordinate System: GDA 1994 MGA Zone 56
Map: 82016126-GS-057-FinalZoning.mxd 02
Aerial imagery supplied by Metromap (July, 2020)



4.5 Commonwealth legislation

4.5.1 Environment Protection and Biodiversity Conservation 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the relevant Commonwealth environment and heritage legislation applicable to Matters of National Environmental Significance (MNES). The EPBC Act requires approval from the Commonwealth Department of Agriculture, Water and Environment for any action that has, will have or is likely to have a significant impact on the nine listed MNES, which are:

- > World Heritage properties
- > National Heritage places
- > Wetlands of international importance
- > Threatened species and ecological communities
- > Migratory species
- > Commonwealth marine or land areas
- > The Great Barrier Reef Marine Park
- > Nuclear actions (including uranium mining)
- > A water resource (coal seam gas development and large coal mining development).

Two threatened species listed under the EPBC Act are assessed as having a 'moderate' likelihood of occurrence or 'recent record' within the study area, *Chalinolobus dwyeri* (Large-eared Pied Bat), and *Pteropus poliocephalus* (Grey-headed Flying-fox). The potential impact of the project upon these species was assessed against the Significant Impact Guidelines (Commonwealth Department of the Environment (DotE) 2013). A significant impact upon them is unlikely to occur, therefore a referral under the EPBC Act is not required for these species.

The Coastal swamp oak (*Casuarina glauca*) forest within the project footprint does not meet the condition criteria to be considered a part of the listed EEC under the EPBC Act. Therefore, assessment against the Significant Impact Guidelines (DotE, 2013) is not required.

The project is unlikely to result in significant impacts on MNES or the environment of Commonwealth land.

Potential impacts on biodiversity matters are discussed in **Section 6.3** of this REF and **Appendix D**.

4.6 Confirmation of statutory position

The project is categorised as development for the purpose of a road and road infrastructure facilities, and is being carried out by or on behalf of a public authority (Council). Under clause 94 of ISEPP the project is permissible without consent. The project is not State significant infrastructure or State significant development. The project can be assessed and approved under Division 5.1 of the EP&A Act.

Council is the determining authority for the project. This REF fulfils Council's obligation under Section 5.5 of the EP&A Act, including examining and taking into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5 Stakeholder and community consultation

This chapter discusses the consultation undertaken to date for the project and the consultation proposed for the future. The description contains the consultation strategy or approach used and the results of consulting with the community and relevant government agencies and stakeholders. In response to the project works, a consultation strategy has been developed to ensure that proper consideration of potentially interested stakeholders and the greater community are provided with transparency and given the opportunity to provide feedback regarding the project.

Cardno prepared a community and stakeholder consultation strategy to ensure that Council could establish and identify the key stakeholder and community concerns, issues and expectations and how these can be considered during the full life cycle of the project. The consultation responses will be initially considered through the concept design development and REF phase, and also to inform the future detailed design and construction phases of the project.

The current objectives of the consultation approach were to implement a community and stakeholder consultation process that allowed for an informed design and assessment of the TWE. This has allowed stakeholders and community members to be informed and provide feedback and recommendations regarding the project. This provides confidence to the community that Council has had a consultative approach to the TWE project. The consultation strategy outlined four key sections including:

- > Identification of key stakeholders – potential interests and concerns
- > Consultation steps and timing
- > Stakeholder and agency consultation
- > Community consultation.

An analysis of the consultation process is provided in the below sections.

5.1 ISEPP consultation

The ISEPP requires consultation with Council if any of the following clauses apply to the project:

- > Clause 13: development with impacts on Council-related infrastructure or services
- > Clause 14: development with impacts on local heritage
- > Clause 15: development with impacts on flood liable land
- > Clause 15A: consultation with Council – development with impacts on certain land within the coastal zone.
- > Clause 15AA: consultation with State Emergency Service—development with impacts on flood liable land
- > Clause 16: consultation with public authorities other than Council.

Table 5-1 ISEPP consultation requirements with local Council

Is consultation with council required under clauses 13-15 and 15A of the Infrastructure SEPP?	
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area?	Yes – temporarily during construction
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	No
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place that is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	Yes – temporary structures will be installed such as ancillary facilities as discussed in Section 3.4. In addition, the alignment of TWE will pass through properties (Tulkeroo) under Council management which will be fenced off and temporarily

Is consultation with council required under clauses 13-15 and 15A of the Infrastructure SEPP?	
	closed during construction. These works will be temporary and are considered unlikely to cause more than a minor or inconsequential disruption to pedestrian or vehicular flow.
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes – works will involve excavation of roads. As Council is the proponent for the works, consultation with the relevant departments within Council has been undertaken internally and will be ongoing throughout the project.
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?	Yes – as discussed in Section 6.2 . It is not likely major impacts on flooding patterns will result from the project
Will the works involve development on land within the coastal zone?	No
Is there 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 item/area are more than minor or inconsequential?	Yes - according to the SOHI, the development is proposed to have a significant impact on a local heritage item (the former Albion Park Butter Factory. Council will need to determine this in the context of the matters of consideration under Clause 228 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and the potential need for an EIS to be prepared in order to obtain approval for the project to proceed.

Consultation under clause 13, 14, 15 and 15A do not apply as Council is the proponent. It is understood that Council have consulted internally about all of the matters noted in the table above and will consider any advice received when assessing this REF.

Table 5-2 ISEPP consultation requirements with other government agencies

Is consultation with public authorities other than council required under clauses 15AA and 16 of the Infrastructure SEPP?	
Are the works located on flood liable land? If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	Yes – as discussed in Section 6.2 , part of the TWE alignment will be within flood liable land.
Are the works adjacent to a national park, nature reserve or other area reserved under the National Parks and Wildlife Act 1974?	No
Are the works on land zoned E1 National Parks and Nature Reserves or in land use zone that is equivalent to that zone?	No
Are the works adjacent to a declared aquatic reserve under the Fisheries Management Act 1994?	No
Are the works adjacent to a declared marine park under the Marine Estate Management Act 2014?	No
Are the works in the Sydney Harbour Foreshore Area as defined by the Sydney Harbour Foreshore Authority Act 1998?	No

Do the works involve the installation of a fixed or floating structure in or over navigable waters?	No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	No
Will the development be within the defense communication facilities buffer land within the meaning of clause 5.15 of the Standard Instrument?	No
Will the development 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 – Director of the Observatory?	No

The development is located on flood liable land as described under Clause 15AA and as such consultation with the State Emergency Service (SES) is required.

The development is not located on land to which clause 16 applies. Consequently, this consultation is not required.

5.2 Key stakeholder consultation

5.2.1 Roads and Maritime Services (now Transport for NSW)

The strategic transport infrastructure importance of the TWE and the fact that it ties to state registered road, the Illawarra Highway, has resulted in an extensive consultation process with the RMS (now TfNSW). Consultation has involved email correspondence as well as scheduled meetings and letters dating back prior to 2004. The following occurrences of notable RMS consultation have been considered as part of the planning process and helped shape the TWE:

- > Council Meeting dated 21 October 2015 – advised that consultation with the RMS had commenced in part due to the commencement of the preparation of an EIS for the Albion Park Rail bypass project. The RMS advised Council that without the construction of the TWE it cannot justify the construction of the north-bound entry and south bound exit ramps proposed within the RMS' preferred option. However, Council could not match the RMS proposed date for the commencement of their design phase for TWE as the design phase had not commenced. It was apparent that Council would need to show their intent with the TWE by way of starting land acquisitions and design phase
- > Council letter provided to TfNSW dated 22 April 2020 – the letter provided information regarding the TWE project timing and progression as it moved through the 50% design phase. The intent of the letter was to re-engage TfNSW to initiate input and collaboration, particularly at the intersection of the Illawarra Highway, which would need the approval from TfNSW in order to progress the project. The Illawarra Highway is a State classified road and thus will be impacted as part of the TWE project, hence the required consent by TfNSW.

5.2.2 NSW Environment Protection Authority

Council provided a letter to the NSW Environment Protection Authority (EPA) on 22 April 2020 informing them of the TWE project. The letter was intended to seek comments and feedback relating to the project and in particular whether the project would require an Environment Protection Licence (EPL).

The EPA responded to Council with recommendations regarding the production of the REF and what should be assessed, quantified and reported on within the environmental assessment. The EPA would also like to see mitigation and management measures to prevent, control, abate or mitigate identified environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment.

The response provided by the EPA states:

'Based on advice by Council, the proposed development would not appear to require an EPL at this time. The EPA is however the appropriate regulatory authority for activities undertaken by a public authority. Under the POEO Act the EPA can issue notices or legal directions on public authorities to protect the environment.'

The feedback and recommendations made by the EPA have been thoroughly investigated and addressed during this environmental assessment.

5.2.3 Department of Planning and Environment – Crown Lands

Council provided a letter to the NSW Department of Planning and Environment – Crown Lands (DPE Crown Lands) on 22 April 2020 informing them of the TWE project. The letter was intended to seek comments and feedback relating to the project and in particular advice surrounding Native Title Claims relating to

NC2017/003 – South Coast People. Council were also seeking recommendations and feedback from DPE Crown Lands where the alignment traverses Crown operated land – intersection of Broughton Avenue and Illawarra Highway (Crown Road) as well as the crossing of Hazelton Creek (Crown Waterway).

DPE Crown Land provided a response to Council (email 4 May 2020) and clarification email to Cardno (dated 20 January 2021) with information regarding Native Title Claims and Crown Land acquisition. The intersection at Broughton Avenue and the Illawarra Highway needs to be transferred as part of Council's road infrastructure authority. Information regarding this process was also defined in DPE Crown Lands response. The land that will be occupied by the Bridge over Hazelton Creek will also need to be acquired by Council prior to works commencing. The status of the waterway (ie. Crown Land or freehold) is unclear and the DPE advice includes suggested process to ascertain this. DPE Crown Lands also stated that if Council would like to start construction without formally acquiring the land, a Licence Application for Crown Land Use and occupation must be attained under the *Crown Lands Management Act 2016*.

DPE – Crown Lands states that Native Title Claims do not apply to roads, but is applicable and is presumed to exist over Crown Land (including waterway) unless it has been shown to have been extinguished. As indicated above, the status of Hazelton Creek as Crown or freehold should occur as per the suggested process.

The feedback and recommendations made by DPE Crown Lands have been addressed as part of the environmental assessment and further to the detailed design and construction phases.

5.2.4 Department of Planning, Industry and Environment – Environment, Energy and Science

Council provided a letter to the Department of Planning and Environment – Environment, Energy and Science (DPE EES) on 22 April 2020 informing them of the TWE project. The letter was intended to seek comments and feedback relating Aboriginal cultural heritage in the area.

DPE EES have provided feedback relating to the Aboriginal significance of the site and recommendations relating to appropriate Aboriginal assessments for the project. DPE EES states that:

'The area has significant Aboriginal cultural heritage values.'

The area has been identified as having high significance of Aboriginal heritage and is recommended that an Aboriginal Cultural Heritage Assessment must be conducted and incorporated in the REF. They also suggest that an Aboriginal Heritage Impact Permit (AHIP) may be required if Aboriginal artefacts are identified and harm to those objects cannot be avoided.

Council have engaged Biosis to undertake an Aboriginal Due Diligence Assessment for the project, see **Appendix I**, and summarised in **Section 6.8**. Council intend to conduct an Aboriginal Cultural Heritage Assessment as part of the detailed design phase of the project.

5.2.5 Civil Aviation Safety Authority

Council provided a letter to the Civil Aviation Safety Authority (CASA) on 22 April 2020 informing them of the TWE project. The letter was intended to seek comments and feedback related to the proximity to Shellharbour Airport and aviation safety requirements.

CASA recommended that all work would be in accordance with the National Airports Safeguarding Framework for aviation safety. The recommended guidelines include:

- > Guideline C – managing the risk of wildlife strikes in the vicinity of Airports
- > Guideline E – managing the risk of distractions to pilots from lighting in the vicinity of Airports
- > Guideline F – managing the risk of intrusions into the Protected Airspace of Airports (in the event that tall cranes or drilling rigs are required)
- > Guideline G – protecting aviation facilities – Communications, Navigation and Surveillance (CNS) (in the event that tall cranes or drilling rigs are required).

All guidelines identified above have been investigated thoroughly within the Airport Environment report produced by Rehbein (**Appendix K**) and summarised in **Section 6.13**.

5.2.6 National Trust of Australia

Council received a letter dated 14 July 2020 from the National Trust of Australia in relation to the proposed demolition of the Albion Park Butter Factory (former) for the construction of the TWE. The National Trust raised concerns that Council may be proposing the demolition of the heritage listed building and have urged

Council to consider further alignment options that will not have an impact on the Albion Park Butter Factory. The National Trust are pursuing further investigations into the matter and are yet to provide any further recommendations or feedback.

5.2.7 State Emergency Service

A letter was provided to the State Emergency Service (SES) by Council on 3 June 2020 informing them of the TWE project and to fulfil consultation requirements under Clause 15AA of the ISEPP. Council received a letter dated 2 September 2020 from SES regarding their investigation findings and assessment of the project. Based on this review the TWE project works appear to pose minimal risk to NSW SES response operations.

SES note that given the proximity to potentially flood affected areas, NSW SES believe it would be prudent to consider the implications of a Probable Maximum Flood (PMF) event as it may be possible to improve flood immunity during the project.

In the event that the construction phase of the TWE project causes significant disruptions to general road operation, NSW SES request notification so there are no implications to emergency response.

5.2.8 Other key stakeholders

A letter has been provided to the following key stakeholders on 22 April 2020 informing them of the TWE project:

- > Department of Primary Industries – Fisheries (now Department of Planning, Industry and Environment (DoPIE))
- > NSW Office of Water (now DoPIE)

The letters to each stakeholder were intended to seek comments and feedback relating to the project and the identifiable concerns each of the stakeholders may hold with the project. At the stage of publication of this REF, there has been no response from these key stakeholders.

5.3 Community consultation

Council has undertaken a comprehensive community consultation program with local residents, community groups and stakeholders throughout the lifecycle of the project to allow meaningful input into the design and alignment options. The community consultation process began prior to public exhibition of the road upgrade. Council implemented a variety of consultation practices to ensure the community remained well informed about the project and concerns could be addressed.

As part of the community consultation process, it was Council's intention to inform the community of the project, provide updates and field any feedback in response to the project at a scheduled community information session in Albion Park. However, due to the COVID-19 pandemic, face-to-face meetings were not permitted at the scheduled date and the community information sessions were abandoned.

A virtual submissions page was created on Shellharbour Council's 'Let's Chat' online forum where community members were encouraged to review the project documentation and provide feedback. The online forum provided information about the project, frequently asked questions allowed community members to submit queries, share feedback and raise concerns that were responded to by Council representatives. Cardno understands that Council advertised the virtual submissions page and encouraged consultation by utilising social media platforms such as Facebook and Council's webpage.

A total of 15 responses were received and responded to by Council. It is noted that of the 15 responses, seven respondents strongly supported the project and highlighted the need for urgent progression of the TWE.

Subsequent community information 'drop in' sessions were held (in person) on the 14 April 2021 in Albion Park to allow residents to raise any concerns, issues or expectations for the project. A total of 21 responses were received.

Table 5-3 summarises the key concerns raised by respondents to date and where in the report they are addressed.

Table 5-3 Key community concerns

Issues/Concerns	Addressed in Report
Loss of natural environment and biodiversity values	Section 6.3 and Appendix D

Issues/Concerns	Addressed in Report
Construction management	Section 3.3 and Chapter 6
Easing of traffic congestion results and data	Section 6.1 and Appendix C
Traffic and pedestrian impacts	Section 6.1 and Appendix C
Noise and vibration impacts	Section 6.4 and Appendix F
Safety concerns	Chapter 6
Increase in localised air pollution	Section 6.5 and Appendix G
Flooding constraints and mitigation measures	Section 6.2 and Appendix E
Heavy vehicle traffic movements	Section 6.1 and Appendix C
TWE design impacts on private properties	Chapter 6 and Appendix B

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the project. All aspects of the environment potentially impacted upon by the project are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP, 1999) and *Roads and Related Facilities* (DUAP 1996) as required under Clause 228(1) (b) of the *Environmental Planning and Assessment Regulation 2000*. The factors specified in Clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in **Appendix A**. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Traffic

A Traffic and Transport Impact Assessment was prepared by Cardno (2021) for the TWE which is included in full at **Appendix C**. The assessment was undertaken to determine the predicted traffic impacts associated with the project.

It is noted the results of Traffic and Transport Impact Assessment and recommendations for mitigation are based on the assumption that the Broughton Avenue intersection will be upgraded by others prior to 2041. Should this not occur, Council will need to reassess the traffic and transport impacts in the vicinity of the project and ensure all appropriate mitigation measures are applied.

A summary of findings is presented below.

6.1.1 Existing environment

The key road network within and within the vicinity of the Study Area consists of the following roadways:

Tripoli Way

Tripoli Way is an unclassified road under the care and maintenance of Council. It is currently a two-lane carriageway with one lane in each direction. It is a no through road separated by a median for the eastern 230m with street-side parking. Under the existing configuration, Tripoli Way serves only to provide access to private properties from Hamilton Road. There is no posted speed limit hence a default speed of 50km/h applies.

Illawarra Highway / Tongarra Road

Tongarra Road / Illawarra Highway is a state road, part of the Illawarra Highway and under the care and control of TfNSW for the length between Princes Highway, 0.8km south of Albion Park Railway Station to Albion Park. Tongarra Road / Illawarra Highway is a two-lane carriageway with one lane in each direction, expanding into a four-lane configuration from the eastern entry to Albion Park until 490m west of Terry Street.

Tongarra Road serves as the major east-west distributor to Shellharbour and the greater area. The road is approved for B-doubles up to 26m in length from Princes Highway until Calderwood Road. Its speed limit is posted at 60km/hr with 40km/hr school limits in the vicinity of the east side of Tongarra Road. The posted speed at its western extent (west of Yellow Rock Road) is 100km/hr.

Calderwood Road

Calderwood Road is a local road under the care and maintenance of Council. It is a two-lane carriageway with one lane in each direction with street side parking on both sides. Calderwood Road runs north-south from the intersection with Tongarra Road until approximately 1.25km north of Tongarra Road where it reorientates west. The proposed alignment of Tripoli Way is planned to join with Calderwood Road. The posted speed limit is 60km/h.

Illawarra Highway / Terry Street

Terry Street is a state road and a part of the Illawarra Highway. It is a primarily two-lane carriageway with one lane in each direction, expanding to four lanes (two lanes per direction) between the intersection with Tongarra Road and Cawdell Drive. It becomes part of the Illawarra Highway north of the Tongarra Road intersection and carries traffic northbound along the north western boundary of the Illawarra Regional Airport. Terry Street south of the Tongarra Road intersection carries a significant volume of the Albion Park residential traffic. The posted speed limit is 60km/h, which changes to 80km/h on its northern extremity (north of Taylor Road).

Church Street

Church Street is a local road under the care and control of Council. It is a two-lane carriageway with one lane in each direction and street side parking on both sides. Church Street meets Tongarra Road on the west portion the Albion Park residential area and carries mostly residential traffic south of Tongarra Road until Terry Street. The posted speed limit is 60km/h.

Pedestrian and cycling facilities

Paved pedestrian footpaths are provided on both sides of Tongarra Road through the Albion Park Town Centre and on at least one side of the road for all residential areas in Albion Park. Paved footpaths are also provided on Terry Street and parts of Calderwood Road. A non-signalised children's crossing is situated on Tongarra Road directly outside St Paul's Catholic Parish Primary School. A zebra crossing is provided on Church Street outside Albion Park High School.

There are no dedicated cycling paths within the Study Area and cyclists must share the roads with motorised vehicles. **Figure 6-1** shows the pedestrian infrastructure within the Albion Park Town Centre.



Figure 6-1 Existing pedestrian infrastructure

Modelled future network performance without TWE

The Traffic Impact Assessment (**Appendix C**) performed an analysis of future network performance within Albion Park Town Centre. The analysis focussed on the two options considered in **Section 2.4** of this environmental assessment; the road network operating with the TWE in place; and, the road network operating in its current configuration (i.e. without the TWE).

In its present form and left unchanged, the traffic network in 2026 within the Albion Park Town Centre is unsatisfactory in its operation at the intersection of Macquarie Street / Tongarra Road / Calderwood Road and the intersection at Terry Street / Tongarra Road. Under the 2041 model, all key intersections within the Albion Park Town Centre are operating unsatisfactorily and considered to have major delays. Essentially, the traffic demand by 2041 is too high for the present capacity available within the Albion Park Town Centre to be absorbed. This leads to a standstill and vehicle blockage across all roads within the Albion Park Town Centre. This does not allow the traffic demand to be released within the modelled network (**Appendix C**).

Current road safety performance

Crash data statistics have been compiled from 2013 – 2018 and a total of 45 traffic incidents have occurred within the Albion Park Town Centre. At 23 of the identified accidents the drivers were injured (14 serious, 6 moderate and 3 minor) which accounts for 51% of all crashes within Albion Park Town Centre. As shown in **Figure 6-2**, the majority of vehicular accidents are on Terry Street and Russell Street.

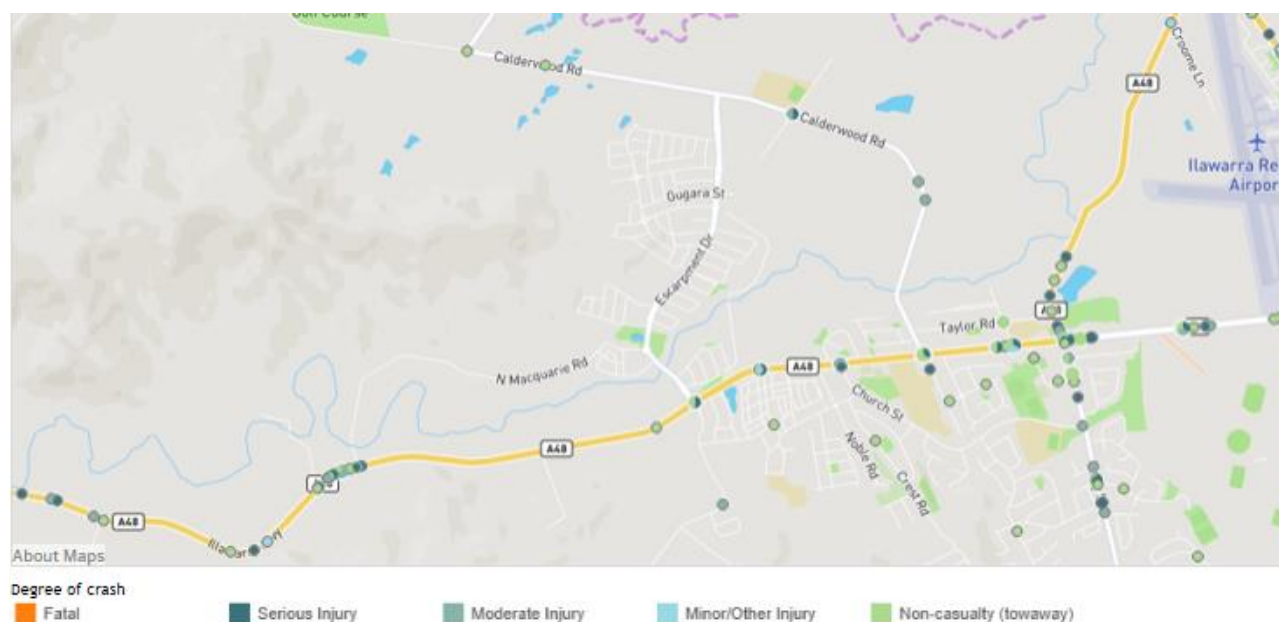


Figure 6-2 Crash locations within Albion Park town centre (TfNSW, 2020)

6.1.2 Potential impacts

Construction

Construction of the TWE would result in temporary traffic and transport related impacts. Potential impacts include:

- > Construction traffic including an increase in heavy vehicle movements
- > Temporary changes to the existing road network
- > Disruption to property access
- > Potential for minor traffic delays.

Due to the location of the TWE project it is anticipated that traffic impacts during construction would be considered minor as the construction would be located away from the main arterial road for the Albion Park Town Centre.

Operation

The TWE has been designed in line with the Austroad classification of a collector road and will cater for heavy vehicles up to the following sizes:

- > Design vehicle: 12.5m single unit truck or bus
- > Checking vehicle: 19m articulated vehicle.

Heavy vehicles over this size would need to continue along Tongarra Rd / Illawarra Highway as per their current arrangement.

As result of the TWE there would be a significant increase in traffic along The Expressway and Tripoli Way thereby impacting the nearby residence, however the significant improvements within the overall traffic network (outlined below) as a result of the TWE would be of significant benefit to the local community as a whole. In addition, the detailed design phase would consider opportunities to minimise traffic impacts on nearby residence where possible.

Modelled future network performance with TWE

The Traffic Impact Assessment (**Appendix C**) performed an analysis of future network performance within Albion Park Town Centre. The analysis focussed on the two options considered in **Section 2.4** of this environmental assessment: the do nothing option (i.e. 'without' TWE); and, the 'with' TWE option.

The modelled TWE shows significant traffic circulation improvements in the 2026 model and will improve the operational performance for the majority of key intersections. Key statistics derived from the traffic modelling suggest that the average speed of the network will increase by 13-18% with an average vehicle delay time reduced by 48%-65%. The upgrade to and extension of Tripoli Way would contribute to an efficient and functional road network.

The 2041 model also shows a significant improvement in operational capacity and efficiency at all major intersections. The introduction of TWE shows improvements in average speed with increases in travel speed of approximately 28% and (AM peak) and 24% (PM peak) in the 2041 traffic modelling.

The TWE would assist in meeting the increased demand of road users as future development and land use changes in the Calderwood area occur. The project would also reduce potential congestion within the surrounding road network and improve safety for motorists, pedestrians and cyclists.

Pedestrian and cyclist facilities

A 2.5m shared path is to be provided on the northern side of the TWE, following and extending the full length of the proposed alignment. A 1.2m footpath is also proposed on the southern side of the proposed Tripoli Way alignment between Moles Street and Hamilton Road. The layout of the proposed paths can be seen in the concept design drawing set at **Appendix B**.

Signalised pedestrian crossings will be provided at the TWE / Calderwood Road intersection, TWE / Hamilton Road intersection and TWE / Terry Street intersection within the Study Area as part of the detailed design process for the project. This will provide greater pedestrian safety and provide greater access to the Albion Park Town Centre.

The inclusion of these facilities enhances the existing pedestrian network within the Albion Park Town Centre and provides for an accessible and safe environment for pedestrians and cyclists.

6.1.3 Safeguards and management measures

Table 6-1 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on traffic and access.

Table 6-1 Safeguards and management measures for traffic

No.	Impact	Environmental Safeguards	Responsibility	Timing
T1	Operational capacity of Broughton Avenue/Illawarra Highway/Tripoli Way intersection and Calderwood Road/Tripoli Way intersection by 2041	<ul style="list-style-type: none"> The performance of the Illawarra Highway/Broughton Ave/Tripoli Way intersection in the 2041 year should be investigated further as part of broader traffic network management arrangements potentially involving Council, TfNSW and others (such as local property developers subject to Voluntary Planning Agreements). 	Shellharbour City Council	Ongoing
T2	Increased heavy vehicle traffic and light vehicle traffic during construction	<ul style="list-style-type: none"> A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the RMS Traffic Control at Work Sites Manual and the worksite manual RMS Specification G10. The TMP must restrict vehicle movements and parking to approved project areas, and manage speed limits near the work. 	Project Manager	Pre-construction
T3	Temporary speed limitations may increase travel times	<ul style="list-style-type: none"> Refer to Safeguard T2 	Project Manager	Construction
T4	Temporary Road Closures	<ul style="list-style-type: none"> Road closures are to be limited during peak traffic periods to ensure impacts to traffic flows are minimal. Suitable traffic control measures are to be in place during the movement of equipment and 	Project Manager	Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		machinery in order to ensure the safety of pedestrians and other road users.		
T5	Limited access to impacted residents within the Study Area	<ul style="list-style-type: none"> Impacted residents must be contacted prior to any works commencing. Accessibility and movements must be allowed for the residents that will be directly impacted as part of the TMP. Works are not to block access along footpaths, except for the minimum possible time when moving equipment or machinery. 	Project Manager	Pre-construction Construction
T6	Pedestrian crossings	<ul style="list-style-type: none"> Signalised pedestrian crossings will be provided at the TWE / Calderwood Road intersection, TWE / Hamilton Road intersection and TWE / Terry Street intersection within the Study Area as part of the detailed design process for the project. 	Council	Detailed design

6.2 Hydrology and flooding

A Flood Assessment (**Appendix E**) was prepared by Cardno (2021) to examine the existing flood behaviour within the Study Area and inform the design of the TWE. A summary of findings is presented below and the full flooding assessment is located at **Appendix E**.

6.2.1 Existing environment

Catchment

The Macquarie Rivulet Catchment is located to the south west of Lake Illawarra and covers a total catchment area of approximately 110km². The catchment extends from the Illawarra escarpment and runs for a distance of approximately 23km before entering Lake Illawarra. The catchment is dominated by rural landscapes with some existing urban development in Albion Park, Albion Park Rail and the Illawarra regional airport. The headwater area within the escarpment is very steep, falling from an elevation of 770m AHD over a short distance before travelling across a relatively flat catchment to approximately sea level at Lake Illawarra.

A number of tributaries contribute to the wider catchment area, including the main Macquarie Rivulet, Frazers Creek, Marshall Mount Creek, Hazelton Creek and Yellow Rock Creek.

Previous Studies

Council engaged WMAwater in 2017 for the Macquarie Rivulet Flood Study (MRFS). The study utilised an extensive library of existing flood studies, research and data within the Macquarie Rivulet to create an array of hydrologic and hydraulic models. These models consider the entire Macquarie Rivulet catchment in combination with backwater flooding from Lake Illawarra.

The Study Area is located within the vicinity of the Macquarie Rivulet and would be directly impacted by flooding events.

Flood Model

The flood modelling utilised in Council's MRFS was adopted for this flood assessment. The model files comprise:

- > Watershed Bounded Network Model (WBNM, 2012). WBNM is an advanced storage-routing model that allows simulation of catchment behaviour and key structures within a catchment and is a recognised network model in Australian Rainfall and Runoff
- > TULFOW model set-up and inputs can be found in the MRFS (2017). The MRFS model utilises a combined one and two dimensional hydrodynamic TUFLOW model to define flood behaviour within the catchment. Modifications to the existing model were made as part of this assessment to incorporate detailed earthworks designs from the Calderwood subdivision, which is located west and north west of the TWE

Flood Levels, Extents and Velocities

The 20- and 100-year ARI design events were simulated for the 9-hour and 2-hour storm durations (critical duration). The culvert blockages were applied as specified in the MRFS and design criteria (refer to

Appendix E). In its existing state, it is predicted that deeper inundation occurs within the watercourses immediately upstream of the proposed culvert and bridge located within the roadworks extents during the 100-year ARI event.

Shallow inundation within the floodplain is demonstrated to the north of Hazelton Creek whilst deeper inundation occurs within the floodplain to the north of the Macquarie Rivulet. It should be noted that the existing culvert underneath Terry Street is at capacity in the 20-year and 100-year ARI event and causes overtopping over Terry Street. Depths of inundation is predicted to reach up to 1000mm across the location of the overtopping flows in the 100-year event.

Hazard classification measuring vehicle trafficability (stability) for the project area was mapped according to criteria provided by the Australian Emergency Management Institute (2014). Descriptions of the classifications are provided in **Table 6-2**.

Table 6-2 Hazard classification descriptions

Hazard Classification	Description
H1	Relatively benign flow conditions. No vulnerability constraints
H2	Unsafe for small vehicles
H3	Unsafe for all vehicles, children and the elderly
H4	Unsafe for all people and all vehicles
H5	Unsafe for all people and all vehicles. Buildings require special engineering design and construction
H6	Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

A hazard classification of between H1 – H4 is predicted during a 100-year ARI event in the western section of the project area, across the Illawarra Highway. The culvert crossing at Terry Street in the east, Calderwood Road, and Hamilton Road also have a hazard classification category of H5, with localised areas of the floodplain reaching a category of H6. During a 20-year ARI storm event, the western extent of the project area has a category of H5, while the Terry Street culvert crossing is categorised as H1.

Existing flood extents and velocities for a 20- and 100-year ARI are shown in **Figure 6-3** and **Figure 6-4**, respectively.

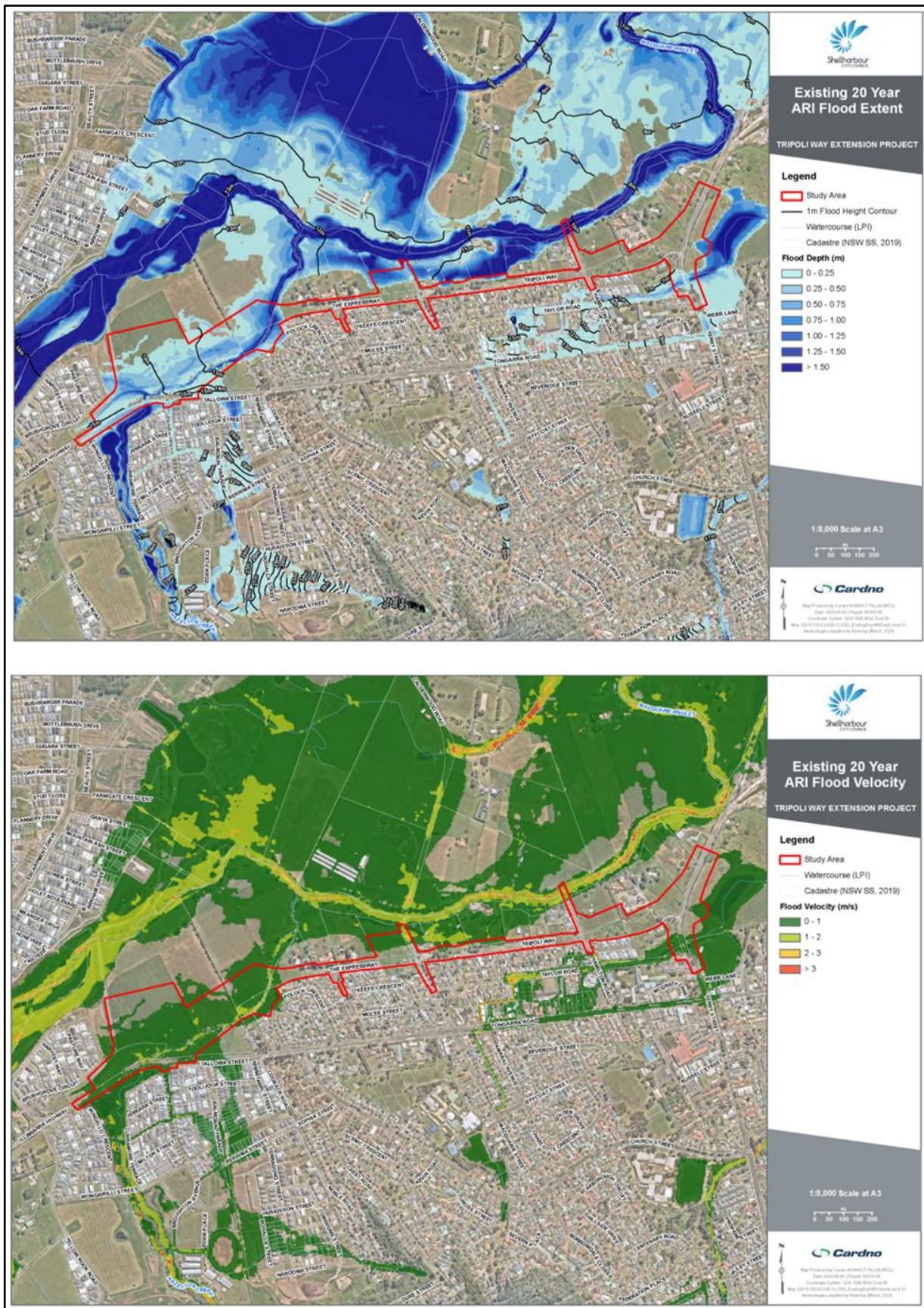


Figure 6-3 Existing 20-year ARI flood extent and velocity

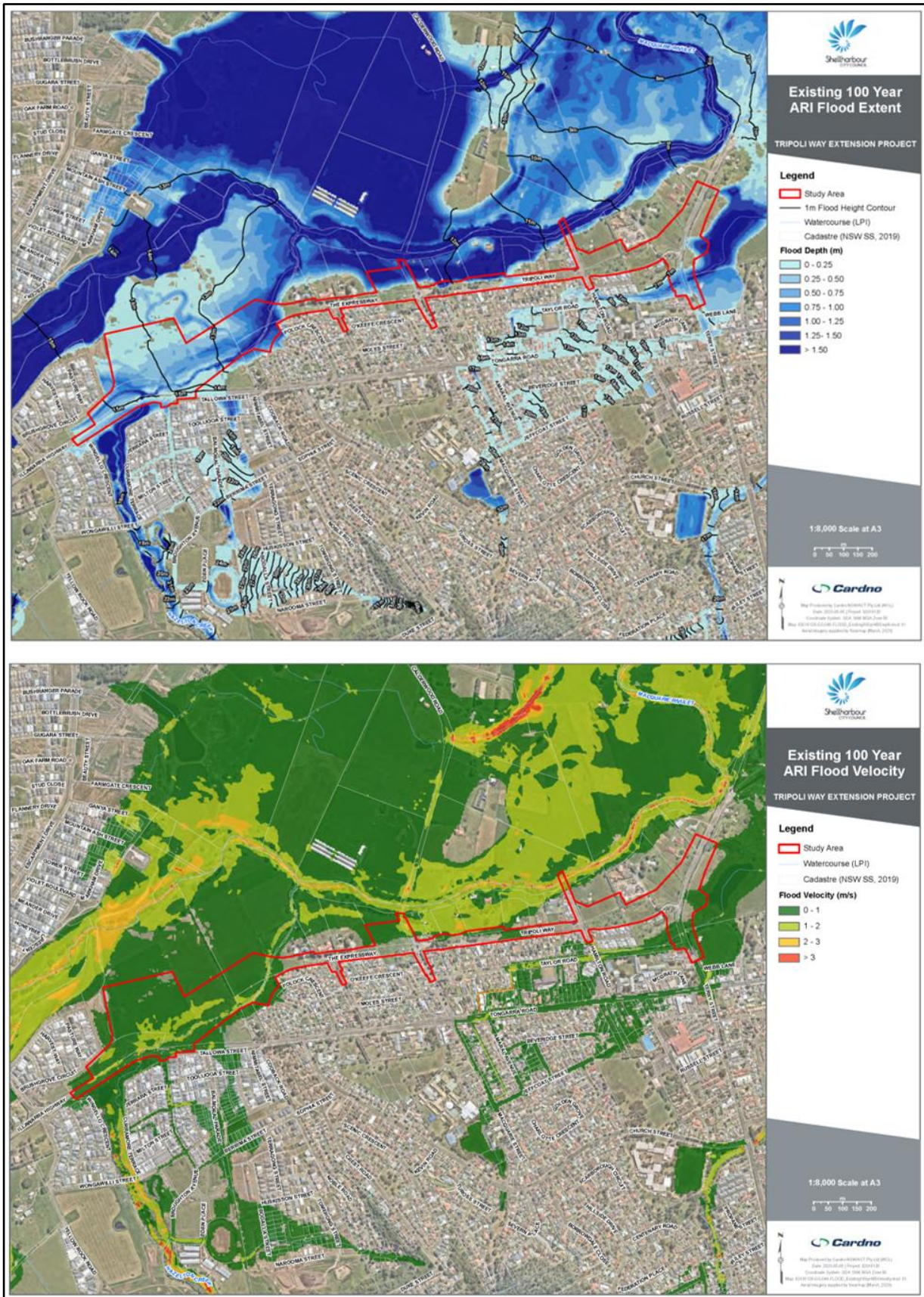


Figure 6-4 Existing 100-year ARI flood extent and velocity

6.2.2 Potential impacts

Based on the design criteria, the TWE would be designed to be flood immune in the 20-year ARI event. Flood impact mapping showing the difference in the existing and proposed flood elevation has been calculated to demonstrate that there are no adverse hydraulic impacts due to the TWE.

Adverse impacts have been considered to be impacts that exceed the criteria adopted in the Hydrology and Flooding Assessment conducted previously for the Albion Park Rail Bypass by Hyder and Cardno in 2015. In this assessment the following flood level impact objectives were adopted for the relevant land zones:

- > Less than 50mm increase for 20- and 100-year ARI events in houses, urban and commercial areas
- > Less than 100mm increase for 20- and 100-year ARI events in recreational areas
- > Less than 250mm increase, with allowance for up to 400mm increases (if localised within 5-hectare areas), for 20- and 100-year ARI events in agricultural areas.

The flood impact mapping is provided in **Appendix E** and the proposed 20- and 100-year ARI flood extent, velocity and flood impact mapping are shown in **Figure 6-5**, **Figure 6-6** and **Figure 6-7** below.



Figure 6-5 Proposed 20-year ARI flood extent and velocity

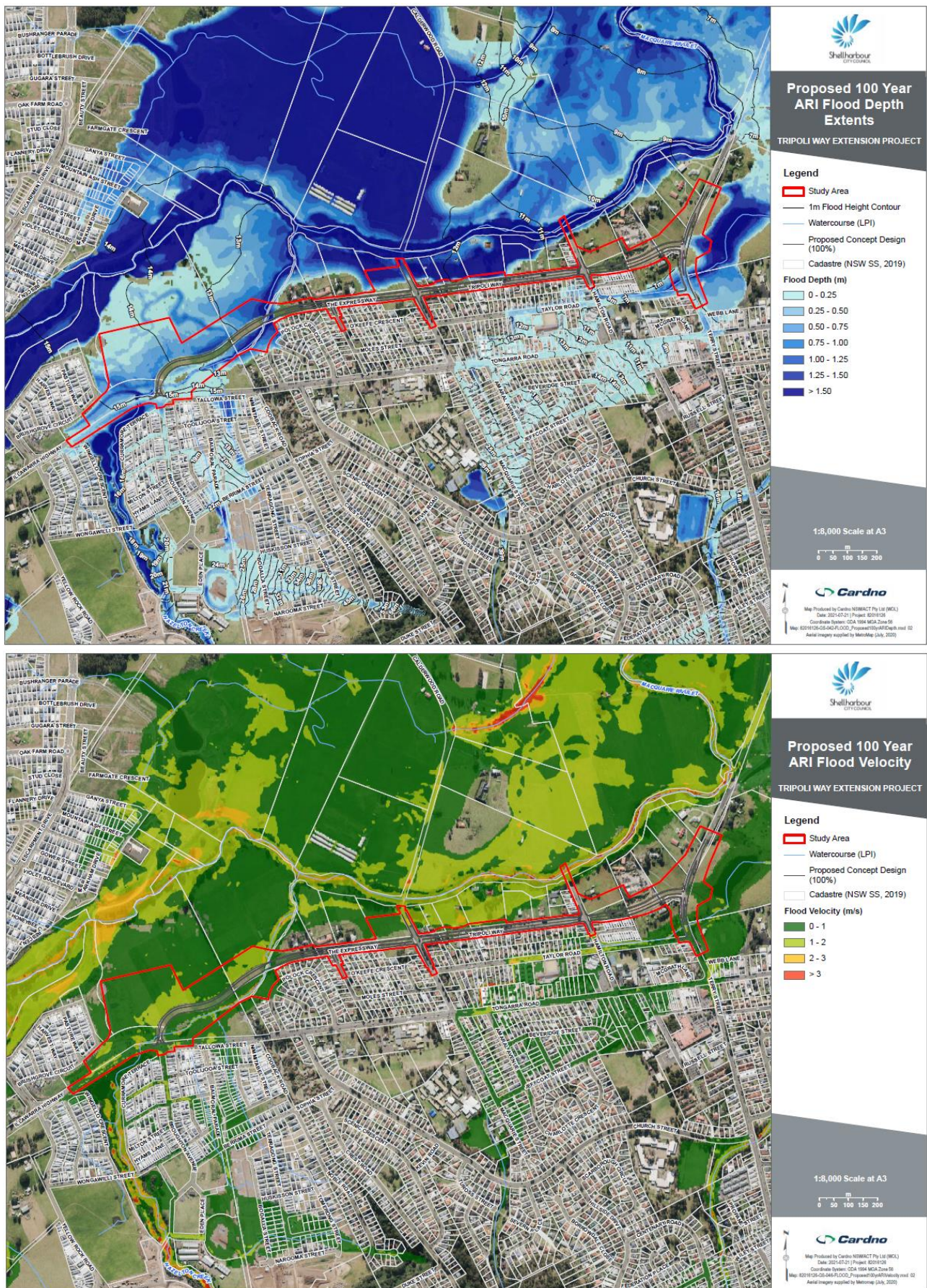


Figure 6-6 Proposed 100-year ARI flood extent and velocity



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As is shown in **Figure 6-7**, impacts up to 100mm increase are predicted in the 20-year and 100-year ARI events at the proposed Calderwood Road tie in. Localised impacts are also predicted to the north of the Broughton Avenue / Illawarra Highway intersection. The impacts in both storm events are within road reserves and agricultural land.

An afflux of 480mm is also predicted directly adjacent to the TWE within the agricultural land in the 20-year ARI event and a 440mm afflux is predicted in the 100-year ARI event within the agricultural area directly adjacent to the proposed box culvert structure near the Illawarra Highway intersection (refer **Figure 6-5** for location reference to these impacts). The impacts in both storm events are within rural agricultural land and have no consequential damages.

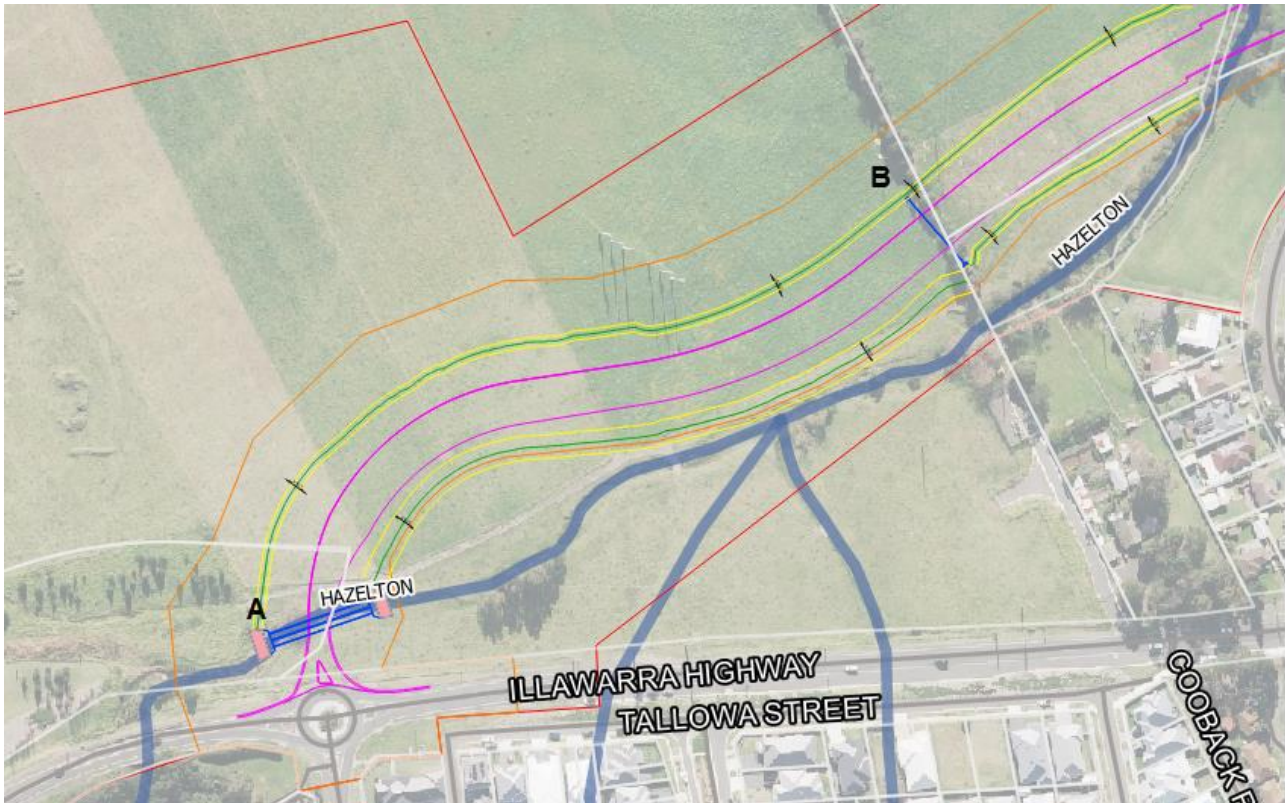


Figure 6-8 Impacts assessment location A for the 100-year ARI and location B for the 20-year ARI

Mitigation measures such as bridge structure and large box culverts to reduce the afflux were considered, however these measures did not correlate to any meaningful reduction in flooding levels. Additionally, the impacts in the 100-year ARI are within the proposed property acquisition boundary and are therefore considered acceptable. Impacts outside of the property acquisition boundary are below the acceptable impacts criteria for agricultural land.

Impacts of 64mm are predicted across Taylor Road immediately upstream of the Terry Street culvert in the 20-year ARI storm (refer **Figure 6-9** for location of impact), however the depth of inundation across the road is greater than 150mm in both the existing and the proposed scenarios. As such there is not expected to be a change in flood levels as a result of the project.



Figure 6-9 Impacts assessment location across Taylor Road (Location A in figure)

Modelling for flood hazard classification shows the Illawarra Highway (within the western extent of the Study Area) has improved hazard, with larger portions of the highway demonstrating a hazard category of between H1 and H2 in the 100-year ARI event compared to the existing scenario. It should also be noted that the TWE itself does provide a flood free access to many of the areas in Albion Park.

Hazard across Terry Street in the 100-year ARI is a H5 hazard classification which is the same as the hazard classification for the existing scenario. The existing roads connecting north of Tripoli Way (Calderwood Road and Hamilton Road) demonstrate a high hazard rating of H5, consistent with the existing hazard category. However, the extent of localised areas depicting a H6 hazard category have been reduced.

During the 20-year ARI storm event, the hazard of the Illawarra Highway (within the western extent of the Study Area) and Terry Street at the culvert crossing retain a hazard category of H3 and H1 respectively, consistent with the existing hazard category within this area.

6.2.3 Safeguards and management measures

Table 6-3 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on hydrology and flooding.

Table 6-3 Safeguards and management measures for hydrology and flooding

No.	Impact	Environmental Safeguards	Responsibility	Timing
F1	Residential inundation from runoff	<ul style="list-style-type: none"> Adequate drainage systems are in place to alleviate runoff capabilities. 	Project Manager	Design
F2	Ancillary site flooding	<ul style="list-style-type: none"> Ancillary sites are not to be established in flood prone areas unless an assessment is undertaken by the contractor with an appropriate flood management plan developed for approval by Council. 	Project Manager	Design Construction

F3	Surface water accumulation	<ul style="list-style-type: none"> Appropriate drainage design be developed and implemented at ancillary sites. 	Project Manager	Design Construction
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6.3 Biodiversity

6.3.1 Flora and Fauna Assessment

A Flora and Fauna Assessment (**Appendix D**) was prepared by Ecoplanning (2022) to determine the predicted flora and fauna impacts associated with the TWE. A summary of the findings is presented below.

Existing environment

The Flora and Fauna Assessment study area is considered to be the area defined by the project footprint, as well surrounding areas that would be indirectly impacted upon by works.

The study area includes a number of partial lots covering both public and private residential land, as well as privately owned agricultural allotments. The total area covered by the study area is approximately 27.21 hectares (ha), located within the Shellharbour LGA.

Biodiversity Values

The project study area has land mapped as 'Protected Riparian Land' (PRL) on the DoPIE Biodiversity Values Map (2020). Areas of land mapped as PRL include all of the 5th order stream, Macquarie Rivulet, and parts of the 3rd order stream, Hazelton Creek. The project area is intersected by the Hazelton Creek PRL in the western section, and the Macquarie Rivulet PRL near Broughton Avenue, with a small area at the northern end of Hamilton Road. Both the Macquarie Rivulet and Hazelton Creek are considered Key Fish Habitat under the FM Act.

Small areas of the project area are mapped as 'Terrestrial Biodiversity' under the Shellharbour LEP (2013). There are three areas of intersection with the project area; adjacent to the Macquarie Rivulet at the northern end of Calderwood Road, the northern end of Hamilton Road, and the eastern boundary at Terry Road. Consideration must be given by the consent authority to matters under Clause 6.5 of the Shellharbour LEP, which are detailed in Section 4.4 of the Flora and Fauna Assessment (**Appendix D**).

Vegetation Communities

The total area mapped as native vegetation within the study area is approximately 0.72ha, comprising Riparian River Oak Forest, Floodplain Wetland, and Acacia Scrub. Two of the communities' present form components of Endangered Ecological Communities (EECs) under the EPBC Act.

Two additional native vegetation communities were identified within the study area; Riparian River Oak Forest, and Acacia Scrub. Neither of these communities' form components of EECs listed under the EPBC Act or BC Act. Both communities were in a highly disturbed condition, with dense patches of exotic and invasive species, including Weed of National Significance, *Lantana camara* (Lantana).

A further area of approximately 1.45ha was mapped as containing aquatics and emergent, and native and non-native plantings. The remaining vegetation mapped was categorised as exotic grassland, and covered an area approximately 16.96ha.

Threatened Species

Though desktop studies revealed up to nine threatened species have a moderate or high likelihood to use the study area for foraging or nesting, field surveys did not record any threatened flora or fauna species present listed under the EPBC Act or BC Act.

Fauna Habitat

A number of fauna habitat areas were identified during the field survey. Based on the habitat values identified, a range of fauna species are likely to use the study area for foraging, refuge, nesting or breeding habitat. Habitat areas present and the fauna species they support are listed in **Table 6-4**.

Table 6-4 Fauna habitat areas present across study area

Habitat Area	Fauna Species
Open grassland	Birds, microchiropteran bats, reptiles and frogs
Planted vegetation	Diurnal and nocturnal birds, arboreal mammals and microchiropteran bats

Watercourses	Fish, birds, microchiropteran bats, reptiles and frogs
Coarse woody debris	Arboreal mammals, microchiropteran bats, reptiles and frogs

There were no hollow bearing trees identified within or near the project area, therefore there is no suitable roosting or nesting habitat for hollow dependent bird species. No large stick nests associated with breeding habitat for threatened birds of prey were observed.

6.3.2 Potential impacts

Direct impacts of the project involve clearing of vegetation and the associated loss of fauna habitat.

The total area of vegetation to be impacted by the project is approximately 27ha, with native vegetation communities to be cleared comprising 0.72ha. This represents a comparatively small amount of native vegetation (approximately 2.6%) within the study area. This small coverage of native vegetation represents marginal value foraging habitat, and its removal is unlikely to have more than a negligible impact on local fauna, especially given the amount of remaining habitat areas along the Macquarie Rivulet to the north of the project area.

Indirect impacts of the project could include erosion and water quality impacts associated with construction activities. Likelihood of these impacts can be minimised through the development and implementation of a Construction Environment Management Plan (CEMP). Operational impacts could arise from increased litter, and pest introduction including weeds or pathogens. Given the disturbed nature of the project area, these impacts would be minor in nature, and with the implementation of recommended mitigation measures, are unlikely to occur.

6.3.3 Safeguards and management measures

Table 6-5 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on biodiversity.

Table 6-5 Safeguards and management measures for biodiversity

No.	Impact	Environmental Safeguards	Responsibility	Timing
B1	Impact to threatened species and native vegetation	<ul style="list-style-type: none"> Areas of native vegetation outside of the construction footprint will be "No Go-Zones" for people and machinery and will be clearly delineated using temporary fencing Temporary tree protection fencing around trees not marked for removal. Tree protection is required around the trunk of the tree Removal of vegetation is to be undertaken by a qualified arborist following all relevant industry standards. Trees to be removed have been identified and if any other trees require pruning or removal please call Council's environment team 4221 6014 Any exotic biomass cleared within the construction footprint will be removed from the study area and disposed of at an approved facility Develop a CEMP to address pollution and contamination issues, such as silt control, and oil/fuel/chemical storage/spill management, which could arise during construction No vehicles, machinery, tools or equipment, fuel, chemicals or waste, gravels, soils or other materials are to be located within the drip zone of any trees Erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the study area has been stabilised to prevent off-site transport of eroded sediments 	Project Manager	Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Fencing will need to allow safe passage of native wildlife Landscaping works are to be outside areas of bushland and do not include environmental weed Removal of environmental weeds from the site and their ongoing control. 		
B2	Harm or injury to fauna during clearing	<ul style="list-style-type: none"> Pre-clearance protocols put in place and included in CEMP. Council's environment staff must inspect all vegetation one week prior to removal for any roosting or nesting native fauna present. If hollows or fissures are identified during the pre-clearance survey, nest boxes are required to be installed to replace potential habitat. Inspect all vegetation for the presence of fauna species prior to removal. Rocks, logs, debris that may provide fauna habitat must be retained on-site and disturbance to these features minimised. Trenches must be covered if left overnight to limit potential fauna injury. Any large machinery must be inspected for trapped fauna prior to cessation of works. In the event of injury to native fauna, contact a local vet or Wildlife Rescue South Coast on 0418 427 214 immediately. 	Project Manager	Pre-construction
B3	Indirect offsite impacts during construction	<ul style="list-style-type: none"> Develop a CEMP prior to construction works taking place and include: <ul style="list-style-type: none"> Pre-clearance protocols. Erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the study area has been stabilised to prevent off-site transport of eroded sediments. Consideration of Key Fish Habitat within Macquarie Rivulet and Hazelton Creek. 		Pre-construction
B4	Impacts to key fish habitat during reclamation works	<ul style="list-style-type: none"> A Part 7 fisheries permit under the FM Act must be obtained prior to commencement works All construction and maintenance access tracks across the creek will follow the fish passage guidelines for waterway crossings in Fairfull & Whiteridge 2003. 	Project Manager	Pre-construction
B5	Impact to nearby waterways and stormwater outlets	<ul style="list-style-type: none"> The plant operator is to ensure minimal disturbance to areas outside of the works site through the establishment of entry points and tracks. No equipment should be operated near or from the waterways During the construction phase, access across Hazelton Creek and the Macquarie Rivulet would be minimised for day to day movements, with access points to be determined within the CEMP along with the designed project impacts post-construction. 	Contractor	Construction
B6	Damage to surrounding environments	<ul style="list-style-type: none"> Any damage to landscaped or grassed areas must be restored at the completion of the works 	Contractor	Post-construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		including replacing native plants and mulch as required.		

6.4 Noise and vibration

A Noise Impact Assessment (**Appendix F**) was prepared by Cardno (2021) to determine the predicted noise impacts associated with the TWE. Unattended noise monitoring was conducted at 5 locations along the length of the TWE alignment.

It is noted that the results of Noise Impact Assessment and recommendations for mitigation are based on the assumption the Broughton Avenue intersection will be upgraded by others prior to 2041. Should this not occur, Council will need to reassess the traffic and transport impacts in the vicinity of the project and ensure all appropriate mitigation measures are applied.

A summary of the findings is presented below.

6.4.1 Existing environment

The existing noise environment for the Study Area is consistent with a typical suburban area. Ambient noise affecting residential receivers is primarily caused by varying levels of traffic. There is little acoustic impact to residents from industrial or commercial activities. Some moderate impact to the area may be experienced from overhead aircraft using the nearby Shellharbour Airport. The project is located in a semi-rural area, with low density residential to the north, and adjacent to some higher density residential areas to the south.

Sensitive receivers immediately adjacent to the TWE are predominantly residential receivers located on the southern side of Tripoli Way, with some receptors at greater distances from the road, on the northern side of Tripoli Way. There are some commercial shops, the Albion Park-Shellharbour Presbyterian Church and Albion Park Public School located south of Tripoli Way, but north of Tongarra Road. Albion Park Anglican Church, St Paul's Catholic Church, and St Pauls Catholic Primary School are located immediately south of Tongarra Road and up to 250 metres south of the TWE. Most commercial shops present are located east of the project area.

The observed noise environment that would affect measured noise levels at each monitor along the alignment is summarised in **Table 6-6**. This environmental descriptor assists in determining key sources of noise impacts associated with project construction and operational noise.

Table 6-6 Observed existing noise environment

Logger	Location	Observed Noise Environment
1	3 Broughton Avenue, Tullimbar	The primary source of noise was from traffic on Tongarra Road. Noise generated by high wind speeds were also recorded.
2	23 Calderwood Road, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on Calderwood Road was also observed. Traffic noise from Tongarra Road was also recorded.
3	6 Tripoli Way, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on Tripoli Way was also observed. Traffic noise from Tongarra Road was also recorded.
4	12 Hamilton Road, Albion Park	The primary source of noise was from rustling leaves due to relative high wind speeds. Noise as a result of intermittent traffic on the local roads were also observed. Traffic noise from Tongarra Road was also noticed. Noise from domestic activities within the dwelling was also identified.
5	28 Terry Street, Albion Park	The primary source of noise was from traffic on Terry Street. Noise generated by rustling leaves was also identified.

Existing background noise levels were determined in accordance with the Noise Policy for Industry (EPA, 2017), with Rating Background Noise Level (RBL) used for assessment purposes. The single figure RBL represents each assessment period (day/evening/night) over a 24-hour measurement period. The measured RBL of the existing project area are shown in **Table 6-7**.

Table 6-7 Rating background noise level

Logger	Location	Measured Rating Background Noise Level, dB(A)		
		07:00 – 18:00	18:00 – 22:00	22:00 – 07:00
1	3 Broughton Avenue, Tullimbar	45	33	27
2	23 Calderwood Road, Albion Park	39	33	30
3	6 Tripoli Way, Albion Park	41	35	29
4	12 Hamilton Road, Albion Park	38	34	28
5	28 Terry Street, Albion Park	50	43	33

6.4.2 Potential impacts

Construction

Noise

The calculated RBLs were used to divide the project area into catchment areas containing similar ambient noise levels in order to assess potential construction noise impacts on surrounding receivers.

Works are mostly scheduled to occur during standard construction hours, it is likely that outside of standard construction hours work would be required. Traffic diversion for large periods of construction would also be required. Construction noise management levels of each noise catchment area were therefore calculated for standard and non-standard construction hours, as well as potential sleep disturbance thresholds. These are shown in **Table 6-8**.

Table 6-8 Sample construction noise management levels

Noise Catchment Area	Noise Management Level, dB(A)			Sleep Disturbance, LA1, 1 min
	Day (RBL + 10dB(A))	Evening (RBL + 5dB(A))	Night (RBL + 5dB(A))	
1	55	38	35	45
2	49	38	35	45
3	51	50	35	45
4	48	39	35	45
5	60	48	38	48

Construction requirements for the project are not yet known, as such a further assessment will be required once final construction details are available. Modelling was completed based on previous similar projects, and assumed immediate proximity to receivers. The results of the construction noise modelling should therefore be considered conservative, and representative of a 'worst case' scenario.

Results of this conservative construction noise model show that construction noise levels are likely to exceed noise management levels during non-standard hours of operation for all phases of construction for nearby residential receivers. Receivers exposed to construction noise above 75dB(A) are considered 'highly noise affected'. There are no receivers projected to be highly noise affected by the works.

Sleep disturbance from night works is most likely to arise from the use of a pneumatic hammer/s or saw cutting during utilities relocation and/or road pavement works, or from truck movements on site, in particular the application of truck air brakes. High impact noise sources such as piling or jackhammering may cause sleep disturbances, however they are not scheduled to be carried out for the project, therefore sleep disturbance is unlikely to occur as a result of project construction activities.

Vibration

Vibration from construction activities could potentially impact upon the amenity of occupants of buildings located close to the project construction. Vibration impacts are categorised as having either an effect on human comfort, or causing a structural or cosmetic damage to buildings. Detailed criteria for maximum vibration levels during construction, for both human comfort and structural damage can be found in Section 5.3 of the Noise Impact Assessment (**Appendix F**).

Potential vibration impacts to buildings from construction activities could occur where works involve vibratory rollers within 10m of buildings. Pre-construction dilapidation surveys and construction vibration monitoring can be implemented to minimise any impacts.

Human comfort can be impacted by vibratory rolling within 100m of buildings. It is recommended vibratory rolling not be carried out at night to due to the high potential for sleep disturbance.

Operation

The completion of the TWE would see an increase in traffic volume along Tripoli Way, Tongarra Road, the Illawarra Highway, and Calderwood Road. This increase has the potential to impact upon up to 147 dwellings, with an impact level in exceedance of the *NSW Department of Roads and Maritime Noise Criteria Guideline (RMS, 2015)* (NCG) criteria. Properties where the noise criteria are predicted to be exceeded are eligible for consideration of at-property acoustic treatments to mitigate traffic noise. Options for mitigation include road surface treatments, acoustic barriers, and at-property treatments. The road surface for the project is Dense Graded Asphalt (DGA - AC14), therefore options for quieter pavements are limited. Barriers and earth mounds are not a feasible treatment option for all properties in order to maintain driveway access from Tripoli Way. Specific mitigation measures for operational noise impacts should be determined with an operational noise impact assessment, including additional traffic monitoring. The operational noise impact assessment should be carried out during the detailed design phase or upon project completion.

6.4.3 Safeguards and management measures

Table 6-9 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on noise vibration.

Table 6-9 Safeguards and management measures for noise and vibration

No.	Impact	Environmental Safeguards	Responsibility	Timing
N1	Construction noise and vibration	<p>Implement best practice construction noise and vibration mitigation measures in accordance with recommendations provided within the NSW Interim Construction Noise Guidelines (DECCW, 1999) (ICNG) and Australian Standard AS2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites. Measures include:</p> <ul style="list-style-type: none"> ▪ Development and implementation of all reasonable and feasible site-specific mitigation measures to meet noise criteria applicable to the project in consultation with residents ▪ Use of noise attenuation controls at source, such as mufflers, acoustic screens etc. ▪ Maintaining plant and equipment ▪ Locating static sources of noise such as generators as remotely as possible from noise sensitive receivers ▪ Developing proposed hours of operation in consultation with the residents/occupants of the affected receivers and TfNSW ▪ Allowing construction to occur only during approved construction hours, unless otherwise required as a condition of TfNSW safety requirements ▪ Informing potentially affected receivers with adequate notice of the construction program and any planned activities that may exceed noise and vibration targets. ▪ Conducting noise monitoring during operations for the purposes of assisting in noise mitigation and to verify the findings of this noise assessment, if complaints are received or proposed activities and number of plant exceed those assumed in this assessment 	Project Manager	Design Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Use of temporary noise barriers where practical Application of respite periods for noisy activities Reduce the number of plant operating at one time where works are required to be carried out outside of standard hours Preference should be for electric powered plant over combustion engine powered plant Preference should be for hydraulic or electric powered plant over pneumatic powered plant Avoid metal to metal contact on equipment to reduce impulsive or scraping noise Use of broadband reversing alarms, or "quackers", on mobile equipment in accordance with the relevant health and safety regulations Modification of work activities where noise or vibration is found to cause unacceptable impact Should operations be required outside daytime hours, all reasonable and feasible efforts should be undertaken to ensure noise levels would not exceed the INP Noise criteria stated in Section 5.2 and Table 5-1 of the Noise Impact Assessment (Error! Reference source not found.) by carrying out night-works adjacent to the school rather than nearby residential receivers for example Implementing a procedure for dealing with complaints to ensure that all complaints are registered and dealt with appropriately. 		
N2	Sleep disturbance to nearby receivers	<ul style="list-style-type: none"> Avoid scheduling construction activities during non-standard hours of operation where possible Develop a detailed Construction Noise and Vibration Management Plan. 	Project Manager	Pre-Construction Construction
N3	Construction vibration impacting upon human comfort	<ul style="list-style-type: none"> Vibratory rolling should not be carried out within 100m of nearby receivers during Standard Construction Hours Vibratory rolling should not be carried out at night to avoid sleep disturbance. 	Project Manager	Construction
N4	Construction vibration causing structural or cosmetic damage to buildings	<ul style="list-style-type: none"> Vibratory rolling should not be carried out within 10m of residential dwellings Develop a detailed Construction Vibration Management Plan to determine management methodology and monitoring procedures. 	Project Manager	Construction
N5	Operational traffic noise	<ul style="list-style-type: none"> Consideration of quieter pavement surfaces. Consideration of noise barriers, including noise mounds and noise walls Assessment of suitability of at property treatments (mechanical ventilation, upgraded glazing etc.) An operational Noise and Vibration Management Plan should be prepared for the project, to include, but not be limited to, the above measures The results of Noise Impact Assessment and recommendations for mitigation are based on the assumption the Broughton Avenue intersection will be upgraded by others prior to 2041. Should this not occur, Council will need to reassess the traffic and transport impacts in the 	Project Manager	Design Post-Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		vicinity of the project and ensure all appropriate mitigation measures are applied.		
N6	Site specific measures	<p>Site Controls:</p> <ul style="list-style-type: none"> Due to the proximity of residents to the project, temporary barriers (i.e. 2m high solid screens) may be a feasible treatment option to mitigate noise from activities such as services relocations or other activities that may occur during the night period Site offices, car-parks, and hard stand areas should ideally be located at the western extent of the project, on the northern side of the alignment in order to maximise separation distance to as many residents as possible. <p>Manage hours of operation:</p> <ul style="list-style-type: none"> Carrying out works within daytime hours as follows: <ul style="list-style-type: none"> 7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays No work on Sunday and public holidays. Do not carry out operations during evening or night-time hours, unless absolutely necessary for road safety reasons. <p>Management and Behaviour Controls:</p> <ul style="list-style-type: none"> Ensure that managers effectively communicate acceptable and unacceptable work practices for the site, through staff site inductions, notice boards, and prestart meetings Avoid the need for reversing in the new area by creating a loop road or similar Avoid dropping materials from height Workers should avoid shouting, minimise talking loudly, and avoid slamming vehicle doors. 		

6.5 Air quality

An Air Quality Assessment (**Appendix G**) was prepared by ERM Environmental (2020) to determine the potential impacts of construction and operational vehicle emissions from the new alignment on any nearby sensitive receptors. It is noted that the assessment was based on the 80% concept design of the TWE which had minimal changes compared to the 100% concept design, and therefore would not impact the findings of this assessment. A summary of the findings is presented below.

6.5.1 Existing environment

Climate

Climate data for the project site was obtained from the Albion Park Automatic Weather Station (AWS) (Site number 062841), located in the middle of the project area.

The annual average maximum temperature recorded at the Albion Park AWS was 22.5°C, with the average minimum annual temperature recorded was 11.4°C. On average, January is the hottest month, with an average maximum temperature of 27.1°C, and an average minimum temperature of 17.1°C. July is the coldest month, with average maximum temperature of 17.8°C, and an average minimum temperature of 6.2°C. The annual average relative humidity reading collected at 9am from the Albion Park AWS is 67% and at 3pm the annual average is 59%.

Rainfall data collected from the Albion Park AWS shows that February is the wettest month, with an average rainfall of 145.5mm over an average of 12.0 rain days. The average annual rainfall is 893mm with an average of 120.6 rain days per year.

Wind speed and direction was derived from wind roses compiled in 2010/4. Annually, the most common winds were from the west, above 7.5m/s. The winds are also more frequent from the western and north-eastern quadrants. Seasonally, the westerly winds dominate through the autumn, winter and spring. During summer months the north-easterly wind direction is more common. The mean wind speed in 2014 was 3.8 m/s and the annual mean percentage of calms (wind speeds of less than 0.5 m/s) was 6.3%.

Air quality and pollutants

Existing air quality data were derived from the DoPIE managed Albion Park South monitoring site, located south of the Shellharbour Airport. Data from 2014 to 2018 were used to establish an existing air quality environment. Data from 2019 were not included due to the extreme bushfire conditions of the latter half of the year.

The existing air quality of the project area is generally good, with all background concentrations of Nitrogen dioxide (NO₂), PM₁₀, and PM_{2.5} falling below the annual mean air quality criteria drawn from the *National Environment Protection (Ambient Air Quality) Measures for Ambient Air Quality (AAQ NEPM)* (NEPC, 2016).

6.5.2 Potential impacts

Potential air quality impacts from construction are most likely to present as increased dust emissions and diesel vehicle exhaust. Activities likely to cause dust emissions include site preparation (clearing and earthworks), vehicle movement within project area over unsealed paths/roads, tracking of dirt/mud from project site onto public roads, rock crushing and screening, and excavation and loading of spoil material.

The maximum measured background concentrations, the predicted air quality impacts from the operation of the TWE and the predicted cumulative impacts of the TWE are shown in **Table 6-10**, and compared with the annual mean air quality criteria.

Table 6-10 Maximum measured, modelled, and criteria, annual means

Pollutant	Background (µg/m ³)	Operation of TWE	Cumulative (µg/m ³)	Criteria levels (µg/m ³)
Maximum 1-hour average Nitrogen dioxide (NO ₂)	179 (NO _x)	75.7 (NO _x)	157.5	246
Annual average NO ₂	8.2 (NO _x)	3.9 (NO _x)	10.9	62
Maximum 24-hour average PM ₁₀	40.5	0.6	41.1	50
Annual average PM ₁₀	17.8	0.2	18	25
Maximum 24-hour average PM _{2.5}	16.5	0.4	16.9	25
Annual average PM _{2.5}	7.2	0.1	7.3	8

Modelling was carried out to a worst-case scenario for sensitive receivers along the existing alignment and the project alignment, and showed that the operation of the TWE would not result in an exceedance of the air quality criteria. Potential impacts to air quality from construction and operation of the TWE are low, and can further be mitigated through implantation of recommended management measures.

6.5.3 Safeguards and management measures

Table 6-11 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on air quality.

Table 6-11 Safeguards and management measures for air quality

No.	Impact	Environmental Safeguards	Responsibility	Timing
AQ1	General air quality impacts	An Air Quality Management Plan will be prepared to detail the air quality control measures and procedures to be undertaken during construction, including:	Project Manager	Pre-construction

		<ul style="list-style-type: none"> ▪ Air quality and dust management objectives that are consistent with DPIE guidelines ▪ Potential sources and impacts of dust, identifying all dust-sensitive receptors ▪ Mitigation measures to minimise dust impacts on sensitive receptors and the environment ▪ A dust monitoring program to assess compliance with the identified objectives ▪ Contingency plans to be implemented in the event of non-compliances and/or complaints about dust. 		
AQ2	Impacts on local air quality during construction	<ul style="list-style-type: none"> ▪ Areas of exposed surface are to be minimised throughout the construction site planning and programming, to reduce the area of potential construction dust emission sources ▪ Control measures, such as stabilisation or covering will be implemented in order to minimise dust from stockpile sites ▪ Dust suppression measures, such as the use of water carts, will be used in any unsealed road surfaces and other exposed areas ▪ All trucks will be covered when transporting materials to and from the site ▪ Activities that generate dust will be avoided or modified during high wind periods ▪ Work activities will be reviewed if the dust suppression measures are not adequately restricting dust generation ▪ Rehabilitation of completed sections, where practical, will be progressively undertaken. 	Project Manager	Construction
AQ3	Exhaust emissions	<ul style="list-style-type: none"> ▪ Construction plant and equipment will be maintained in good working condition to limit impacts on air quality ▪ Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use. 	Project Manager	Construction

6.6 Topography, geology, soils, contamination and water quality

A Preliminary Site Investigation (PSI) and Targeted Site Assessment was undertaken by Cardno (2020) to determine the extent of potential contamination to the environment within the Study Area. The assessment was used to assess the potential risk to human and ecological receptors and to determine the site suitability for the TWE. The findings of the assessment are summarised below and the full report is located at **Appendix H**.

6.6.1 Existing environment

Topography

Generally, the topography within the site is highly modified and typically situated in areas of low density residential and rural-residential dwellings within the suburb of Albion Park. The site has a gradual fall from west to east toward Macquarie Rivulet and has an elevation ranging from 9m Australian Height Datum (AHD) in the east to 15m AHD in the west. Macquarie Rivulet is located approximately 130m north of the Study Area and runs roughly parallel with the proposed road corridor. In the developed parts of the site, surface water is expected to drain to existing stormwater drainage infrastructure and discharge into the Macquarie Rivulet.

Soils

The DPIE online tool, eSPADE, was accessed on the 13th of January 2020 and situates the western portion of the Study Area within the Fairy Meadow landscape which is characterised by gently undulating broad alluvial plains with slopes of less than 5% gradient, and floodplains and valley flats with minor terraces and scattered swamps. The remainder, and majority, of the Study Area is situated within the Albion Park landscape, which is characterised by short steep upper slopes grading into long gently inclined foot slopes.

The central portion of the site is located on the Albion Park Erosional Landscape which is characterised by short steep upper slopes grading into gently inclined foot slopes. The landscape is known to encounter waterlogging, seasonally high-water table, shrink-swell; low wet bearing strength, high available water holding capacity.

Geology

The geology of the site is summarised below and detailed within **Appendix H**:

- > Quaternary age alluvium and Permian age Shoalhaven Group geology of the Berry Formation. Alluvium is located at the eastern and western end of the site and at areas within close proximity to Macquarie Rivulet. The alluvium can be described as, gravel, swamp deposits and sand dunes
- > Permian age Shoalhaven Group geology of the Berry Formation is located in the central portion of the site and is characterised by undifferentiated siltstone, shale and sandstone
- > Older (Pleistocene) alluvial deposits over the eastern section of the site, with more recent Holocene deposits characterising the floodplain at the western end of the alignment.

Water Quality

The proposed road upgrade drains into the Macquarie Rivulet and ultimately Lake Illawarra. The watercourses within the area are characterised by largely rural landscapes which are predominantly cleared for rural purposes such as grazing. As these watercourses reach Lake Illawarra they flow through townships located adjacent to the shoreline, where they are influenced by directed stormwater from urban areas. Large scale land developments such as Tullimbar and Calderwood, upstream of the catchment, also has the potential to result in impacts to the watercourses.

It was noted in the Albion Park Rail Bypass Review of Environmental Factors (APRB REF, 2016) that the water quality data taken from the State of the Environment Report by Shellharbour City Council (2011) indicates that the total phosphorus and nitrogen values were exceeding several of the Australian and New Zealand Environment and Conservation Council (2000) (ANZECC) guideline values at the lower reaches of Macquarie Rivulet. Additionally, the State of the Catchment 2010 Riverine Ecosystems report for the Southern Rivers Region (NSW Government, 2010) reported that Macquarie Rivulet had exceedances in total nitrogen and total phosphorous as well as high turbidity during their reporting period. As such, it is noted that Macquarie Rivulet is already impacted in its current state from the existing road network and other activities within the catchment.

Groundwater

A search of the NSW Department of Primary Industries (Water) groundwater database of registered groundwater bores were undertaken on the 26th of November 2019. The search identified one registered groundwater bore located within 500 m of the site, which is located approximately 110m south of the site (Bore ID: GW107819).

Three boreholes, BH003, BH006 and BH007, were drilled by Cardno in 2016 in the low-lying western portion of the Study Area in the vicinity of Hazleton Creek. Each borehole was converted to a permanent groundwater monitoring well and groundwater levels were gauged on up to seven occasions between 17 August 2016 and 3 July 2017. The data obtained by Cardno showed that the depth to groundwater ranged from 0.78 to 1.56 metres below ground level (mbgl), indicative of a shallow groundwater table. Groundwater samples were not collected or submitted for laboratory testing during the geotechnical investigation.

Acid Sulfate Soils

With reference to Council's LEP Acid Sulfate Soils (ASS) risk maps, the Study Area lies outside the indicative regions mapped as being at risk of ASS. A large portion of land to the north of the Study Area, north of Macquarie Rivulet, is mapped as a Class 4 ASS area.

Whilst the LEP does not indicate the presence of ASS beneath the site, given the alluvial nature and low relative elevation the presence of ASS cannot be discounted.

Salinity

The Fairy Meadow Landscape indicates that salinity may be present in olive brown heavy clay subsoil, however, the report does not specify the depth at which this material may be encountered. The Albion Park Landscape report does not identify the soils as being prone to salinity.

Contamination

A review of the following publicly available registers maintained by the EPA was conducted on 26 November 2019:

- > Register of contaminated land Record of Notices under the *Contaminated Land Management Act 1997*
- > Register of Environment Protection Licences (EPLs) issued under the POEO Act
- > List of NSW contaminated sites notified to the EPA.

The database searches did not identify any contaminated land record of notices, lands identified on the PoEO Public Register and did not identify any EPA listed contaminated sites within Albion Park.

It is noted that the registers are not an exhaustive list of contaminated sites and there may be previously unidentified sites in the vicinity of the proposal. A search of other registers did not identify anything of relevance to this proposal.

Field study and soil sample analysis identified a number of sources of potential contamination in and around the site whilst also identifying some incidences of soil contamination.

Cardno reviewed seven historical aerial photographs taken in the years 1948, 1961, 1973, 1980, 1993, 2008 and 2016. The intent of the review was to identify historical land uses that may present potential contaminant sources. The review of the site history identified the following potential sources of contamination, which were recorded as Potential Areas of Environmental Concern (AEC) in the report:

- > AEC01 – Construction laydown and stockpiling area in far western extremity of the study area
- > AEC02 – Farm laydown area in the southern portion of Lot 1 DP55989
- > AEC03 – Former Dairy and Butter Factory
- > AEC04 – Stockpiles observed in Lots 11 and 12 DP1205733
- > AEC05 – Fill areas observed within Lot 1 DP 1119325 and Lot 24 DP1138317
- > AEC06 – Landscape supplies activities
- > AEC07 – Potential coal tar and asphalt pavement within the study area
- > AEC08 – Demolished building within lot 3 DP714125
- > AEC09 - Potential Filling within Keith Grey Oval.

6.6.2 Potential impacts

Construction

Soils and Contamination

Following field surveys conducted by Cardno, the following field observations and results were observed:

- > Fill material was observed at two locations at a depth of 0.5mbgl and 1.3mbgl, respectively. Fill materials included reworked natural soil, concrete fragments, bricks, tiles, timber and plastic. No asbestos containing materials were observed at the locations assessed.
- > Nine PAEC were identified within the Study Area. The nature of each PAEC and the contaminants of potential concern (COPCs) are detailed within **Appendix H**. The approximate lateral extent of each PAEC is also provided in the figures within **Appendix H**.

Laboratory testing confirmed that soils beneath the site are slightly to moderately acidic with several exceedances of the ASSMAC (1998) PASS Indicator Values and Action Criteria for TPA and TSA. Whilst soils are acidic, the SPOS and SCR results indicate that sulfides and sulfidic ores do not appear to be present, suggesting that the acidity present within soil may not be attributable to ASS, however as a precautionary measure the soils must be appropriately considered and managed during construction.

Water Quality

Water quality impacts during construction can potentially affect the health of downstream receiving waters (including Macquarie Rivulet, Hazelton Creek, Frazers Creek and Lake Illawarra) including related impacts to recreational users of those waters. The key risks to downstream water quality during construction would be associated with:

- > Vegetation clearing and exposure of soils (through topsoil stripping, excavation, stockpiling and transport of soil) which could result in soil erosion and transport into waterways
- > Earthworks or dewatering which could result in exposure to potential ASS in some parts of the project area, which could result in acidic runoff into watercourses
- > Disturbance of contaminated materials, which if not managed correctly could lead to mobilisation of contaminants into surface water
- > The use of vehicles, plant and machinery on site, which would create potential for an accidental spill or leak of fuel, oil, greases or other chemicals, which could pollute surface water and/or groundwater
- > Activities at ancillary sites, which could adversely impact surface water and groundwater. These activities include the storage of chemicals and hazardous materials, stockpiling, vehicle wash downs and vehicle re-fuelling. These ancillary sites would generally experience a higher volume of traffic movements, which could generate dust emissions. All these activities could result in mobilisation of soils, leading to increased turbidity and sedimentation of waterways. There is potential for accidental spills or other releases of pollution to surface water and/or groundwater
- > General construction activities generating waste and spoil which could result in solid waste and contaminants entering surface water. Spoil generation and movement could result in sediment transport, leading to increased turbidity and sedimentation of watercourses
- > Excavation as part of the project has the potential to intersect the groundwater table leading to incidental discharge of groundwater. This has the potential to reduce groundwater levels in the immediate vicinity and impact on surrounding environments when the water is discharged downstream.

It is considered that, provided the environmental safeguards to manage environmental impacts on water quality are implemented (outlined in **Section 6.6.3**), the impacts on water quality, aquatic ecosystems and water users will be minor.

Operation

Once the project is operational, there would be potential for indirect impacts on soils as a result of run-off and drainage. This potential impact would be managed through revegetation of exposed soils.

During operation, contamination and water quality impacts are considered minor and would likely be associated with contaminated run-off, which may arise from normal vehicle operation (tyre wear, minor leaks of lubricants and fuels, etc.), maintenance practices, or a spill or accident.

Treatment of the proposed additional run-off as a result the project has been considered as part of the design development process. Water quality measures include the implementation of road side swales,

swales at piped stormwater discharge points and gross pollutant traps (GPT) at piped stormwater discharge points.

Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software was used to assess impacts to the discharge water quality associated with this project. The MUSIC modelling resulted in a reduction in all parameters assessed, indicating that with reasonable water quality treatment measures such as swales at the discharge point, the water quality of the discharged stormwater will not be adversely impacted, and this stormwater will not result in further degradation of the receiving environment.

6.6.3 Safeguards and management measures

Table 6-12 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on contamination.

Table 6-12 Safeguards and management measures for air quality

No.	Impact	Environmental Safeguards	Responsibility	Timing
S1	Site disturbance may result in increased erosion, sedimentation and contamination risk.	<ul style="list-style-type: none"> Intrusive investigations should be undertaken at each AEC to determine if measurable COPCs are present and the suitability of these areas for the proposed land use/redevelopment Investigations should be undertaken in accordance with relevant regulatory legislation and guidance including the <i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i>, as amended 2013. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> If concentrations of COPCs are identified above the Tier I screening values, remedial or management actions may be necessary. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> The proposed intrusive investigation should include a thorough inspection of all drainage channels and overgrown areas as well as private properties that were unable to be accessed during this investigation (refer to Appendix H) Some areas were inaccessible at the time of the inspection due to a thick cover of Lantana and other vegetation, and as such potential contaminant sources were not adequately assessed. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> Any future works involving soil disturbance should incorporate an unexpected finds protocol to facilitate the identification and management of previously undocumented contamination In the instance that any suspected contaminant is identified site work must cease until a Council environment officer can advise on treatment required. 	Contractor	Construction
		<ul style="list-style-type: none"> Soil disturbance is to occur only within the construction footprint. Minimise disturbance wherever possible. 	Contractor	Construction
		<ul style="list-style-type: none"> Cut vegetation to be removed to allow the roots to remain and stabilise soil on slopes. Use jute matting or similar to stabilise banks and prevent erosion. 	Contractor	Construction
		<ul style="list-style-type: none"> Adequate sediment controls are required to prevent disturbed sediment from entering the nearby waterways and stormwater outlets during heavy rainfall 	Contractor	Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> All sediment and erosion control measures are to be installed prior to works commence and maintained throughout the life of the project No activities (including drilling and/or excavation) are to be undertaken immediately after heavy rainfall events or if it is likely for rain to occur. Unless it is certain that no sediment would be discharged from site. 		
		<ul style="list-style-type: none"> No chemicals, fuels and/or waste are to be stored within 5m of the roadway, gutter or stormwater drains. All such substances must be stored in a designated containment area within the works site Emergency spill kits are to be carried by all works crew and kept on-site during operation. 	Contractor	Construction
		<ul style="list-style-type: none"> Any imported fill must be from a known source, free of contaminants and compatible with the local soil types. If any potential contamination or suspect material is encountered cease works immediately and contact Council's environment team. 	Contractor	Construction
S2	Demolition of existing structures	<ul style="list-style-type: none"> A hazardous building material survey should be undertaken prior to the demolition of any buildings and structures within the site. Underground utilities such as water mains and Telstra pits may contain asbestos cement and should be identified and removed in accordance with regulatory guidance prior to and/or during construction of the project. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> Any future works involving demolition should incorporate an unexpected finds protocol to facilitate the identification and management of previously undocumented contamination. 	Contractor	Construction
S3	Disturbance of Acid Sulfate Soils	<ul style="list-style-type: none"> The PSI and Limited Soil Assessment Report should be reviewed by an appropriately qualified consultant upon confirmation of the project design and excavation extents. Where required, supplementary testing must be undertaken to confirm that the risk of acid sulfate soils has been adequately assessed. This applies particularly to areas of deep cut and at the locations of foundations and piling. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> Whilst the acidity present in soil may not be attributable to oxidisable sulfur, it is recommended that a management plan be prepared prior to the commencement of earthworks and construction. The management plan should be prepared in consideration of the ASSMAC Guidelines (ASSMAC 1998) and should be included as a sub-plan of the broader project Construction. 	Contractor	Pre-construction Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Environmental Management Plan (CEMP). > The management plan must include the following: <ul style="list-style-type: none"> Review and interpretation of field testing and analytical results from previous investigations, and in doing so identify areas of the site that may contain ASS / acidic soils Describe the construction works and identify those works that may result in the disturbance of ASS / acidic soils Detail the mitigation measures and actions that would be required to mitigate potential risks associated with disturbance of ASS / acidic soils. This includes but is not limited to excavated soils, excavation surfaces, soil treatment performance criteria, validation testing, stockpiling durations, soil treatment areas, prescribed liming rates, groundwater and surface water management and contingencies (e.g. weather events, over-liming and offsite disposal of soil) Monitoring oversight and reporting requirements including environmental monitoring programs (surface water and stockpile), inspection and oversight and provision of suitable reporting and deliverables. The ASSMP (or equivalent) must adhere to Part 6.1 of the Shellharbour LEP and any other relevant local, state or national government planning and regulatory instrument. Additional testing may be required prior to or during construction to confirm the neutralising capacity of soil. 		
S4	Soil and water	<ul style="list-style-type: none"> A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. 	Contractor	Pre-construction Construction
WQ1	Accidental spill	<ul style="list-style-type: none"> A spill management plan will be developed as part of the CEMP and communicated to all staff working on site Appropriate land and aquatic spill kits are to be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit must be appropriately sized for the volume of potentially polluting liquids stored at the work site All workers will be advised of the location of the spill kit and trained in its use 	Contractor	Pre-construction Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks Any chemicals or fuels stored at the site or equipment barges will be stored in a bunded area. 		
WQ2	Groundwater	<ul style="list-style-type: none"> Any incidental groundwater discharge that may occur during construction will need to be captured, tested and if necessary treated before disposal to the surrounding environment If groundwater discharge is expected to exceed 3ML per year an aquifer interference licence will be required under the <i>Water Management Act</i> Measures will need to be put in place to ensure no ongoing groundwater discharge occurs after completion of construction. 	Contractor	Construction

6.7 Visual amenity

6.7.1 Existing environment

Key landscape features at the site include the Illawarra Highway, Broughton Avenue, Calderwood Road and Terry Street. These road features are present within a mixed setting that comprises vegetation adjacent to roads and along medians and verges. In addition to this, open rural areas occupy the western extent of the Study Area as well as grasslands and the Macquarie Rivulet to the northern extents of the Study Area boundary. The TWE is bordered by the Illawarra escarpment and surrounding hills that create a visually appealing backdrop for residences in the area.

The alignment will traverse along residential property towards the central and eastern extents of the Study Area. The eastern extremity of the Study Area is the Albion Park Showground and Boles Meadows, both of which are locally listed heritage items under the Shellharbour LEP.

Key landscape features are shown in **Figure 6-10**.

Figure 6-10 Key landscape features



a) Western extent of study area looking north-east.



b) Looking east onto Broughton Avenue from the western extents of the study area.



c) Landscape on northern section of Broughton Avenue intersection.



d) View north onto Broughton Avenue/Illawarra Highway intersection.



e) View west towards Broughton Avenue/Illawarra Highway intersection.



f) Landscape north on western extents of study area – view of escarpment.



g) Escarpment views towards the western extent of the study area.



h) View from Pollock Crescent.



i) Pollock Crescent looking north to the study area.



j) Pollock Crescent north east view.



k) The Expressway looking east.



l) View north towards potential ancillary site 2 from The Expressway.



m) Southern view from Calderwood Road.



n) Proposed Calderwood Road / TWE intersection – Tulkeroo.



o) View east on proposed TWE alignment.



p) Northern view of proposed Calderwood Road/TWE intersection.



q) Western extent of the existing Tripoli Way.



r) Proposed alignment on Tripoli Way.



s) Tripoli Way looking west.



t) Tripoli Way looking east towards Hamilton Road.



u) Terry Street north towards proposed TWE intersection.



v) Intersection of TWE and Illawarra Highway.



w) View south from the eastern extents of the study area.



x) North view from the eastern extents of the study area.

6.7.2 Potential impacts

Construction

The works are likely to result in short term visual impacts during the construction phase due to the use of construction equipment, stockpiling and storage of materials and establishment of ancillary sites. These impacts would be most visible from the Illawarra Highway, Tripoli Way and Terry Street. The construction area would also be visible from the Calderwood residential subdivision which is located to the west and north-west of the Study Area.

Operation

Once operational, the project would result in localised impacts to visual amenity in almost all areas of the alignment. Due to much of the existing western extent being rural landscape, the development of a road will have a visual impact on residents bordering the Illawarra Highway at Tullimbar and the current and future residents at Calderwood Valley subdivision. The existing residents in the middle portion of the alignment will be visually impacted by a four lane road running parallel to their front and rear boundaries. The increased traffic flow through this area will have an impact on the properties that adjoin the project.

Landscape and visual impacts to the eastern extents of the Study Area will be seen from the existing Illawarra Highway/Terry Street intersection as well as traffic flow running north/south on the Illawarra Highway, connecting to the Princes Highway. Users of the Albion Park Showground may also experience a change in visual amenity due to the position of the final intersection at the eastern extent of the alignment with Terry Street.

A Landscape Plan (**Appendix B**) has been developed for the project and will assist in reducing the visual impacts felt by the TWE. A Vegetation Management Plan (**Appendix D**) has also been developed to inform

the landscape plan of appropriate native plant species to be used and the appropriate management of these plantings to ensure impacts to visual amenity is reduced.

Photomontages of the what the project is expected to look like once operational are included in **Appendix M**.

6.7.3 Safeguards and management measures

Table 6-13 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on visual amenity and landscape character.

Table 6-13 Safeguards and management measures for visual amenity

No.	Impact	Environmental Safeguards	Responsibility	Timing
V1	Some short-term visual impacts would result from the works due to disturbed areas, site fencing, machinery and equipment working on the Illawarra Highway, Tripoli Way and Terry Street.	<ul style="list-style-type: none"> Work areas near residential dwellings must be fenced and include the use of visual screening (shade cloth or similar) to minimise visual impacts Lights utilised for night works will be directed away from residential dwellings and roadways to minimise light impacts on surrounding residential areas The site must be kept neat and clean of general litter and neat for the duration of works. 	Contractor	Pre-construction During Construction
V2	Longer term impacts on visual amenity	<ul style="list-style-type: none"> A vegetation management plan and landscaping plan have been considered and can be seen at Appendix B and Appendix D. These plans will be considered during detailed design and implemented in accordance with the approved assessment. 	Project Manager Contractor	Pre-construction

6.8 Aboriginal heritage

An Aboriginal Due Diligence Assessment (ADDA) has been prepared by Biosis (2021) to consider potential Aboriginal heritage impacts. The assessment was undertaken in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010a) to inform responsibilities with regards to Aboriginal cultural heritage in the area.

The ADDA has identified areas of potential Aboriginal heritage within the Study Area and has detailed a range of mitigation measures that should be employed to ensure the retention of Aboriginal heritage. A summary of the findings are presented below and the detailed ADDA is shown in **Appendix I**.

6.8.1 Existing environment

Recent research has identified the potential that Aboriginal peoples have inhabited Australia for at least 65,000 years and possessed a distinctive stone tool assemblage. The Illawarra region is the traditional land of the Wodi Wodi, a group of people who spoke a variant of the Dharawal language. The area occupied by this group extended from Botany Bay down the coast to around Nowra. Early historic references record Aboriginal groups moving frequently between the coast and the escarpment and travelling for special ceremonies, although camps were also noted along the coast and coastal plains. However, during the 19th and 20th centuries, the arrival of settlers to the Illawarra, created competition for resources, which restricted the movement of Aboriginal inhabitants and their traditional lifestyle was severely affected.

Extensive Aboriginal heritage assessments have been completed within the vicinity of the Study Area and are detailed further in **Appendix I**.

An extensive search of the Aboriginal Heritage Information Management Systems (AHIMS) database was conducted by Biosis on 3 August 2021 as part of the ADDA. The search identified 102 Aboriginal archaeological sites within a four-kilometre search area, centred on the Study Area and are summarised in **Table 6-14**. One of these registered sites is located *within* the Study Area. Refer to Figure 6 within **Appendix I**.

Table 6-14 AHIMS sites within the vicinity of the Study Area

Site Type	Occurrences	Frequency (%)
Artefact	84	82
Shell	2	2
Artefact, PAD	4	4
PAD	12	12
Total	102	100

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area.

Large parts of the study area have been subject to significant ground disturbance, such as the initial agricultural activities inclusive of intensive grazing and cultivation, road infrastructure and the development of residential subdivisions in Albion Park. The disturbances observed within the study area have had an influence on site heritage integrity.

6.8.2 Potential impacts

A series of statements have been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are likely to be located. The following prediction statements have been formulated using a predictive model and are summarised in **Table 6-15** and detailed further in **Appendix I**.

Table 6-15 Aboriginal site prediction statements

Site Type	Site description	Potential for occurrence
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to	Moderate

Site Type	Site description	Potential for occurrence
	sparse, low-density 'background' scatters and isolated finds.	
Potential Archaeological Deposits (PAD)	Potential sub surface deposits of cultural material.	Moderate
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low
Quarries	Raw stone material procurement sites.	Low
Modified trees	Trees with cultural modifications	Low
Burials	Aboriginal burial sites.	Low
Rock shelters with art and/or deposits	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low
Aboriginal ceremony and Dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low
Aboriginal places	Aboriginal Places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low

Following archaeological investigations conducted by Biosis, three areas of archaeological potential have been identified within the ADDA (**Appendix I**) as Potential Archaeological Deposits (PAD). The location of the PAD areas are summarised below:

- > PAD 1 – North of Pollock Crescent, Albion Park – towards the West of the Study Area
- > PAD 2 – West and adjacent to Calderwood Road – centre of the Study Area
- > PAD 3 – East of Calderwood Road and adjacent to the existing Tripoli Way – centre of Study Area

These areas fall within the Study Area and will be directly impacted by the construction of the TWE.

One new Aboriginal site was identified within the Study Area – Tulkeroo ISO (AHIMS 52-5-0961), which consisted of a basalt ground edge axe located within the historical property of 'Tulkeroo' and the Albion Park Butter Factory.

The survey revealed that large parts of the Study Area had been subject to significant ground disturbance, such as intensive agricultural practices, road infrastructure and the development of residential dwellings throughout the Study Area. Although these processes would displace surface cultural material, it would not affect deeper buried archaeological deposits.

The identification of three PAD sites within the Study Area and the finding of an Aboriginal site requires an Aboriginal Cultural Heritage Assessment to be prepared and for Council to acquire an Aboriginal Heritage Impact Permit (AHIP) prior to any excavation works on the site.

6.8.3 Safeguards and management measures

The following recommendations have been formulated to respond to the need for the TWE and the significance of the site. The recommendations are presented in **Table 6-16**.

Table 6-16 Safeguards and management measures for Aboriginal heritage

No.	Impact	Environmental Safeguards	Responsibility	Timing
AH1	Impacts to Aboriginal heritage	<p>Application for an Aboriginal Heritage Impact Permit (AHIP)</p> <p>An AHIP is required to impact the listed Aboriginal site, Tulkeroo ISO (AHIMS 52-5-0961), within the Study Area which is currently protected under the NPW Act. It is recommended that the surface stone artefact associated with the site is collected prior to destruction.</p> <p>Advice preparing AHIPs</p> <ul style="list-style-type: none"> An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. Heritage NSW issues AHIPs under Part 6 of the NPW Act. AHIPs should be prepared by a qualified archaeologist and lodged with the Heritage NSW. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the Heritage NSW for the processing of AHIPs, which is dependent on the estimated total cost of the development project. Where there are multiple sites within one Study Area an application for an AHIP to cover the entire Study Area is recommended. 	Project Manager	Pre-construction
AH2	Impacts to areas identified as having moderate archaeological potential	<p>Aboriginal Cultural Heritage Assessment (ACHA)</p> <ul style="list-style-type: none"> As three areas of moderate potential have been identified as part of this assessment, it is recommended that a program of test excavations is undertaken to determine if subsurface Aboriginal sites are present and whether an AHIP application will be required. This process will consist of an ACHA prepared in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), an archaeological report prepared in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and consultation with Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010c). 	Consultant Archaeologist Project Manager	Pre-construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
AH3	Impacts to unexpected Aboriginal heritage	Unexpected Finds Protocol <ul style="list-style-type: none"> All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Heritage NSW. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the Heritage NSW and Aboriginal stakeholders. 	Contractor	Pre-construction
AH4	Impact to Aboriginal ancestral remains	Unexpected Finds Protocol <p>Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:</p> <ol style="list-style-type: none"> 1. Immediately cease all work at that location and not further move or disturb the remains. 2. Notify the NSW Police and NSW Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location. 3. Not recommence work at that location unless authorised in writing by Heritage NSW 	Contractor	Pre-construction

6.9 Historical heritage

A Historic Heritage Assessment (HHA, 2020) and a subsequent Statement of Heritage Impact (SoHI, 2021) have been prepared by Biosis to consider potential non-Aboriginal heritage impacts. The reports investigated the historical background of the Albion Park area, identifying various heritage features of the town that have the potential to be impacted upon by the TWE project. The SOHI identifies impacts and details the range of mitigation measures that should be employed to ensure the retention of Albion Park's historical past. A summary of the findings are presented below and the detailed heritage assessments are shown in **Appendix J**.

6.9.1 Existing environment

The first recorded contact between Aboriginal and European peoples occurred in 1770, when Captain Cook sailed down the east coast of Australia in the Endeavour and observed cook fires and Aboriginal people carrying canoes along the coast.

The Illawarra district was first noted by James Cook in 1770 when he located the headland of Port Kembla, naming it 'Red Point'. He also identified a large hill which looked like the crown of a hat. This was Mount Kembla, which was known as Hat Hill in the early days of the settlement. The Illawarra region was attractive not only for its rich pasture, but also for its Red Cedar, which was exploited by the early timber cutters. Between the cattlemen and the cedar cutters, passage into the Illawarra region was found. The first settlement in the Illawarra region was established by Charles Throsby in 1815, who cut a cattle track from Glenfield and spent his first night in the Illawarra at Bulli.

The Study Area is situated in what would become the Shellharbour district. Surveyor-General John Oxley was sent to the Illawarra region to make a general survey of the area and to connect it to the known parts of the colony, as well as identify specific lands for prospective grantees. The first five grants in the Illawarra region were made in 1821 to absentee landlords, who ran cattle on their lands with a few stockmen present. By 1829, most of the land grants within the current Shellharbour district had come under the control of four families:

- > Wentworth, Peterborough Estate, 14,050 acres (5,686 hectares)
- > Johnston, 'Johnston's Meadows' later known as 'Weston's Meadows', 2,800 acres (1,133 hectares)
- > Terry and Hughes, 'Terry Meadows', later known as 'Albion Park', and 'Tongarra', 5,300 acres (2,145 hectares)
- > Osbourne, 'Marshall Mount', 2,860 acres (1,157 hectares).

The Study Area is situated within the original land grant made to Samuel Terry – Terry Meadows.

The review of historical documents provide evidence to the potential archaeological remains that may exist within the vicinity of the Study Area. This research coupled with extensive desktop review of Federal, State and local Heritage registers has identified a list of Heritage items and sites to be studied in order to determine the extent of any impact caused from the TWE. **Table 6-17** details the heritage items identified within the Study Area or within the vicinity of the Study Area.

Table 6-17 Summary of heritage listings within or within proximity to the study area

Site Number	Site Name	Address/Property Description	Listings		Significance
			Individual Item	As a Conservation Area	
Items within or partly within the Study Area					
I001	Tulkeroo and Albion Park Butter Factory (Former)	23 Calderwood Road, Albion Park, Lot 1 DP 910045	Shellharbour LEP	-	Local
I138	Boles Meadows	2105 Illawarra Highway, Albion Park, Lot 1001 DP 81344	Shellharbour LEP	-	Local
I301	Albion Park Showground	Tongarra Road, Albion Park, Lot 1000 DP 813443	Shellharbour LEP	-	Local
Items within the vicinity of the Study Area					
I012	St Andrews Presbyterian Church and tree	253 Tongarra Road, Albion Park, Lot 250 DP 1090226	Shellharbour LEP	-	Local
I011	Albion Park School and headmaster's residence	154-156 Tongarra Road, Albion Park, Lot 1 DP 782244	Shellharbour LEP	-	Local
I010	ES&A Bank (Former)	148 Tongarra Road, Albion Park, Lot 4 DP 703238	Shellharbour LEP	-	Local
I015	All Saints Anglican Church and tree	253 Tongarra Road, Albion Park, Lot 2 DP 227785	Shellharbour LEP	-	Local
I014	Anglican and Roman Catholic cemeteries	247-253 Tongarra Road, Albion Park, Lot 301 DP 1041577, Lot 2 DP 227785 and Lot 7004 DP 1124374	Shellharbour LEP	-	Local
I208	Condon's Surgery	175 Tongarra Road, Albion Park, Lot 1 DP 1088776	Shellharbour LEP	-	Local

6.9.2 Potential impacts

The principal impact to heritage items by the TWE project is posed through the encroachment of the road towards the listed heritage items resulting in the demolition or modification of the heritage items. Based upon the discussion of impacts to heritage items within the SOHI prepared by Biosis (2021) (**Appendix J**) impacts can be quantified under three main categories:

- > Direct Impacts - direct impacts are where the completion of the development will result in a physical loss or alteration to a heritage item which will impact the heritage value or significance of the place. Direct impacts can be divided into whole or partial impacts. Whole impacts essentially will result in

the removal of a heritage item as a result of the development where as partial impacts normally constitute impacts to a curtilage or partial removal of heritage values

- > Indirect Impacts – indirect impacts to a heritage item relate to alterations to the environment or setting of a heritage item which will result in a loss of heritage value. This may include permanent or temporary visual, noise or vibration impacts caused during construction and after the completion of the development. Indirect impacts diminish the significance of an item through altering its relationship to its surroundings; this in turn impacts its ability to be appreciated for its historical, functional or aesthetic values
- > No Impact - this is where the project does not constitute a measurable direct or indirect impact to the heritage item.

A summary of potential impacts to heritage items are provided in **Table 6-18**. A detailed assessment of impacts are included within **Appendix J**.

Table 6-18 Assessment of impacts to heritage items within or within proximity to the Study Area

Heritage Item	Significance	Discussion	Assessment
Items within or partly within the Study Area			
Tulkeroo and the Albion Park Butter Factory (Former)	Local	<p>This item comprises two buildings and the curtilage of both: the former Albion Park Butter Factory and the nearby manager's residence ("Tulkeroo"), both constructed in 1885. The proposed works will involve the demolition of the Albion Park Butter Factory (Former) and disturbance or removal of the associated area of high archaeological potential, both of which are wholly located within the Study Area. As a result, the proposed works are considered to be unacceptable from a heritage perspective.</p> <p>The demolition of the Albion Park Butter Factory (Former) building will have a significant negative effect on the heritage significance of the item as a whole (i.e. loss of connectivity associated with industrial/agricultural use and adjacent manager's residence), and will result in a loss of local heritage, which is significant for its local historical contribution, rarity and representativeness, technical achievement, and association with individuals and local groups.</p> <p>Any bulk earthworks, vegetation clearing, relocation and installation of sub-surface services, construction of the roadway, and landscaping and remedial works are highly likely to disturb or remove any intact archaeological deposits within the area of high archaeological potential, which may contain remains of equipment/machinery positioning, yard surfaces, footings, well, secondary deposits, artefact scatters, cut and fill deposits, postholes and associated cuts and deposits. The archaeological resource has the potential to be valuable in answering research questions relating to late-19th and early-20th century industrial technology involved in the factory production of butter, including the equipment, tools and materials used in the process. This information could then be compared with other similar sites outside of the Shellharbour district to consider how this site differs from others. The archaeological resource also has the potential to contribute to knowledge regarding the lives of John Fraser, Desmond King and their families, and the kinds of private lives they lived.</p> <p>The works will also result in a direct impact to the relict evolved rural landscape within the heritage item.</p> <p>For reasons discussed in Section 2.4, the concept design has adopted an alignment that will require the demolition of the Albion Park Butter Factory, and hence have a direct impact, however the measures proposed Table 6-19 are to be implemented to minimise the indirect impacts. The Visual Condition Report notes that the structural elements of the building appear to be significantly inadequate to modern Australian building standards and codes. Any construction</p>	Direct physical impact - whole

Heritage Item	Significance	Discussion	Assessment
		<p>work to rectify this would also likely involve damage to or removal of original fabric. While this may potentially detract from the heritage significance of the building, maintenance and conservation works would enable the continued use and/or public enjoyment of the Albion Park Butter Factory (Former).</p> <p>The removal of the Butter Factory structure and construction of the road will result in an indirect visual impact to Tulkeroo, the setting of the heritage item as a whole and views to and from the heritage item. The setting and views will be permanently altered through the construction of the new road.</p> <p>The Shellharbour Development Control Plan states in Section 28.312 that development at Tulkeroo and Albion Park Butter Factory (Former) must retain the visual relationship between the buildings and the Macquarie Rivulet. This relationship contributes to the heritage significance of the item and if disrupted will detract from the item's significance.</p> <p>The current concept designs include some detail for landscaping, but it is noted that this is to be refined at detailed design stage. The concept designs do not include provision for any noise barrier structures. Appropriate landscaping and noise barriers could be used to reduce visual and noise impacts to Tulkeroo.</p> <p>The program of works will also have temporary and potentially permanent indirect impacts to Tulkeroo. The construction of the road will result in a permanent visual impact, disrupting views to and from Tulkeroo and the relict evolved rural landscape. Temporary noise and vibration impacts may also occur during works as a result of plant and movement of materials; these may also occur permanently once the road is operational. Vibration impacts could potentially impact sub-surface deposits or parts of the structure that are vulnerable to disturbance, such as elements that require repair or maintenance. These impacts are unavoidable due to the nature of works required.</p>	Indirect impact – visual, noise and vibration.
Boles Meadows	Local	The works will have temporary indirect impacts to Boles Meadows and will likely consist of temporary visual and noise impacts. However, temporary impacts will only occur during the construction phase and will be resolved upon completion of the project and is unlikely to affect the significance of Boles Meadows.	Indirect impact – visual and noise
Albion Park Showground	Local	The works will have temporary indirect impacts to the Albion Park Showground and will likely consist of temporary visual and noise impacts. However, temporary impacts will only occur during the construction phase and will be resolved upon completion of the project and is unlikely to affect the significance of the Albion Park Showground.	Indirect impact – visual and noise
Items within the vicinity of the Study Area			
St Andrews Presbyterian Church and tree	Local	St Andrews Presbyterian Church and tree is located 100 m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise
Albion Park School and headmaster's residence	Local	Albion Park School and headmaster's residence is located 45m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise
ES&A Bank (Former)	Local	ES&A Bank (Former) is located 115m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise

Heritage Item	Significance	Discussion	Assessment
All Saints Anglican Church and tree	Local	All Saints Anglican Church and is located 200m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise
Anglican and Roman Catholic cemeteries	Local	Anglican and Roman Catholic cemeteries is located 200m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise
Condon's Surgery	Local	Condon's Surgery is located 200m south of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item.	Indirect impact – visual and noise
"Riversford"	Local	"Riversford" is located 295m west of the Study Area. Any proposed development may result in a minor noise and visual impact; however, this is unlikely to affect the significance of the item. It is understood that the homestead building within this item has been demolished.	Indirect impact – visual and noise

The TWE would result in the complete demolition of the former Albion Park Butter Factory thus removing its heritage significance.

As indicated in **Section 2.4**, the alignment of the TWE has been determined by Council through a process of design development which included consideration of two alignment options that avoided the former Butter Factory building. However, Council's Executive Leadership Team resolved to proceed with the alignment that involves significant impacts to the former Butter Factory having regard, principally to flooding impacts and associated required mitigation, area of property acquisition and demolition and a previous Council resolution.

The structural adequacy of the elements of the former Albion Park Butter Factory is also a consideration. A Structural Adequacy report (Inglis Engineering, 2021) is provided in **Appendix L** and Biosis conducted a Visual Inspection of the structural aspect of the building (**Appendix 2** of the detailed heritage assessment provided in Error! Reference source not found.).

Inglis Engineering assessed the structural integrity of the Albion Park Butter Factory building and found that the overall building is in poor to fair condition and the structural integrity of some building elements had been compromised. An analysis of the condition determined that appropriate remedial work, partial reconstruction and make-safe actions could be undertaken to 'extend the serviceable life of the structure'. A detailed summary of recommendations for remedial actions and cost estimates is provided in the Inglis report and was estimated to cost approximately \$213,000 (2020). The report also concluded that failure to implement the recommended remedial actions will lead to further degradation of the structure to a stage where it will become dilapidated beyond repair.

The Visual Condition Report (Biosis) noted that *"the structural elements of the building appear to be significantly inadequate to modern Australian building standards and codes. Any construction work to rectify this would also likely involve damage to or removal of original fabric. While this may potentially detract from the heritage significance of the building, maintenance and conservation works would enable the continued use and/or public enjoyment of the Albion Park Butter Factory (Former)."*

The project will also have an indirect visual impact on multiple listed heritage items that have been considered in this heritage assessment (refer to **Table 6-19**). An application to the Heritage Council is required to obtain a Section 140 excavation permit prior to any excavation works within the Study Area.

6.9.3 Safeguards and management measures

The primary recommendation of the SOHI is to avoid impacts to Tulkeroo and the Albion Park Butter Factory (former) and areas of high and moderate archaeological potential through further design development as:

"...This item is significant for a range of historical, aesthetic, rarity and associative values, and specifically for the technological and social associations of the Albion Park Butter Factory (Former), as well as for the architectural and residential component found in Tulkeroo. This assessment has determined that the proposed works would result in significant loss of local heritage. Direct impacts in the form of demolition

of this structure and disturbance of areas of high archaeological potential should be avoided through design development.”

As the Council has determined that alternative options to avoid or minimise impacts to the former Butter Factory are not feasible an environmental impact statement (EIS) is required prior to granting of approval of the project from the relevant determining authority under Division 5.1, of the EP&A Act. The measures within **Table 6-19** are recommended to mitigate indirect impacts. **Section 2.4** of this report addresses the process of Council's consideration of alternative options for the TWE.

Table 6-19 Safeguards and management measures for historical heritage

No.	Impact	Environmental Safeguards	Responsibility	Timing
H1	Indirect impacts to Tulkeroo and the heritage item setting	<p>Minimise indirect impacts to Tulkeroo and the heritage item setting</p> <p>As the plans are at the concept design stage, it is recommended that design options explore ways in which permanent and temporary indirect impacts to Tulkeroo and the heritage setting can be reduced.</p> <ul style="list-style-type: none"> Design development should explore ways in which the permanent visual impact of the proposed works on Tulkeroo and the heritage item's site setting can be minimised, such as sympathetic fencing and/or vegetation screening Design development should explore ways in which to reduce permanent noise impacts of the proposed works on Tulkeroo Investigate the likelihood of impacts to Tulkeroo caused by permanent noise and vibration impacts from the proposed works once the road is in operation Establish an exclusion zone along the boundary between Lots 11 and 12, DP 1205733 to protect and minimise any potential damage to Tulkeroo which could occur during construction Use discrete fencing to minimise the temporary visual impact of the works on Tulkeroo and the site setting, with temporary information signage displayed in several publicly accessible locations to explain the reason for the disruption of views and site setting, and provide information regarding the area of proposed works Monitor the impact of any temporary noise or vibration from construction works so as to mitigate any physical damage that these may cause to Tulkeroo. 	Contractor Project Manager	Pre-construction
H2	Loss of heritage significance and documentation	<p>Archival recording</p> <p>Prior to any impacts to the Study Area, a detailed archival recording should be undertaken to document the Albion Park Butter Factory (Former), its relationship with Tulkeroo and the wider setting of the heritage item. Archival recordings should be undertaken in accordance with the NSW Heritage Office documents <i>How to Prepare Archival Records of Heritage Items</i> (Heritage Office 1998) and <i>Photographic Recording Of Heritage Items Using Film or Digital Capture</i> (Heritage Office 2006). This should include both photographic and architectural recordings.</p>	Consultant Archaeologist Project Manager	Pre-construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
H3	Direct impacts to the former Butter Factory	<p>Reassessment of the heritage item's heritage and curtilage significance</p> <p>The heritage significance and curtilage of the heritage item, Tulkeroo and Albion Park Butter Factory (Former), should be reassessed. In addition to the loss of one element of the heritage item, the construction of a road through the item would have a major impact on the views from Tulkeroo to the Macquarie Rivulet and the item's setting, which are also considered part of the item's significance as a whole. The removal of the former Butter Factory building and disruption of the views and setting would change the nature of the heritage item's significance, and as such would need to be re-evaluated against the relevant heritage assessment criteria. This would likely involve reconsideration of the curtilage of the heritage item, which may potentially be reduced to the land containing Tulkeroo. The effect of this would be an amendment to the Shellharbour LEP and Development Control Plan.</p>	Consultant Archaeologist Project Manager	Pre-construction
H4	Loss of archaeological heritage items	<p>Archaeological investigation required prior to works for areas of High potential.</p> <p>The analysis for this report has determined that some parts of the Study Area have a moderate or high potential for the survival of archaeological resources of local significance. In NSW, archaeological sites of State or local significance are considered "relics", which are protected by the <i>Heritage Act 1977</i>. In NSW, impacts to relics are only permitted with a Section 140 approval (excavation permit). Given the potential for local significant archaeological remains to be present within the Study Area a Section 140 approval is required.</p> <p>An application should be made to the Heritage Council for a Section 140 approval (excavation permit) supported by the SoHI. An archaeological research design and methodology will also need to be prepared to support the application.</p> <p>It is likely that archaeological works will consist of monitoring during demolition works (i.e. removal of floor surfaces, foundations etc.) and any additional ground disturbance works within the Study Area until an archaeologically sterile layer is encountered. Deeper archaeological excavation may be required depending on the nature of remains encountered. The works described must be supervised by and guided by an appropriately qualified archaeologist to ensure that any archaeological remains are identified and recorded. Should substantial archaeological remains be identified it may be required to undertake archaeological excavation using open area techniques.</p>	Consultant Archaeologist Project Manager	Pre-construction

Summary: The primary recommendation of the SOHI is to avoid impacts to Tulkeroo and the Albion Park Butter Factory (former) and areas of high and moderate archaeological potential through further design development as:

“...This item is significant for a range of historical, aesthetic, rarity and associative values, and specifically for the technological and social associations of the Albion Park Butter Factory (Former), as well as for the architectural and residential component found in Tulkeroo. This assessment has determined that the proposed works would result in significant loss of local heritage. Direct impacts in the form of demolition of this structure and disturbance of areas of high archaeological potential should be avoided through design development.”

As the Council has determined that alternative options to avoid or minimise impacts to the former Butter Factory are not feasible, the mitigation measures within **Table 6-19** of this report are recommended.

Having regard to the significant potential impacts to the Albion Park Butter Factory it is necessary for an environmental impact statement (EIS) to be prepared for consideration prior to granting of approval of the project from the relevant determining authority under Division 5.1, of the EP&A Act.

6.10 Socio-economic

6.10.1 Existing environment

The population forecast of Shellharbour LGA is expected to grow by approximately 28% from 74,391 residents in 2020 to 94,877 residents in 2041 (Profile i.d. 2020). The population increases predicted can be mainly attributed to the residential developments under construction at Shell Cove, Shell Heights, Tullimbar and Calderwood. The residential release areas at Calderwood and Tullimbar are located just west of the project and have had a significant effect on traffic capacity and congestion currently experienced within the Albion Park Town Centre.

Albion Park is a well-established suburb in the Shellharbour LGA. Key industries for the area include:

- > Health and aged care
- > Retail and supermarkets
- > Agriculture
- > Recognised state and private educational institutes
- > Tourism.

Currently, the Illawarra Highway is experiencing major congestion issues with population growth and major project infrastructure (Albion Park Rail bypass) under construction. This has had a negative impact on the amenity and accessibility of the Albion Park Town Centre and thus may be impacting on businesses in the area.

6.10.2 Potential impacts

Construction

The construction phase of works would result in socio-economic impacts from reduced access, increased congestion and reduced visual amenity in the locality. These impacts have the potential to reduce the short-term attractiveness of the area. Given the direction of the alignment and most of the works being away from the main arterial roads in Albion Park it is anticipated that the current condition and use of these roads will not be significantly impacted.

Notification of construction works and potential for delays should be provided to the public. Variable messaging signs may be used to inform road users of imminent construction works and restricted speed limits.

Operation

The project will have some impact on residents within the Study Area with the following impacts noted as a result of the project.

Property access

As a result of the project, property access will be limited along Moles Street as it will be converted into a left in / left out give way arrangement (Moles Street giving way to Tripoli Way). Access to residents' driveways

along Tripoli Way will be converted to a left in / left out arrangement with the addition of a central median. See **Section 6.1** for further detail on traffic impacts.

Agriculture

The project would impact on land used for grazing within the western portion (north of Tongarra Road) of the Study Area. The project would have direct and indirect impacts:

- > The direct impacts would potentially include loss of pasture land, loss of access to some high ground outside of the flood zone and the acquisition of agricultural land. See **Section 3.6** for further on land acquisition
- > The indirect impacts would potentially include requirements to reduce herd numbers or purchase additional feedstock and changes to the management practices of the herd associated with the direct impacts noted above.

Other socio-economic impacts such as noise, air quality and visual amenity are addressed separately in **Sections 6.4, 6.5 and 6.7** of this REF.

The project has strong socio-economic benefits associated with reduced traffic within the Albion Park Town Centre. Reduced traffic would lessen congestion, while improving, safety, amenity and aesthetic, as well as providing for ease of parking. These impacts would benefit the local community and visitors alike. The TWE is therefore expected to have positive implications for the future health and wellbeing within the community.

6.10.3 Safeguards and management measures

Table 6-20 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on socio-economic factors.

Table 6-20 Safeguards and management measures for socio-economic factors

No.	Impact	Environmental Safeguards	Responsibility	Timing
SE1	Potential delays for commuters and freight operators during construction.	<ul style="list-style-type: none"> ▪ All businesses and residences likely to be affected by the works must be notified in accordance with the Council consultation procedures. Notification would include details on the time, duration and nature of works. 	Project Manager	Pre-construction
SE2	Road closures limiting residents' access to their properties	<ul style="list-style-type: none"> ▪ An appropriate Traffic Management Plan will be established as part of the CEMP. 	Project Manager Contractor	Pre-construction
SE3	Impacts on agricultural land	<ul style="list-style-type: none"> ▪ Detailed design to consider opportunities to minimise land acquisition where possible 	Project Manager	Pre-construction

6.11 Utilities

The utilities layout plans of the concept design drawing set (**Appendix B**) present the location of existing utility assets and identify any proposed impacts and alterations as part of the TWE. The following sections detail the assets affected by the works, the proposed treatment and liaison required with utility authorities for each of the asset types including:

- > Water and sewer
- > Electrical
- > Communications
- > Gas.

6.11.1 Existing environment

Water and sewer

Water and sewer utility assets through the development site are owned and maintained by Sydney Water. Adjacent to the existing local roads, Tripoli Way and The Expressway, there are Sydney Water assets that run within the southern road verge. In addition to these lines, there are a number of locations where existing large diameter sewer assets cross the development as shown in **Table 6-21** below.

Table 6-21 Sydney Water assets within project footprint

Chainage*	Road	Asset Type	Asset Size
CH95	Tripoli Way	Sewer	DN525
CH420	Tripoli Way	Sewer	DN355
CH590	Tripoli Way	Sewer	DN750
CH900	Tripoli Way	Sewer	DN150
CH1695	Tripoli Way	Pressure Sewer	DN750
CH20	Calderwood Road	Sewer	DN750
CH185	Calderwood Road	Pressure Sewer	-
CH25	Hamilton Road	Sewer	DN750
CH50	Terry Street	Sewer	DN750

* The 'chainage' refers to the location along the road alignment as shown on the design drawings in **Appendix B**.

Electrical

The electrical assets through the development site are owned and maintained by Endeavour Energy. There are three major transmission lines that cross the TWE alignment and a network of low voltage overhead power lines adjacent to the existing local access roads. Existing transmission lines include the 132kV transmission line, the 33kV transmission line and low voltage overhead power lines.

Communications

Existing communications assets through the development site are owned and maintained by a number of providers. A large number of existing communications pits have been identified in the concept design. A major optic fibre line crosses the TWE alignment in the western extents of the Study Area.

Gas

Existing gas lines are located in the southern verge of the existing local access roads, Tripoli Way and The Expressway and along Terry Street. These will likely be able to retain their existing location through the proposed road development.

6.11.2 Potential impacts

Potential impacts to existing utilities have been considered as part of the conceptual design of the TWE, however, the treatments of safeguards must be confirmed at the detailed design phase of the project. The following treatment has been proposed for impacts to utilities.

Sewer and Water

As part of the road construction works, the existing sewer and water assets will need to be moved from the Southern Verge to the Northern Verge where there is adequate verge width for them to be contained. Localised protection of water main assets at road crossings and relocation of existing stop valves will need to be considered at detailed design stage. **Table 6-22** presents the proposed treatments of the sewer assets described above.

Table 6-22 Sydney Water assets proposed treatments

Chainage	Road	Asset Type	Asset Size	Proposed Treatment
CH95	Tripoli Way	Sewer	DN525	Concrete Encasement
CH420	Tripoli Way	Sewer	DN355	Concrete Encasement
CH590	Tripoli Way	Sewer	DN750	Relocation for Bridge Alignment
CH900	Tripoli Way	Sewer	DN150	Concrete Encasement
CH1695	Tripoli Way	Pressure Sewer	DN750	Concrete Encasement
CH20	Calderwood Road	Sewer	DN750	Concrete Encasement
CH185	Calderwood Road	Pressure Sewer	-	Concrete Encasement
CH25	Hamilton Road	Sewer	DN750	Concrete Encasement
CH50	Terry Street	Sewer	DN750	No Treatment Required

Electrical

The 132kV transmission lines that cross the TWE alignment have sufficient clearance above the road design. These lines can likely remain unchanged through the road construction and operation.

The 33kV transmission line that crosses the TWE alignment does not achieve the Endeavour Energy special/main road clearance requirement, but does achieve the Endeavour Energy standard road clearance. At this stage, it is proposed that this line is relocated underground to eliminate the non-compliance to Endeavour Energy's clearance requirements.

For each of the transmission lines, the clearance is to be confirmed through the detailed design phase and liaison with Endeavour Energy will be required to detail relocation specifications or protection requirements.

In addition to transmission lines, a number of low voltage overhead power lines will require relocation to the proposed verge. Details of these relocations will be confirmed during the detailed design stage.

Communications

The communication assets currently present within the Study Area have been identified as either requiring:

- > Isolation and protection during works
- > Adjustment to the new surface level in the existing location
- > Relocation to the proposed road verge.

The optic fibre will likely need to be encased in concrete to allow protection of the asset. Liaison with Optus will be required during the detailed design phase.

Gas

Localised relocation or protection of services may be required and liaison with the relevant service provider during the detailed design stage will be required.

6.11.3 Safeguards and management measures for utilities

Table 6-23 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on utilities.

Table 6-23 Safeguards and management measures for utilities

No.	Impact	Environmental Safeguards	Responsibility	Timing
U1	Potential damage may occur to utilities and services not identified in this REF	<ul style="list-style-type: none"> Prior to the commencement of works the location of existing utilities will be identified and marked. A Hazard and Risk Management Plan will be prepared and implemented as part of the CEMP. The Plan will identify working around existing utilities as a site hazard. 	Project Manager Contractor	Pre-construction Construction
U2	Decrease in service efficiency and design	<ul style="list-style-type: none"> Consultation with relevant network providers is necessary at the detailed design stage to help inform protection measures, relocations of services and the retention following development. 	Project Manager	Pre-construction

6.12 Waste management

6.12.1 Existing environment

Potential wastes that would be generated during construction of the project include existing road pavement, road base, kerbing, top soil and vegetation. It is unlikely that existing road base will be recycled to create new asphalt. More likely that the existing wearing course (possibly asphalt and/or two coat seal in places) and road base will be reused on site as pavement subbase or subgrade replacement material.

6.12.2 Potential impacts

Construction

The following waste streams are expected to be produced during the construction phase of the project:

- > Green waste generated during tree removal and vegetation clearing. Green waste will be reused where possible as mulch or alternatively sent to a composting facility. Weed species would be separated and disposed of in line with the *Biosecurity Act 2015* recommendations
- > Waste road material from the decommissioning of the existing roadways
- > General construction litter
- > Waste oils and other materials from the maintenance of construction machinery may also be produced in relatively small quantities
- > Redundant erosion and sediment control materials including sediment fencing, stakes, hay bales and socks.

All waste generated during construction activities would be managed in accordance with the POEO Act, POEO (Waste) Regulation 2014, *Waste Avoidance and Resource Recovery Act 2001* and applicable resource recovery orders and exemptions.

Fill material considered unsuitable to remain on site would be classified in accordance with the NSW EPA Waste Classification Guidelines (2014) and disposed of at an appropriately licenced facility. Waste classification would be carried out by a suitably qualified and experienced environmental professional and could be done so while the materials are in-situ (i.e. in ground) or ex-situ (i.e. stockpiled). Surplus materials may also be suitable for reuse offsite subject to satisfaction of an NSW EPA Resource Recovery Exemption/Order and appropriate classification.

Improper management and handling of stockpiled materials may lead to the need to dispose of materials that would otherwise be able to be reused during construction. Stockpiled materials must be kept separate where possible to maximise potential for reuse either for this proposal or used offsite, and any potentially contaminated material must be managed in accordance with the CEMP to ensure that it is not mixed or blended with other materials.

Short term impacts may include a slight increase in the general domestic waste as a result of escape from construction bins or littering.

Materials requiring import to site during construction must be geotechnically suitable and have been classified in accordance with and to the satisfaction of an NSW EPA Resource Recovery Exemption / Order. The materials that are considered suitable for importation as fill would be specified in the CEMP. Materials being imported to site as fill during construction would require appropriate supporting documentation (i.e. evidence of classification), appropriate tracking and material validation at receipt of the site to satisfy quality control.

Operation

Wastes are not expected to be generated during the operational phase of the project with the exception of surficial litter, debris and materials lost from vehicles as unsecured loads. It is anticipated that the quantities of waste would be minimal and would be managed by Council during routine maintenance activities such as road-side litter picking and cleaning of gross pollutant traps.

6.12.3 Safeguards and management measures

Table 6-24 identifies safeguards and management measures that would be implemented to assess potential impacts of the project in terms of waste management.

Table 6-24 Safeguards and management measures for waste management

No.	Impact	Environmental Safeguards	Responsibility	Timing
WM1	Waste material including green waste, construction waste and general litter generated during construction.	<p>A Waste Management Plan will be prepared and implemented as part of the CEMP. The Plan will outline:</p> <ul style="list-style-type: none"> Compliance with the resource management hierarchy principles Measures and controls to monitor and minimise waste generation Lawful handling and disposal of unavoidable waste The plan will be prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land (2014), the NSW Waste Classification Guidelines (2014) and relevant RMS Waste Fact Sheets Unsuitable fill material and all other waste streams must be classified in accordance with the NSW EPA Waste Classification Guidelines (2014) and disposed of at an appropriately licensed facility Any excess excavated soil, spoil, green waste or general waste will be loaded into trucks and disposed of at Dunmore Recycling and Waste Disposal Depot. 	Contractor	Pre-construction
WM2	General domestic waste is expected to be generated during construction activities.	<ul style="list-style-type: none"> General waste and recycling bins will be provided at the site ancillary sites and throughout project areas for the duration of construction Ancillary sites and work areas will be maintained, kept free of rubbish and cleaned up at the end of each working day Important to prevent material to enter the nearby waterways and stormwater outlets. 	Contractor	Construction
WM3	Waste oils and other materials from the maintenance of construction machinery may be generated.	<ul style="list-style-type: none"> Any uncontrolled spills of waste oils, fuels and other materials will be contained using a spill kit and managed by an environmental professional. All waste generated as a result of uncontrolled spills and maintenance will be managed in accordance with the protocol in Safeguard WM1. 	Contractor Project Manager	Pre-construction Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Spills and uncontrolled releases of fluids and dangerous goods must be managed in accordance with a procedure specified in the CEMP and government regulators (i.e. NSW EPA) notified as required. 		

6.13 Airport environment

Rehbein Airport Consulting prepared an Aviation Impact Statement (2020) in consideration of the 80% design of the TWE. The project was assessed against the relevant National Airports Safeguarding Framework Guidelines and is summarised below with the Aviation Impact Statement located at **Appendix K**.

6.13.1 Existing environment

Shellharbour Airport (previously known as the Illawarra Regional Airport) is located approximately 1km north-east of the Study Area's eastern extents. Shellharbour Airport is owned and operated by Council. The airport operates a range of general aviation business and is home to the HARS Aviation Museum and annual 'Wings over Illawarra' air show. Airline services are available from Shellharbour Airport to Brisbane and Melbourne (Essendon).

The airport consists of two runways, Runway 16/34 and Runway 08/26. Runway 16/34 is lit for night time operations whereas Runway 08/26 is only utilised during the daylight hours. However, this assessment has incorporated Runway 08/26 as a future possible lit runway as a precautionary measure to assess all potential impacts.

6.13.2 Potential impacts

The Aviation Impact Statement defines each of the National Airports Safeguarding Framework that aims to:

- > Improve community amenity by minimising aircraft noise-sensitive developments near airports including through the use of additional noise metrics and improved noise disclosure mechanisms
- > Improve safety outcomes by ensuring aviation safety requirements are recognised in land use planning decisions through guidelines being adopted by jurisdictions on various safety related issues.

The framework currently consists of nine guidelines and have been summarised in **Table 6-25** below as potential impacts to aviation safety and their relevance to the TWE. The detailed assessment is presented within **Appendix K**.

Table 6-25 National Airports Safeguarding Framework Guidelines and association with the TWE

Guideline	Definition	Relevance to the TWE
Guideline A – Aircraft Noise	Guideline A: Measures for Managing Impacts of Aircraft Noise provides guidance to Commonwealth, state/territory and local government decision makers to manage the impacts of noise around airports including assessing the suitability of developments.	NA
Guideline B – Windshear and Turbulence	Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports provides guidance to Commonwealth, state/territory and local government decision makers and airport operators to manage the risk of building generated windshear and building generated turbulence at airports. This Guideline relates specifically to buildings and similar structures.	<p>The easternmost section of the TWE alignment is within the assessment trigger area for the Shellharbour Airport Runway 08/26 as illustrated on Figure B16262/B within Appendix K. At the closest point the road extension is approximately 450 m from the extended Runway 08/26 centreline.</p> <p>Where a proposed development is within the assessment trigger area, the next step is to consider the height of the building to determine its acceptability. The rule is that buildings should not penetrate a 1:35 surface sloping upwards in the direction</p>

Guideline	Definition	Relevance to the TWE
		<p>perpendicular to the runway centreline. Applying the 1:35 surface, building-like structures should not exceed 13 m in height within the assessment trigger area.</p> <p>The 100% concept design includes light poles and electrical overhead power poles which may be considered slender items that do not fit into this Guideline. The 100% concept design does not identify any substantial structures such as substations or similar elements. Providing there are no “building-like” structures to be included in the design this guideline is not considered relevant.</p>
Guideline C - Wildlife	Guideline C: Managing the Risk of Wildlife Strikes in the Vicinity of Airports is intended to inform land use planning decisions and the way in which existing land uses are managed in the vicinity of airports with respect to the attraction of wildlife which could present a hazard to aviation, particularly birds and bats.	The TWE sits within the Shellharbour Airport 3 km buffer zone. Attachment 1 of Appendix K does not list road infrastructure as a land use which may present a wildlife attraction risk. However, to respect the intent of the Guideline it should be noted that areas of standing water, and certain vegetation, have the potential to attract bird and bat populations.
Guideline D – Wind Farms	Guideline D: Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers	NA
Guideline E - Lighting	<p>Guideline E: Managing the Risk of Distraction to Pilots from Lighting in the Vicinity of Airports provides guidance on the risk of distractions to pilots of aircraft lighting and light fixtures near airports. The CASA Manual of Standards Part 139 – Aerodromes Section 9.21: Lighting in the Vicinity of Aerodromes sets out the restrictions and Guideline E provides advice to lighting suppliers on the general requirements to ensure aviation safety.</p> <p>The primary area is divided into four light control zones: A, B, C and D. These zones reflect the degree of interference ground lights can cause pilots on approach to a runway. Lighting zones are applied to runways lit for night use (Appendix K).</p>	<p>The easternmost section of the TWE, from approximately Hamilton Road east to and along the Illawarra Highway is within the Runway 08/26 possible future light control zones C and D as illustrated on Figure B16262/E2 of Appendix K.</p> <p>Zone C allows for a maximum intensity of light sources, measured at 3 degrees above the horizontal, to be 150 candela (cd).</p> <p>Zone D allows for 450 cd.</p> <p>It is recommended that, to the extent practical that Zone C and Zone D restrictions be taken into account in the final lighting design.</p> <p>Any penetration of the OLS will need to be reviewed by the Shellharbour Airport operator (Council) and CASA.</p>
Guideline F – Protected Operational Airspace	<p>Guideline F: Managing the Risk of Intrusions into the Protected Operational Airspace of Airports is designed to address the issue of intrusions into the operational airspace of airports by tall structures, such as buildings and cranes as well as trees in the vicinity of airports.</p> <p>The Guideline also addresses activities that could cause air turbulence that could affect the normal flight of aircraft operating in the prescribed airspace and/or emissions of steam, other gas,</p>	<p>Providing all poles and signposts are no higher than 15m above the highest point in the road level, the maximum height of any structure would be below 52m AHD.</p> <p>Structures below 52m AHD would not infringe the OLS.</p>

Guideline	Definition	Relevance to the TWE
	<p>smoke, dust or other particulate matter that could affect the prescribed airspace in accordance with Visual Flight Rules (VFR).</p> <p>There are two sets of prescribed airspace to consider:</p> <p>Obstacle Limitation Surfaces (OLS)</p> <p>Procedures of Air Navigation Services – Aircraft Operations</p>	
Guideline G – Communication, Navigation and Surveillance (CNS)	Guideline G: Protecting Aviation Facilities – Communication, Navigation and Surveillance (CNS) provides land use planning guidance to better protect CNS facilities which support the systems and processes in place by Airservices Australia, the Department of Defence or other agencies under contract with the Australian Government to safely manage the flow of aircraft into, out of and across Australian airspace.	The road works are outside the Building Restricted Area for the NDB as set out in Guideline G (a 300m radius from the NDB) and should not impact the operation of the facility.
Guideline H – Helicopter Landing Sites	Guideline H: Protecting Strategically Important Helicopter Landing Sites (HLS) provides guidance to state/territory and local government decision makers as well as the owner/operators of identified strategically important HLS.	The road is not within the extents of the obstacle protection areas identified within Guideline H, which extend approximately 3.5km from the HLS.
Guideline I – Public Safety Areas	<p>Guideline I: Managing the Risk in Public Safety Areas at the Ends of Runways provides guidance on approaches for the application of a Public Safety Area (PSA) planning framework in Australian jurisdictions. This Guideline is intended to ensure there is no increase in risk from new development and assist land-use planners to better consider public safety when assessing development proposals, rezoning requests and when developing strategic plans.</p> <p>A PSA is a designated area of land at the end of an airport runway within which development may be restricted in order to control the number of people on the ground around runway ends. Roads and transport corridors are identified as uses which required careful consideration within a PSA.</p>	The TWE is not within the PSAs when defined using the State Planning Policy PSA Model.

Impacts to the Airport environment are considered unlikely, however a review of the detailed design and detailed construction methodology is needed prior to construction. The project would not impact upon the Obstacle Limitation Surfaces (OLS) of Shellharbour Airport. Any structures must remain below 52m AHD to avoid infringing the OLS. All structures associated with the project would be below 52m AHD.

6.13.3 Safeguards and management measures

The following recommendations have been formulated to respond to the need for the TWE and the significance of the site. The recommendations are presented in **Table 6-26**.

Table 6-26 Safeguards and management measures for the airport environment

No.	Impact	Environmental Safeguards	Responsibility	Timing
A1	Structures exceeding 13m in height	<ul style="list-style-type: none"> Substantial (building-like) structures should not exceed 13m in height in the assessment trigger area to avoid further assessment. 	Project Manager Contractor	Design Construction
A2	Increase of wildlife activity	<ul style="list-style-type: none"> Shellharbour Airport to review and comment on the plant species list specified in the Landscape Plans (Appendix B). Stormwater management should ensure that any basins incorporated into the design are intended for short term holding of water only i.e. emptied within approximately one (1) day. 	Project Manager Contractor	Pre-construction Construction
A3	Lighting impacts to safety	<ul style="list-style-type: none"> Zone C and D (identified in Appendix K) lighting restrictions should be taken into account in the final lighting design, to accommodate for potential future lighting of Runway 08/26. 	Project Manager	Design
A4	Impact to the Protected Operational Airspace	<ul style="list-style-type: none"> Based on an estimated maximum height of any structure at approximately 32m AHD there would be no infringement of the OLS inner horizontal at 52m AHD Preliminary assessment of the PANS-OPS indicates the instrument approach procedures surfaces to be higher than the OLS Any impact on the PANS-OPS procedures will need to be confirmed by Airservices Australia at the request of the airport operator. 	Project Manager	Design Pre - construction
A5	Potential impacts during construction	<ul style="list-style-type: none"> Construction sequencing and methodology should be considered in relation to the OLS and PANS-OPS surfaces. The most restrictive limit over the site is the OLS inner horizontal at 52m AHD. All intrusions above 52m AHD, including equipment during construction such as cranes, must be reviewed and assessed by the airport operator in consultation with the relevant aviation authorities. 	Contractor	Pre-construction

6.14 Greenhouse gas

An Air Quality Assessment (**Appendix G**) was prepared by ERM Environmental (2020) to determine the potential impacts of vehicle emissions from the new alignment on any nearby sensitive receptors. This report has been used to assess greenhouse gas conditions and potential impacts of the project. A summary of the findings is presented below.

6.14.1 Existing environment

Existing air quality data were derived from the DoPIE managed Albion Park South monitoring site, located south of the Shellharbour Airport. Data from 2014 to 2018 were used to establish an existing air quality environment. Data from 2019 were not included due to the extreme bushfire conditions in the latter half of the year.

The existing air quality of the project area is generally good, with all background concentrations of Nitrogen dioxide (NO₂), PM₁₀, and PM_{2.5} falling below the annual mean air quality criteria drawn from the National Environment Protection (Ambient Air Quality) Measures for Ambient Air Quality (AAQ NEPM) (NEPC, 2016).

Isolated exceedances of criterion were recorded in 2011, 2014, 2018 and 2019, and are generally associated with regional events including bushfires or dust storms. There is little evidence to suggest that local sources of pollution cause elevated levels of greenhouse gases in the area associated with the project. Over the five years of data collected, there were only 20 incidences of data present when daily PM₁₀ concentrations exceeded 40µg/m³, a value well under the set criteria of 50µg/m³ for a 24-hour period.

6.14.2 Potential impacts

Construction activities and operational increase in traffic volumes each pose a potential impact to greenhouse gas levels in the area surrounding the project. The most likely cause of long-term greenhouse gas emissions is from the increased number of vehicles using the TWE upon project completion. Modelling of greenhouse gas emissions based on predicted future traffic volumes shows a cumulative increase in vehicle emissions as a potential impact from the project, however the total predicted values for greenhouse gases would still be well under the set criteria for both hourly and annual means, and therefore represent a low potential impact.

6.14.3 Safeguards and management measures

Table 6-27 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on greenhouse gases.

Table 6-27 Safeguards and management measures for greenhouse gas

No.	Impact	Environmental Safeguards	Responsibility	Timing
G1	Exhaust emissions	<ul style="list-style-type: none"> Construction plant and equipment will be maintained in good working condition to limit impacts on air quality Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use. 	Project Manager	Construction

6.15 Human health

Cardno prepared a Noise Impact Assessment (2021) (**Appendix F**) to determine noise and vibration impacts associated with the construction and operation of the TWE. An Air Quality Assessment (**Appendix G**) was prepared by ERM Environmental (2020) to determine the potential impacts of construction and operational vehicle emissions from the new alignment on any nearby sensitive receptors. These reports have been used to assess potential human health impacts of the project. A summary of the findings is presented below.

6.15.1 Existing environment

The existing air quality of the project area is generally good, with all background concentrations of Nitrogen dioxide (NO₂), PM₁₀, and PM_{2.5} falling below the annual mean air quality criteria drawn from the National Environment Protection (Ambient Air Quality) Measures for Ambient Air Quality (AAQ NEPM) (NEPC, 2016).

Isolated exceedances of criterion were recorded in 2011, 2014, 2018, and 2019, and are generally associated with regional events including bushfires or dust storms. There is little evidence to suggest that local sources of pollution cause elevated levels of greenhouse gases in the area associated with the project. Over the five years of data collected, there were only 20 incidences of data present when daily PM₁₀ concentrations exceeded 40µg/m³, a value well under the set criteria of 50µg/m³ for a 24-hour period.

The noise environment for the project area is consistent with that of a typical suburban area. Ambient noise affecting residential receivers is primarily caused by varying levels of traffic on nearby roads. Some moderate impact to the area may be experienced from overhead aircraft using the nearby Shellharbour Airport.

6.15.2 Potential impacts

Potential human health impacts arising from project construction would most likely present as increased dust emissions and diesel vehicle exhaust. Construction activities likely to cause dust emissions include site preparation (clearing and earthworks), vehicle movement within project area over unsealed paths/roads, tracking of dirt/mud from project site onto public roads, rock crushing and screening, and excavation and loading of spoil material. Health impacts associated with inhaled dust particles are determined by the particulate physical and chemical properties. The ability of particulates to cause health effects is directly related to their size, with smaller sized particles having the ability to deposit deeper in the respiratory system, and are therefore of greater concern.

Construction noise and vibration associated with the project has some potential to cause sleep disturbance and affect human comfort. The NSW Environmental Criteria for Road Traffic Noise (EPA, 1999) (NSW ECRTN) assesses various causes of sleep disturbance and provides guidelines for management. Sleep disturbance from construction noise over 1-2 nights are not likely to affect health and wellbeing (ECRTN,

1999), and so present a low potential risk during project construction. Operational noise modelling suggests that increased traffic has the potential to impact upon up to 147 dwellings, exceeding the criteria of the NCG. Properties where the noise criteria are predicted to be exceeded are eligible for consideration of at-property acoustic treatments to mitigate traffic noise. Options for mitigation include road surface treatments, acoustic barriers, and at-property treatments. The road surface for the project is Dense Graded Asphalt (DGA - AC14), therefore options for quieter pavements are limited. Barriers and earth mounds are not a feasible treatment option for all properties in order to maintain driveway access from Tripoli Way. Specific mitigation measures for operational noise impacts should be determined with an operational noise impact assessment, including additional traffic monitoring. The operational noise impact assessment should be carried out during the detailed design phase or upon project completion.

Vibration from activities associated with the project could potentially impact upon the comfort of occupants of buildings located close to the site. Human comfort can be impacted by vibratory rolling within 100 metres of buildings. It is recommended vibratory rolling not be carried out at night to due to the high potential for sleep disturbance. Preferred and maximum levels of vibration to minimise impact on human comfort have been determined for the project, as described in **Appendix F** and should be adhered to ensure impacts on human health are limited.

6.15.3 Safeguards and management measures

Table 6-28 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on human health.

Table 6-28 Safeguards and management measures for human health

No.	Impact	Environmental Safeguards	Responsibility	Timing
HH1	General air quality impacts	<ul style="list-style-type: none"> See safeguard 'AQ1' in Section 6.5. 	Project Manager	Pre-construction
HH2	Impacts on local air quality during construction	<ul style="list-style-type: none"> Areas of exposed surface are to be minimised throughout the construction site planning and programming, to reduce the area of potential construction dust emission sources Control measures, such as stabilisation or covering will be implemented in order to minimise dust from stockpile sites Dust suppression measures, such as the use of water carts, will be used in any unsealed road surfaces and other exposed areas All trucks will be covered when transporting materials to and from the site Activities that generate dust will be avoided or modified during high wind periods Work activities will be reviewed if the dust suppression measures are not adequately restricting dust generation Rehabilitation of completed sections, where practical, will be progressively undertaken. 	Project Manager	Construction
HH3	Exhaust emissions	<ul style="list-style-type: none"> Construction plant and equipment will be maintained in good working condition to limit impacts on air quality Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use. 	Project Manager	Construction
HH4	Construction noise and vibration	<ul style="list-style-type: none"> See safeguard 'N1' in Section 6.4. 	Project Manager	Design Construction

No.	Impact	Environmental Safeguards	Responsibility	Timing
HH5	Sleep disturbance to nearby residents	<ul style="list-style-type: none"> See safeguard 'N3' in Section 6.4. 	Project Manager	Pre-Construction Construction
HH6	Construction Vibration	<ul style="list-style-type: none"> See safeguard 'N4' in Section 6.4. 	Project Manager	Construction

6.16 Cumulative impacts

6.16.1 Existing environment

There is a requirement under Clause 228(2) of the EP&A Regulations to take into account any cumulative environmental impacts of the works with other existing or planned future activities. Cumulative impacts have the potential to arise from the interaction of individual components within the site and the effects of the proposal with other projects in the local area.

A review of the DPIE Major Projects Register on 16 June 2020 returned 60 results for Shellharbour LGA. These projects predominately relate to quarries and residential development. The Albion Park Rail bypass and the Calderwood Residential Land Release area are located within the vicinity of the Study Area. It is important to consider the cumulative impacts these projects may have when considered in culmination with the TWE. The TWE would have a direct interaction with the Albion Park Rail bypass and allow commuters efficient travel to and from Albion Park. The Albion Park Rail bypass is earmarked for completion in 2021 whilst the start of construction for the TWE is predicted to be 2026, rendering cumulative construction impacts non-applicable.

6.16.2 Potential impacts

Construction

Due to the scale of the works assessed in this REF, and the likely timing of construction, cumulative impacts are unlikely to be significant but may include:

- > Additional traffic impacts as a result of multiple construction projects in the local, including residential subdivisions. This may increase traffic and travel times, however, due to proposed staging and individual traffic management at the project level, impacts are anticipated to be minimal
- > Noise, vibration and air quality impacts associated with each of the infrastructure projects are expected to be managed at project level through appropriate noise, vibration and air quality mitigation measures. The TWE would provide a detour of the Albion Park town centre and therefore it is unlikely that significant cumulative impacts would be felt
- > Multiple projects within the locality have the potential to increase the area of ecological disturbance.

Operation

The project is expected to contribute to cumulative impacts such as loss of local heritage, biodiversity, increased noise and local impacts to air quality however these adverse impacts have been minimised where possible and are balanced with the benefits of the project in terms of managing traffic through the Albion Park town centre and providing a more efficient road network.

As part of the broader Shellharbour wide network improvement program, this project is expected to have a positive contribution to the overall safety of the road network in the Illawarra. The TWE would assist in meeting the increased demand of road users as future development and land use changes in the Calderwood area occur. The project would also reduce potential congestion within the surrounding road network and improve safety for motorists, pedestrians and cyclists. The proximity of residences within the Study Area to the alignment and the predicted traffic increase on the TWE would have cumulative impacts in relation to noise, visual and socio-economic impacts, amongst others, that have been explored throughout this environmental assessment.

In terms of local heritage, the Statement of Heritage Impact (Biosis) concluded that the proposed works will result in significant direct physical impacts to the heritage listed former Albion Park Butter Factory, as well as to the area of high archaeological potential beneath and surrounding the structure. The removal of the former Albion Park Butter Factory would have a significant and detrimental effect on the heritage significance of the item as a whole, and represents a considerable loss to Shellharbour's local heritage for future generations.

6.16.3 Safeguards and management measures

Table 6-29 identifies safeguards and management measures that would be implemented to assess potential impacts of the project on cumulative impacts.

Table 6-29 Safeguards and management measures for cumulative impacts

No.	Impact	Environmental Safeguards	Responsibility	Timing
C1	Cumulative traffic, noise, air quality and ecological impacts	<ul style="list-style-type: none"> The construction schedule is to be developed in conjunction with other planned developments to minimise cumulative impacts. 	Project Manager	Design Pre-construction

7 Environment management

This chapter describes how the project would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant specifications. A summary of site-specific environmental safeguards is provided as detailed in **Section 7.2** and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the project. Should the project proceed, these management measures will be incorporated into the detailed design and applied during the construction and operation of the project.

A Project Environmental Management Plan (PEMP) and a CEMP will be prepared to describe safeguards and management measures identified. These plans will provide a framework for establishing how these measures will be implemented and who will be responsible for their implementation.

The plans would be prepared prior to construction of the project and must be reviewed by Council, 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 and PEMP will be developed in accordance with TfNSW 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.

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be incorporated into the detailed design phase of the project and during construction and operational phases, should the project proceed. These safeguards would minimise any potential adverse impacts arising from the works on the surrounding environment. The safeguards and management measures are summarised in **Table 7-1**.

Table 7-1 Summary of site-specific environmental safeguards

No.	Impact	Environmental Safeguard	Responsibility	Timing
T1	Operational capacity of Broughton Avenue/Illawarra Highway and Calderwood Road/Tripoli Way by 2041	<ul style="list-style-type: none"> The performance of the Illawarra Highway/Broughton Ave/Tripoli Way intersection in the 2041 year should be investigated further as part of broader traffic network management arrangements potentially involving Council, TfNSW and others (such as local property developers subject to Voluntary Planning Agreements). 	Project Manager	Post-construction
T2	Increased heavy vehicle traffic and light vehicle traffic	<ul style="list-style-type: none"> A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the RMS Traffic Control at Work Sites Manual and the worksite manual RMS Specification G10. The TMP must restrict vehicle movements and parking to approved project areas, and manage speed limits near the work. 	Project Manager	Pre-construction
T3	Temporary speed limitations may increase travel times	<ul style="list-style-type: none"> Refer to Safeguard T1 	Project Manager	Construction
T4	Temporary Road Closures	<ul style="list-style-type: none"> Road closures are to be limited during peak traffic periods to ensure impacts to traffic flows are minimal. Suitable traffic control measures are to be in place during the movement of equipment and machinery in order to ensure the safety of pedestrians and other road users. 	Project Manager	Construction
T5	Limited access to impacted residents within the Study Area	<ul style="list-style-type: none"> Impacted residents must be contacted prior to any works commencing. Accessibility and movements must be allowed for the residents that will be directly impacted as part of the TMP. Works are not to block access along footpaths, except for the minimum possible time when moving equipment or machinery. 	Project Manager	Pre-construction Construction
T6	Pedestrian crossings	<ul style="list-style-type: none"> Signalised pedestrian crossings will be provided at the TWE / Calderwood Road intersection, TWE / Hamilton Road intersection and TWE / Terry Street intersection within the Study Area as part of the detailed design process for the project. 	Council	Detailed design
F1	Residential inundation from runoff	<ul style="list-style-type: none"> Adequate drainage systems are in place to alleviate runoff capabilities. 	Project Manager	Design
F2	Ancillary site flooding	<ul style="list-style-type: none"> Ancillary sites are not to be established in flood prone areas unless an assessment is undertaken by the contractor with an appropriate flood management plan developed for approval by Council. 	Project Manager	Design Construction

F3	Surface water accumulation	<ul style="list-style-type: none"> Appropriate drainage design be developed and implemented at ancillary sites. 	Project Manager	Design Construction
B1	Impact to threatened species and native vegetation	<ul style="list-style-type: none"> Areas of native vegetation outside of the construction footprint will be "No Go-Zones" for people and machinery and will be clearly delineated using temporary fencing Temporary tree protection fencing around trees not marked for removal. Tree protection is required around the trunk of the tree Removal of vegetation is to be undertaken by a qualified arborist following all relevant industry standards. Trees to be removed have been identified and if any other trees require pruning or removal please call Council's environment team 4221 6014 Any exotic biomass cleared within the construction footprint will be removed from the study area and disposed of at an approved facility Develop a Construction Environmental Management Plan to address pollution and contamination issues, such as silt control, and oil/fuel/chemical storage/spill management, which could arise during construction No vehicles, machinery, tools or equipment, fuel, chemicals or waste, gravels, soils or other materials are to be located within the drip zone of any trees Erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the study area has been stabilised to prevent off-site transport of eroded sediments Fencing will need to allow safe passage of native wildlife Landscaping works are to be outside areas of bushland and do not include environmental weed Removal of environmental weeds from the site and their ongoing control. 	Project Manager	Construction
B2	Harm or injury to fauna during clearing	<ul style="list-style-type: none"> Pre-clearance protocols put in place and included in CEMP Council's environment staff must inspect all vegetation one week prior to removal for any roosting or nesting native fauna present. If hollows or fissures are identified during the pre-clearance survey, nest boxes are required to be installed to replace potential habitat Inspect all vegetation for the presence of fauna species prior to removal Rocks, logs, debris that may provide fauna habitat must be retained on-site and disturbance to these features minimised Trenches must be covered if left overnight to limit potential fauna injury Any large machinery must be inspected for trapped fauna prior to cessation of works In the event of injury to native fauna, contact a local vet or Wildlife Rescue South Coast on 0418 427 214 immediately 	Project Manager	Pre-construction
B3	Indirect offsite impacts during construction	<ul style="list-style-type: none"> Develop a Construction Environmental Management Plan prior to construction works taking place and include: <ul style="list-style-type: none"> Pre-clearance protocols Erosion and sediment control measures will be established before work begins and maintained in effective working order throughout the duration of the works, and until the study area has been stabilised to prevent off-site transport of eroded sediments. 		Pre-construction

		<ul style="list-style-type: none"> Consideration of Key Fish Habitat within Macquarie Rivulet and Hazelton Creek. 		
B4	Impacts to key fish habitat during reclamation works	<ul style="list-style-type: none"> A Part 7 fisheries permit under the <i>Fisheries Management Act 1994</i> must be obtained prior to commencement works All construction and maintenance access tracks across the creek will follow the fish passage guidelines for waterway crossings in Fairfull & Whiteridge 2003. 	Project Manager	Pre-construction
B5	Impact to nearby waterways and stormwater outlets	<ul style="list-style-type: none"> The plant operator is to ensure minimal disturbance to areas outside of the works site through the establishment of entry points and tracks. No equipment should be operated near or from the waterways During the construction phase, access across Hazelton Creek and the Macquarie Rivulet would be minimised for day to day movements, with access points to be determined within the CEMP along with the designed project impacts post-construction. 	Contractor	Construction
B6	Damage to surrounding environments	<ul style="list-style-type: none"> Any damage to landscaped or grassed areas must be restored at the completion of the works including replacing native plants and mulch as required. 	Contractor	Post-construction
N1	Construction noise and vibration	<p>Implement best practice construction noise and vibration mitigation measures in accordance with recommendations provided within the NSW Interim Construction Noise Guidelines (DECCW, 1999) (ICNG) and Australian Standard AS2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites. Measures include:</p> <ul style="list-style-type: none"> Development and implementation of all reasonable and feasible site-specific mitigation measures to meet noise criteria applicable to the project in consultation with residents Use of noise attenuation controls at source, such as mufflers, acoustic screens etc. Maintaining plant and equipment Locating static sources of noise such as generators as remotely as possible from noise sensitive receivers Developing proposed hours of operation in consultation with the residents/occupants of the affected receivers and TfNSW Allowing construction to occur only during approved construction hours, unless otherwise required as a condition of TfNSW safety requirements Informing potentially affected receivers with adequate notice of the construction program and any planned activities that may exceed noise and vibration targets Conducting noise monitoring during operations for the purposes of assisting in noise mitigation and to verify the findings of this noise assessment, if complaints are received or proposed activities and number of plant exceed those assumed in this assessment Use of temporary noise barriers where practical Application of respite periods for noisy activities Reduce the number of plant operating at one time where works are required to be carried out outside of standard hours Preference should be for electric powered plant over combustion engine powered plant Preference should be for hydraulic or electric powered plant over pneumatic powered plant Avoid metal to metal contact on equipment to reduce impulsive or scraping noise 	Project Manager	Design Construction

		<ul style="list-style-type: none"> Use of broadband reversing alarms, or “quackers”, on mobile equipment in accordance with the relevant health and safety regulations Modification of work activities where noise or vibration is found to cause unacceptable impact Should operations be required outside daytime hours, all reasonable and feasible efforts should be undertaken to ensure noise levels would not exceed the INP Noise criteria stated in Section 5.2 and Table 5-1 of the Noise Impact Assessment by carrying out night-works adjacent to the school rather than nearby residential receivers for example. <p>Implementing a procedure for dealing with complaints to ensure that all complaints are registered and dealt with appropriately.</p>		
N2	Sleep disturbance to nearby receivers	<ul style="list-style-type: none"> Avoid scheduling construction activities during non-standard hours of operation where possible Develop a detailed Construction Noise and Vibration Management Plan. 	Project Manager	Pre-Construction Construction
N3	Construction Vibration impacting upon human comfort	<ul style="list-style-type: none"> Vibratory rolling should not be carried out within 100m of nearby receivers during Standard Construction Hours Vibratory rolling should not be carried out at night to avoid sleep disturbance. 	Project Manager	Construction
N4	Construction vibration causing structural or cosmetic damage to buildings	<ul style="list-style-type: none"> Vibratory rolling should not be carried out within 10m of residential dwellings Develop a detailed Construction Vibration Management Plan to determine management methodology and monitoring procedures. 	Project Manager	Construction
N5	Operational traffic noise	<ul style="list-style-type: none"> Consideration of quieter pavement surfaces Installation of noise barriers, including noise mounds and noise walls Assessment of suitability of at property treatments (mechanical ventilation, upgraded glazing etc.) An operational Noise and Vibration Management Plan should be prepared for the project, to include, but not be limited to, the above measures The results of Noise Impact Assessment and recommendations for mitigation are based on the assumption the Broughton Avenue intersection will be upgraded by others prior to 2041. Should this not occur, Council will need to reassess the traffic and transport impacts in the vicinity of the project and ensure all appropriate mitigation measures are applied. 	Project Manager	Design Post-Construction
N6	Site specific measures	<p>Site Controls:</p> <ul style="list-style-type: none"> Due to the proximity of residents to the project, temporary barriers (i.e. 2m high solid screens) may be a feasible treatment option to mitigate noise from activities such as services relocations or other activities that may occur during the night period Site offices, car-parks, and hard stand areas should ideally be located at the western extent of the project, on the northern side of the alignment in order to maximise separation distance to as many residents as possible. 	Project Manager	Design Post-Construction

		<p>Manage Hours of Operation:</p> <ul style="list-style-type: none"> Carrying out works within daytime hours as follows: <ul style="list-style-type: none"> 7:00am to 6:00pm Monday to Friday 8:00am to 1:00pm Saturdays No work on Sunday and public holidays. Do not carry out operations during evening or night-time hours, unless absolutely necessary for road safety reasons. <p>Management and Behaviour Controls:</p> <ul style="list-style-type: none"> Ensure that managers effectively communicate acceptable and unacceptable work practices for the site, through staff site inductions, notice boards, and prestart meetings Avoid the need for reversing in the new area by creating a loop road or similar Avoid dropping materials from height. <p>Workers should avoid shouting, minimise talking loudly, and avoid slamming vehicle doors.</p>		
AQ1	General air quality impacts	<p>An Air Quality Management Plan will be prepared to detail the air quality control measures and procedures to be undertaken during construction, including:</p> <ul style="list-style-type: none"> Air quality and dust management objectives that are consistent with DPIE guidelines Potential sources and impacts of dust, identifying all dust-sensitive receptors Mitigation measures to minimise dust impacts on sensitive receptors and the environment A dust monitoring program to assess compliance with the identified objectives Contingency plans to be implemented in the event of non-compliances and/or complaints about dust. 	Project Manager	Pre-construction
AQ2	Impacts on local air quality during construction	<ul style="list-style-type: none"> Areas of exposed surface are to be minimised throughout the construction site planning and programming, to reduce the area of potential construction dust emission sources Control measures, such as stabilisation or covering will be implemented in order to minimise dust from stockpile sites Dust suppression measures, such as the use of water carts, will be used in any unsealed road surfaces and other exposed areas All trucks will be covered when transporting materials to and from the site Activities that generate dust will be avoided or modified during high wind periods Work activities will be reviewed if the dust suppression measures are not adequately restricting dust generation Rehabilitation of completed sections, where practical, will be progressively undertaken. 	Project Manager	Construction
AQ3	Exhaust emissions	<ul style="list-style-type: none"> Construction plant and equipment will be maintained in good working condition to limit impacts on air quality Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use 	Project Manager	Construction

S1	Site disturbance may result in increased erosion, sedimentation and contamination risk.	<ul style="list-style-type: none"> Intrusive investigations should be undertaken at each AEC to determine if measurable COPCs are present and the suitability of these areas for the proposed land use / redevelopment Investigations should be undertaken in accordance with relevant regulatory legislation and guidance including the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> If concentrations of COPCs are identified above the Tier I screening values, remedial or management actions may be necessary. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> The proposed intrusive investigation should include a thorough inspection of all drainage channels and overgrown areas as well as private properties that were unable to be accessed during this investigation (refer to Appendix H) Some areas were inaccessible at the time of the inspection due to a thick cover of Lantana and other vegetation, and as such potential contaminant sources were not adequately assessed. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> Any future works involving soil disturbance should incorporate an unexpected finds protocol to facilitate the identification and management of previously undocumented contamination In the instance that any suspected contaminant is identified site work must cease until a Council environment officer can advise on treatment required. 	Contractor	Construction
		<ul style="list-style-type: none"> Soil disturbance is to occur only within the construction footprint. Minimise disturbance wherever possible. 	Contractor	Construction
		<ul style="list-style-type: none"> Cut vegetation to be removed to allow the roots to remain and stabilise soil on slopes. Use jute matting or similar to stabilise banks and prevent erosion. 	Contractor	Construction
		<ul style="list-style-type: none"> Adequate sediment controls are required to prevent disturbed sediment from entering the nearby waterways and stormwater outlets during heavy rainfall All sediment and erosion control measures are to be installed prior to works commence and maintained throughout the life of the project No activities (including drilling and/or excavation) are to be undertaken immediately after heavy rainfall events or if it is likely for rain to occur. Unless it is certain that no sediment would be discharged from site. 	Contractor	Construction
		<ul style="list-style-type: none"> No chemicals, fuels and/or waste are to be stored within 5 m of the roadway, gutter or stormwater drains. All such substances must be stored in a designated containment area within the works site Emergency spill kits are to be carried by all works crew and kept on-site during operation. 	Contractor	Construction
		<ul style="list-style-type: none"> Any imported fill must be from a known source, free of contaminants and compatible with the local soil types. If any potential contamination or suspect material is encountered cease works immediately and contact Council's environment team. 	Contractor	Construction
S2	Demolition of existing structures	<ul style="list-style-type: none"> A hazardous building material survey should be undertaken prior to the demolition of any buildings and structures within the site. Underground utilities such as water mains and 	Project Manager	Pre-construction

		Telstra pits may contain asbestos cement and should be identified and removed in accordance with regulatory guidance prior to and/or during construction of the project.		
		<ul style="list-style-type: none"> Any future works involving demolition should incorporate an unexpected finds protocol to facilitate the identification and management of previously undocumented contamination. 	Contractor	Construction
S3	Disturbance of Acid Sulfate Soils	<ul style="list-style-type: none"> The PSI and Limited Soil Assessment Report should be reviewed by an appropriately qualified consultant upon confirmation of the project design and excavation extents. Where required, supplementary testing must be undertaken to confirm that the risk of acid sulfate soils has been adequately assessed. This applies particularly to areas of deep cut and at the locations of foundations and piling. 	Project Manager	Pre-construction
		<ul style="list-style-type: none"> Whilst the acidity present in soil may not be attributable to oxidisable sulfur, it is recommended that a management plan be prepared prior to the commencement of earthworks and construction. The management plan should be prepared in consideration of the ASSMAC Guidelines (ASSMAC 1998) and should be included as a sub-plan of the broader project Construction. Environmental Management Plan (CEMP). <p>The management plan must include the following:</p> <ul style="list-style-type: none"> Review and interpretation of field testing and analytical results from previous investigations, and in doing so identify areas of the site that may contain ASS / acidic soils Describe the construction works and identify those works that may result in the disturbance of ASS / acidic soils Detail the mitigation measures and actions that would be required to mitigate potential risks associated with disturbance of ASS / acidic soils. This includes but is not limited to excavated soils, excavation surfaces, soil treatment performance criteria, validation testing, stockpiling durations, soil treatment areas, prescribed liming rates, groundwater and surface water management and contingencies (e.g. weather events, over-liming and offsite disposal of soil) Monitoring oversight and reporting requirements including environmental monitoring programs (surface water and stockpile), inspection and oversight and provision of suitable reporting and deliverables. The ASSMP (or equivalent) must adhere to Part 6.1 of the Shellharbour LEP and any other relevant local, state or national government planning and regulatory instrument. Additional testing may be required prior to or during construction to confirm the neutralising capacity of soil. 	Contractor	Pre-construction Construction
S4	Soil and water	<ul style="list-style-type: none"> A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. 	Contractor	Pre-construction Construction
WQ1	Accidental spill	<ul style="list-style-type: none"> A spill management plan will be developed as part of the CEMP and communicated to all staff working on site Appropriate land and aquatic spill kits are to be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit 	Contractor	Pre-construction Construction

		<p>must be appropriately sized for the volume of potentially polluting liquids stored at the work site</p> <ul style="list-style-type: none"> All workers will be advised of the location of the spill kit and trained in its use Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures Vehicles, vessels and plant must be properly maintained and regularly inspected for fluid leaks Any chemicals or fuels stored at the site or equipment barges will be stored in a bunded area. 		
WQ2	Groundwater	<ul style="list-style-type: none"> Any incidental groundwater discharge that may occur during construction will need to be captured, tested and if necessary treated before disposal to the surrounding environment If groundwater discharge is expected to exceed 3ML per year an aquifer interference licence will be required under the <i>Water Management Act</i> Measures will need to be put in place to ensure no ongoing groundwater discharge occurs after completion of construction. 	Contractor	Construction
V1	Some short-term visual impacts would result from the works due to disturbed areas, site fencing, machinery and equipment working on the Illawarra Highway, Tripoli Way and Terry Street.	<ul style="list-style-type: none"> Work areas near residential dwellings must be fenced and include the use of visual screening (shade cloth or similar) to minimise visual impacts Lights utilised for night works will be directed away from residential dwellings and roadways to minimise light impacts on surrounding residential areas The site must be kept neat and clean of general litter and neat for the duration of works. 	Contractor	Pre-construction During Construction
V2	Longer term impacts on visual amenity	<ul style="list-style-type: none"> A vegetation management plan and landscaping plan have been considered and can be seen at Appendix B and Appendix D. These plans will be considered during detailed design and implemented in accordance with the approved assessment. 	Project Manager Contractor	Pre-construction
AH1	Impacts to Aboriginal heritage	<p>Application for an Aboriginal Heritage Impact Permit (AHIP)</p> <ul style="list-style-type: none"> An AHIP is required to impact the listed Aboriginal site, Tulkeroo ISO (AHIMS 52-5-0961), within the Study Area which is currently protected under the NPW Act. It is recommended that the surface stone artefact associated with the site is collected prior to destruction. <p>Advice preparing AHIPs</p> <p>An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. Heritage NSW issues AHIPs under Part 6 of the NPW Act. AHIPs should be prepared by a qualified archaeologist and lodged with the Heritage NSW. Once the application is lodged processing</p>	Project Manager	Pre-construction

		time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the Heritage NSW for the processing of AHIPs, which is dependent on the estimated total cost of the development project. Where there are multiple sites within one Study Area an application for an AHIP to cover the entire Study Area is recommended.		
AH2	Impacts to areas identified as having moderate archaeological potential	<p>Aboriginal Cultural Heritage Assessment (ACHA)</p> <p>As three areas of moderate potential have been identified as part of this assessment, it is recommended that a program of test excavations is undertaken to determine if subsurface Aboriginal sites are present and whether an AHIP application will be required. This process will consist of an ACHA prepared in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), an archaeological report prepared in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and consultation with Aboriginal community in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010c).</p>	Consultant Archaeologist Project Manager	Pre-construction
AH3	Impacts to unexpected Aboriginal heritage	<p>Unexpected Finds Protocol</p> <p>All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Heritage NSW. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the Heritage NSW and Aboriginal stakeholders.</p>	Contractor	Pre-construction
AH4	Impact to Aboriginal ancestral remains	<p>Unexpected Finds Protocol</p> <p>Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:</p> <ol style="list-style-type: none"> 1. Immediately cease all work at that location and not further move or disturb the remains 2. Notify the NSW Police and NSW Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location 3. Not recommence work at that location unless authorised in writing by Heritage NSW 	Contractor	Pre-construction
H1	Indirect impacts to Tulkeroo and the heritage item setting	<p>Minimise indirect impacts to Tulkeroo and the heritage item setting</p> <p>As the plans are at the concept design stage, it is recommended that design options explore ways in which permanent and temporary indirect impacts to Tulkeroo and the heritage setting can be reduced.</p> <ul style="list-style-type: none"> ▪ Design development should explore ways in which the permanent visual impact of the proposed works on Tulkeroo and the heritage item's site setting can be minimised, such as sympathetic fencing and/or vegetation screening ▪ Design development should explore ways in which to reduce permanent noise impacts of the proposed works on Tulkeroo 	Contractor Project Manager	Pre-construction

		<ul style="list-style-type: none"> Investigate the likelihood of impacts to Tulkeroo caused by permanent noise and vibration impacts from the proposed works once the road is in operation Establish an exclusion zone along the boundary between Lots 11 and 12, DP 1205733 to protect and minimise any potential damage to Tulkeroo which could occur during construction Use discrete fencing to minimise the temporary visual impact of the works on Tulkeroo and the site setting, with temporary information signage displayed in several publicly accessible locations to explain the reason for the disruption of views and site setting, and provide information regarding the area of proposed works Monitor the impact of any temporary noise or vibration from construction works so as to mitigate any physical damage that these may cause to Tulkeroo. 		
H2	Loss of heritage significance and documentation	<p>Archival recording</p> <p>Prior to any impacts to the Study Area, a detailed archival recording should be undertaken to document the Albion Park Butter Factory (Former), its relationship with Tulkeroo and the wider setting of the heritage item. Archival recordings should be undertaken in accordance with the NSW Heritage Office documents How to Prepare Archival Records of Heritage Items (Heritage Office 1998) and Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Office 2006). This should include both photographic and architectural recordings.</p>	Consultant Archaeologist Project Manager	Pre-construction
H3	Direct impacts to the former Butter Factory	<p>Reassessment of the heritage item's heritage and curtilage significance</p> <p>The heritage significance and curtilage of the heritage item, Tulkeroo and Albion Park Butter Factory (Former), should be reassessed. In addition to the loss of one element of the heritage item, the construction of a road through the item would have a major impact on the views from Tulkeroo to the Macquarie Rivulet and the item's setting, which are also considered part of the item's significance as a whole. The removal of the former Butter Factory building and disruption of the views and setting would change the nature of the heritage item's significance, and as such would need to be re-evaluated against the relevant heritage assessment criteria. This would likely involve reconsideration of the curtilage of the heritage item, which may potentially be reduced to the land containing Tulkeroo. The effect of this would be an amendment to the Shellharbour LEP and Development Control Plan.</p>	Consultant Archaeologist Project Manager	Pre-construction
H4	Loss of archaeological heritage items	<p>Archaeological investigation required prior to works for areas of High potential</p> <p>The analysis for this report has determined that some parts of the Study Area have a moderate or high potential for the survival of archaeological resources of local significance. In NSW, archaeological sites of State or local significance are considered "relics", which are protected by the <i>Heritage Act 1977</i>. In NSW, impacts to relics are only permitted with a Section 140 approval (excavation permit). Given the potential for local significant archaeological remains to be present within the Study Area a Section 140 approval is required.</p> <p>An application should be made to the Heritage Council for a Section 140 approval (excavation permit) supported by the SoHI. An archaeological research design and methodology will also need to be prepared to support the application.</p>	Consultant Archaeologist Project Manager	Pre-construction

		It is likely that archaeological works will consist of monitoring during demolition works (i.e. removal of floor surfaces, foundations etc.) and any additional ground disturbance works within the Study Area until an archaeologically sterile layer is encountered. Deeper archaeological excavation may be required depending on the nature of remains encountered. The works described must be supervised by and guided by an appropriately qualified archaeologist to ensure that any archaeological remains are identified and recorded. Should substantial archaeological remains be identified it may be required to undertake archaeological excavation using open area techniques.		
SE1	Potential delays for commuters and freight operators during construction.	<ul style="list-style-type: none"> All businesses and residences likely to be affected by the works must be notified in accordance with the Council consultation procedures. Notification would include details on the time, duration and nature of works. 	Project Manager	Pre-construction
SE2	Road closures limiting residents access to their properties	<ul style="list-style-type: none"> An appropriate Traffic Management Plan will be established as part of the CEMP. 	Project Manager Contractor	Pre-construction
SE3	Impacts on agricultural land	<ul style="list-style-type: none"> Detailed design to consider opportunities to minimise land acquisition where possible 	Project Manager	Pre-construction
U1	Potential damage may occur to utilities and services not identified in this REF	<ul style="list-style-type: none"> Prior to the commencement of works the location of existing utilities will be identified and marked A Hazard and Risk Management Plan will be prepared and implemented as part of the CEMP. The Plan will identify working around existing utilities as a site hazard. 	Project Manager Contractor	Pre-construction Construction
U2	Decrease in service efficiency and design	<ul style="list-style-type: none"> Consultation with relevant network providers is necessary at the detailed design stage to help inform protection measures, relocations of services and the retention following development. 	Project Manager	Pre-construction
WM1	Waste material including green waste, construction waste and general litter generated during construction.	<p>A Waste Management Plan will be prepared and implemented as part of the CEMP. The Plan will outline:</p> <ul style="list-style-type: none"> Compliance with the resource management hierarchy principles Measures and controls to monitor and minimise waste generation Lawful handling and disposal of unavoidable waste The plan will be prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land (2014), the NSW Waste Classification Guidelines (2014) and relevant RMS Waste Fact Sheets Unsuitable fill material and all other waste streams must be classified in accordance with the NSW EPA Waste Classification Guidelines (2014) and disposed of at an appropriately licensed facility Any excess excavated soil, spoil, green waste or general waste will be loaded into trucks and disposed of at Dunmore Recycling and Waste Disposal Depot 	Contractor	Pre-construction

WM2	General domestic waste is expected to be generated during construction activities.	<ul style="list-style-type: none"> General waste and recycling bins will be provided at the site ancillary sites and throughout project areas for the duration of construction Ancillary sites and work areas will be maintained, kept free of rubbish and cleaned up at the end of each working day Important to prevent material to enter the nearby waterways and stormwater outlets. 	Contractor	Construction
WM3	Waste oils and other materials from the maintenance of construction machinery may be generated.	<ul style="list-style-type: none"> Any uncontrolled spills of waste oils, fuels and other materials will be contained using a spill kit and managed by an environmental professional. All waste generated as a result of uncontrolled spills and maintenance will be managed in accordance with the protocol in Safeguard WM1 Spills and uncontrolled releases of fluids and dangerous goods must be managed in accordance with a procedure specified in the CEMP and government regulators (i.e. NSW EPA) notified as required. 	Contractor Project Manager	Pre-construction Construction
A1	Structures exceeding 13m in height	<ul style="list-style-type: none"> Substantial (building-like) structures should not exceed 13 m in height in the assessment trigger area to avoid further assessment. 	Project Manager Contractor	Design Construction
A2	Increase of wildlife activity	<ul style="list-style-type: none"> Shellharbour Airport to review and comment on the plant species list specified in the Landscape Plans (Appendix B) Stormwater management should ensure that any basins incorporated into the design are intended for short term holding of water only i.e. emptied within approximately one (1) day. 	Project Manager Contractor	Pre-construction Construction
A3	Lighting impacts to safety	<ul style="list-style-type: none"> Zone C and D (identified in Appendix K) lighting restrictions should be taken into account in the final lighting design, to accommodate for potential future lighting of Runway 08/26. 	Project Manager	Design
A4	Impact to the Protected Operational Airspace	<ul style="list-style-type: none"> Based on an estimated maximum height of any structure at approximately 32m AHD there would be no infringement of the OLS inner horizontal at 52m AHD Preliminary assessment of the PANS-OPS indicates the instrument approach procedures surfaces to be higher than the OLS Any impact on the PANS-OPS procedures will need to be confirmed by Airservices Australia at the request of the airport operator. 	Project Manager	Design Pre - construction
A5	Potential impacts during construction	<ul style="list-style-type: none"> Construction sequencing and methodology should be considered in relation to the OLS and PANS-OPS surfaces. The most restrictive limit over the site is the OLS inner horizontal at 52m AHD. All intrusions above 52m AHD, including equipment during construction such as cranes, must be reviewed and assessed by the airport operator in consultation with the relevant aviation authorities. 	Contractor	Pre-construction
G1	Exhaust emissions	<ul style="list-style-type: none"> Construction plant and equipment will be maintained in good working condition to limit impacts on air quality 	Project Manager	Construction

		<ul style="list-style-type: none"> Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use. 		
HH1	General air quality impacts	<ul style="list-style-type: none"> See safeguard 'AQ1' 	Project Manager	Pre-construction
HH2	Impacts on local air quality during construction	<ul style="list-style-type: none"> Areas of exposed surface are to be minimised throughout the construction site planning and programming, to reduce the area of potential construction dust emission sources Control measures, such as stabilisation or covering will be implemented in order to minimise dust from stockpile sites Dust suppression measures, such as the use of water carts, will be used in any unsealed road surfaces and other exposed areas All trucks will be covered when transporting materials to and from the sit Activities that generate dust will be avoided or modified during high wind periods Work activities will be reviewed if the dust suppression measures are not adequately restricting dust generation Rehabilitation of completed sections, where practical, will be progressively undertaken. 	Project Manager	Construction
HH3	Exhaust emissions	<ul style="list-style-type: none"> Construction plant and equipment will be maintained in good working condition to limit impacts on air quality Where practicable, vehicles will be fitted with pollution reduction devices and switched off when not in use. 	Project Manager	Construction
HH4	Construction noise and vibration	<ul style="list-style-type: none"> See safeguard 'N1' 	Project Manager	Design Construction
HH5	Sleep disturbance to nearby residents	<ul style="list-style-type: none"> See safeguard 'N3' 	Project Manager	Pre-Construction Construction
HH6	Construction Vibration	<ul style="list-style-type: none"> See safeguard 'N4' 	Project Manager	Construction
C1	Cumulative traffic, noise, air quality and ecological impacts	<ul style="list-style-type: none"> The construction schedule is to be developed in conjunction with other planned developments to minimise cumulative impacts. 	Project Manager	Design Pre-construction

8 Conclusion

This section provides the justification for the project taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the project is in the public interest. The project 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*.

8.1 Justification

The development of the TWE provides a key transport route that relocates traffic flows from the Albion Park Town Centre to the northern periphery of the township. The current main arterial road through the Albion Park Town Centre (Illawarra Highway/Tongarra Road) experiences heavy traffic flows and congestion problems for the local community and commuters, which is projected to worsen due to increased urban development in the surrounding area. The TWE will provide a multi-lane through road connecting the Illawarra Highway/Tongarra Road intersection with the Illawarra Highway/Terry Street in the east.

The traffic modelling conducted and reported in this REF showed that the TWE delivers positive traffic outcomes for the Albion Park Town Centre by reducing congestion and thereby presenting opportunities for further activation of the Town. Such activation would enable further scope for economic development within the Albion Park Town Centre.

The do-nothing option would result in continued delays and declines in traffic flows at this location which would worsen as traffic flows increase with future predicted population increases in the area. Council has considered the need for the project against its potential benefits and impacts, and has determined that the beneficial outcomes outweigh the potential negative outcomes, provided adequate mitigation is implemented.

8.1.1 Selected Design and Alignment

Section 2.4 discussed design options considered by Council for the project including alternative alignments to avoid the demolition of the heritage-listed former Albion Park Butter Factory building. Factors considered for alternative options included flooding impacts (and associated mitigation required), property acquisition and house demolition requirements Council endorsed the proposed alignment, which requires the demolition of the former Albion Park Butter Factory building. Further detail on the heritage impacts associated with the demolition of the Albion Park Butter Factory building is included in **Section 6.9**.

8.2 Objects of the EP&A Act

Table 8-1 identifies the objects identified in Section 1.3 of the EP&A Act and their relevance to the project.

Summary of objects of the EP&A Act

Object of the EP&A Act	Comment
(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	<p>The project design, impact mitigation and management measures detailed in this REF allow for the proper management, development and conservation of natural and artificial resources. The main objective of the project is to improve traffic flows and the safety of road users at this location.</p> <p>Where possible, throughout the design of the project, management and conservation of natural resources has been incorporated. This has included minimizing vegetation removal and land acquisition to the greatest extent practicable to reduce the potential impact on the environment.</p> <p>The proposed road alignment will have significant impacts on the former Albion Park Butter Factory. Alternative alignments were considered by Council however the proposed alignment was selected over these alternatives. The impact on the Albion Park Butter Factory is considered significant.</p>

Object of the EP&A Act	Comment
(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The TWE would improve traffic flows in accordance with the designated land use.
(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Where possible, disturbance and interference with utilities would be avoided. Where interaction with utilities will occur, adequate consultation with the relevant utility owner would be undertaken to ensure impacts are minimised or avoided.
(a)(iv) To encourage the provision of land for public purposes.	The intent of the project is to provide the public with improved local road infrastructure and to alleviate traffic congestion.
(a)(v) To encourage the provision and co-ordination of community services and facilities.	The project would improve safety for local motorists and those in the broader community, and improve the safety of pedestrians within the Albion Park Town Centre.
(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The project has been designed to minimise impacts on the environment, including threatened species, populations and ecological communities and their habitats as far as practicable. The proposed design alignment will involve significant impacts to the former Albion Park Butter Factory. This will have a significant detrimental impact on this item of local heritage significance and its conservation.
(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1– 8.2.4 below.
(a)(viii) To encourage the provision and maintenance of affordable housing.	No relevant to the project
(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	No relevant to the project
(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	No relevant to the project

8.2.1 The precautionary principle

The assessment of the potential impacts associated with the project is considered to be consistent with the precautionary principle. The detailed environmental assessments and investigations carried out during preparation of this REF have been consistent with accepted scientific and assessment methodologies. The investigations have identified a range of potential impacts associated with the construction and operation of the project.

The evaluation and assessment of alternative options and designs within the project have also aimed to reduce the risk of serious and irreversible impacts on the environment as a result of the project.

The project has sought to take a precautionary approach to minimising environmental impacts. This has been applied through the development of a range of environmental safeguards, as summarised in **Section 7.2**. These safeguards would be implemented during the pre-construction, construction and operation phases of the project.

The selected construction contractor would be required to prepare a PEMP and CEMP before commencement of construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

The project would benefit future generations by improving traffic flow, road safety, reducing the potential number of crashes and improving the safety of pedestrians within the Albion Park Town Centre. Implementation of the safeguards contained in this REF (see **Section 7.2**) would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The TWE will allow the Albion Park Town Centre to become an accessible and integral location of the wider community. Further benefits include improvements to road and pedestrian safety, potential economic improvements and an improvement in the efficiencies of the Albion Park Town Centre.

Section 6.8 and **Section 6.9** outline the proposal's impact on Aboriginal and Non-Aboriginal heritage within the Study Area.

An Aboriginal Due Diligence Assessment was conducted for the project. The assessment identified areas of moderate archaeological potential and one Aboriginal site within the study area. The Assessment recommended Council to acquire an Aboriginal Heritage Impact Permit prior to any excavation works on the Aboriginal site [Tulkeroo ISO (AHIMS 52-5-0961)] and that the surface stone artefact be collected prior to destruction, that an Aboriginal Cultural Heritage Assessment be conducted prior to the commencement of works (in the three areas of moderate potential only), and implementation of an unexpected finds protocol during any works.

A Statement of Heritage Impact concludes that the proposed works will result in significant direct physical impacts to the heritage listed former Albion Park Butter Factory, as well as to the area of high archaeological potential beneath and surrounding the structure. The removal of the former Albion Park Butter Factory building would have a significant and detrimental effect on the heritage significance of the item as a whole, and represents a considerable loss to Shellharbour's local heritage for future generations. Due to the heritage significance of the the Albion Park Butter Factory (former) and adjacent related heritage item 'Tulkeroo' the impacts that would occur as a result of the works are considered significant.

The primary recommendation of the SOHI is to avoid impacts to Tulkeroo and the Albion Park Butter Factory (former) and areas of high and moderate archaeological potential through further design development.

As the Council has determined that alternative options to avoid or minimise impacts to the former Butter Factory are not feasible, the report recommended the following measures where impacts cannot be avoided:

- > Minimise indirect impacts to Tulkeroo and the heritage item setting
- > Archival recording
- > Reassessment of the heritage item's heritage and curtilage significance
- > Archaeological investigation required prior to works for areas of High potential (at Butter Factory building site) for which a Section 140 permit will be required.

However, as the SoHI found that the impact on the Albion Park Butter Factory is considered significant, it is necessary for an environmental impact statement (EIS) to be prepared for consideration and prior to any approval being granted for the project by the relevant determining authority under Division 5.1, of the EP&A Act.

8.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered during all stages of the project's development. Potential impacts have been avoided where possible, and safeguarded against or offset where necessary.

The biodiversity assessment (**Section 6.3**) and the biodiversity specialist report in **Appendix D**) concludes that the project would not have a significant impact on the existing ecological environment. Impacts would be minimised through the safeguards summarised in **Section 7.2**.

8.2.4 Improved valuation, pricing and incentive mechanisms

Environmental and social issues were considered in the strategic planning and establishment of the need for the project, and in consideration of various alternative proposal options. The value placed on environmental resources is evident in the extent of the planning and environmental investigations, and in the design of the proposed mitigation measures and safeguards. Implementation of these mitigation measures and safeguards would result in an economic cost to Shellharbour City Council, which would be included in the capital cost of the project.

8.3 Conclusion

The TWE in Albion Park is subject to assessment under Division 5.1 of the EP&A Act. The REF has been prepared in accordance with the provisions of Section 5.5 of the EP&A Act and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The TWE would contribute to an efficient and functional road network, and would assist in meeting the increased demand of road users as future development and land use changes in the Calderwood and Tullimbar areas occur. The project would also reduce potential congestion within the surrounding road network and improve safety for motorists, pedestrians and cyclists.

The project has strong socio-economic benefits associated with reduced traffic within the Albion Park Town Centre. Reduced traffic would lessen congestion, while improving, safety, air quality, amenity and aesthetic, as well as providing for ease of parking within the town centre. These impacts would benefit the local community and visitors alike. The TWE is therefore expected to have positive implications for the future health and wellbeing within the community.

The project represents an opportunity to improve traffic, visual amenity and social opportunities within the township of Albion Park and the wider community

A number of potential environmental impacts from the project have been avoided or reduced during the concept design development and options assessment and the design as articulated through this REF and provided in **Appendix B**, is considered to best meet the project objectives, while addressing environmental aspects. **Chapter 6** of this REF provides an assessment of the impacts of the project in accordance with Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and **Appendix A** specifically responds to the factors for consideration under Clause 228.

This REF details mitigation measures that will ameliorate or minimise these expected impacts of potential environmental impacts, which are not likely to be significant, with the exception of the impact to the locally-listed heritage item, the former Albion Park Butter Factory, which is proposed to be significantly impacted as it is located within the road alignment.

The project is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994*. Therefore, a Species Impact Statement is not required. The project is also unlikely to affect Commonwealth land or have an impact on any Matters of National Environmental Significance.

This REF references the Statement of Heritage Impact (SoHI) which considered the impact to heritage sites within the Study Area and the vicinity. The statement concluded that “*due to the heritage significance of Tulkeroo and the Albion Park Butter Factory (former), the impacts that would occur as a result of the works are considered significant.*”

Having regard to the significant potential impacts to the Albion Park Butter Factory it is necessary for an environmental impact statement (EIS) to be prepared for assessment, and prior to an approval being granted for the project by the relevant determining authority under Division 5.1, of the EP&A Act.

9 References

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- DUAP (1996), Roads and Related Facilities
- DUAP (1999), 'Is an EIS required?'
- Environment Protection Authority (2014), Waste Classification Guidelines
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- Shellharbour City Council Local Environmental Plan 2013
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- Transport for NSW (2018), Traffic Control at Work Sites Version 5
- Transport for NSW (2020), Crash and Casualty Statistics – Shellharbour
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