



Hexham Straight Widening

Submissions Report

Transport for NSW | July 2022

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Prepared by Jacobs and Transport for NSW

TfNSW 22.155

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Document controls

Approval and authorisation

Pacific Highway improvements at Hexham (Hexham Straight Widening)	Pacific Highway improvements at Hexham (Hexham Straight Widening)
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Signed:	
Dated:	14 July 2022

Document status

Document status	Date	Prepared by	Reviewed by
Rev01	23 February 2022	Ada Zeng, Sam Bourke	Rachel Vazey
Rev02	6 April 2022	Ada Zeng, Lauren Clear	Rachel Vazey
Rev03	3 May 2022	Rachel Vazey	Rachel Vazey
Rev04	24 May 2022	Rachel Vazey	Rachel Vazey
Rev05	7 June 2022	Rachel Vazey	Rachel Vazey

Executive summary

The proposal

Transport for NSW (Transport) is proposing to widen a six kilometre section of the Pacific Highway (Maitland Road) from four lanes to six lanes, starting about 290 metres south of the intersection with the Newcastle Inner City Bypass at Sandgate, and extending through to about 760 metres north of Hexham Bridge, in Hexham, NSW (the proposal). The proposal would create two additional lanes in each direction and would include replacing the existing bridge over Ironbark Creek with new twin bridges. The section of road is known as the 'Hexham Straight' and is located within the City of Newcastle local government area (LGA) with a small portion of the construction area within the Port Stephens Council LGA.

Maitland Road is a critical link in the National Land Transport Network, providing access to and from the Port of Newcastle. It carries some of the highest traffic volumes in the Hunter. Around 50,000 motorists use this section of the road daily. The proposal would reduce congestion during peak periods and ensure Maitland Road is prepared to handle future growth.

The proposal would include:

- Widening six kilometres of Maitland Road from four to six lanes
- Demolition and replacement of the existing bridge over Ironbark Creek
- Relocating utilities
- U-turn facilities on Sparke Street, Shamrock Street and Old Maitland Road
- Modifying existing intersections along the route
- Improved cyclist and pedestrian connectivity.

The majority of the proposal has been assessed under a Review of Environmental Factors under Division 5.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act); however small parts of the proposal that are within areas mapped as 'Coastal Wetlands' under the former State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP). Coastal Wetland areas now included in the State Environmental Planning Policy (Resilience and Hazards) 2021 but for the purposes of this assessment we will continue to refer to these as CM SEPP Coastal Wetlands. These parts of the proposal have been assessed within an Environmental Impact Statement in accordance with Part 4 of the EP&A Act and which was submitted in November 2021 as part of a Crown Development Application to the City of Newcastle for consent.

Display of the Review of Environmental Factors

Transport prepared a review of environmental factors (REF) for the Hexham Straight Widening proposal. The REF was publicly displayed for feedback between Tuesday 16 November 2021 and Tuesday 14 December 2021. Due to COVID-19 restrictions, hard copies of the REF were not displayed but were available on request.

The REF was published on the [Transport project website](#) and displayed via an [online portal](#) developed to provide a detailed view of the project and its impacts. A community update was distributed to residents and businesses in the Sandgate and Hexham areas, along with targeted Facebook advertisements linking to the online portal. The project update included information on the proposal, an overview of the REF and information sessions, and a link to the project website.

In addition, two online information sessions were held during the public display period to give the community a chance to learn more about the proposal, ask questions and 'have their say'. The virtual information sessions were held on Wednesday 1 December 2021 and Tuesday 6 December 2021. Transport also met with residents and stakeholders who would be directly affected by the proposal.

Summary of issues and responses

Public display of the REF and the supporting consultation resulted in a total of 37 submissions, of which 30 were from the general community, two were from businesses, and four from government authorities. Nineteen submissions were received via the interactive online portal and the remaining were received via email.

Of these submissions, eight per cent were in support of the proposal, five per cent partially support the proposal, 19 per cent objected to the proposal and three per cent partially object of the proposal. The remaining 65 per cent of the submissions offered no position on whether they supported or objected to the proposal.

The main issues raised by the public and businesses and a summary of the responses for each of these issues are provided below.

Traffic and transport

The largest number of submissions received related to the operational changes to traffic from the proposal. The comments mostly related to the proposed closure of the median, the proposed U-turn locations, traffic signal phasing and the inclusion of a right hand turn from Sparke Street. Other matters raised included increased congestion on local roads and road safety.

The proposal would increase the width of Maitland Road from four lanes to six lanes with a speed limit of 80 km per hour. The increase in travel lanes from four lanes to six lanes on Maitland Road would reduce the opportunities to pick a safe gap to turn across in traffic. Based on the volumes of traffic, including heavy vehicles, for six lanes of traffic the inclusion of a central continuous median safety barrier would be required in order to meet relevant road safety standards and prevent cross carriageway accidents. This would close the median at Fenwick Street and Millams Road (which has recently been renamed Schoolhouse Road but for the purposes of this report will continue to be referred to as Millams Road) and would require the inclusion of U-turn facilities at Sparke Street, Shamrock Street and Old Maitland Road. The closure of the median would add distance to the trip of some residents in Hexham. A new mitigation measure is proposed to review traffic signal phasing at the Shamrock Street and Maitland Road intersection as part of detailed design.

High levels of traffic congestion within the area was noted in several submissions. Traffic modelling completed as part of the Traffic and Transport Assessment found the proposal would ease congestion and improve travel times along Maitland Road by about 34 per cent in 2028, about 31 per cent in 2038 and by about 27 per cent in 2048.

The consideration to provide a right turn out of Sparke Street would increase congestion along Maitland Road southbound due to an additional traffic signal phase being added to the intersection. Under the proposal, vehicles travelling south out of Sparke Street would continue to use the current U-turn facility located at Hexham Bridge.

Noise and vibration

Comments related to construction and operational noise impacts to sensitive receivers in Hexham and proposed mitigation measures. Several of these noted high levels of existing noise in the Hexham area and were concerned the proposal would increase upon this.

As part of the REF, Transport carried out a Noise and Vibration Impact Assessment to determine the potential impacts of the construction and operation of the proposal. A worst-case scenario was used to assess the potential impacts to sensitive receivers during construction. Construction noise would be mitigated by the implementation of a Construction Noise and Vibration Management Plan (CNVMP), prepared as part of the Construction Environment Management Plan (CEMP) for the proposal. The CNVMP will include mitigation measures, targets, monitoring programs and a consultation process for affected

sensitive receivers. The CNVMP will also consider the use of respite measures, such as alternative accommodation, where feasible and reasonable.

Seventy-four receivers are predicted to be to be affected and are eligible for consideration of further noise mitigation treatment, which may include measures such as architectural treatments. Other options to reduce noise were considered such as noise walls, however these would increase flooding impacts significantly in the area and were considered impractical for residential access. Transport will consult with these property owners and review on a case-by-case basis during detailed design.

Flooding and hydrology

Comments related to drainage and flood impacts from the proposal. The submissions highlighted existing flooding and drainage issues impacting residential properties and streets within Hexham and raised concern over the potential impacts of the proposal to residential and industrial properties.

A Flooding and Hydrology Assessment was completed as part of the REF which included modelling of existing flood conditions within the broader catchment area of the proposal. The proposal is located within the low-lying and low-gradient floodplains surrounding the Hunter River and South Channel Hunter River.

Flooding and hydrology impacts were key considerations in the design which investigated existing and predicted flood events and the probable maximum flood (PMF). The proposal aimed at maintaining existing road levels along Maitland Road and would adopt a post and rail barrier for the central median as it was found to be the most flood sensitive design option.

During construction, two buildings (Id 5525 and 5529) are newly flood affected above floor level due to the proposal in Stage 1 and one building (Id 5525) is flood affected above floor level both in Stage 2 and Stage 3 in the one per cent Annual Exceedance Probability (AEP) event (1 in 100 year event).

During operation, the proposal would not result in any newly flood affected properties, and the majority of flood-affected residential, commercial and industrial properties experience negligible change in overall flood depth (less than 0.03 metres increase) and flood hazard. There are three buildings (Id 4958, 4959 and 4986) having afflux greater than 0.05 metres and the maximum afflux is 0.07 metres in the two per cent AEP event. The identified three buildings experience at least, 0.3 metres depth of flooding above floor in the one per cent AEP event in the existing case.

The design and construction methodology would be further reviewed during detailed design to minimise flooding impacts where practicable and to confirm impacts remain the same or less than those assessed in the Flooding and Hydrology assessment.

Stormwater discharge modelling has been completed for the cross-drainage systems that exist along the proposal. The results of the modelling indicate that modifications to the existing drainage infrastructure and increases in the area of road pavement may impact stormwater discharges causing some minor increases in rates, volumes and velocity. These changes are not expected to result in a material impact to the receiving environment however may result in some impacts to processes downstream of proposal discharge locations from storm events during construction and operation. The proposal includes appropriate mitigations including scour protection in the form of rock transition aprons at all culvert outlets upgraded as part of the proposal to manage impacts.

Socio-economic, land use and property

Comments were mostly associated with proposal impacts to amenity, health, property acquisition and value. Some other issues that were raised related to business impact, future developments, and landscape character.

The proposal would involve partial acquisition of two lots located within the proposal area. No acquisition of residential properties is expected. Property acquisition would be confirmed during detailed design and would be minimised wherever possible. Transport would continue to consult with all directly affected landholders during the detailed design phase when property acquisition requirements are confirmed.

Compensation associated with property impacts would be undertaken in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Reform 2016 process (<https://www.propertyacquisition.nsw.gov.au/>).

During construction, the community and businesses in the area would likely experience temporary traffic, noise, air quality and visual amenity impacts. Property access and access to utilities would be maintained at all times where practicable and safe to do so. Mitigation measures have been amended to include further consideration of construction impacts such as dirt/mud tracking from vehicles. Transport would continue to consult with affected community and stakeholders during detailed design and construction.

The proposal would have wider regional and local benefits through travel time savings, enhanced travel reliability and improved road safety during operation that would support improved access and connectivity for local and regional communities, business and industry. This would have long-term benefits and support improved access to employment areas and future growth and development of strategic centres in Greater Newcastle.

The proposal

Most comments related to existing operational issues occurring along Maitland Road, and alternative proposal options; specifically a suggested fly over at the Newcastle Inner City Bypass and Maitland Road intersection.

Traffic modelling was completed during the concept options assessment which considered various intersection options for the Newcastle Inner City Bypass and Maitland Road intersection, including a flyover, and found that an at-grade intersection would provide an acceptable level of service for the next 20 years.

Existing traffic issues such as congestion and safety associated along Maitland Road would be addressed through the implementation of the proposal. Other existing environmental constraints have been identified within the respective technical reporting assessments and have been used as a baseline to determine proposal specific impacts. Where impacts occur during construction and operation of the proposal, safeguards and management measures have been identified to minimise proposal impacts.

Biodiversity

Concerns were raised about impacts to flora and fauna, wetlands and conservation areas from the proposal. A Biodiversity Assessment Report (BAR) was prepared as part of the REF which compiled the findings for several targeted field surveys and habitat assessments undertaken to determine potential impacts to threatened species, including the Green and Golden Bell Frog. Based on regional records and targeted field surveys, the proposal area is considered unlikely to provide habitat for the Green and Golden Bell Frog.

The proposal would have direct impacts on 3.82 hectares of native vegetation involving removal to allow for construction. The proposal is located near to Hexham Swamp Nature Reserve and Ramsar wetlands (Hunter Estuary Wetlands) and the area to the south-east of Ironbark Creek is located immediately alongside Hunter Wetlands National Park. The BAR found that there would be no direct impacts to these conservation areas but there may be some potential for indirect impacts associated with surface water drainage. Mitigation measures would be implemented to manage any direct and indirect impacts from the proposal.

Offsets are required to manage unavoidable impacts associated with vegetation clearance for the proposal including impacts to mangroves and wetlands. A Biodiversity Offset Strategy (BOS) will be developed in consultation with relevant government agencies and prepared in accordance with Transport's *Guidelines for Biodiversity Offsets* (Roads and Maritime Services, 2016).

Air quality

Comments related to dust and pollution during construction and operation of the proposal at Hexham, and mitigation measures proposed.

As part of the REF, Transport carried out an Air Quality Impact Assessment to determine the potential impacts from the construction and the operation of the proposal. Several of the submissions noted existing contributing factors to air quality in the Hexham area and were concerned with a potential negative impact to air quality from the proposal.

An Air Quality Management Plan (AQMP) will be developed to manage the proposals impacts during construction. The AQMP would include consideration of construction staging methods for minimising impacts from activities on site as well as outline a dust monitoring program.

An air quality dispersion model was used to quantify the potential operational impacts of the proposal and found that there would be some minor increases in air quality impacts, however these increases would not cause exceedances of the EPA air quality impact assessment criteria at sensitive receivers.

Changes to the proposal

In response to submissions received, Transport is including a new one kilometre long pedestrian footpath along the western side of Maitland Road between the intersection with Shamrock Street near McDonalds and the intersection with Old Maitland Road to the south of the Hexham Bowling Club. This would provide access for residents in Hexham to bus stops located near these two intersections and the Hexham Bowling Club. This would be a positive socio-economic outcome for the proposal providing improved pedestrian connectivity and pedestrian safety in the Hexham region.

Additional assessment

This report also details additional studies and survey undertaken since the display of the REF. This includes additional environmental assessment following some recent changes to the *Environmental Planning and Assessment Regulation 2021*, the completion of the *Hexham Straight Widening Stage 2 Contamination and Waste Classification Assessment* (Jacobs, 2022a) (Stage 2 Contamination and Waste Classification Assessment) and some additional cumulative impact assessment to consider the Richmond Vale Rail Trail cycleway (DA2020/00641) which has been granted conditional approval by the Hunter and Central Coast Regional Planning Panel.

Next steps

Transport as the determining authority will consider the information in the REF and this submissions report and decide whether or not to proceed with the proposal.

Transport will inform the community and stakeholders of this decision and where a decision is made to proceed and will continue to consult with the community and stakeholders prior to and during the construction phase.

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Appendix D	Kerb design figures
Appendix E	City of Newcastle additional drainage matter considerations
Appendix F	Phase 2 Contamination and Waste Classification Assessment
Appendix G	Property acquisition drawings

1. Introduction and background

1.1 The proposal

Transport for NSW (Transport) is proposing to widen about six kilometres of the Pacific Highway (Maitland Road) from four lanes to six lanes, starting about 290 metres south from the intersection with the Newcastle Inner City Bypass (NICB) at Sandgate, and extending through to about 760 metres north of Hexham Bridge, in Hexham, NSW (the proposal). The proposal would create two additional lanes in each direction and would include replacing the existing bridge over Ironbark Creek with new twin bridges across Ironbark Creek. The section of road is known as the 'Hexham Straight' and is located within the City of Newcastle local government area (LGA) with a small portion of the construction area within the Port Stephens Council LGA (refer to **Figure 1.1**).

The proposal is subject to assessment under two planning pathways, a review of environmental factors (REF) under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and an environmental impact statement (EIS) under Part 4 of the EP&A Act. The majority of the proposal (the REF area) is subject to approval under Division 5.1 of the EP&A Act that would be determined through this REF by Transport. However, a small part of the proposal (3.28 hectares) is within land mapped as 'Coastal Wetlands' under the former State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP). Coastal Wetland areas now included in the State Environmental Planning Policy (Resilience and Hazards) 2021 but for the purposes of this assessment we will continue to refer to these as CM SEPP Coastal Wetlands. As such, that part of the proposal (known as the EIS areas) is subject to approval under Part 4 of the EP&A Act and considered within an EIS.

Key features of the proposal are shown in **Figure 1.2** and include:

- Widening a six kilometre section of Maitland Road starting about 290 metres to the south of the intersection with the Newcastle Inner City Bypass (A37) at Sandgate and extending to about 760 metres north of Hexham Bridge at Hexham on Maitland Road. The highway would be widened from generally two lanes in each direction to three lanes in each direction
- Replacement of the bridge which spans Ironbark Creek with new twin bridges. The existing bridge and all piers would be demolished and the outlet of a small drainage channel would be relocated about 10 metres to the east of its existing location
- Minor improvements to nine signalised intersections
- Minor improvements to access roads, unsignalised intersections, entry and exit ramps connecting to the A1 Pacific Highway and the U-turn facility at the northern end of the proposal
- Closure of breaks in the existing median and direct access to two local side roads, one private access road and one U-turn facility
- Provision of a three metre wide shared use path northbound between the Oak Factory and the northern end of the proposal and a new section of off-road shared use path heading east along the Newcastle Inner City Bypass
- Widening of existing footpaths at intersections and bus stops
- Adjustments to property accesses and bus stops
- Provision of U-turn facilities on Sparke Street, Shamrock Street, and Old Maitland Road at Hexham
- Relocation of utilities including power, communications, water, gas and wastewater services
- Modifications and maintenance of existing drainage structures including pits, pipes, headwalls and culverts to suit the road widening and to maintain capacity
- Construction of retaining walls to minimise impacts on nearby properties

- Property acquisition, leases and adjustments
- Construction of hardstand for oversize and overmass (OSOM) vehicle parking at the southern and northern end of the proposal
- Intrusive investigation works such as geotechnical investigations
- Temporary construction facilities, including site compounds and stockpile sites at four separate locations.

Construction of the proposal would be staged and would take about 30 months.

A more detailed description of the proposal is found in the Hexham Straight Widening REF prepared by Transport in November 2021.

1.1.1 Relationship of the REF and EIS

Development consent under Part 4 is usually not required for development for the purposes of a road being undertaken by Transport as a public authority. Rather, this development is ordinarily assessed as an 'activity' under Division 5.1 of the EP&A Act.

However, on those parts of the land which are identified as Coastal Wetland under the CM SEPP, the development is classified as designated development and requires consent from City of Newcastle under Part 4 of the EP&A Act. The part of the proposal located within the Coastal Wetlands is therefore assessed under Part 4 of the EP&A Act. An EIS is required to assess the impacts of any works located within the Coastal Wetlands or any impacts on a coastal wetland. The EIS provides an assessment of the EIS area in accordance with Part 4 of the EP&A Act. The City of Newcastle will be preparing a submissions report for submissions provided as part of the display of the EIS.

The REF has been prepared for the assessment of the REF area (refer to **Figure 1.3**) in accordance with Division 5.1 of the EP&A Act to assess the REF area of the proposal and would be determined by Transport. The EIS area (refer to **Figure 1.3**) would be constructed and operated together with the REF area. Together, the EIS and the REF assess the potential environmental impacts of the proposal and it is intended that these documents be read in conjunction with each other. Detailed discussion of the planning approval framework and consent requirements is provided in Chapter 4 of the REF.



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Legend

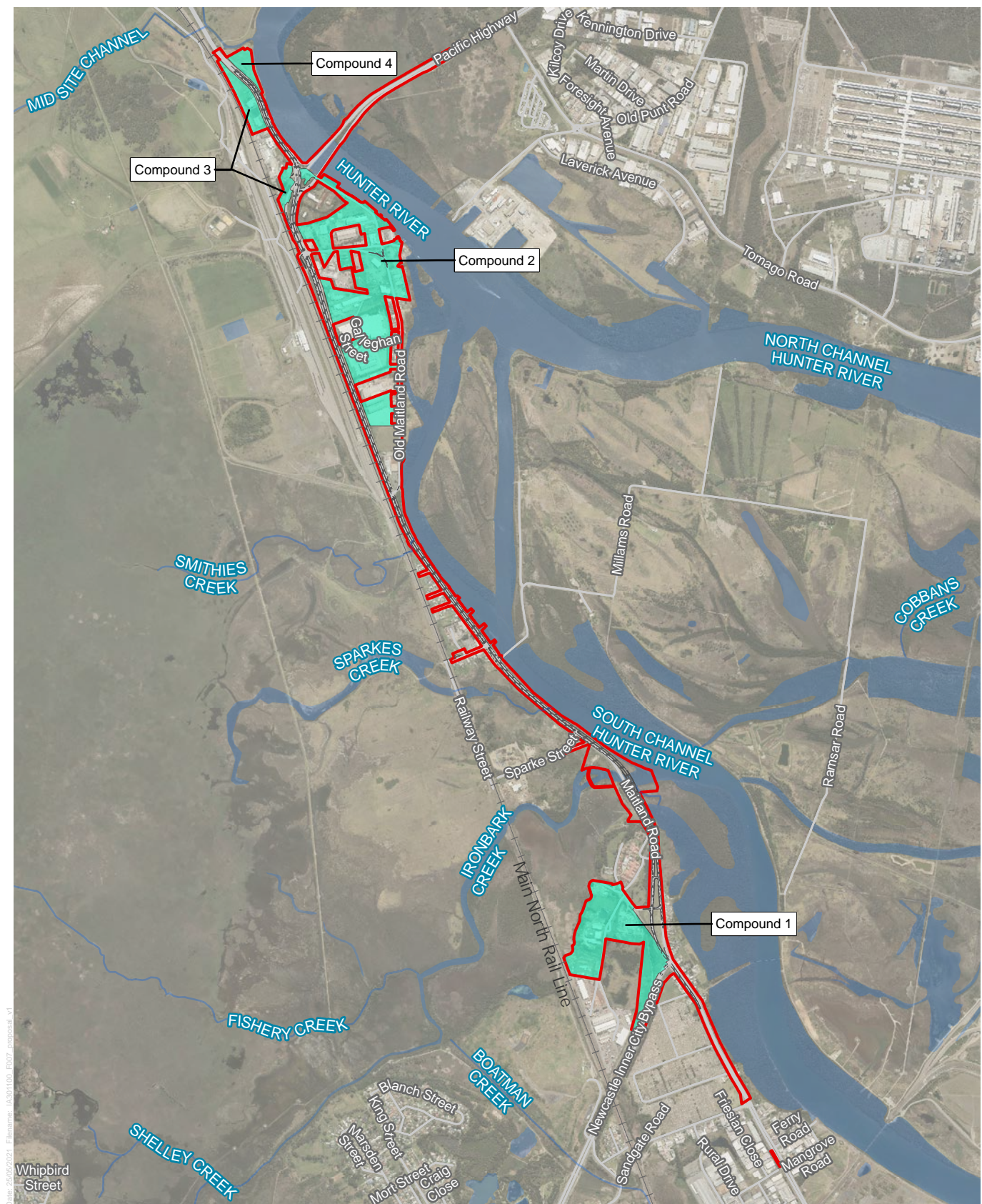
- Construction area
- Local government area
- National Park
- Waterway
- Railway
- Road

0 1 2 km
Scale 1:100,000 at A4
GDA94 MGA56

Data sources:

Jacobs 2020
Department Finance,
Services and Innovation 2020

Figure 1.1 Proposal local area
Hexham Straight Widening

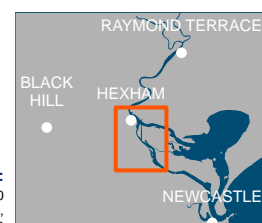
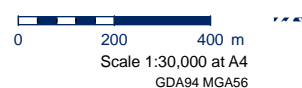


Date: 25/05/2021 Filename: IA301100_F007_proposal_v1

Date: 25/05/2021 Filename: IA301100_F007_proposal_v1

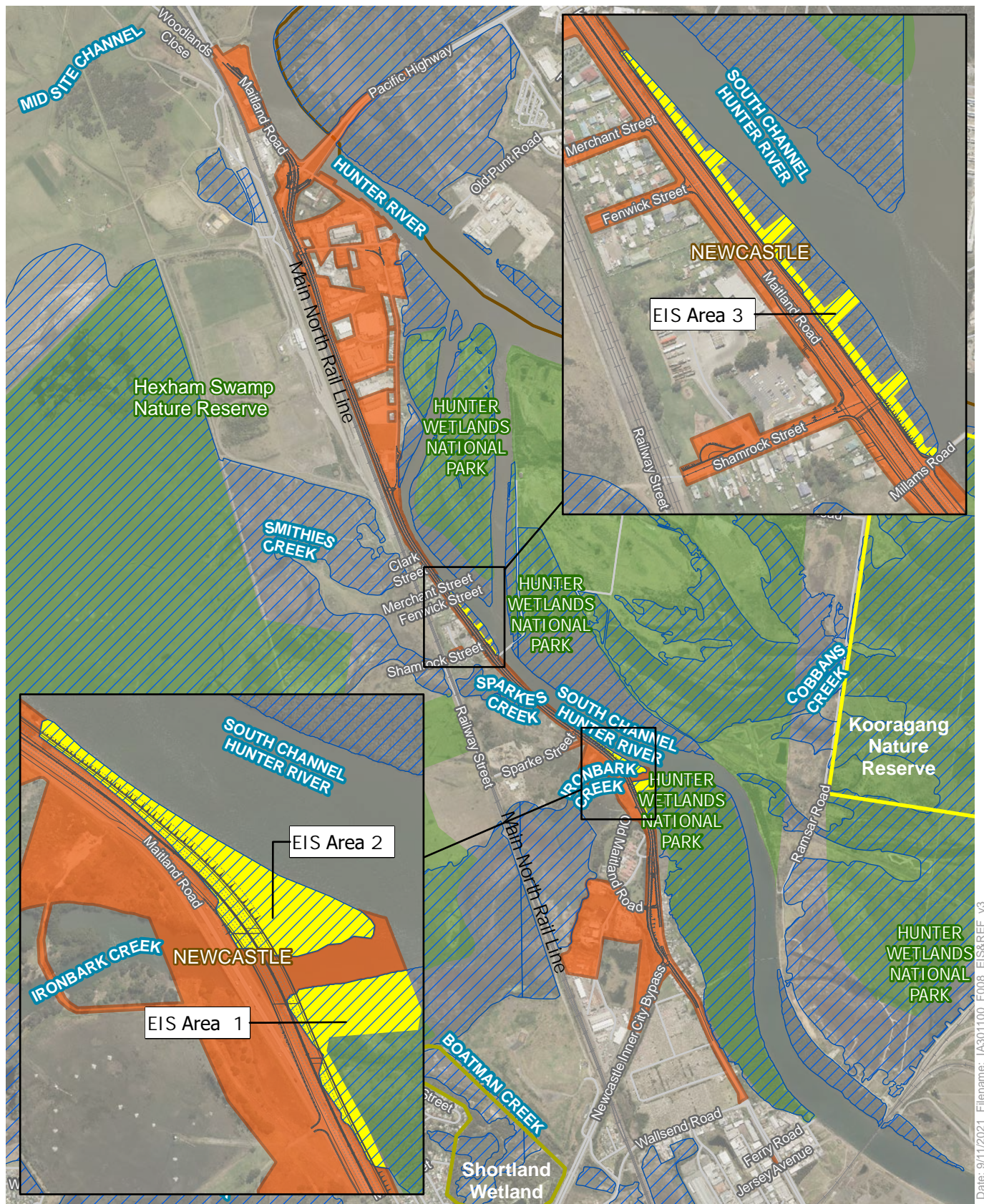
Legend

- The proposal
- Construction area
- Construction compound
- Waterway
- Road
- Railway



Data sources:
Jacobs 2020
Department Finance,
Services and Innovation 2020

Figure 1.2 The proposal
Hexham Straight Widening

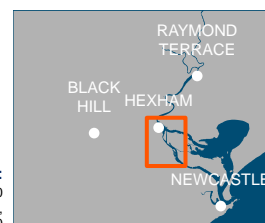


Date: 9/11/2021 Filename: IA301100_F008_EIS&REF_v3

Legend

- | | | |
|--------------|------------------|--------------------------|
| The proposal | Railway | Kooragang Nature Reserve |
| EIS area | Road | Shortland Wetland |
| REF area | LGA | National Park |
| | Coastal Wetlands | |

0 400 800 m
Scale 1:30,000 at A4
GDA94 MGA56



Data sources:
Jacobs 2020
Department Finance,
Services and Innovation 2020

Figure 1.3 EIS area and REF area

Hexham Straight Widening

1.2 REF display

Transport prepared a review of environmental factors (REF) to assess the potential environmental impacts of the proposed works. The REF was publicly displayed for feedback from Tuesday 16 November 2021 until Tuesday 14 December 2021.

The REF was made available on the [Transport project webpage](#), as well as an [online portal](#).

A range of communication and engagement activities were carried out during the public display period to give the community a chance to learn more about the project, ask questions and 'have their say'. These included:

- Transport hosted online information sessions on the Thursday 1 December 2021 (12-1pm) and Wednesday 7 December (6:30-7:30pm)
- Facebook ads linked directly to the REF/Have You Say, as well as promoted the online information sessions
- A media release was issued by Barnaby Joyce on the 16 November 2021
- A project update, outlining the project features and including an invitation to comment on the REF, was sent to about 3000 residents and several identified stakeholders of Sandgate and Hexham
- Transport met in-person with four residents who would be directly affected by the proposal at Hexham Bowling Club on Monday 6 December 2021 (11am – 1pm)
- Direct email/phone call responses to community members with specific queries or feedback relating to the proposal.

Transport has consulted with the City of Newcastle, National Parks and Wildlife Services, the State Emergency Services (SES), the Australian Rail Track Corporation (ARTC) in accordance with the requirements of State Environmental Planning Policy (Transport and Infrastructure) 2021 former State Environmental Planning Policy (Infrastructure) 2007 (ISEPP). Transport has also consulted with the Department of Primary Industries (DPI) (Fisheries) under Section 199 of the *Fisheries Management Act 1994* (FM Act).

Transport has also consulted on an ongoing basis with key State and local government agencies, utility service owners as well as several businesses in the proposal area. This has included a site inspection with National Parks and Wildlife Services and the Environment Protection Authority. This consultation was designed to ensure issues and concerns were understood, documented, and addressed, and that stakeholders had an opportunity to discuss any aspect of the proposal.

Transport contacted those property owners who would be impacted by acquisition or road boundary changes via phone calls, video calls or emails, prior or during the display of the REF. Consultation will be ongoing as the proposal develops and the design is progressed.

Transport sought feedback on the corridor strategy and preliminary concept design during a nine-week consultation period from December 2020 to February 2021. Consultation included a project update, a project webpage and map, a business survey and consultation with stakeholders online or over the phone.

Key feedback from the consultation related to property and access, traffic issues including lane configurations, concerns about construction and operational impacts such as flooding and noise, bicycle transport and queries relating to the proposed design. Transport will continue to consult with the community and stakeholders as planning progresses.

1.3 Purpose of the report

This submissions report relates to the REF prepared for the proposal and should be read in conjunction with that document.

The REF was placed on public display and submissions relating to the proposal and the REF were received by Transport. This submissions report summarises the issues raised and provides responses to each issue (**Chapter 2**). It describes and assesses the environmental impact of changes to the proposal (**Chapter 4**) and details any investigations carried out since finalisation of the REF (**Chapter 5**), and identifies new or revised environmental management measures (**Chapter 5.3**).

2. Response to issues

Transport received 37 submissions, accepted up until Tuesday 14 December 2021. **Table 2.1** lists the respondents and each respondent's allocated submission number. The table also indicates where the issues from each submission have been addressed in **Chapter 2** of this report.

Table 2.1 Respondents

Respondent	Submission No.	Section number where issues are addressed
State Emergency Service (SES)	G1	3.5
Department of Primary Industries (DPI) (Fisheries)	G2	3.3
City of Newcastle	G3	3.2
Environment Protection Authority (EPA)	G4	3.4
Public	1	2.1
Public	2	2.7.6, 2.7.8, 2.9.1 and 2.10.7
Public	3	2.7.1
Public	4	2.1
Public	5	2.7.7
Public	6	2.2.2
Public	7	2.7.8
Public	8	2.7.6
Public	9	2.1
Public	10	2.1
Public	11	2.2.2
Public	12	2.7.6
Public	13	2.7.6
Public	14	2.7.3
Public	15	2.2.2
Public	16	2.7.8, 2.7.9, 2.9.1, 2.10.1 and 2.10.7
Public	17	2.1
Public	18	2.5.2, 2.5.4, 2.7.3 and 2.9.3
Business	19	2.7.5, 2.7.8, 2.7.9, 2.10.2 and 2.10.7
Public	20	2.2.3, 2.5.1, 2.5.2, 2.6.1, 2.6.3, 2.7.5, 2.7.9, 2.7.10, 2.9.1, 2.9.2 and 2.9.3
Public	21	2.2.2 and 2.7.1
Public	22	2.4.1, 2.4.2, 2.5.1, 2.5.2, , 2.7.2, 2.7.6, 2.7.8, 2.7.9, 2.7.10, 2.8.1, , 2.9.1, 2.9.3, 2.10.6 and 2.11
Public	23	2.2.1, 2.4.1, 2.5.2, 2.5.3, 2.5.4, , 2.7.1, 2.7.5, 2.7.8, 2.7.9, 2.7.10, 2.9.1, 2.9.3 and 2.11
Public	24	2.4.1, 2.5.2, 2.5.3, 2.7.6, 2.7.8, 2.9.1, 2.9.2, 2.9.3, 2.10.1 and 2.11

Respondent	Submission No.	Section number where issues are addressed
Public	25	2.2.1, 2.4.1, 2.5.3, 2.7.6, 2.9.1, 2.9.2, 2.9.3, 2.10.1 and 2.11
Public	26	2.5.12.6.2, 2.7.4, 2.7.5, 2.7.8, 2.7.9, 2.7.10, 2.9.1, 2.9.3, 2.10.4 and 2.11
Public	27	2.2.1, , 2.5.4, 2.6.1, 2.7.1, 2.7.5, 2.7.9, 2.7.10 and 2.9.2 and 2.9.3
Business	28	2.3.1, 2.6.2, 2.6.4, 2.7.10, 2.9.1, 2.10.3
Business	29	2.7.5, 2.7.8, 2.7.9, 2.10.2 and 2.10.7
Public	30	2.2.1, 2.2.3, 2.6.22.7.1, 2.7.4, 2.7.5, 2.7.8, 2.7.9, 2.7.10, 2.9.1, 2.9.2, 2.9.3 and 2.11
Public	31	2.4.1, 2.5.1, 2.6.2, 2.7.3, 2.7.4, 2.7.5, 2.7.7, 2.7.8, 2.7.10, 2.9.1, 2.9.3, 2.10.4 and 2.10.5
Public	32	2.5.1, 2.5.2, 2.6.2, 2.7.4, 2.7.5, 2.7.9, 2.7.10, 2.9.3 and 2.10.4
Public	33	2.2.2

2.1 Overview of issues raised

A total of 37 submissions were received in response to the display of the review of environmental factors. This included submissions from four government agencies and 33 from the community comprised of 31 from the public and two from businesses. Nineteen submissions were received via the interactive online consultation map and the rest were received via email.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and Transport response to these issues forms the basis of this chapter.

The main issues raised by the community are listed in **Table 2.2**. Responses to issues raised by the City of Newcastle and other government authorities are provided in **Chapter 3**. Of the submissions received, eight per cent were in support of the proposal, 19 per cent objected to the proposal, five per cent were partially supportive of certain aspects of the proposal such as its ability to ease congestion and the inclusion of three lanes at the northern end of the proposal at the intersection of the A1 Pacific Highway and Maitland Road at the southbound exit to the Hexham Bridge, but consider the overall proposal only a short term solution and three per cent partially object to the inclusion of the U-turn facility at Sparke Street. The remaining 65 per cent of the submissions offered no position on whether they supported or objected to the proposal.

Table 2.2 Main issues raised by the community

Category	Issues	Section in the report
The proposal	Existing environment	2.2.1
	Proposal options	2.2.2
	Construction impacts	2.2.3
Consultation	Lack of consultation	2.3.1
Biodiversity	Flora and fauna	2.4.1

Category	Issues	Section in the report
	Wetlands	2.4.2
Hydrology	Existing drainage	2.5.1
	Proposed drainage	2.5.2
	Maintenance of drainage systems	2.5.3
	Other drainage issues	2.5.4
Flooding	Existing flood impacts	2.6.1
	Flood impacts	2.6.2
	Road closure during flood events	2.6.3
	Flood impact to future development site	2.6.4
Traffic and transport	Congestion	2.7.1
	Emergency vehicle access	2.7.2
	Footpaths, cyclists, and bus stops	2.7.3
	Old Maitland Road	2.7.4
	Parking and property access	2.7.5
	Closure of median and right turn capacity	2.7.6
	Road surface and level	2.7.7
	Safety	2.7.8
	Shamrock Street – traffic volume and congestion	2.7.9
	Shamrock Street – traffic light phasing	2.7.10
	Shamrock Street – U-turn facility	2.7.11
	Sparke Street	2.7.12
Heritage	Heritage values	2.8.1
Noise and vibration	Noise impacts	2.9.1
	Noise mitigation	2.9.2
Socio-economic, land use and property	Amenity	2.10.1
	Business impact	2.10.2
	Future development	2.10.3
	Health	2.10.4
	Landscape character	2.10.5
	Property impacts	2.10.6
	Property value	2.10.7
Air quality	Air quality impacts and mitigation	2.11.1

2.2 The proposal

2.2.1 Existing environment

Submission number(s)

23, 25, 26.

Issue description

Three respondents raised issues related to the existing environment, including:

- Concerned about existing issues associated with traffic, noise, drainage issues and flooding in Hexham and request that the City of Newcastle resolve these before approving any new construction.

Response

Transport notes that the proposal is located on a section of Maitland Road currently experiencing high levels of traffic congestion, is low lying and has a history of flooding. These conditions have been taken into consideration in the development of the proposal and either improved or met existing conditions where practical. There are however, some existing regional and localised issues are outside the scope of the proposal. Existing issues and feedback raised has been forwarded to Newcastle Council and other relevant agencies responsible for their consideration. Transport will continue to consult with the City of Newcastle during the development of the detailed design.

2.2.2 Proposal options

Submission number(s)

6, 11, 15, 21, 33.

Issue description

Five respondents raised the following concern about the proposal options:

- Consideration for a flyover at the Newcastle bypass interchange to improve traffic flow, safety and congestion for southbound traffic and to prevent accidents and road blockages.

Response

The Newcastle Inner City Bypass and Maitland Road intersection bypass was identified as a hotspot during the crash analysis based on existing data (Oct 13 - March 2019). During this period, 10 crashes were recorded within the intersection, the majority of crashes recorded (8 of 10) were classified as rear collisions (i.e. a vehicle driving into the back of another vehicle) which are typically associated with stop start traffic. The proposed widening at this intersection would improve traffic flow and reduce the risk of rear collisions.

Traffic modelling completed during strategic optioneering as part of the Traffic and Transport Assessment found that an at-grade intersection at the Newcastle Inner City Bypass and Maitland Road intersection would provide an acceptable level of service for the next 20 years. Consequently, the proposal has not included a flyover at this intersection but it may be considered in the future if justified by traffic volumes.

2.2.3 Construction impacts

Submission number(s)

20, 30.

Issue description

Two respondents raised questions about construction impacts including:

- Where a site office would be located during construction, and whether construction vehicles or workers would use the Shamrock Street U-turn facility, making that street further congested during construction
- If there would be a traffic management plan prepared during construction.

Response

The location of the site office would be determined in detailed design but would be located at one of the four temporary construction compound locations as shown in **Figure 1.2** and which include:

- One area located in the industrial estate located on Old Maitland Road, Sandgate to the south of Calvary St Joseph's Retirement Community (Compound 1)
- Two areas located in the industrial estate located to the east of Maitland Road and the west of Old Maitland Road, Hexham extending north from the northern boundary of the Hexham sports field to the area of road corridor underneath the entry ramps to the A1 Pacific Highway and Hexham Bridge (Compound 2)
- Two areas located in the industrial estate located to the west of Maitland Road, Hexham near the Oak Factory (Compound 3)
- One area located on vacant land to the east of the U-turn facility at the northern end of the proposal on Maitland Road, Hexham to the west of the main channel of the Hunter River (Compound 4).

A Traffic Management Plan would be developed as part of the CEMP during detailed design and would include details on construction vehicle routes. It is anticipated that vehicles would use major roads to access the proposal, and this would include Maitland Road to the north and south of the proposal, the A1 Pacific Highway to the east of the proposal or the A37 Newcastle Inner City Bypass to the south-west of the proposal (refer to Figure 5.2 of the Traffic and Transport Assessment). These major highways are sufficient to cater for heavy construction vehicles without imparting significant road user delay to other vehicles. Vehicles would transport materials to the four construction ancillary facilities identified in **Figure 1.2**. Transport would minimise the use of Shamrock Street for construction vehicles for most of the proposal construction activities except for work that is required on Shamrock Street itself. Workers may however access Shamrock Street for meal breaks during construction if they are seeking to access McDonalds.

In response to this concern, Transport have updated the traffic and transport mitigation measure number TT1 relating to the Traffic Management Plan to be prepared as part of the Construction Environment Management Plan (refer further to **Section 6.2**) to include the following:

Minimise the use of local roads during construction and include consideration of alternate U-turn facilities for traffic movements where practicable.

Further discussion on traffic numbers and congestion in Shamrock Street is included in **Section 2.7.9**.

2.3 Consultation

2.3.1 Lack of consultation

Submission number(s)

28.

Issue description

One respondent indicated that they had not been consulted on the location of the Sparke Street U-turn Bay despite the direct impacts to their property.

Response

The Sparke Street U-turn facility is located within road reserve and would not directly impact on any private property, consequently consultation has been undertaken as part of the display of the REF and through the issuing of community updates as part of the design development. Consultation included a nine week display period from 2 December 2020 to 5 February 2021 on the December 2020 Project Update and the strategic concept design, refer to Section 5.2 and Appendix G of the REF. The aim of the consultation was to introduce the proposal to the community and obtain community feedback on perceived issues, including local traffic. Community members were encouraged to provide their feedback, leave comments, and make submissions at information sessions or via mail, email or phone contact with the project team. A second community update was issued as part of the display of the REF. Both community updates issued showed the location of the proposed U-turn facility on Sparke Street. The display period for the REF is described in more detail in **Section 1.1.1** of this Submissions Report.

2.4 Biodiversity

2.4.1 Flora and fauna

Submission number(s)

22, 23, 24, 25, 31.

Issue description

Five respondents had concerns about impacts to biodiversity from the proposal, including:

- Impacts to existing flora and fauna from the proposal specifically impacts to rare birds and the Green and Golden Bell Frog and what measures are being implemented to manage impacts and protect the habitat of threatened species
- What measures are being implemented to manage impacts associated with the removal of mangroves
- Increased traffic and noise impacts to local wildlife.

Response

The *Hexham Straight Widening Biodiversity Assessment Report* (Jacobs, 2021d) (BAR) was completed to assess the impacts of the proposal to threatened flora and fauna and was included as Appendix H of the REF and summarised in Section 6.1 of the REF. The assessment included:

- Targeted surveys for the Green and Golden Bell Frog in March 2021 however no frogs were found. Based on regional records and targeted field surveys, the proposal area is considered unlikely to provide habitat for the Green and Golden Bell Frog
- An assessment of impacts to mangroves was completed
- An assessment of impacts to threatened flora and fauna species including the removal of fauna habitat
- An assessment of the impact of increased traffic and noise to local wildlife.

The proposal would require the removal of 3.82 hectares of native vegetation within the REF area, including vegetation identified as Threatened Ecological Communities (TECs).

The development of the design has sought to minimise vegetation impacts where possible and mitigation measures have been included to manage impacts. Offsets are also required for to manage unavoidable impacts associated with vegetation clearance to two vegetation communities and an offset strategy will be developed in consultation with relevant government agencies, refer further to **Section 3.3**.

The native vegetation to be removed provides habitat (or potential habitat) for 14 threatened fauna species that were either identified in the study area (i.e. Southern Myotis) or are considered at least moderately likely to occur based on the presence of suitable habitat. An Assessment of Significance has been conducted for these threatened species and conclude of the assessment indicates that a significant impact is considered unlikely on any threatened species or TECs listed under the BC Act. The demolition of the current Ironbark Creek Bridge would have direct impacts to a population of Southern Myotis (Microbats) through the removal of roosts within the bridge itself. To ensure that these impacts are prevented or minimised where possible, the proposal will implement a Microbat Management Plan that is to be prepared by a qualified bat specialist to specifically to monitor and manage impacts.

Biodiversity offsets are proposed to compensate for impacts associated with vegetation clearance. An offset strategy will be developed in consultation with council and relevant government agencies, refer further to **Section 3.3**. This would include offsets for two saline wetland formations (saltmarsh and mangroves). NSW DPI enforces a 'no net loss' habitat policy as a condition of consent (DPI, 2013). The policy and guidelines for fish habitat conservation and management (DPI, 2013) identifies habitat compensation on a minimum 2:1 basis for all key fish habitat (TYPE1-3). The policy and guidelines (DPI, 2013) also allow habitat restoration, therefore, efforts to restore areas of key fish habitat in the local area would be undertaken in consultation with DPI (Fisheries).

2.4.2 Wetlands

Submission number(s)

22.

Issue description

One respondent was concerned about impacts to conservation areas and wetlands from the proposal, particularly the extra lanes at Ironbark Creek bridge, and the widening of Maitland Road.

Response

An assessment of the impact of the proposal on wetlands was completed as part of the BAR and included consideration of freshwater wetlands, coastal wetlands and Ramsar wetlands within or near to the proposal area. The assessment found that the proposal REF area would impact on 3.82 hectares of native vegetation, including around 1.06 hectares of *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071). The significance assessment found that the proposal would not have a significant impact on any threatened biodiversity listed under the BC Act or EPBC Act. The proposal in the REF area would also impact on 1.23 hectares of saline wetlands and offsets would be required to impacts to wetland vegetation including saline wetland vegetation and these are described in **Section 3.3.2**.

Coastal wetlands are located next to the REF area of the proposal and were assessed within the Biodiversity Development Assessment Report for the EIS. Within the REF area 38.25 hectares of land is located within areas mapped as Coastal Wetland Proximity Areas under the CM SEPP, with 8.91 hectares being directly impacted by vegetation clearance. The BAR found that impacts to Coastal Wetland Proximity Areas are unlikely from the proposal.

Ramsar wetlands are located near to the proposal and include Hunter Estuary Wetland comprised of Kooragang Nature Reserve about one kilometre to the east and Shortland Wetland (including Hunter Wetlands Centre) located about 800 metres to the west of the proposal. The impacts to the Ramsar wetland areas are considered unlikely as any potential sedimentation or poor water quality during construction would be managed using safeguards during construction and the implementation of a Soil & Water Management Plan.

An assessment of impacts to nearby conservation areas including Hunter Wetlands National Park and Hexham Swamp Nature Reserve was also completed as part of the REF. The proposal would not directly impact on the National Park and potential indirect impacts on the Hexham Swamp Nature Reserve are able to be managed through mitigation measures provided in **Section 6.2**.

2.5 Hydrology

2.5.1 Existing drainage

Submission number(s)

20, 22, 25, 26, 27, 30, 31, 32.

Issue description

Eight respondents raised concerns about existing drainage issues associated with the proposal, including:

- Residents of Hexham currently effected by poor drainage and cannot see that the proposal will improve the situation
- Notes that existing stormwater and drainage system is limited and are blocked with rubbish causing water to lay on their properties. Questioned whether this would be resolved as part of the proposal
- Existing drainage is insufficient and results in minor and major flooding of Shamrock Street, Merchant Street and Fenwick Street. Drainage network is not properly maintained or repaired which causes water to flow over the road in minimal rainfall or during high tides.

Response

The *Hexham Straight Widening Flooding and Hydrology Assessment* (Jacobs, 2021c) (Flooding and Hydrology Assessment) considers existing drainage and flooding issues and is included as Appendix L of the REF and summarised in Section 6.2 of the REF. The Flooding and Hydrology Assessment notes that Hexham is located on floodplains surrounding the Hunter River and South Channel Hunter River.

Flood maps have been prepared of the existing environment showing the peak flood depth and peak flood level 63.2 per cent, 50 per cent, 20 per cent, 10 per cent, five per cent, two per cent and one per cent AEP flood events and the PMF and have been included as Attachment B of Appendix L of the REF.

Maitland Road is a known area that is within a low-lying floodplain and has a history of flooding. These issues have been considered in the development of the proposal where relevant and improved where possible, however some existing issues are considered outside the scope of the proposal. The existing matters raised would be forwarded to relevant parties responsible for management of these issues for future consideration.

Existing drainage and flooding issues in the area are not directly attributed to the operation of the existing roadway but are the result of Hexham's location on low-lying and low-gradient floodplains that are located next to the Hunter River. This flat topography means that overland surface flow cannot always run off into the surrounding stormwater drainage system or nearby drainage channels of the Hunter River, South Channel Hunter River and Ironbark Creek and will have to evaporate or infiltrate the soil or the groundwater system, depending on the weather conditions and how saturated the soils are. Consequently, some of the roads in Hexham (including Maitland Road, Shamrock Street, Fenwick Street and Merchant Street) gets inundated in some rainfall events when the stormwater capacity exceeds the design criteria for the drainage system, which is typically designed to cater for events up to 10 per cent AEP. Any stormwater drainage required to be upgraded as part of the proposal has also been designed to cater for rainfall events up to the 10 per cent AEP (refer to **Section 2.5.2**).

Drainage and flooding impacts associated with construction and operation of the proposal would be addressed through the implementation of mitigation measures detailed in Chapter 7 of the REF.

2.5.2 Proposed drainage

Submission number(s)

18, 20, 22, 23, 24, 25, 27, 30, 31, 32.

Issue description

Ten respondents raised concerns about proposed drainage associated with the proposal, including:

- Questions about what work is to be completed on existing drainage and requests that drainage along Maitland Road, Merchant Street, Fenwick Street, and Shamrock Street be modified as part of the proposal
- Questions whether the proposed drainage would fix existing drainage issues
- Notes that flooding and drainage are linked and questions if sufficient drainage has been provided
- Questions whether the proposal has considered runoff from inundation and whether sufficient drainage has been included to prevent flooding into surrounding properties
- Concern that the widening of Maitland Road will force additional water down Fenwick Street and Shamrock Streets

- Questions whether gutters will be constructed in areas in Hexham where there is no existing guttering.

Response

Stormwater discharge modelling has been completed on the proposal as part of the Flooding and Hydrology Assessment to assess changes to the rates and volume of stormwater discharged from the proposal during the operational phase. This included 12D dynamic hydraulic modelling of the existing and operational phase drainage conditions. The proposal has assessed stormwater drainage for storms up to 10per cent AEP, however it is noted that some sections of Maitland Road and other Hexham roads are already flooded during these events and would continue to be impacted with the proposal in place. This is because Hexham is low-lying and located on Hunter River floodplains. The drainage for the proposal has been designed to ensure one lane remains open during these events. In addition, the proposal has been designed to current road safety and design standards and specifications which considers aquaplaning checks and depths of flow for travel lanes. Discharges to the receiving environment were quantified at the downstream boundary to assess impacts to downstream drainage systems and natural areas. Where permanent water quality basins form part of the drainage flow path, the basins were conservatively modelled as drainage nodes with no storage capacity being considered in the modelling. Drainage requirements for the proposal were based and designed according to the outcomes of the 12D dynamic hydraulic modelling.

The widening of Maitland Road between Shamrock Street and Clarke Street as part of the proposal occurs primarily within the extent of the existing paved surfaces but includes the removal of the grassed median to accommodate additional lanes, new pavement, new lane-marking, and the inclusion of back-to-back post and steel rail safety barrier to separate traffic. In addition, the concept design has sought to maintain road levels to minimise any potential flooding impacts and the drainage design has included additional drainage where changes in the road catchment area have been modified and it is warranted, refer further to **Appendix B**. Road pavement on either side of the median on Maitland Road Hexham between Millams Road (which has recently been renamed Schoolhouse Road but for the purposes of this report will continue to be referred to as Millams Road) and Clarke Street drains from the median and inside lanes to the outside lanes of the road pavement. Stormwater on the eastern side drains to the road shoulder and to the South Channel Hunter River. Stormwater on the western side drains to the kerb and gutters on the west side of Maitland Road which drain into pits and pipes and culverts located beneath Maitland Road which then drain to the east and discharge into the South Channel Hunter River. The drainage design in this area includes some new pipes and some minor upgrades to the drainage system on this side of the road to account for the increased pavement associated with moving lanes into the central median.

Drainage features that would be removed as part of the proposal include:

- The inlet drainage pipe of System 02 is being removed where the new water quality basin (Basin 1) to the south of the Old Maitland southbound access road at Sandgate is being constructed, water would be directed through new pipes connecting Basin 1 to Basin 2 and would discharge down grassed swale (SW1) and out through System 04 to the South Channel Hunter River catchment
- Old pits and pipes (System 07) to the south of existing Ironbark Creek Bridge
- Old pits and pipes (System 08) to the north of existing Ironbark Creek Bridge
- Old pipes in the roadway to the north of System 12 and Sparkes Creek
- Old pipes in the roadway to the north and south of System 13
- Old pipes in the roadway to the east of System 25.

Drainage pipes associated with Systems 04, 05, 06, 09, 10, 15, 28 and 29 would be replaced as part of the proposal and new drainage features are also proposed and include:

- A series of new pipes to the south-east of water quality basin B1 around upgrades on the intersection of Old Maitland Road Sandgate and Maitland Road
- New pipe on the eastern side of Maitland Road and connecting to System 02
- New pipes in the median to the north and south of System 06
- New drainage features to the south of the new Ironbark Creek Bridge which drain to water quality basin (B3) and grassed swale (SW2) located to the south of Ironbark Creek
- New drainage features to the north of the new Ironbark Creek Bridge which drain to water quality basin (B4) located to the north of Ironbark Creek
- New drainage pipes to the north and south of System 08
- New drainage features to the south of the Shamrock Street and Maitland Road intersection associated with System 14
- New pipes on the western side of Maitland Road where new kerb and gutter is proposed as part of Systems 16, 17 and 22
- New pipes on the eastern side of Maitland Road associated with Systems 26, 27, 30 and 31
- New pits and pipes near drainage infrastructure associated with the A1 Pacific Highway and Maitland Road intersection and including Systems 34, 35, 36, 37 and 38
- New pits in the road median associated with Systems 33, 38, 41, 45.

No further modification of the existing drainage has been proposed where there is no direct impact from the proposal.

New kerb and gutter or upgrades to kerb and gutter impacted by the road widening will be provided in locations as described in **Section 2.7.8** to ensure road safety and drainage requirements are met and to minimise stormwater flow on road pavement.

While the proposal would include the upgrade of the roadway, as much as possible the existing surface levels have been matched. There are some instances where the crown of the road has been raised in order to provide adequate pavement crossfall to remove water from the travel lanes to improve road safety.

Results of the stormwater discharge modelling found that there is a minor increase in the imperviousness of the catchment from the upgrades to the drainage system as part of the proposal, however the size of the road catchment remains largely the same as the existing. Where changes occur, additional drainage is proposed consequently no additional runoff would flow into the local streets from the road upgrade and new pavement areas.

Transport will include the following new flooding and hydrology mitigation measure number FL9 (refer further to **Section 6.2**) in response to comments:

The proposal will further investigate localised flooding impacts related to stormwater drainage during detailed design. This will include but not be limited to:

- A review of design considerations provided by Newcastle Council (refer to **Appendix E**)
- Confirm the extent of localised flooding impacts.

Where flooding may increase, the proposal would consider amendments to the design to minimise these impacts.

2.5.3 Maintenance of drainage systems

Submission number(s)

22, 23, 24, 25.

Issue description

Four respondents raised requests about drainage management associated with the proposal, including:

- Requests that drains are cleaned during and after construction
- Questions what measures will be put in place to keep drains clean and free of weeds and rubbish during operation and whether this will be done routinely so that residents don't have to make requests for the drains to be cleaned.

Response

Drainage systems impacted by the proposal would be cleaned as part of the construction activities where required. Road drainage features would be owned by Transport or the City of Newcastle and ongoing maintenance would occur according to routine maintenance schedules.

2.5.4 Other drainage issues

Submission number(s)

18, 23, 26, 27.

Issue description

Four respondents raised issues about other drainage issues associated with the proposal, including:

- Concerns about road safety and visual amenity associated with water lying on the road
- Concerns that there are existing issues associated with the Coles Express Service Station transpiration area (septic) which would be impacted on by the proposal. Queried where the excess water and waste would go
- Requests that Hunter Water be contacted to repair drainage and sewage systems during construction when utilities are exposed.

Response

During construction Transport would be responsible for ensuring the roads impacted by the proposal are kept clean and safe for road users, refer further to **Section 2.7.8**. New kerb and gutter, or upgrades to kerbs and gutter for the proposal will be provided in locations described in **Section 2.7.8** to ensure road safety and drainage requirements are met, and to minimise stormwater flow onto the road pavement during operation of the proposal. While it is noted that there are some visual amenity issues associated with water lying on roads during rainfall events, these amenity impacts from the proposal are minor and are temporary but the length of time the area is inundated will be dictated by the duration of the storm or flood event.

Transport would consult with the Coles Express Service Station to confirm the location of the transpiration area (septic) for the facility and to identify if it would be impacted by the proposed U-turn facility on Shamrock Street. Any impacts would be further considered in detailed design in consultation with the Coles Express Service Station to ensure that capacity of the transpiration area is accommodated.

Transport has been in contact with Hunter Water regarding their assets that would be impacted by the proposal which include various water mains that would require relocation and protection. Water mains attached to the existing Ironbark Creek Bridge would be relocated via underboring to the western side of the existing bridge. Various other water mains would require relocation or protection, depending on further development of the pavement design and construction methodologies and validation via potholing. There is one pressure sewer main that is located within the proposal area however no adjustments proposed. Services would be protected rather than relocated.

2.6 Flooding

2.6.1 Existing flood impacts

Submission number(s)

20, 27, 31.

Issue description

Three respondents raised concerns about existing flood impacts including:

- Residents of Hexham currently experience flooding on Maitland Road and cannot see that the proposal will improve the situation
- Concerns about existing flooding of residential properties in the Hexham area
- Notes that the area regularly floods and Shamrock Street currently floods during some rain and king tides as drainage is inadequate and is blocked in some locations.

Response

Transport notes that the proposal is situated on a floodplain and these existing issues have been considered in the development of the proposal where relevant and improved where possible, however some of the existing issues are outside the scope of the proposal. Existing issues raised would be forwarded to relevant parties responsible for management of these issues for future consideration. Existing flood mapping completed as part of the Flooding and Hydrology Assessment shows that the area is subject to flooding and that during flood events the homes in Hexham regularly flood in a range of flood events. The Flooding and Hydrology Assessment included a brief history of recorded flooding in the Hunter River which includes 1955, 1963, 1978, 1990, 2000, 2007, 2015 and 2016. The largest flood on record occurred in 1955. Within the Lower Hunter Estuary, the 1955 flood caused extensive overbank inundation, with flood depths of up to three metres across the Kooragang Island wetlands. Peak flood levels for the 1955 flood event at Hexham Bridge and in the South Channel Hunter River at Ironbark Creek were about 4.1 and 3.4 metres Australian Height Datum (AHD) respectively (DHI, 2008). All the low-lying land between Fullerton Cove, Williamtown and Salt Ash was completely inundated. This flood has been estimated at about a one per cent Annual Exceedance Probability (AEP) event (Lawson and Treloar, 1994).

The most recent flood events to occur in the Hexham region include the April 2015 and January 2016 floods. The peak water level recorded at the Ironbark Creek Gauge during the April 2015 severe storm

event was 1.45 metres AHD (10:55pm on 21 April) which is similar to the 10 per cent AEP event design event (refer to Section 4.4.5 of the Flooding and Hydrology Assessment). The gauge on the Hunter River at Hexham Bridge reached a peak water level of 1.88 metres AHD (1:45am on 23 April 2015), which is between the ten per cent and the five per cent AEP design events (refer to Section 4.4.5 of the Flooding and Hydrology Assessment). In the storm event of January 2016, the water level was 1.11 metres AHD at the Ironbark Creek (7:00am on 7 January) gauge and 1.50 metres AHD (8:00am on 7 January) at the Hexham Bridge gauge.

The flood model shows that flooding in Hexham can occur from the east from the Hunter River and the South Channel Hunter River, or it can occur from overland surface flow from the west as water starts draining out of Hexham Swamp once its water storage capacity is reached. During flood events the surrounding landscape is inundated, and this will include roads and any supporting drainage features which are under the height of the floodwaters. Flood modelling of the existing environment has also shown that most houses on Shamrock Street are already impacted during the 10 per cent AEP to a depth between 0.05 - 1.0 metres. Impacts increase to include all houses on Shamrock Street in the two per cent AEP to a depth of about 1.2 to 2.0 metres and for the one per cent AEP flood event all houses are impacted to a depth of 2.0 to 3.0 metres.

The flood assessment has considered historical flood events in the development of the flood model including the 2015 and 2016 flood events.

2.6.2 Flood impacts

Submission number(s)

20, 26, 27, 28, 30, 31, 32.

Issue description

Seven respondents raised issues about flood impacts from the proposal including:

- Concern about where the water from the road will drain to if the level of the road is raised
- Concern the Shamrock Street U-turn facility will impact on drainage and the Coles Express Service Station transpiration area (septic) and will force additional water towards homes in Shamrock Street
- Concern there will be greater and more localised flood impacts from the proposal
- Requests that low-lying homes in Shamrock Street are raised to a flood free level to prevent flooding (existing and future) into homes and to ensure affordable home insurance rates.

Response

Flooding of roads and properties along the proposal has been a major consideration for the design. To limit flood impacts of the design, the proposal has aimed to not increase road levels where possible. While there are upgrades to existing road pavement as part of the proposal this would include cutting and milling of the existing surface effectively lowering the surface before re-sheeting with new asphalt or concrete to maintain the existing road level height.

Surveyed floor levels of buildings near to the proposal were provided by City of Newcastle and concentrated on the flooding study area so that a total of 333 buildings were used to assess flooding impacts to buildings from the proposal (refer to the figures included in Attachment J of the REF). Impacts to these buildings during construction of the proposal are included in Table J.2 in Attachment J of the REF). It is to be noted that the data provided by City of Newcastle does not include floor levels of all buildings

located near to proposal. The afflux was calculated separately for buildings which were flooded above floor and below floor. In addition, buildings newly flooded above or below floor due to the proposal have been identified and addressed separately as part of the discussion around additional number of buildings flooded.

The change in water level height (afflux) at houses on Shamrock Street (buildings 4985, 4993-4998) from the proposal is between 0.01 - 0.03 metres for the one per cent AEP during construction, refer to **Table 2.3** and between 0.01 and 0.02 metres for the one per cent AEP during operation, refer to **Table 2.4**. The existing peak water level during the one per cent AEP ranges between 3.49 and 3.98 metres AHD at buildings surveyed.

Table 2.3 Flood impacts on identified buildings in Shamrock Street during construction

Building ID	Floor Level (m AHD)	Existing peak water level (m AHD)		Change in Peak Water Level (m) during construction					
				20% AEP			1% AEP		
		20% AEP	1% AEP	Stage 1	Stage 2	Stage 3	Stage 1	Stage 2	Stage 3
4985	1.28	1.21	3.54	0.00	0.00	0.00	0.03	0.02	0.01
4993	1.66	0.00	3.61	0.00	0.00	0.00	0.04	0.02	0.01
4994	1.50	0.00	3.59	0.00	0.00	0.00	0.03	0.02	0.01
4995	1.51	1.20	3.58	0.00	0.00	0.00	0.03	0.02	0.01
4996	1.35	1.21	3.57	0.00	0.00	0.00	0.03	0.02	0.01
4997	2.67	1.21	3.57	0.00	0.00	0.00	0.03	0.02	0.01
4998	1.34	1.21	3.56	0.00	0.00	0.00	0.03	0.02	0.01

The development of the concept design has tried to minimise flooding impacts to buildings where possible and this has included the use of a post and rail barrier rather than a solid concrete barrier to minimise blockage of water flow into the Hunter River and South Channel Hunter River. In addition, the afflux development criteria was based on 50 millimetres of change and given this does not occur at any of the houses on Shamrock Street changes in afflux are not considered significant, consequently Transport will not be raising the level of any houses as part of the proposal.

The Shamrock Street U-turn facility would require the construction of pavement over a small area of grassed area, approximately 424 metres squared in size near the Coles Express Service Station transpiration area. The Shamrock Street U-turn facility would generate a small amount of runoff that would drain to the west towards the existing open channel in the rail corridor which then flows north towards Smithies Creek where it discharges to the east through a large, reinforced concrete box culvert (System 24) into the South Channel Hunter River. Flooding impacts from the proposal including the new pavement associated with the Shamrock Street U-turn facility to the properties on the eastern side of Shamrock Street have been assessed and impacts from the proposal would occur but are minor as shown in **Table 2.3** and **Table 2.4**.

Table 2.4 Flood impacts on identified buildings in Shamrock Street during operation

Building ID	Floor Level (mAHD)	Existing peak water level (mAHD)						Change in peak water level during operation (m)					
		20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	PMF	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	PMF
4985	1.28	1.21	1.42	1.66	2.68	3.54	7.20	0.00	0.00	0.00	0.04	0.01	0.01
4993	1.66	0.00	1.43	1.66	2.75	3.61	7.25	0.00	0.00	0.00	0.04	0.02	0.01
4994	1.50	0.00	1.43	1.66	2.73	3.59	7.24	0.00	0.00	0.00	0.04	0.02	0.01
4995	1.51	1.20	1.43	1.66	2.72	3.58	7.23	0.00	0.00	0.00	0.04	0.02	0.01
4996	1.35	1.21	1.43	1.66	2.71	3.57	7.22	0.00	0.00	0.00	0.04	0.01	0.01
4997	2.67	1.21	1.43	1.66	2.71	3.57	7.22	0.00	0.00	0.00	0.04	0.01	0.01
4998	1.34	1.21	1.43	1.66	2.69	3.56	7.21	0.00	0.00	0.00	0.04	0.01	0.01

2.6.3 Road closure during flood events

Submission number(s)

20.

Issue description

One respondent raised a concern that during flood events residents have tried to contact the State Emergency Services (SES), the City of Newcastle and the Police to request that Shamrock Street be closed. Concerned about the lack of government response to the requests.

Response

The closure of roads during flood events is detailed in the Flood Evacuation Plan as developed by the State Emergency Services (SES). During flood events the SES works with the police to enact road closures. Consequently, the SES and Police would be the main points of contact during flood events to discuss road closures during flood events or to review the Flood Evacuation Plan for the area, specifically timing and flood level for road closures.

2.6.4 Flood impact to future development site

Submission number(s)

28.

Issue description

One respondent raised concerns about flood impacts from the proposal to a future development site on Sparke Street including:

- The increase in flood levels during construction at Lots 2 and 3 DP874409 includes increases of 0.1-0.25 metres in the one per cent AEP flood level during Stage 1 of construction and increases of 0.03 and 0.1 metres during Stages 2 and 3 of construction
- The change in the flood hazard on portions of Lot 2 DP874409 from low to high
- The change in flood level at Lots 3 and 4 DP874409 is predicted to be between 0.01 and 0.05 metres during operation of the proposal.

Response

The Flooding and Hydrology Assessment has identified that there are some very small areas where increases in flooding at Lots 2 and 3 DP874409 during construction and operation from the proposal, however given that there are no existing buildings, and the area is zoned IN3 heavy industrial impacts are considered to be minor. In regard to the changes in flood hazard for the two per cent AEP from the proposal, the area of change is very small i.e. 0.07 hectares of 8.40 hectares (area of Lots 2 and 3 DP874409) which equates to only 0.006 per cent of the total lot size. For the one per cent AEP the area of impact is slightly bigger but again a very small area i.e. 0.14 hectares of 8.40 hectares (area of Lots 2 and 3 DP874409) which equates to only 0.012 per cent of the total lot size. Future development would still be

permissible with consent, but the design would have to cater for these minor changes in floor levels which include an increase between 0.01 and 0.05 metres i.e. 1 to 5 centimetres during flood.

2.7 Traffic and transport

2.7.1 Congestion

Submission number(s)

3, 21, 23, 26, 30.

Issue description

Five respondents raised concerns about congestion, including:

- Concern about traffic jams
- Concern about existing conditions, especially if there is an accident but consider that the proposal will help ease congestion
- Concern about impacts to local roads and negative impacts
- Concern about existing traffic issues as well as reckless drivers on Shamrock Street and cannot see the proposal will improve the situation
- Considers that the bypass at John Renshaw Drive is more of a priority for road work and will ease traffic in Hexham if addressed.

Response

The *Hexham Straight Widening Traffic and Transport Assessment* (Jacobs, 2021b) (Traffic and Transport Assessment) is included as Appendix P of the REF and summarised in Section 6.6 of the REF. The Traffic and Transport Assessment notes that there are currently around 50,000 motorists that use Maitland Road daily and it is one of the busiest transport corridors in the Hunter. Congestion is an existing issue along Maitland Road and Transport is seeking to resolve this issue and other traffic safety concerns through the implementation of the proposal. The Traffic and Transport Assessment assessed impacts to local roads from the proposal and particularly impacts to Shamrock Street with the construction of the proposed U-turn facility. Traffic counts undertaken in March 2021 on Shamrock Street indicate that around 2,150 vehicles currently use Shamrock Street daily. The closure of the median on Maitland Road north of Shamrock Street and the subsequent rerouting of vehicles to the U-turn facility on Shamrock Street would result in a minor number of additional vehicles using Shamrock Street. Analysis undertaken using the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002) found that the closure of the median is expected to lead to approximately 45 additional vehicles traveling on Shamrock Street daily, which is a two per cent increase in daily traffic movement and is not considered significant. Analysis of the level of service at intersections was completed as part of the Traffic and Transport Assessment (refer to Section 5.3.1 of that report), and found that the Shamrock Street and Maitland Road intersection would continue to operate at a satisfactory level of service.

Traffic modelling has been completed as part of the Traffic and Transport Assessment to try and address issues associated with existing congestion along Maitland Road (including traffic jams and bottle necks in the road network) the level of service (LoS) of intersections along Maitland Road and future traffic growth. Extensive traffic modelling was completed of existing conditions and for the proposal for the opening year (2028) and future years (2038 and 2048). The construction, operational and cumulative impact of the

proposal on traffic and transport have been identified from quantitative performance indicators such as network statistics, level of service and travel time.

Section 5.3.1 of the REF discusses the results of the traffic modelling on road network performance. The conclusions of the traffic assessment found that during operation:

- The proposal would provide positive outcomes for the performance of the road network in each of the modelled scenarios across both the morning and evening peak periods. This is demonstrated by the improvements to network statistics such as average speed, delays and vehicle hours travelled
- The proposal would result in improved outcomes for the road network as the increased capacity would cater to a higher volume of vehicles, while also maintaining faster travelling speeds for motorists
- The operational performance at the main intersections in the study area shows a generally improved level of service because of the proposal
- The provision of an additional lane and central median with a solid barrier requiring the closure of existing breaks in the median would result in improved safety outcomes for all road users as it would improve traffic flow, remove dangerous merging and U-turn locations resulting in more controlled movements. This is expected to reduce rear end crashes and run-off-road crashes.

The proposal would assist in easing congestion on Maitland Road as confirmed by traffic modelling completed for the Traffic and Transport Assessment completed for the proposal and included as Appendix P and summarised in Section 6.6 of the REF.

Maitland Road is one of the main arterial roads into Newcastle and has an existing speed limit of 80 kilometres per hour that would be maintained by the proposal. The management of speeding on the road is the responsibility of the police. In addition, there are two existing speed cameras located on either side of Maitland Road near to Ironbark Creek Bridge that are intended to deter speeding, and these would be maintained as part of the proposal.

2.7.2 Emergency vehicle access

Submission number(s)

22, 27, 30.

Issue description

Three respondents were concerned about access for emergency vehicles to Shamrock, Fenwick, and Merchant Streets associated with the proposed traffic conditions and increased traffic on Shamrock Street.

Response

Due to the proposal including six lanes of traffic with 16 per cent heavy vehicles, and traffic speed of 80 kilometres per hour a solid median barrier is required for the safety of road users. This median would block any cross-carriageway movements and provide protection for cross carriageway head on collisions. Residents are concerned about the closure of the median and the impact this might have on emergency vehicle access and travel time. However, there would be no change in travel time for emergency vehicles travelling northbound from Newcastle or from the nearest ambulance station which is in Jesmond to residential properties in Hexham. For emergency vehicles travelling southbound on Maitland Road the closest ambulance station is in Beresfield and there would an additional 290 metres of travel for vehicles to

access Shamrock Steet where they could potentially do an emergency U-turn at the traffic lights under emergency vehicle lights and siren with road users clearing the way. Total additional travel distance would be 580 metres.

2.7.3 Footpaths, bicycle access and bus stops

Submission number(s)

14, 18, 31.

Issue description

Three respondents made requests regarding footpaths and bus stops, including:

- That the proposal include a separate bicycle lane
- That footpaths be constructed as residents currently have to walk through long grass along the side of the road to access local bus stops and people on mobility scooters have to use the road shoulder making it extremely dangerous for them
- That the proposal provide methods for stopping motorists using the footpath to access Maitland Road
- That shelters are constructed at bus stops in Hexham.

Response

The existing cycle network in the REF area is facilitated by Maitland Road shoulders which provide dedicated on road bike paths for most of the study area. There is an off-road cycle path northbound from Hexham Railway Station to the northbound on-ramp of the A1 Pacific Highway and another off-road shared use path on the eastern side of Maitland Road from the A1 Pacific Highway and Maitland Road intersection to a pedestrian crossing at Old Maitland Road and another one on the northern side of Newcastle Inner City Bypass on the approach to the intersection of the Newcastle Inner City Bypass and Maitland Road.

The proposal includes a dedicated two metre-wide shoulders for cyclist which would improve cycle connectivity through the study area and encourage an increased mode share to cycle. This bike lane would not be separated from the roadway.

The proposal as described in the REF also includes changes to the cycling network (refer to **Appendix A**) in the following locations which would be separated from the roadway:

- A new 300 metre long bicycle lane on the northern side of Newcastle Inner City Bypass on the approach to the Maitland Road intersection
- The short cycle lane at the east approach to the A1 Pacific Highway and Maitland Road intersection would be removed. This would be replaced with off-road provisions at the intersection which would connect to the off-road shared path located on the eastern side of Maitland Road between the A1 Pacific Highway and Maitland Road intersection and the Old Maitland Road (north), the rail access maintenance road and Maitland Road intersection
- The dedicated-on road cycle lane at the northern approach to the A1 Pacific Highway intersection and Maitland Road would be removed. A shoulder would be provided at the intersection for southbound cyclists to use

- A new 900 metre shared user path along Maitland Road on the western side of Maitland Road north of the Oak Factory access road and Maitland Road intersection.

Transport also notes that the City of Newcastle has recently approved the new Richmond Vale Rail Trail between Shortland to Tarro and Pambalong that provides an off-road cycleway through Hexham Swamp, refer to DA2020/00641. This new cycle way is an off road, alternate cycle route that cyclists could seek to use.

Upgraded pedestrian crossing facilities are also included in the proposal at some of the signalised intersections along Maitland Road, including:

- Across the eastbound and westbound lanes of the Newcastle Inner City Bypass and across the northbound travel lanes of Maitland Road
- Across the north bound and southbound Maitland Road travel lanes to the north of the U-turn crossing near Calvary St Joseph's Retirement Community entrance
- Across the northbound access road into Sparke Street
- At Shamrock Street intersection across the northbound and southbound Maitland Road travel lanes and across the eastbound and westbound Shamrock Street travel lanes
- At Old Maitland Road (south) intersection across the northbound and southbound Maitland Road travel lanes
- At the A1 Pacific Highway intersection across the northbound and southbound Maitland Road travel lanes and across the A1 Pacific Highway travel lanes into Newcastle
- At the Oak Factory access road, two signalised pedestrian crossings are proposed and includes one across the northbound access road into the Oak Factory and one across the eastbound and westbound travel lanes of the Oak Factory access road and the Maitland Road intersection.

These changes to the pedestrian network would improve connectivity, improve desire lines and provide safer access to bus stops, Hexham Railway Station and adjacent commercial and industrial properties. These improvements are displayed in Figure 5.12 of the Traffic and Transport Assessment.

In response to submissions received, Transport have also included, a new one kilometre long pedestrian footpath from Shamrock Street to the Old Maitland Road (south), Hexham and Maitland Road intersection on the western side of Maitland Road which will connect to the existing traffic signals and bus stops, refer further to **Section 4.1**.

The proposal generally includes new SA or SF kerbs where footpaths are proposed, and this should assist in minimising intentional and unintentional use of footpaths by motor vehicles. Further discussion on kerbs including a description of the location of where upgrades occur as part of the proposal is included in **Section 2.7.8**.

Bus stops located along the proposal and modifications to these as part of the proposal are shown in **Appendix A** and described in **Table 2.4**.

Table 2.5 Bus stop locations and proposal modifications

Bus stop	Proposal impacts	Description
Bus Stop 1	No change	A new bus stop would be constructed on the western side of Maitland Road for northbound buses about 50 metres north Newcastle Inner City Bypass and Maitland Road intersection.

Bus stop	Proposal impacts	Description
Bus Stop 2	New	An existing bus stop is located about 200 metres to the north of the Newcastle Inner City Bypass and Maitland Road intersection on the eastern side of the road next to southbound traffic, there would be no change to this bus stop from the proposal.
Bus Stop 3	Relocated	The existing bus stop located on the eastern side of the southbound travel lanes of Maitland Road opposite Calvary St Joseph's Retirement Community would be relocated about 70 metres to the south. The relocated bus stop would provide better connectivity to the pedestrian operated signals to the north of the U-turn facility in the road median and the Calvary St Joseph's Retirement Community. This bus stop has a new bus shelter (A) included as part of the proposal.
Bus Stop 4	Existing	The existing bus stop to the south of the St Vincent's Retirement Community Village driveway access on Maitland Road on the western side of the road next to northbound travel lanes would not be impacted by the proposal.
Bus Stop 5A and Bus Stop 5B	Existing	Two existing bus stops located to the north of the Shamrock Street and Maitland Road intersection next to McDonalds on the western side of the road next to northbound traffic. The northern bus stop is for overflow bus traffic and has a new bus shelter (C) included as part of the proposal. There would also be some minor changes to the kerb and gutter and footpath near these two bus stops as part of the proposal.
Bus Stop 6	Relocated	The existing bus stop located immediately to the north of the Shamrock Street and Maitland Road intersection on the eastern side of the road next to southbound traffic would be relocated about 50 metres to the south of the intersection. This bus stop has a new bus shelter (B) included as part of the proposal and would provide better connectivity to the signalised pedestrian crossing at the Shamrock Street and Maitland Road intersection.
Bus Stop 7	Removed and integrated	The bus stop located on Maitland Road to the east of southbound traffic opposite Fenwick Street would be removed and integrated into Bus Stop 6 located about 340 metres to the south between Shamrock Street and Millams Road.
Bus Stop 8	Relocated	The existing bus stop to the north of the Old Maitland Road (south), Hexham and Maitland Road intersection opposite the Hexham Bowling Club on the western side of the road next to northbound traffic would be relocated about 150 metres to the south so it is immediately to the north of the intersection. This would provide better connectivity to the signalised pedestrian crossing at the intersection and Hexham Bowling Club.
Bus Stop 9A and Bus Stop 9B	Existing	Two existing bus stops located to north of the Old Maitland Road (south), Hexham and Maitland Road intersection next to the Hexham Bowling Club on the eastern side of the road next to southbound traffic. No changes are proposed as part of the proposal.
Bus Stop 10	Removed	The bus stop on the western side of Maitland Road opposite property 338 would be removed.
Bus Stop 11	Relocated	The existing bus stop on the eastern side of Maitland Road near the Hexham Station would be relocated to the south of the Old Maitland Road (north), Hexham, Hexham Station access road and Maitland Road intersection. The bus stop is next to Hexham Station on the eastern side

Bus stop	Proposal impacts	Description
		of the road alongside southbound traffic and has a new bus shelter (D) included as part of the proposal.
Bus Stop 12	Relocated	The existing bus stop on the western side of the Old Maitland Road (north), Hexham Station access road and Maitland Road intersection opposite Hexham Station would be relocated about thirty metres from the northern side of the access road to the southern side of the access road. This bus stop is on the western side of the road next to northbound traffic has a new bus shelter (E) included as part of the proposal.

2.7.4 Old Maitland Road

Submission number(s)

26, 30, 31, 32.

Issue description

Four respondents made comments about Old Maitland Road in Hexham including:

- Requests that a right turn exit lane be installed at Old Maitland Road (south) near the Hexham Bowling Club so vehicles do not have to drive into Shamrock Street to do a U-turn
- Concern that the U-turn facility proposed on Old Maitland Road will not help local traffic flow near the Hexham Bowling Club and will create congestion
- Concern about traffic and existing use of Old Maitland Road by heavy vehicles (including B-doubles). Queries how this will impact on the safety and efficiency of the Old Maitland Road U-turn facility
- Notes that Old Maitland Road is sometimes used as a detour when there are accidents on Maitland Road. Queries how residents are supposed to use the U-turn facility when it is blocked by traffic.

Response

The inclusion of a right hand turn at the Old Maitland Road (south) and Maitland Road intersection would not prevent traffic using Shamrock Street as the proposed U-turn facility on Shamrock Street is required to allow access to residential properties between Fenwick Street and Clarke Street for traffic travelling southbound on Maitland Road due to the closure of the break in the median at Fenwick Street.

Analysis undertaken using the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002) as detailed in Section 5.3.7 of the Traffic and Transport Assessment has estimated that about 45 additional vehicles would be required on Old Maitland Road to access the U-turn facility. This is not considered a significant increase in traffic flow and the Old Maitland Road (south) and Maitland Road intersection would continue to operate at a satisfactory level of service.

It is noted that along the section of road where the U-turn facility is proposed on Old Maitland Road that 19 metre long semi-trailers may transit, in addition traffic speeds along this section of road are 60 kilometres per hour. Traffic analysis has shown that provided all road users abide by the road rules that the safety and efficiency of the Old Maitland Road U-turn facility is acceptable.

With the additional lane and shoulder between Old Maitland Road North and Old Maitland Road South, this would reduce the chance of a full closure of the southbound carriageway in the event of an accident. Should this be the case and Old Maitland Road is closed due to an accident on Maitland Road, police and traffic control would be in use to safely manage the detour.

2.7.5 Parking and property access

Submission number(s)

20, 23, 26, 27, 29, 30, 31, 32.

Issue description

Eight respondents raised some issues about parking and property access, including:

- Residents already have issues exiting and entering their driveways on Maitland Road and currently use the road shoulder to access. Concerned that the shoulder would be removed as part of the proposal reducing property access safety. Queries what measures would be put in place to ensure safe access
- Concern about the loss of kerbside parking from the construction of the Shamrock Street U-turn facility for residents and visitors as off-street parking is already tight
- Requests further information on any impact to traffic using the property access into the Coles Express Service Station off Maitland Road and any potential effect of the relocated bus stop on Maitland Road.

Response

A two metre road shoulder still exists along Maitland Road that residents can use to access driveways on Maitland Road. While there are some areas long the proposal where the kerb will be modified (refer to **Section 2.7.8**), the edge of pavement would not be relocated and largely remains in its existing location. Consequently access to properties would remain largely unchanged, except for the three properties to the south of Shamrock Street on the western side of Maitland Road. In this location the informal dirt road to the west of the existing road that currently provides access to properties 15, 17, 19 Maitland Road, Hexham would be removed and replaced with driveways that connect directly to Maitland Road, refer to **Appendix A**.

A small amount of on street parking would be lost as part of the proposal for a 50 metre section of the road on Shamrock Street which would equate to a loss of about four to five parking spaces. On road parking spaces are still available for about 15 vehicles on Shamrock Street. Alternatively residents would have to park on their properties.

The construction of the U-turn facility on Shamrock Street and removal of parking on the northern side of Shamrock Street would potentially assist some residents entering and exiting their driveways on the southern side of Shamrock Street as there would be no cars parked where the U-turn facility is proposed on the northern side of the road.

On Maitland Road near to Shamrock Street, there is very little change to the existing situation. However the edge of pavement would move about 0.7 metres to the west on Maitland Road between Shamrock Street and extend about seven metres north towards the first driveway access (entry) to the Coles Express Service Station. New kerb and gutter and footpaths would be created, and the configuration of the bus stop closest to the intersection of Shamrock Street and Maitland Road would change. There would be no

changes to the configuration of the northern bus stop in this location, which is used for overflow bus traffic, consequently there is still adequate space for motorists to decelerate to enter the service station.

2.7.6 Closure of median and right turn capacity at Millams Road and Fenwick Street

Submission number(s)

2, 8, 12, 13, 22, 24, 25.

Issue description

Seven respondents raised concerns about the closure of medians as part of the proposal including:

- Concern about the change in access to Ash Island for recreational users. Suggests that a merge lane should also be included when exiting Ash Island
- Concern about increased travel time associated with the closure of the median and the use of the proposed U-turn facility at Shamrock Street during busy times.
- Queries how the change in access to Fenwick Street and Merchant Street will impact on emergency response times
- Closure of the Fenwick Street turning lane will make it more difficult to access properties on Merchant Street and queried where they would turn to travel south

Response

Currently people wanting to access Ash Island via Millams Road can either turn left in off Maitland Road heading southbound or utilise the right hand turn bay to select a safe gap and cross two lanes of traffic if heading north. However, with the implementation of the proposal, the increase in travel lanes from four lanes to six lanes on Maitland Road would reduce the opportunities to pick a safe gap in traffic. Furthermore, based on the high volumes of traffic and significant percentage of heavy vehicles using Maitland Road, a central, continuous median barrier is required for the safety of all road users. It would not be safe to allow an uncontrolled turn movement across Maitland Road in this environment and would require the closure of the gap in the median at Millams Road and Fenwick Street and inclusion of U-turn facilities at Sparke Street, Shamrock Street and Old Maitland Road. The inclusion of the solid safety barrier to separate northbound and southbound traffic would improve safety and prevent cross carriageway accidents but would mean some residents in Hexham would be required to add distance to their trips.

The new access routes for northbound traffic at Millams Road is as follows:

- Vehicles travelling northbound would have to travel an additional 600 metres and would be required to use the new Shamrock Street U-turn facility and existing signalised intersection to access Millams Road from the southbound travel lanes of Maitland Road
- Vehicles leaving Millams Road and seeking to travelling north towards Maitland would have to use the new Sparke Street U-turn facility located to the south of Millams Road to access northbound travel lanes on Maitland Road. The whole detour would be about 1.5 kilometres.

Both these movement are via existing signalised intersections and offer the safest solution for road users.

A merge lane exiting Millams Road southbound would not be feasible due to the limited space on the eastern side of Maitland Road to accommodate this as the road is very close to the banks of the South Channel Hunter River in this location. The existing exit would remain in its current location, with vehicles

required to pick a safe gap in the traffic, which is made easier when the traffic signals stop the southbound lanes on Maitland Road.

There is currently no right turn access into or out of Merchant Street as this is blocked by a grassed median. The median on Maitland Road at Fenwick Street would be closed and the right turn into and out of Fenwick Street would be removed. Access to Fenwick Street would be left in and left out only. The closure of the median at Fenwick Street would require additional travel distance and travel times for southbound vehicles and residents of Fenwick Street, Merchant Street and Clarke Street of:

- About 840 metres for vehicles travelling from the north using the southbound lanes of Maitland Road as vehicles would be required to Shamrock Street U-turn facility to turn around
- About 1.4 kilometre for vehicles travelling north and seeking to travel south on Maitland Road as vehicles would be required to use the Old Maitland Road U-turn facility to turn around.

Travel time for the changed access routes would vary according to the time of day. The closure of the median at Fenwick Street would impact all residential properties located to the west of Maitland Road and north of the service station (refer to Figure 5.16 of the REF).

Traffic analysis has estimated that there would be about 45 vehicles per day using Shamrock Street to turn around but as traffic counts shows that there are already 2,150 vehicles per day using this street, as such impacts are considered minor, refer further to **Section 2.7.9**.

Emergency vehicle access and the timing of detours are discussed in **Section 2.6.2**.

2.7.7 Road surface and level

Submission number(s)

5, 20, 31.

Issue description

Three respondents raised concerns about the road surface and road levels of the proposal which include:

- A request to replace the concrete section of Maitland Road near Hexham Bridge as well as the northbound approaches to the bridge over the Hunter River as these are old and in poor condition
- Concern that the road level of Shamrock Street would be raised as part of the proposal and that during flood events there will be additional impacts on the properties downstream of the raised road area
- Questions if adequate drainage is being provided if the road level is raised.

Response

Transport would be upgrading road surfaces on Maitland Road where required as part of the proposal. Replacement of poor condition concrete pavement is part of the current scope; however, the extent will be determined during detail design. Upgrading of local road surfaces would also occur as part of the proposal and would include milling and resurfacing with about 50 millimetres of new asphalt at:

- Sparke Street from the intersection with Maitland Road and extending to the tie-in with the new full depth pavement for a small section of the Sparke Street U-turn facility

- Shamrock Street from the intersection with Maitland Road and extending to the tie-in with the new full depth pavement for the Shamrock Street U-turn facility
- The southern end of Old Maitland Road Hexham from the intersection with Maitland Road to the south of the Hexham Bowling Club and extending to the tie-in with the new full depth pavement for the Old Maitland Road U-turn facility
- The northern end of Old Maitland Road, Hexham from the intersection with Maitland Road opposite the Hexham Railway Station and extending to the driveway entrance to Diesel Pro. Old Punt Road and the second connection to Old Maitland Road would also be resurfaced with 50 millimetres of asphalt.

Pavement design drawings have been included as **Appendix C**.

The proposal aims to match the exiting surface levels wherever possible. Transport would not be raising any of the houses located on Shamrock Street as these houses are located on the flood plain and are already flood affected in their current, existing situation, refer further to **Section 2.5**.

Transport will include the following new mitigation measure number FL9 (refer further to **Section 6.2**), in response to comments:

During detail design, Transport will review flooding impacts and where required design mitigation measures such as changes in drainage would be investigated to minimise impacts on localised flooding.

2.7.8 Safety

Submission number(s)

2, 7, 16, 20, 22, 23, 24, 26, 29, 30, 31.

Issue description

Eleven respondents raised concerns about road safety associated with the proposal including:

- Vehicles leaving the travel lanes and crashing into private property
- Concern about traffic safety as the traffic lanes design are 3.2 metres wide and not 3.5 metres wide as per the standard for 80 kilometre per hour roadways
- Concern about road safety associated with increased traffic that will occur with the widening of Maitland Road from four lanes to six lanes
- Concerned that Hexham currently experiences severe traffic issues and suggests there are weekly motor vehicle accidents
- Questions what measures will be put in place to ensure pedestrian safety when playing or walking to local facilities and public transport
- Objects to the widening of roads as Maitland Road as believe it will encourage speeding
- Concerned that customers of Coles Express (Truck Stop area) and McDonalds do not always give way to local traffic when exiting (and sometimes entering) these business premises which is dangerous for Shamrock Street residents
- Requests further information on safety concerns in relation to all the proposed changes near the Coles Express Service Station and the Shamrock Street U-turn facility.

Response

As discussed in the Traffic and Transport Assessment, Maitland Road is one of the main arterial roads connecting Newcastle to the Hunter Valley. Maitland Road is also recognised as the Pacific Highway to the east of the A1 Pacific Highway and Maitland Road intersection and is recognised as the New England Highway and the A1 Pacific Highway to the west of the intersection. As a major State road, it is subject to high traffic volumes which are summarised in Table 4.2 of the Traffic and Transport Assessment included as Appendix P of the REF. As part of the traffic and transport assessment, available crash data was reviewed and found that there were 18 instances in the past 5 years where crashes occurred due to an off-road movement on a straight sections of road and hitting an object as a result. This accounted for 10 per cent of total crashes during the study period. To manage off-road and on-road accidents, the concept design has been developed based on relevant Australian Standards and road design guidelines which includes consideration of the road geometry including the horizontal curves, road surface and road speed to ensure that the road is safe for the design speeds.

A solid central median safety barrier would be installed as part of the proposal which would assist in cross carriageway and cross intersection accidents. The inclusion of an additional lane in each direction also contributes to improving safety for the section of Maitland Road being upgraded for the proposal.

For most of the proposal length the current kerb alignment would not be shifting from its existing alignment and as such would not be shifting the road closer to properties. The road widening for the additional lanes would occur in the existing grass median and the eastern, southbound shoulder. Small sections of kerb would be upgraded where there are upgrades of intersections or at the new bus stop or four relocated bus stop locations and this would provide some pedestrian protection. New kerbs are shown in **Appendix D**.

Transport has designed the travel lane widths in accordance with the relevant road design standards, project and environmental constraints. The proposal is highly constrained by utilities existing residential and industrial infrastructure on the west and by the Hunter River and the South Channel Hunter River on the east. Generally, the road design along the proposal has been designed to account for the expected vehicle use for each lane as follows:

- The northbound outside lane i.e. the slow lane is 3.3 - 3.8 metres wide along the proposal length as it also has a two metre road shoulder that can be accessed if required
- The northbound middle lane is between 3.4 to 3.9 metres wide to accommodate heavy vehicles
- The northbound inside lane (i.e. closest to the median) is between 3.2 - 3.6 metres wide along the proposal length.
- The southside outside lane (i.e. slow lane) is 3.3 to 3.8 metres wide along the proposal length as it also has a two metre road shoulder that can be accessed if required
- The southbound middle lane is between 3.0 to 4.0 metres wide to accommodate heavy vehicles
- The southbound inside lane (i.e. fast lane) i is between 3.1 to 3.6 metres wide along the proposal length.

The Traffic and Transport Assessment has identified that there are some existing heavy traffic conditions on Maitland Road in Hexham. Shamrock Street and Old Maitland Road currently experience higher traffic volumes compared to the lower volume traffic numbers on Fenwick Street, Merchant Street and Clarke Street. This is due to Shamrock Street and Old Maitland Road having businesses and infrastructure access points located on them that are utilised by customers and heavy vehicles. Transport has maintained the edge of pavement on the eastern side of Maitland Road in Hexham and the large, grassed verge remains accessible for pedestrians separating private properties from the roadway. Footpaths have been provided to bus stops as part of the proposal that will improve pedestrian safety. In addition a one kilometre long new footpath is proposed on the western side of Maitland Road between Shamrock Street and extending north to the intersection with Old Maitland Road (south), Hexham, refer further to **Section 2.7.3** and **Section 4.1**. Two metre road shoulders have also been included in the proposal and these are also identified as an

unpainted bicycle route. Some off-road cycle paths are included in the proposal and these are discussed in **Section 2.7.3**.

Transport have developed the design to reduce congestion and improve road safety where possible. Traffic analysis undertaken for the assessment indicate that there would be about 45 additional vehicle movements a day on Shamrock Street that equates to around two per cent of the existing traffic volume and is not considered to be significant, refer further to **Section 5.3.7** of the Traffic and Transport Assessment and **Section 2.7.9** of this Submissions Report.

The proposal has been designed according to relevant road safety standards to allow road users to following existing road rules. Concerns about driver behaviour on Shamrock Street should be directed to the NSW police.

Transport would continue to consult with Coles Express Service Station on the acquisition of Lot 1, DP623278 and any safety concerns they may have about changes in access during construction and operation of the proposal.

2.7.9 Shamrock Street – traffic volume and congestion

Submission number(s)

16, 20, 22, 23, 26, 27, 32.

Issue description

Seven respondents raised comments regarding traffic volume and congestion on Shamrock Street including:

- Residents of Shamrock Street already experience high volumes of traffic which is exacerbated by heavy vehicle use (including heavy vehicles from the Infrabuild Recycling Centre) and suggest that a right turn at Sparke Street be provided for heavy vehicles to prevent them using Shamrock Street
- Customers access McDonalds and the Coles Express Truck Stop 24 hours per day and it would be beneficial for residents to reduce traffic flow
- A suggestion that a left hand exit be installed between Coles Express Service Station and McDonald's for northbound traffic onto Maitland Road in order to reduce traffic on Shamrock Street
- Shamrock Street is already narrow, busy and struggles with existing traffic flow making it dangerous for residents and children. Suggests that the proposed Shamrock Street U-turn facility would increase traffic and escalate existing traffic issues. Questions what will be done to ease traffic congestion for Shamrock Street residents.

Response

Shamrock Street currently receives non-residential traffic accessing businesses on the northern side of the street and the Main North Rail Line. This includes heavy vehicles accessing the Coles Express Truck Stop and the rail corridor and customers accessing McDonalds at the western end of the street and that this access occurs for 24 hours per day.

Traffic counts undertaken in March 2021 at the Shamrock Street and Maitland Road intersection indicate approximately 2150 vehicles currently use Shamrock Street daily. There would be a minor increase in traffic flow on Shamrock Street from the closure of medians along Maitland Road as part of the proposal. Extrapolating growth from 2017 traffic counts to 2021, it was found the model overestimates trips using

Shamrock Street by approximately 20 per cent, thus the model results for Shamrock Street can be viewed as conservative. Consequently, the closure of medians on Maitland Road is expected to lead to a two per cent increase in traffic movement on Shamrock Street which is not considered significant. The proposal would not change the proportion of existing Coles Express and McDonalds customers accessing Shamrock Street. However, during construction if workers seek to access McDonalds during meal breaks, refer further to **Section 2.2.3**.

The design of the proposed upgrades to Shamrock Street has taken into consideration road safety guidelines and standards, refer further to **Section 2.7.8**. Noise impacts associated with the proposal and mitigation measures proposed for noise affected sensitive receivers are also discussed in **Section 2.9.2**.

The suggestion to include a left turn exit out of McDonald's on the grassed area between McDonalds and the Coles Express Service Station would conflict with an existing bus stop and deceleration lane for the entry access into the Coles Express Service Station. This would cause a traffic conflict and would not result in a safe solution. In addition, there is no existing access between McDonalds and the Coles Express Service Station and as these are private properties and businesses, this is outside the scope of the proposal.

2.7.10 Shamrock Street – traffic light phasing

Submission number(s)

20, 23, 26, 27, 30, 32.

Issue description

Six respondents made comments regarding traffic light phasing on Shamrock Street including:

- Concern about the phase timing on Shamrock Street traffic lights
- Requests that these lights change more often to ease congestion on Shamrock Street and to provide better access for residents and emergency vehicles
- Concern that the length of time it takes to exit Shamrock Street will increase following the construction of the U-turn facility on Shamrock Street
- Requests that the traffic signal timing at Shamrock Street be reviewed to reduce queuing and to assist residents exiting and entering their properties in a safe and timely manner.

Response

Concern was raised about the length of time it currently takes to exit Shamrock Street and what the impacts from additional traffic associated with the proposed from the proposed U-turn facility. Currently the phasing of the signaling at the intersection favours traffic travelling on Maitland Road as this is where the majority of the traffic is travelling, approximately 55,000 vehicles per day compared to approximately 2,000 vehicles using Shamrock Street. Transport have however added the following new traffic and transport mitigation measure number TT10 (refer further to **Section 6.2**), to address this concern:

The traffic signal timing at the intersection of Maitland Road and Shamrock Street, would be reviewed as part of detailed design to see if any improvements in timing for drivers exiting Shamrock Street is feasible.

2.7.11 Shamrock Street – U-turn facility

Submission number(s)

16, 26, 27, 29, 30, 32.

Issue description

Five respondents made comments about the new U-turn facility on Shamrock Street and including:

- Concerns about the change in access and increased journey time associated with the new U-turn facility
- Concerns that the new U-turn facility will make it unsafe for children and will encourage reckless driver behaviour and will escalate existing issues on the street
- Concern that vehicle lights will shine into nearby home at night time when using the U-turn facility
- Concern about vehicles with caravans using the facility to turn around
- Requests further information on the need for the Shamrock Street U-turn facility and its impact on the land owned by Viva Energy, and any impact on the access of vehicles currently entering the site off Shamrock Street, through increased usage and vehicles turning
- Concern that the proposed U-turn on Shamrock Street will force excess water towards residents
- Concern the U-turn facility will impact on drainage and the Coles Express Service Station transpiration area (septic)
- The Shamrock Street infrastructure is in poor repair and not designed to carry extra traffic flow
- Concern was raised about heavy vehicles using Shamrock Street including customers accessing McDonalds, vehicles using the Coles Express Service Station Truck Stop and trucks from nearby industry using Shamrock Street to turn around.
-

Response

The Shamrock Street U-turn facility is required to allow residents living in Fenwick Street, Merchant Street and Clarke Street access to their properties when travelling southbound on Maitland Road as the proposal would remove the break in the median at Fenwick Street. The median is being closed at this location as the proposal includes a solid median barrier for the entire length of the works to improve road safety by preventing cross carriageway accidents. Furthermore, an uncontrolled turning movement across three lanes at a speed limit of 80 kilometres per hour is not permissible for the safety of all road users. The Shamrock Street U-turn facility is also required to allow vehicle access for northbound traffic seeking to access Ash Island Bridge and Kooragang Island following the closure of the median at Millams Road. U-turn facilities have also been included in the design at Sparke Street, and Old Maitland Road to enable road access for Hexham residents and vehicles seeking to access Ash Island Bridge and Kooragang Island, refer further to **Section 2.7.6**.

The closure of the breaks in the median on Maitland Road as part of the proposal would result in a change in access for residents along Maitland Road between Fenwick Street and Clarke Road and for northbound vehicles seeking to access Millams Road. Travel distances and times would increase as part of the proposed detours and further discussion is included **Section 2.7.6**. Road modifications included in the proposal are made in accordance with relevant road safety guidelines, refer further to **Section 2.7.8**.

Transport do not enforce the road rules or have control over driver behaviour. Reckless driving or breaches of the road rules should be reported to the NSW Police.

The proposed U-turn facility may cause additional light spill to residents on Shamrock Street. However, there would be little change from the existing environment as heavy vehicles would already be exiting the Truck Stop located at the back of the Coles Express Service Station and this driveway is located immediately to the east of the exit of the proposed U-turn facility and light spill caused during the left turn manoeuvre would impact on the same three properties. As such there would be a minor increase in light spill from turning vehicles in this location.

The new U-turn facilities at Sparke Street, Shamrock Street and Old Maitland Road, Hexham have been designed to cater for vehicles up to 19 metres (i.e. a semi-trailer) in size and that this would be suitable for many vehicles towing caravans to access. The U-turn facility would make it a much safer turn around for vehicles towing caravans as this would minimise the need to reverse, making it much safer for all road users.

The construction of the proposed Shamrock Street U-turn facility would require the acquisition of about 424 square metres of private land (Lot 1, DP623278), which forms part of the larger Coles Express Service Station property immediately to the south of the rear Truck Stop access. The Shamrock Street U-turn facility would not impact on the operation of the business, specifically the access for heavy vehicles into the rest area accessed off Shamrock Street at the back of the service. A separate submission has noted that the Coles Express Service Station has a sewage transpiration pit on this lot and Transport would need to obtain further information from Viva Energy on this issue which would be reviewed in detailed design. Further discussion on the impacts of the Shamrock Street U-turn facility on drainage is included in **Section 2.5.1** of this Submissions Report.

The road surface of Shamrock Street would be upgraded as part of the proposal between the intersection and the proposed U-turn facility and has been designed to cater for heavy vehicles that access the Truck Stop area at the back of the Coles Express Service Station and the small increase in local traffic having to use Shamrock Street to turn around following the closure of the median at Millams Road and Fenwick Street.

Transport has contacted the EPA and Newcastle Council to make them aware of heavy vehicles using Shamrock Street to turn around from the neighbouring industrial businesses.

2.7.12 Sparke Street

Submission number(s)

20, 22, 23, 26, 27, 28, 30, 31, 32

Issue description

Nine respondents raised issues about Sparke Street including:

- A request that a right-hand turn exiting Sparke Street Hexham be constructed as it would be beneficial to reduce impacts and ease the traffic at Shamrock Street Hexham, including heavy vehicle use and would remove the need for a U-turn facility on Shamrock Street
- Not clear whether the drainage swale located along the Sparke Street U-turn facility will impact on the curtilage of private property and concerned that the U-turn facility at Sparke Street will restrict property access and street frontage to Lot 3 DP874409 and impact on future development opportunities

- Questions whether the U-turn facility will restrict the existing access to the return located to the south of the electrical sub-station
- Concern the U-turn facility on Sparke Street would encourage more general traffic use, potentially causing traffic conflicts between passenger vehicles and heavy vehicles including 26 metre B-Doubles.

Response

The suggestion to include a right turn lane out of Sparke Street for heavy vehicles would adversely impact on southbound traffic flow along Maitland Road as there are no existing right turn movements out of this intersection currently. In addition, the inclusion of a right turn out of Sparke Street would not reduce the need for a U-turn facility on Shamrock Street as this is required to provide access for Hexham property owners travelling southbound on Maitland Road and for northbound traffic seeking to access Millams Road.

The drainage swale located along the southern side of the Sparke Street U-turn facility would not impact on the curtilage of private property as all work is in the road reserve. The proposed Sparke Street U-turn facility and associated drainage swale would take up about 40 metres of the road corridor within Sparke Street. Around 180 metres of the northern boundary of Lot 3 DP874409 is available for future access, providing street frontage and enabling future development opportunities.

The return located to the south of the electrical sub-station was closed as part of developer funded works to upgrade the intersection to traffic signals and is no longer the legal access of Sparke Street and consequently would be unlikely to be accessible for future developments.

Additional traffic use of the proposed Sparke Street U-turn facility is only required for traffic exiting Millams Road and heading northbound which is anticipated to be a very small number of vehicles i.e. about 10 - 20 vehicles per day. Consequently, traffic conflicts, including conflicts between passenger vehicles and heavy vehicles such as 26 metre B-Doubles would be minimal provided all road users abide by the road rules.

2.8 Heritage

2.8.1 Heritage values

Submission number

22.

Issue description

One respondent raised concerns over potential impacts to heritage items and values due to the proposal.

Response

A Statement of Heritage Impact (SOHI) has been completed to assess impacts to non-Aboriginal heritage for the proposal and has been included as Appendix J of the REF and summarised in Section 6.8 of the REF.

There are eight non-Aboriginal heritage items, listed on the Newcastle Local Environmental Plan 2012 (LEP), and one item identified as part of the heritage assessment that is located close to the REF area:

- Sandgate Cemetery (LEP item # I516)
- 2HD Studios (LEP item # I519)
- Ironbark Creek crossing point
- Former Travellers Rest Hotel (LEP item # I177)
- Hexham Railway Station (LEP item # I332)
- Hexham Bridge (LEP item # I187)
- Oak Factory (LEP item # I178)
- Hannel Family Vault (LEP item # I179)
- Hexham Shipbuilding Yard (LEP item # I180).

There would be direct physical impacts to one item of local significance (Ironbark Creek crossing point) during the construction of the proposal in the REF area as part of the installation of the new Ironbark Creek Bridge and the demolition of existing Ironbark Creek Bridge. The Ironbark Creek crossing point is not currently listed under the LEP and is considered an archaeological work of local significance that would be archivally recorded and managed in accordance with Transport's *Cultural Heritage Guideline*.

Potential impacts may also occur during construction due to inadvertent impacts from construction plant to four of the listed heritage items. In addition, there may also be indirect impacts from vibration during construction to five of the listed heritage items according to minimum safe working distances for vibration identified in the *Construction Noise and Vibration Guideline* (Transport for NSW, 2016).

An assessment of impacts to Aboriginal heritage has been carried out in accordance with Stage 3 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime Services, 2011) (PACHCI), and is summarised in Section 6.7 of the REF. The proposal would not impact on any tangible Aboriginal sites or items but is located within areas identified as having Aboriginal cultural values. This includes the three cultural value items identified as the Burraghihnbihng Wetlands, Hunter River and estuary islands, and Water Spirit (Bunyip or Wau-wai, Yaa-hoo or Wowee Wowee). An Aboriginal cultural heritage interpretation plan would be developed to promote understanding and awareness of the cultural values of the study area, including, but not limited to, development of interpretative signage.

2.9 Noise and vibration

2.9.1 Noise and vibration impacts

Submission number(s)

2, 16, 20, 22, 23, 24, 25, 26, 27, 30, 31.

Issue description

Eleven respondents raised concerns about noise and vibration, including:

- Residents already experience noise and house vibration from Maitland Road and Shamrock Street
- Concern about additional noise from the proposal and impacts associated with the increase in noise due to increased traffic flow
- Currently experience excessive noise and vibration impacts and concerned about the increases in noise and vibration from the proposal

- Concerns about psychological and physiological effects on sleep patterns impacting on an individual's performance and mental health from the proposed increase in noise during construction and operation of the proposal.

Response

The *Hexham Straight Widening Noise and Vibration Assessment* (SLR, 2021) (Noise and Vibration Assessment) was completed to assess noise and vibration from the proposal and is included as Appendix M of the REF and summarised in Section 6.9 of the REF.

Noise catchment areas (NCAs) relevant to the proposal and the location of sensitive receivers located along the proposal are shown in **Figure 2.1** below and discussed in Section 6.3 of the Noise and Vibration Assessment.

The Noise and Vibration Assessment found that existing background noise levels along the proposal are high with background noise levels at Hexham for residential receivers are between 43– 69 dBA during the day (7am to 6pm); between 44 – 57dBA during the evening (6pm to 10pm) and between 41 – 46dBA during the night (10pm to 7am). The noise assessment also confirmed the existing environment is subject to impacts from vibration from sources such as traffic passing on Maitland Road and the adjacent rail operations of the Main North Rail Line.

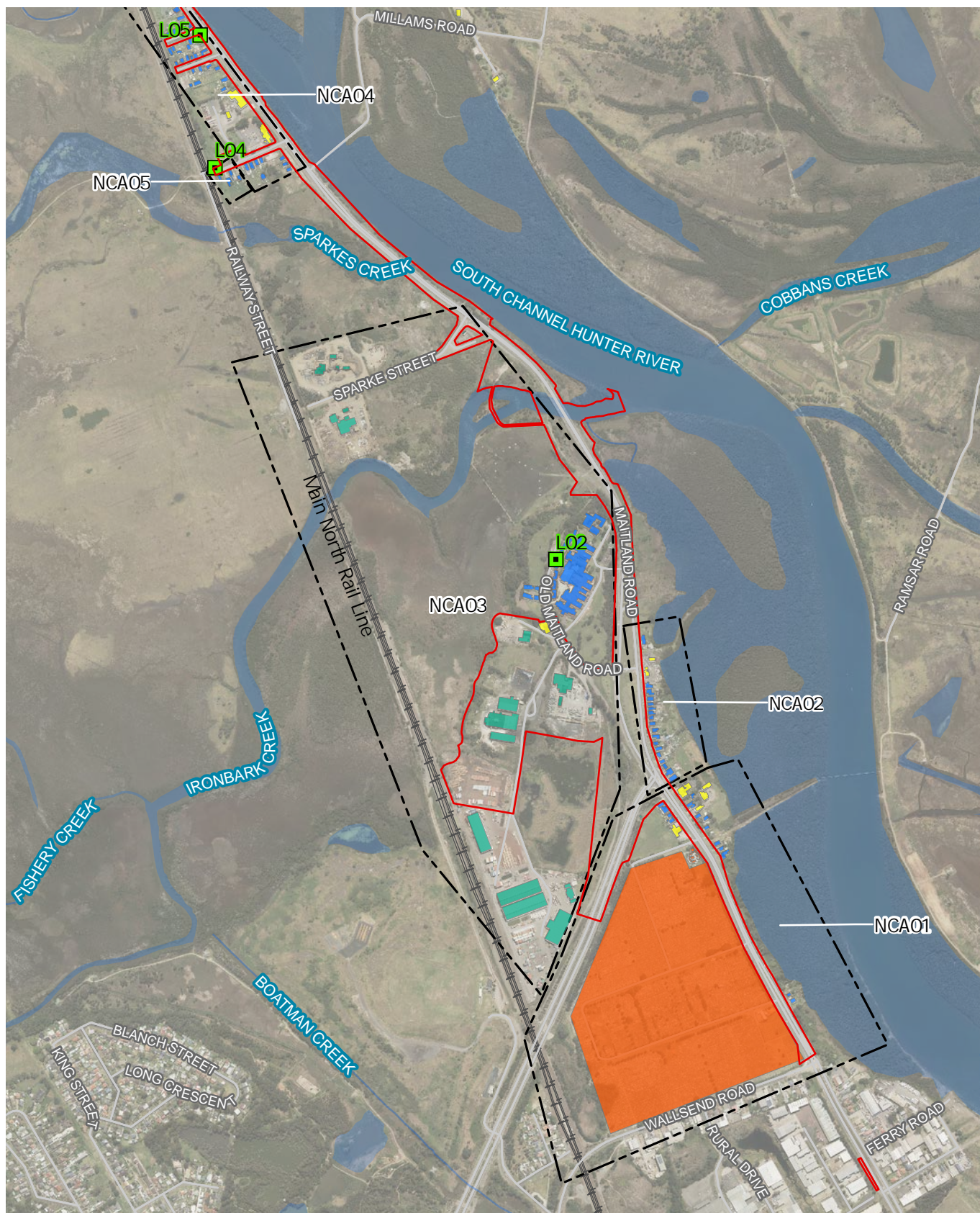
The Noise and Vibration Assessment found that there would be additional noise impacts to some residents during construction and operation of the proposal including from additional traffic flow. Where possible the proposal would be constructed during standard construction hours. However, many activities such as the bridge construction and demolition, utility relocation works, and civil works would be required to be carried out outside of standard construction hours due to safety and traffic disruption reasons.

Consultation would be carried out with the potentially affected receivers. Respite periods would be provided in accordance with Roads and Maritime Services, Construction Noise and Vibration Guidelines.

During construction, the main potential sources of construction vibration to sensitive receivers includes vibratory rollers and rockbreakers. Certain receivers in the study area are within the human comfort minimum working distance and occupants of affected buildings and may be able to perceive vibration impacts at times when vibration intensive equipment is in use. Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is nearby.

An assessment of sleep disturbance was undertaken as part of the Noise and Vibration Assessment. A review of the predictions shows that the sleep disturbance screening criterion is likely to be exceeded when night works occur near residential receivers. Noise mitigation is proposed for sensitive receivers that would be impacted by an increase in noise during construction and operation of the proposal to assist in reducing fatigue and other physical and mental health impacts associated with disturbance of sleep where practicable. A Construction Noise Management Plan would be developed as part of the CEMP to outline the feasible and reasonable mitigation measures to be implemented in certain circumstances during construction and would include monitoring and verification of noise impacts, notification and consultation to affected residents and the community for upcoming works and management measures proposed.

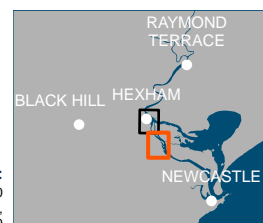
During operation, exceedances of the criteria are predicted at all NCAs due to cumulative limit exceedances and acute noise levels due to increases in traffic volumes over time. It is noted that an increase of more than 2.0 dB is not expected to any sensitive receivers. A total of 74 receivers are predicted to have exceedances of the operational road traffic noise criteria. Transport have identified potential mitigation measures to reduce these operational noise impacts. This includes at-property architectural treatments where reasonable and feasible and would be assessed on a case-by-case basis.



Date: 28/03/2022 Filename: IA301100_SubReport_F002_Noise_v1

Legend

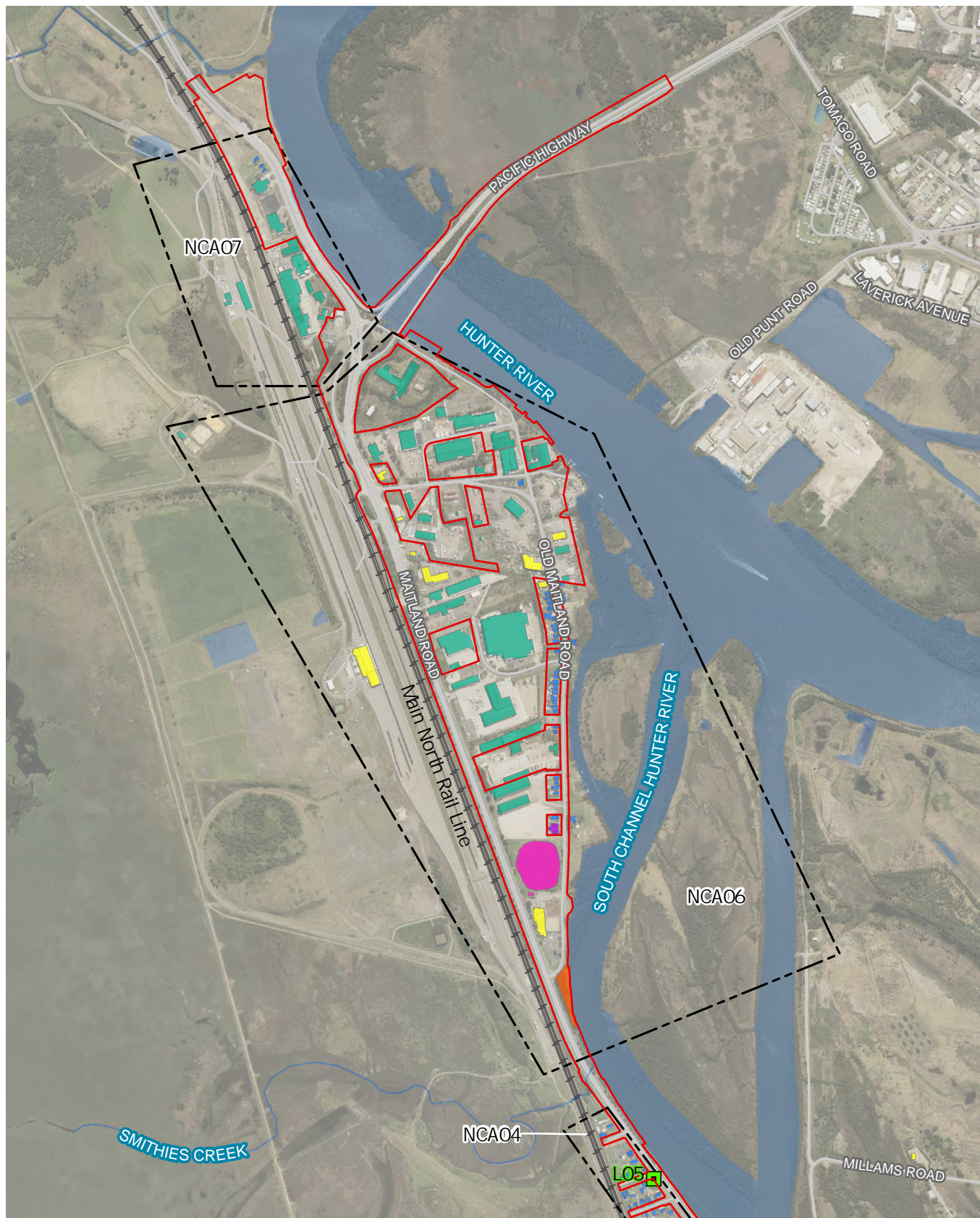
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|--|--|---|
| REF area | NCA boundaries | Waterway |
| Logger locations | Receiver types | Road |
| | Industrial | Railway |
| | Residential | |
| | Commercial | |
| | Other (Outdoor Passive) | |



Data sources:
 Jacobs 2020
 Department Finance,
 Services and Innovation 2020

Figure 2.1a Site plan, receivers and noise monitoring locations

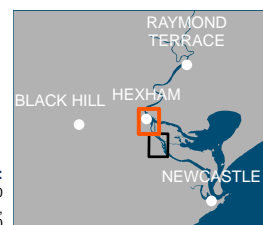
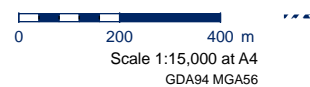
Hexham Straight Widening



Date: 28/03/2022 Filename: IA301100_SubReport_F002_Noise_v1

Legend

 REF area	 NCA boundaries	— Waterway
 Logger locations	Receiver types	— Road
	 Industrial	—+— Railway
	 Residential	
	 Commercial	
	 Other (Outdoor Active)	
	 Other (Outdoor Passive)	
	 Other (Place of Worship)	



Data sources:
 Jacobs 2020
 Department Finance,
 Services and Innovation 2020

Figure 2.1b Site plan, receivers and noise monitoring locations

Hexham Straight Widening

2.9.2 Noise mitigation

Submission number(s)

18, 20, 22, 23, 24, 25, 26, 27, 30, 31, 32.

Issue description

Eleven respondents raised concerns about noise and vibration mitigation, including:

- Questions if testing of noise levels would be undertaken regularly during operation of the proposal
- Questions what mitigation is proposed to residential properties to manage noise impacts and requests that adequate noise barriers be provided such as the supply and installation of:
 - High-density sound-proofing insulation batts
 - Sound proof noise barrier wall (fence) along the front of impacted properties
 - Glazed windows, doors, and wall insulation
 - Air tight windows and doors that are double glazed and have high-quality seals
 - Mechanical ventilation
- Request that their property on Maitland Road be relocated to the back of the property to reduce noise impacts
- Requested that alternate respite accommodation be provided during construction including for work that starts before 7am or finishes after 6pm weekdays and for work on weekends.

Response

A Noise and Vibration Assessment was completed for the proposal and is included as Appendix M of the REF and summarised in Section 6.9 of the REF.

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared to manage and mitigate construction noise impacts from the proposal and will form part of the Construction Environment Management Plan (CEMP). The CNVMP would be prepared in accordance with the *Interim Construction Noise Guideline* (DECC 2009) and Transports *Construction Noise and Vibration Guideline* (2016). The *Construction Noise and Vibration Guideline* identifies standard mitigation measures to be implemented as well as additional mitigation measures to be implemented in certain circumstances. Under the guideline alternative accommodation would be considered for residents living close to the construction works when they are likely to experience highly intrusive noise levels (as defined by the guideline). The offer of alternative accommodation is determined on a case-by-case basis and may consider other additional circumstances or impacts. The CNVMP would be implemented for the duration of construction.

A total of 74 sensitive receiver buildings/locations are predicted to have exceedances of the Noise Criteria Guideline (NCG) (Roads and Maritime Services, 2015) operational road traffic noise criteria and are therefore eligible for consideration of 'additional noise mitigation'. The receivers which have been identified as eligible for consideration of 'additional noise mitigation' (i.e. triggered receivers) are summarised in Table 6.56 of the REF and shown in **Table 2.5** below.

Table 2.6 Receivers eligible for consideration for 'additional noise mitigation'

NCA	Number of triggered buildings	
	Residential	Other sensitive
NCA01	12	1
NCA02	18	-
NCA03	4	-
NCA04	32	-
NCA05	1	-
NCA06	-	3
NCA07	3	-
Total	70	4

Operational noise and vibration mitigation measures will be confirmed during detailed design as part of the Operational Noise and Vibration Review (ONVR) in accordance with the Noise Mitigation Guideline (NMG) (Roads and Maritime Services, 2015).

Where feasible and reasonable, implementation of operational noise mitigation will be carried out within 12 months of construction activities commencing to provide attenuation to construction noise.

The Noise and Vibration Assessment has carried out a review of potential operational mitigation treatments including:

At-source mitigation:

- Quieter road pavement surfaces
- In-corridor mitigation:
 - Noise mounds
 - Noise barriers
- At-receiver mitigation:
 - Property treatments.

The assessment of noise barriers (in the form of walls or mounds) found that while they can provide significant noise reductions and also reduce both external and internal noise levels they can result in other impacts such as flooding, reduced access to property and utilities, visual impacts, overshadowing, changes to drainage, and safety concerns. For these impacts, noise walls or mounds were not considered a viable or practical option.

Noise barriers are typically most efficient when receivers are located at ground floor level. As the height of a receiver increases, the noise reduction from barriers reduces due to line of sight over the top of the barrier. Because of this, noise barriers are assessed using noise predictions at ground and first floor only, with at property treatment of individual dwellings being used for higher floors if necessary.

At-property mitigation is also considered the most reasonable noise mitigation strategy where receivers are not grouped together or where there is community preference for this measure.

At-property treatment typically involves using architectural treatments such as thicker glazing and doors, or upgraded facade constructions to achieve appropriate internal noise levels. Installation of boundary acoustic fences or walls close to the receiver can also be considered, which can have the benefit of reducing noise levels in outdoor spaces.

The architectural treatments provided are typically limited to:

- Fresh air ventilation systems that meet the National Construction Code of Australia requirements with the windows and doors shut
- Upgraded windows and glazing and solid core doors on the exposed facades of the substantial structures only (e.g. masonry or insulated weather board cladding with sealed underfloor). These techniques would be unlikely to produce any noticeable benefit for light frame structures with no acoustic insulation in the walls
- Upgrading window or door seals and appropriately treating sub-floor ventilation
- The sealing of wall vents
- The sealing of the underfloor below the bearers
- The sealing of eaves.

The operational noise mitigation treatments for the proposal would be confirmed during detailed design. At this stage in the proposal the preferred option is considered likely to be at-property treatment of eligible receivers.

Receivers that are identified as being eligible for at-property have been identified and will be assessed for treatment prior to the start of construction work that has the potential to affect them, where possible. Transport would consider architectural treatments to manage noise at noise affected sensitive receivers as described above however this would not include relocating houses.

Within the first year of operation, monitoring of operational noise levels would be undertaken and would be compared to predicted noise levels to verify the predictions and to determine the effectiveness of the noise mitigation measures. Additional feasible and reasonable mitigation will be considered at eligible receivers where measured noise levels are found to be significantly different from the predictions.

2.10 Socioeconomic, land use and property

2.10.1 Amenity

Submission number(s)

16, 20, 22, 24, 25.

Issue description

Five respondents had concerns about the impacts to amenity due to the proposal, including:

- Noise, traffic and dust amenity impacts during construction which can impact on health, wellbeing and livelihoods of nearby residents
- Impacts during construction and operation of the proposal
- Power and water outages during construction
- Request for a weekly street sweeper to keep curbs clear of excess dirt build-up during construction.

Response

Transport has completed the *Hexham Straight Widening Socio-economic, Land Use and Property Assessment* (Jacobs, 2021e) (Socio-economic, Land Use and Property Assessment) for the proposal, and this is included as Appendix Q of the REF and summarised in Section 6.10 of the REF. The Socio-economic, Land Use and Property Assessment has considered impacts during construction of the proposal to nearby sensitive receivers including noise and dust amenity impacts, and power and water outages. The assessment has found that these construction impacts would be temporary however mitigation measures have been proposed, including at-property architectural treatments for noise affected residents which would manage these impacts.

During construction, the proposal would have some temporary negative impacts including:

- Temporary changes to local amenity for local residents, particularly within outdoor areas
- Noise and light spill from night works, resulting in potential temporary impacts on night-time amenity at residential properties closest to these works and impacts on health and wellbeing due to sleep disturbance or disruptions to sleeping patterns
- Dust from construction activities, resulting in possible effects on the health and wellbeing of some people near to construction works who may be more sensitive to changes in air quality.
- Temporary disruptions of power and utility services during construction
- Increased construction traffic on roads and temporary changes in property access for the three residential properties located on Maitland Road to the south of Shamrock Street.

Impacts to local residents near to the proposal would be managed through the implementation of mitigation measures for noise and vibration, air quality, traffic and transport, and visual amenity. Access to residential properties will be maintained during construction and operation. A Community Communication Strategy will also be prepared for the proposal to facilitate communication with the local community, business, and other stakeholders.

Power outage and water outage are considered unlikely to occur as a result of the proposal and mitigation measures will be implemented to minimise potential impacts including NV3 and UT1 (refer to **Table 6.1**). Safety barrier systems will also be selected and implemented to improve safety while minimising impact on utilities and properties. Services would be protected rather than relocated, as detailed in **Section 2.5.4**.

To manage potential dirt on roads during construction, Transport have added the following new socio-economic mitigation measure number SE9 (refer further to **Section 6.2**), in response to comments:

Transport would regularly sweep roads within the construction area to remove any dirt from construction activities associated with the proposal.

Once operational, the proposal would have positive impacts by enhancing access and connectivity for residents and the main negative impacts from operation of the proposal would be:

- Changes in local access at Hexham due to the restriction of right-turn movements at Millams Road and Fenwick Street, resulting in changes to local routes and increasing travel distance
- Use of the U-turn facility at Shamrock Street, Hexham impacting on perceptions of safety for local residents, amenity of residential properties and possible disruptions to sleeping patterns for some individuals.

The City of Newcastle would be responsible for any ongoing street sweeping during operation of the proposal and this would be undertaken as per Council maintenance schedules.

2.10.2 Business impact

Submission number(s)

29.

Issue description

One respondent raised an issue relating to potential business impacts associated with the loss or impact to trade or current site operations for the Coles Express Service Station because of the proposal and requested more information during and post construction periods relating to the proposed road widening and the relocated bus stop.

Response

The proposal would require the partial acquisition of one of the Coles Express Service Stations' properties as detailed in **Section 2.10.7**. The partial acquisition would not impact any commercial functions or change existing commercial operations on this property.

Transport would provide additional information to Viva Energy regarding the construction of the proposal so that they better understand impacts.

The Socio-economic, Property and Land Use Assessment included an assessment of impacts to businesses during construction and operation of the proposal. The assessment found that during construction, potential impacts on local businesses may result from:

- Increased expenditure by construction workers on local goods and services
- Traffic disruptions and local access changes due to road works
- Increased noise, dust and construction traffic impacting on business amenity.

For the Coles Express Service Station, the construction phase may have a positive effect on through increased customers and trade in response to the day-to-day needs of construction workers.

There would be some minor upgrades of the kerb on the approach and exit to the Coles Express Service Station on Maitland Road. There would also be some impacts to the access to the Truck Stop associated with work associated for the new Shamrock Street U-turn facility and this would potentially include impacts to the Coles Express transpiration facility. Access to the Coles Express Service Station and Truck Stop would however be maintained during construction.

During construction there would be some disruptions for motorists and road users due to temporary lane changes and reduced speed limits that has the potential to cause delays for customers, staff and deliveries accessing the Coles Express Service Station. However this would be a temporary inconvenience and is unlikely to impact on a customer's decision to access the Coles Express Service Station.

During construction, increased noise and dust from construction activities may also impact on the amenity of Coles Express Service Station. Construction activities that have the highest potential to cause amenity disruptions include noise intensive works for early works, utilities, and roadworks. These impacts would however be temporary and mitigation measures would be put in place to manage impacts.

2.10.3 Future development

Submission number(s)

28.

Issue description

One respondent had concerns about business impacts because of the proposal, including:

- Future development opportunities of Lot 2 and 3 DP874409 as existing development plans are being prepared for these lots and the owners are concerned, they are being unfairly impacted by the proposal and have made significant investment in developing plans for future use of the site that will require access for heavy vehicles including 25 metre B-Doubles
- Future development opportunities preventing the business from addressing legacy contamination issues and continuing impacts to surrounding wetlands and waterways
- Requests that Transport considers alternative arrangements or additional mitigation measures to avoid impacts.

Response

All work on the Sparke Street U-turn facility including the drainage swale to the south of the U-turn facility is within the road reserve and is permissible under Division 5.1 of the EP&A Act with Transport as the determining authority. Any future development of adjoining lots would have to consider the existing road configuration as well as the proposed road configuration should the current proposal be approved.

Transport have not considered any development plans for Lots 2 and 3 DP874409 as these have not been publicly available. All future plans involving 26 metre B-doubles would have to consider the location of existing B-Double routes and would also require approval from Transport to ensure road safety and efficiency are being maintained. The proposal would not preclude future development opportunities for Lots 2 and 3 DP874409 nor the businesses capacity to addressing legacy contamination issues and reducing ongoing impacts to surrounding wetlands and waterways.

2.10.4 Health

Submission number(s)

26, 31, 32.

Issue description

- Three respondents had concerns about the impacts to health because of the proposal, including concern about potential impacts on the physical and mental health of residents near the proposal including at Shamrock Street during construction and operation

Response

Mitigation measures have been included within the REF to minimise impacts associated with construction and operation of the proposal, including to minimise potential health impacts as a result of construction noise, traffic and air quality.

The *Hexham Straight Widening Air Quality Assessment* (Jacobs, 2021f) (Air Quality Assessment) as summarised in Section 6.13 of the REF has assessed potential construction and operation air quality impacts. With the implementation of mitigation measures provided in Table 6.1 of the Air Quality Assessment, significant air quality impacts associated with dust, exhaust emissions, odours and airborne hazardous materials are not anticipated. During the operation of the proposal, it is not considered that the proposal would result in unacceptable changes in local air quality with regards to carbon monoxide, nitrogen dioxide, particulate matter, and any air toxics. As a result, the proposal is not anticipated to lead to significant changes in local air quality that would result in exacerbated health issues for nearby residents.

The proposal is expected to lead to minimal change in traffic in Shamrock Street and would not be expected to significantly impact on the health and wellbeing of the residents in the local community. The proposal would improve road safety and reduce congestion which are considered positive outcomes for the road network users and the surrounding communities, with substantial increase in forecast average network speed (refer to further details in Section 6.6.3 of the REF).

Transport would continue to liaise and consult with property owners during construction of the proposal to provide certainty of construction impacts on surrounding residents.

2.10.5 Landscape character

Submission number

31.

Issue description

One respondent raised concerns that the proposal is incompatible with the current local housing infrastructure, and the unique character of the local area.

Response

Planning decisions within the City of Newcastle are guided by land use zoning defined within the Newcastle LEP. Land use zoning in the study area is shown in Figure 4.3 of the REF. The REF area is located within the following land use zones:

- C2 – Environmental conservation (former E2)
- C3 – Environmental management (former E3)
- IN3 – Heavy Industrial
- RE1 – Public recreation
- RE2 – Private recreation
- SP2 – Infrastructure
- W2 – Recreational waterways.

The majority of the REF area is within the land use zone SP2 – Infrastructure. The purpose of SP2 zoning is to provide for infrastructure and related uses, and to prevent development that is not compatible with or that may detract from the provision of infrastructure. The proposal would be consistent with the objectives of this zone as it is road infrastructure.

The construction compounds are located within the REF area and these four compound areas are located within the following land use zones:

- C2 – Environmental conservation (former E2)
- C3 – Environmental management (former E3)
- IN3 – Heavy Industrial
- SP2 – Infrastructure.

A description of the land use zones that the REF area of the proposal are located within and consistency of the proposal with the LEP objectives is included in Table 4.1 of the REF.

An Urban Design and Landscape Character and Visual Impact Assessment (Tract, 2021) (Urban Design and LCVIA) has also been completed for the proposal and is included as Appendix C of the REF and is summarised in Section 6.11 of the REF. The landscape character assessment identified nine landscape character zones. The sensitivity of the landscape character varies along the length of the REF area with most of the works being within the existing road corridor. As a result, much of the REF area would result in a negligible impact to landscape character.

Landscape character zones that would experience moderate or higher impact to landscape character during operation include:

- LCZ7 – Riverfront/floodplain would experience a high magnitude of change associated with the removal of the existing bridge over Ironbark Creek and construction of a new structure requiring the removal of some vegetation along Ironbark Creek. This would result in a moderate to high impact to landscape character
- LCZ8 – Residential / commercial would experience a moderate impact to landscape character
- LCZ9 – Gateway would experience a moderate impact to landscape character.

Mitigation measures would be implemented to manage landscape character impacts, including:

- Revegetation of areas disturbed by the proposal using a selection of vegetation communities that reflect the existing communities and landscape character
- Landscaping to utilise local material where possible.

2.10.6 Property impacts

Submission number(s)

29.

Issue description

One respondent raised issues about property impacts, it is noted that Viva Energy Australia owns and leases property lots where the Shell Coles Express Hexham is located and requested further information about the partial acquisition of Lot 1 DP 623278 for the Shamrock Street U-turn facility.

Response

Properties that are directly impacted include the following two properties:

- About 424 square metres of private land located on Shamrock Street, which forms part of the larger Coles Express Service Station property and is used for commercial uses
- About 628 square metres of vacant Crown land located to the east of Old Maitland Road to the north of the Hexham Bowling Club.

A third property also requires property acquisition and is described in **Section 4.2**.

Where private property is only partly affected by the proposal, Transport would carry out a partial acquisition of the directly affected portion. The partial acquisition of the one private property that is used for commercial uses would not impact on the operation of the business.

Properties would be acquired in accordance with the provisions of the NSW *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Reform 2016 process (<https://www.propertyacquisition.nsw.gov.au/>). The Act provides the basis for an appropriate valuation process and the fair assessment of compensation.

2.10.7 Property value

Submission number(s)

2, 16.

Issue description

- Two respondents raised concerns about property value, specifically values decreasing from the change from a four lane road to a six lane road and request that compensation is provided.

Response

Many aspects influence property values such as location and use. We acknowledge that residential properties in Hexham are already adjacent by a four lane road that will increase to a six lane road in most sections by completion of the proposal. It is recognised properties affected by the proposal during the construction may be difficult to market before completion of the proposal due to uncertainty of environmental impacts. Directly affected landowners are being consulted where property acquisition is required. Appropriate compensation would be negotiated in line with the *Land Acquisition Information Guide* (Roads and Maritime 2014c) and the *Land Acquisition (Just Terms Compensation) Act 1991*.

During operation there would be some changes in air quality however the Air Quality Assessment has identified that these impacts would not be significant (refer to further details in **Section 2.11**). There would also be some impacts to noise sensitive receivers as identified by the Noise and Vibration Assessment (refer to further details in **Section 2.9**), however impacts would be managed by the implementation of reasonable and feasible measures including architectural treatments at locations that are considered eligible for additional noise mitigation. Regarding traffic impacts there would be improvements in congestion and the proposal would not modify the speed limit, vertical alignment, traffic volume or bring the kerb closer to residents, with the exception of three private properties located on Maitland Road to the south of the intersection with Shamrock Street where the informal road shoulder and access road is being replaced with

kerb and gutter and formal driveway accesses. As a result, impacts on property value during operation of the proposal are not anticipated.

2.11 Air quality

2.11.1 Air quality impacts and mitigation

Submission number(s)

22, 23, 24, 25, 26, 30.

Issue description

Six respondents raised concerns about air quality impacts, including:

- Residents in Hexham already experience dust, and vehicle fumes and the proposal will increase impacts
- Concerns about increased dust impacts and vehicle fumes from the proposal and queries what measures will be implemented to prevent or compensate for any increases in dust and vehicle fumes
- Requests that dust controls are implemented during construction and dust treatment / barriers be provided at impacted residences to minimise impacts
- Questions if testing of dust levels will be undertaken regularly during operation of the proposal
- Queries what will be done to manage the health of residents in Hexham from air pollution
- Queries what mitigation is proposed to residential properties to manage pollution impacts during operation.

Response

An Air Quality Assessment was completed to assess the impacts of the proposal on air quality and is included as Appendix R of the REF and summarised in Section 6.13 of the REF. The assessment describes the existing environment which is noted as already being poor and assessed the impacts of the proposal on air quality during construction and operation.

The Air Quality Assessment identified that land uses surrounding the proposal can contribute to poor air quality including road and rail infrastructure (both heavy and passenger rail), commercial and industrial activities. Motor vehicles and rail trains are a significant source of air pollution. Other sources of pollution include wood heaters which contribute significantly to air pollution, especially in winter and also heavy vehicles, particularly rigid trucks that use diesel fuels are large contributors to exhaust particulate matter emissions. Cleaner fuels and cleaner vehicles have however been reducing emissions from motor vehicles over the last 40 years with the adoption of more stringent vehicle emission standards that have been set by the Australian Design Rules. With the adoption of more electric vehicles in the future this trend will continue even with future traffic growth and emissions are projected to continue declining until 2030 and beyond as identified by the EPA (2014) in *TP01: Trends in Motor Vehicles and their Emissions*.

Dust is mostly a construction issue during which standard measures apply which include monitoring of dust during construction as part of the AQMP. Mitigation measures to manage air quality impacts during construction include:

Preparation and implementation of an Air Quality Management Plan (AQMP) to minimise risks to air quality. The AQMP will identify:

- Potential sources of air pollution (including odours unexpected finds and dust) during construction
- Air quality management objectives consistent with relevant published guidelines
- Identification of all dust and odour sensitive receivers
- Measures to manage air quality impacts
- Community notification and complaint handling, monitoring and incident response procedures.

Dust is not identified as an issue during operation and ongoing dust monitoring would consequently not be undertaken.

An air quality dispersion model was used to quantify the potential operational impacts of the proposal. Results from the modelling have been assessed by examining the spatial differences between the with and without proposal scenarios, and also in terms of the potential for the proposal to cause exceedances of the EPA air quality impact assessment criteria at sensitive receivers. The air quality assessment for the proposal has predicted that air quality in Hexham and the results are shown in Section 5.2 of the Air Quality Assessment which indicate the following outcomes for air quality impacts associated with carbon monoxide (CO), nitrogen dioxide (NO₂), particulate matter (P M₁₀), particulate matter (PM_{2.5}) and air toxics for sensitive receivers at in Hexham (location RR3). The modelling results for predicted concentrations of CO, NO₂, PM₁₀ and PM_{2.5} at location RR3 in Hexham are summarised in **Table 2.6** and the modelling results for predicted for air toxics at location RR3 are summarised in **Table 2.7**.

Table 2.7 Predicated CO, NO₂, PM₁₀ and PM_{2.5} concentrations at sensitive receiver location RR3

Criterion	Concentration due to modelled road sources				Background level	Change due to proposal		Cumulative due to change with the proposal	
	2028 DN	2028 WP	2038 DN	2038 WP		2028	2038	2028	2038
Maximum 1-hour average CO (µg/m³)									
30,000	853	933	611	775	2,400	80	164	2,480	2,564
Maximum 8-hour average CO (µg/m³)									
10,000	757	799	416	603	1,700	42	187	1,742	1,887
Maximum 1-hour average NO ₂ (µg/m³)									
246	82	82	69	85	105	0	16	105	121
Annual average NO ₂ (µg/m³)									
62	25.3	26.0	22.5	25.9	17	0.7	3.4	17.7	20.4
Maximum 24-hour average PM ₁₀ (µg/m³)									
50	16	16	15	20	48	0	5	48	53
Annual average PM ₁₀ (µg/m³)									
25	4.6	4.6	4.6	5.3	22	0	0.9	22.0	22.9

Criterion	Concentration due to modelled road sources				Background level	Change due to proposal		Cumulative due to change with the proposal	
	2028 DN	2028 WP	2038 DN	2038 WP		2028	2038	2028	2038
Maximum 24-hour average PM _{2.5} (µg/m³)									
25	16	16	15	20	28	0	5	28	33
Annual average PM _{2.5} (µg/m³)									
8	4.6	4.6	4.6	5.5	8.7	0	0.9	13.3	13.3

Table 2.8 Predicted air toxics concentrations at sensitive receiver location RR3

Criterion	Concentration due to modelled road sources			Change due to proposal		
	2028 DN	2028 WP	2038 DN	2038 WP	2028	2038
Maximum 1-hour average benzene (µg/m ³)						
29	4.1	4.5	3.3	4.0	0.4	0.7
Maximum 1-hour average formaldehyde (µg/m ³)						
20	1.2	1.3	0.9	1.1	0.1	0.2
Maximum 1-hour average toluene (µg/m ³)						
360	3.9	4.2	3.1	3.8	0.4	0.7
Maximum 1-hour average toluene (µg/m ³)						
190	2.9	3.1	2.3	2.8	0.3	0.5
Maximum 1-hour average benzo(a)pyrene (µg/m ³)						
0.4	0.3	0.4	0.3	0.3	0.1	0

Pollution impacts from the operation of the proposal are considered minimal according to the EPA air quality impact assessment criteria completed for the proposal and consequently no additional mitigation measures are proposed to manage operational air quality impacts.

Residents in Hexham and Sandgate that are noise affected by the proposal would be provided with reasonable and feasible measures to manage noise impacts. This would potentially include architectural treatments that would also assist in reducing construction dust entering residents' houses, refer further to **Section 2.9.2**.

3. Response to government issues

3.1 Overview of issues raised

A total of four government submissions were provided including submissions by the City of Newcastle, DPI (Fisheries), EPA and the NSW SES. The main issues raised by these four government submissions are listed in **Table 3.1** and responses provided in subsequent sections of **Chapter 3**.

Each submission has been examined individually to understand the issues being raised. The issues raised in each submission have been extracted and collated, and corresponding responses to the issues have been provided. Where similar issues have been raised in different submissions, only one response has been provided. The issues raised and Transport response to these issues forms the basis of this chapter.

Table 3.1 Main issues raised by the community

Category	Issues	Section in the report
City of Newcastle	Surface water and groundwater	3.2.1
	Traffic and transport	3.2.2
	Socio-economic, land use and property	3.2.3
	Non-Aboriginal heritage	3.2.4
	Aboriginal heritage	3.2.5
	Cumulative assessment	3.2.6
	Flooding and hydrology	3.2.7
	Urban design and landscaping	3.2.8
DPI (Fisheries)	Statutory	3.3.1
	Biodiversity offsets	3.3.2
EPA	Soils and contamination	3.4.1
	Noise and vibration	3.4.2
	Surface water	3.4.3
	Groundwater	3.4.4
NSW SES	Flooding and hydrology	3.5.1

3.2 City of Newcastle

3.2.1 Surface water and groundwater

Issue description

The City of Newcastle noted that the concept design for drainage is generally acceptable but raised concerns about stormwater drainage and questioned why water quality control targets of the Newcastle Development Control Plan 2012 (Newcastle DCP) are not being met and why reduction targets for Hydrocarbons and Gross Pollutants are not modelled or considered as per the Newcastle DCP. The City of

Newcastle requested that additional matters relating to drainage as outlined in **Appendix E** be considered in detailed design.

In regard to water quality the City of Newcastle requested that all hydrological design targets be consistent with Transport's 2017 guideline *Applying Water Sensitive Urban Design Principles to NSW Transport Projects*; and the NSW Governments' *Risk-based Framework for Considering Waterway Health Outcomes*.

Response

The *Hexham Straight Widening Surface Water and Groundwater Assessment* (Jacobs, 2021g) (Surface Water and Groundwater Assessment) completed for the proposal and has been included as Appendix N of the REF and summarised within Sections 6.3 and 6.4 of the REF. An Operational Water Quality Strategy was developed for the whole proposal as discussed in Section 5.2 of the Surface Water and Groundwater Assessment. This included an assessment of the following water quality parameters: total suspended solids, total phosphorous and total nitrogen. Reduction targets for hydrocarbons and gross pollutants were excluded as the City of Newcastle who are responsible for the maintenance of the drainage systems along Maitland Road had requested as part of consultation undertaken as part of Clause 13, 14 and 15 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 former State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) that no gross pollutant traps be included as part of the operational water quality strategy. As requested, gross pollutant traps controls were removed by Transport from the operational water quality strategy for the proposal and no modelling of hydrocarbons and gross pollutants was completed for the proposal as no controls would be implemented. At locations where a permanent water quality basin have been proposed, gross pollutants and hydrocarbons would be captured within these basins through the proposed underflow baffle arrangement located at the outlet side of the proposed basins.

Transport have updated mitigation measure FL9 in response to City of Newcastle additional drainage matters as detailed in **Appendix E**.

New pits and pipes have also been added on the new kerb and gutters along the proposal to capture the pavement runoff as part of the concept design (refer to **Appendix B**). The placement of pits would be carried out in a way that the gutter flow spread on the highway meets the design criteria for the 10 per cent AEP (10-year ARI) flood event.

An assessment of impacts from the changes in pavement drainage was also completed and the results of the modelling indicate that modifications to the existing drainage infrastructure and increases in the area of road pavement may impact stormwater discharges causing some minor increases in rates, volumes and velocity into the existing receiving environments. These changes may result in some impacts to local receiving waterway processes and health, immediately downstream of proposal discharge locations from storm events during construction and operation. Impacts include:

- Increased erosion and water turbidity
- Geomorphological impacts including reduced bank stability
- Minor increases to the duration and depth of inundation for overbank events to areas downstream of stormwater discharge locations being upgraded by the proposal.

The proposal includes appropriate mitigations including scour protection in the form of rock transition aprons at all culvert outlets upgraded as part of the proposal to manage impacts.

The proposal would maintain existing water flow under Maitland Road to Hexham Swamp and no changes are expected from the proposal to the existing surface water hydrology including sensitive receiving environments such as Hexham Swamp, the surrounding Coastal Wetlands and freshwater wetlands or Ramsar listed wetlands.

Proposal specific water quality objectives have been developed and summarised in Section 3.3.4 and Attachment A of the Surface Water and Groundwater Assessment. The design has been developed based on these water quality objectives and as detailed in Section 6.2.1 of the Surface Water and Groundwater Assessment would provide an improvement of the existing stormwater discharge quality. A mitigation measure has already been included that refers to designing drainage features to be consistent with Transport's 2017 guideline *Applying Water Sensitive Urban Design Principles to NSW Transport Projects*.

There are five proposed water quality basins and five water quality vegetated swales with a combined total length of about 425 metres along the proposal as shown in Appendix B of the REF. This is part of the Water Sensitive Urban Design (WSUD) that has been adopted for the proposal. The proposed WSUD water quality controls will provide an improvement to water quality when compared to existing conditions. The improvement has been assessed and quantified in the Surface Water and Groundwater Assessment. It shows that there will be an approximate three per cent to five per cent improvement for Total Suspended Sediments (TSS), Total Phosphorus (TP) and Total Nitrogen (TN) annual average pollutant loads. The surface water mitigation measure number SW1 already refers to implementing erosion and sediment control measures in accordance with *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom 2004) and Volume 2D (DECC, 2008) but would also be modified to include reference to the NSW Governments' *Risk-based Framework for Considering Waterway Health Outcomes*, refer further to **Section 6.2**.

3.2.2 Traffic and transport

Issue description

Nine comments were raised about traffic and transport including:

- Old Maitland Road (north) is approved for 26 metres long 'B-Double' trucks north of Gallegan Street only, south of Gallegan Street only 19 metres long semi-trailers may transit
- The inclusion of turn around provisions and line marking changes within Old Maitland Road should include repair or upgrade of the connecting road pavement, otherwise significant degradation of existing surface can be expected
- It is preferred that the of the Old Maitland Road (north and Maitland Road intersection in Hexham provide right turning movements for northbound vehicles seeking to enter Old Maitland Road. –
- Questions who will be responsible for the future maintenance of the Shamrock Street U-turn facility and what type of heavy vehicle this facility has been designed for.
- Questions who will be responsible for the future maintenance of the Old Maitland Road U-turn facility and notes that the site is not owned by the City of Newcastle and would require acquisition and reclassification of the land by Transport
- Questions who will be responsible for the future maintenance of basins included in the proposal
- Advises that the oversize and/or overmass (OSOM) vehicle parking facility is to be responsibility of Transport
- Requests that each bus stop include a concrete boarding pad (3.6 metre depth by 7 metre long) to allow for installation of a shelter, are wheelchair accessible and include footpaths linking the bus stops to signalized
- A continuous footpath is to be provided from Hexham Station to the Old Maitland Road (north) and Maitland Road intersection and the proposed relocated bus stops
- Clarification is required as to whether the City of Newcastle would be required to manage the roadside through Transport's road maintenance team. If so, will a sufficient budget be provided by Transport.

Response

The information in the REF noted about heavy vehicle use on Old Maitland Road in Hexham is incorrect and should state that the road is only approved for 26 metre long 'B-Double' trucks north of Galleghan Street only, and to the south of Galleghan Street only 19 metre long semi-trailers may transit.

The City of Newcastle's request for a repair or new pavement of any local roads where road marking or changes are proposed otherwise significant degradation of existing surface can be expected is noted. As discussed in **Section 2.7.7** upgrades to local roads impacted by the proposal would be repaired. This includes the tie-in to at all local road intersections along the proposal length and extending to the new U-turn facilities proposed on Sparke Street, Shamrock Street and Old Maitland Road in Hexham. In addition, Old Maitland Road (north) in Hexham and sections of Old Punt Road would also be repaired.

The City of Newcastle have requested that a right turn lane northbound at the Old Maitland Road (north) Hexham and Maitland Road intersection, however there is limited room in the road alignment in this location to provide for the proposed three lanes in each direction. In addition, traffic modelling has shown that the introduction of another phase at this set of lights would reduce travel efficiency along Maitland Road, consequently this intersection modification has been rejected.

Maintenance of the U-turn facilities on Sparke Street, Shamrock Street and Old Maitland Road and drainage features including basins and swales, would be maintained by City of Newcastle under the existing routine maintenance contract funded by Transport.

Transport would be responsible for the OSOM parking area that would primarily be used during construction.

Transport would relocate six bus stops, remove one bus stop and construct one new bus stop as part of the proposal as summarised in **Table 2.4** and shown in the concept design drawings included as **Appendix A**. Footpaths being included as part of the proposal are summarised in **Section 2.7.8**. Bus stops and footpaths impacted and requiring modification by the proposal have been upgraded in accordance with relevant road design standards, Australian Standards and Specifications where space is available.

Transport would provide a continuous footpath between Hexham Station and the Old Maitland Road (north) and Maitland Road intersection and would provide footpaths to all bus stops impacted by the proposal as shown in **Appendix A** and described in **Table 2.4**.

Assets behind the kerb would be maintained by City of Newcastle as part of their existing maintenance contract.

3.2.3 Socio-economic, land use and property

Issue summary

It is not indicated in the REF as to whether any consideration has been given to minimising the potential/opportunity for illegal dumping along the new roadside.

Response

During construction, Transport will manage the security of the construction site to deter activities such as illegal dumping wherever possible. Transport will manage all wastes generated or encountered within the site areas as per the Waste Regulations included in the *Protection of the Environment Operations Act (1997)*. Temporary roads would be removed at the end of construction to prevent access to off-road areas that may be used for dumping.

3.2.4 Non-Aboriginal heritage

Issue description

The City of Newcastle are concerned that the Ironbark Creek crossing will be directly impacted by the proposal, however no alternative solutions or adjustments to the proposed crossing point location have been discussed. Although this place is not listed on a statutory register, the SoHI has identified the Ironbark Creek crossing point as being of local heritage significance. Avoidance of impacts and retention of the archaeological work in situ is the preferred option in any instance. It does not appear that alternative options have been investigated and/or discounted during the design process.

The SoHI has identified that other indirect impacts to eight listed heritage items near to the proposal including potential construction vibration impacts or impacts from moving plant and equipment. Protective barriers should be placed around all heritage items in proximity to the construction zone of the proposal, including protection of the visual curtilage of the heritage items, significant landscaping, and outbuildings.

Response

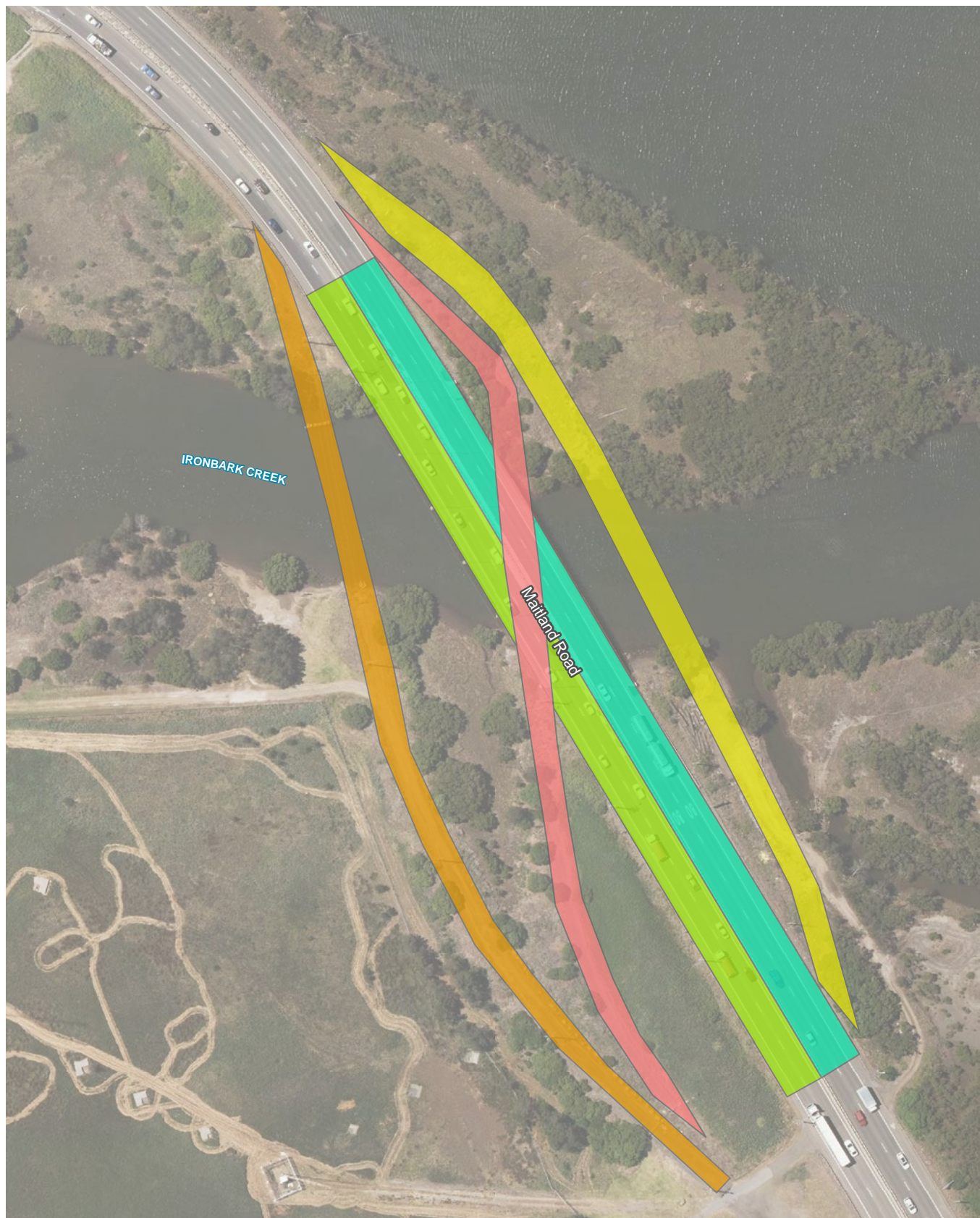
Transport prepared the *Hexham Straight Widening Statement of Heritage Impact* (SoHI) (Jacobs, 2021h) which is included in Appendix J and summarized in Section 6.8 of the REF. There are 13 local heritage items within the proposal area of which eight have the potential to be impacted. These heritage items have been discussed and assessed according to relevant legislative guidelines within the Statement of Heritage Impact provided to the City of Newcastle as part of the EIS. As noted, an additional heritage work, 'Ironbark Creek crossing point', was identified during the non-Aboriginal heritage survey and has also been assessed as having local heritage significance and includes both the current bridge crossing and historical bridge locations. This item is currently not listed on any of the statutory or non-statutory heritage registers and has been defined as an archaeological 'work' for the purposes of this assessment.

A summary of design refinements in Section 2.5.2 of the REF outlines how four potential alternative designs and locations for Ironbark Creek were investigated as part of the design development. These options were all on the eastern side of the existing Ironbark Creek location. However, prior to this Transport had considered locating the new bridge over Ironbark Creek to the western side of the existing structure to reduce the impact on coastal wetlands. This involved constructing one bridge, demolishing the existing and constructing the second bridge.

During the strategic challenge period a second alignment was considered where a single, offline bridge would be constructed on the eastern side of the existing bridge, resulting in the following:

- Reduced impacts to utilities
- Eliminates the need to reconstruct the existing retaining wall at St Joseph's Retirement Community
- Possible impacts on Crown and NPWS Lands
- The bridge construction would be carried out in single stage.

Consequently, the option to construct the bridge on the eastern side of the existing Ironbark Creek bridge was selected as the preferred strategic option. Heritage constraints around Ironbark Creek Bridge were not known at this stage as the strategic analysis only considered desktop information and the Ironbark Creek crossing point had not been identified at this stage. It is noted however that heritage constraints associated with the Ironbark Creek crossing point, exist on both sides of the existing Ironbark Creek Bridge as shown in **Figure 3.1**. Consequently, impacts to this archaeological work from the proposal are unavoidable and have been assessed in accordance with the requirements of the *Heritage Act 1977*.

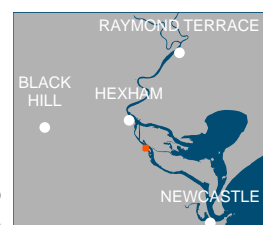
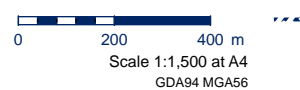


Date: 30/07/2021 Filename: IA301100_NonAbHer_F004_IronbarkCreekCrossingTimeline_v1

Legend

Previous bridge locations

- 1857
- 1938
- 1956
- Northern 1962
- Southern 1966



Data sources:
 Jacobs 2020
 Department of Finance,
 Services and Innovation 2020

Figure 3.1 Ironbark Creek crossing point timeline

Hexham Straight Widening

Mitigation measures have already been included to manage impacts to the Ironbark Creek crossing point, refer to measures NH5 and NH6. In addition to manage vibration impacts to local heritage items located close to the proposal the Noise and Vibration Assessment has included mitigation measure NV4.

3.2.5 Aboriginal heritage

Issue description

As there are Aboriginal cultural values within the proposal area the City of Newcastle recommends that during construction, the site induction is expanded to include training in relation to the Aboriginal cultural heritage significance of the project area and their obligations under the *National Parks and Wildlife Act 1974*.

The REF notes that an Aboriginal Cultural Heritage Assessment Report was prepared, including community consultation (referenced in the REF as Appendix I), however, the Aboriginal Cultural Heritage Assessment Report has not been provided for comment.

Response

The *Hexham Straight Widening Aboriginal Cultural Heritage Assessment Report* (ACHAR) (EMM, 2021) was prepared for the proposal to assess impacts to Aboriginal heritage and is included as Appendix L and summarized in Section 6.7 of the REF. The ACHAR and REF already includes measures to manage Aboriginal cultural heritage including cultural awareness training but will modify Aboriginal heritage mitigation measure number AH5 (refer further to **Section 6.2**), to include reference to a site induction that identifies the Aboriginal cultural heritage significance within the proposal area and outlines obligations under the *National Parks and Wildlife Act 1974*.

It is noted that the ACHAR has been completed in accordance with the requirements of the *Due Diligence Code of Practice* (Department of Environment Climate Change and Water (DECCW), 2010a), and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010) has been reviewed by the registered Aboriginal parties. The ACHAR has not been made public as part of the REF as it includes sensitive information, however the ACHAR was provided to Council as part of the EIS.

3.2.6 Cumulative assessment

Issue description

Section 6.18 of the REF has not considered potential cumulative impacts regarding the Richmond Vale Rail Trail cycleway project, which has been granted conditional approval by the City of Newcastle.

Response

Cumulative impacts associated with the Richmond Vale Rail Trail cycleway (DA2020/00641) have been considered in **Section 5.3**.

3.2.7 Flooding and hydrology

Issue description

Five concerns were raised about flooding including:

- The City of Newcastle has previously provided Transport with some data regarding floor level heights in the study area. However, the conclusions of the flooding assessment indicate there are some properties where there is an 'over floor' survey data gap and that this data should have been sought as part of the concept design rather than being sought in detailed design
- Concern about the resolution of the flood model and requests that the model methodology for detailed design include grid sub sampling or refined 2D mesh sections of the model to assess flood impacts more accurately to residents and businesses
- The proposal identifies consultation as part of its mitigation measure for flood impacts to property but there are no recommendations to reduce the afflux experienced by the property owners, particularly in the operational phase of the project. It is recommended that prior to approval mitigation measures relating to the individual properties are identified and communicated with the affected property owners.
- During construction it is anticipated that flood levels will slightly increase but it is not clear if there is a strategy in place during a significant rainfall event to limit the environmental impacts.
- While runoff and coastal processes may directly affect the local environment during construction/operation, it is also possible to have significant flows from the Hunter River upper catchment without significant rainfall on or near the proposal. It is not clear whether the possibility or impacts of this, particularly from an environmental impact perspective have been considered or modelled for during/after construction and what assumptions have been made in this validation process.

Response

The City of Newcastle provided Transport with data on floor level heights for 333 buildings near to the proposal and this data has been used in the assessment of flooding impacts on buildings from the proposal. As noted in Section 5.2.3 of the Flooding and Hydrology Assessment, the data did not include floor levels for all buildings located within the vicinity of the proposal. Transport has committed to completing additional flood modelling as part of the detailed design to verify impacts to buildings. In response to the City of Newcastle's comment on data gaps, Transport would modify flooding and hydrology mitigation measure number FL2 (refer further to **Section 6.2**), to include a review of building floor level data and undertake additional survey to obtain floor levels where there are gaps.

In consideration of the City of Newcastle's comment on mitigation measures, Transport will amend flooding and hydrology mitigation measure number FL1 (refer further to **Section 6.2**), to include a grid sub sampling or refined 2D mesh sections to more accurately assess flood impacts to residents in the flood model.

Transport has committed to consulting with individual property owners that are impacted by afflux from the proposal. It is noted that all residents impacted by the proposal are already significantly impacted during flood events, refer further to Section 5.3.2 of the Flooding and Hydrology Assessment and **Section 2.5.2** of this Submissions Report.

It is noted that there would be impacts to flood levels during construction as discussed in the Flooding and Hydrology Assessment as the proposal would be constructed within a period of 2.5 years. Results of the construction flood assessment found that:

- The properties between Shamrock Street and Clarke Street, Hexham experience an afflux ranging from 0.02 metres to 0.10 metres in Stage 1
- The properties around Old Maitland Road, Hexham to the south of Hexham Bridge experience an afflux of approximately 0.02 metres both in Stage 1 and Stage 2 only. These buildings are currently flood affected during the one per cent AEP when the existing peak level water levels ranges between 3.48 – 3.98 metres AHD
- The properties to the east of Maitland Road at Sandgate and north of the Newcastle Inner City Bypass experience an afflux up to 0.05 metres in construction Stage 1 and Stage 2 compared to Stage 3 when afflux is limited to 0.03 metres
- During Stage 1 of construction of the proposal, 19 buildings located within the vicinity of the proposal were identified as experiencing afflux above floor, exceeding the relevant flooding criteria in the one per cent annual exceedance probability (AEP) event and the maximum afflux above floor is modelled at 0.07 metres
- The identified 19 buildings already experience at least, one metre depth of flooding above floor in the one per cent AEP event in the existing case. Afflux at buildings in the one per cent AEP event is below the relevant flooding criteria for the remaining construction stages. During the one per cent AEP event, two buildings are newly flooded above floor due to the proposal in construction Stage 1 and one building is newly flooded above floor both in Stage 2 and Stage 3. It is to be noted that at all newly flooded buildings above floor is up to 0.04 metres
- While the proposal would impact on a number of buildings in the one per cent AEP event, the chance of a one per cent AEP flood event occurring within the construction period is only 2.5 per cent. Afflux at buildings for the construction phase of the proposal is negligible in the 20 per cent AEP event.

The Flooding and Hydrology assessment found that impacts during construction would be minimal and no specific mitigation measures are proposed.

It is noted that there is a possibility that there may be flood events occurring at the project site from rainfall events higher upstream whereby there may not be a significant rainfall event at the project site. The model extends five kilometres upstream on the Hunter River and four kilometres upstream on the Williams River from the junction of the Hunter River and the Williams River at Raymond Terrace and includes the floodplains of those rivers. The model extends in the downstream direction to the river's outlet into the Tasman Sea to the east of the City of Newcastle. The model also extends to cover:

- The Hunter River floodplain west to Thornton and Beresfield
- Swamp areas around Hexham in the west and to the south-east of the Hunter River, this includes some areas of Coastal Wetlands and areas within Hexham Swamp Nature Reserve that are referred to in this report as Hexham Swamp
- The Fullerton Cove overflow onto the Tilligerry Creek floodplain at Williamstown and Salt Ash to the south and southeast
- The Tilligerry Creek outlet to Port Stephens, in the northeast. Flood events have been assessed as part of the catchment wide modelling and it is noted that rainfall events may occur anywhere within the catchment.

Assumptions / limitations made as part of the flood model include:

- The extent of identified flooding impacts is in some cases limited by the extent of the available flood modelling. Impacts may extend further than the model domain
- The flood model is based on a 20-metre resolution model grid and estimates of localised impacts due to small scale features are considered indicative

- The flood model does not include tidal areas located upstream of Raymond Terrace and all embayments located within the modelled area.

Verification of the updated TUFLOW model was also completed for the flood events of April 2015 and January 2016. The modelling assessment was also undertaken for a range of design flood events including the 63.2, 50, 20, 10, five, two and one per cent AEP events and the probable maximum flood (PMF) event for the existing case utilising an envelope of flooding mechanisms dominated by a combination of rainfall runoff generated over the local catchments, Hunter River inflow and tide levels

Validation of the results was undertaken with comparison to design flood levels presented in previous studies (DHI, 2008; BMT WBM, 2012; and BMT WBM, 2017), refer to Section 4.4.5 of the Flooding and Hydrology Assessment included as Appendix L of the REF and summarised in Section 6.3 of the REF.

Stormwater discharge modelling has been completed for 26 of the cross-drainage systems that exist along the proposal as part of the Flooding and Hydrology Assessment. Drainage proposed is subsequently based on the results of the 12D hydraulic modelling and has been designed to cater for the 10 per cent AEP (10-year ARI) storm event and has been designed to keep one lane open in each direction during this event. The proposed drainage networks either connect to the existing drainage network or discharge into the inlet or outlet headwall of the proposed or existing cross drainage. Where a water quality treatment device has been provided, the proposed drainage network would discharge the runoff into the water quality treatment device before discharging the flow into the drainage outlet at the Hunter River, the Hunter River South Channel, or Ironbark Creek. Changes to drainage pits, pipes and open drains would be provided as part of the proposal to collect and convey storm water runoff from the upgraded road pavements, these are described in **Section 2.5.1** and shown in Appendix B of the REF.

3.2.8 Urban design, LCVIA

Issue description

The proposed species *Callistemon 'Kings Park'* is not appropriate because of its multi stem habit, and the regular pruning maintenance required to establish it. The design instructions not to plant under existing powerlines are not supported. The following species of street trees are preferred for areas under existing powerlines or adjacent to signage and those sites where no powerlines or signage would be impacted:

- For areas directly under powerlines - *Callistemon salignus* and or *Acmena hemilampra*
- For areas without powerlines *Melaleuca leucadendron* and or *Eucalyptus robusta*.

It is also recommended that the 'Gateway' planting stand of *Eucalyptus tereticornis* proposed in the road median at Sandgate have other Eucalypt species included to increase biodiversity and resilience as well as smooth bark species to maintain the aesthetics of the proposed gateway.

Response

A landscaping plan has been developed for the proposal and is included in the Urban Design and LCVIA has also been completed for the proposal and is included as Appendix C of the REF and is summarised in Section 6.11 of the REF. Transport will consult with the Council of Newcastle during detailed design on the species used in the landscaping plan.

3.3 Department of Primary Industries (Fisheries)

3.3.1 Statutory

Issue description

The NSW Department of Primary Industries – Fisheries (DPI Fisheries) has reviewed the REF documents provided and would advise that:

- A permit to harm marine vegetation is required under Section 204-205 of the FM Act to clear the 1.58 hectares of mangroves and saltmarsh impacted by the proposal
- Transport is required to consult with Fisheries NSW to obtain approval for works for the dredge and reclamation of Ironbark creek under Section 199 of the FM Act.

Response

It is noted that the 1.58 hectares of mangrove and saltmarsh impacted by the proposal relates to the area described in the EIS. The REF area would impact on 1.23 hectares of wetland saline vegetation.

The licencing section of the REF (Table 7.2) has noted that a permit under Section 204-205 of the FM Act is required to clear the 1.23 hectares of wetland saline vegetation for the REF and will submit the application prior to construction commencing. Transport would continue to consult with Fisheries NSW regarding any relevant permits under the FM Act.

3.3.2 Biodiversity offsets

Issue description

DPI Fisheries notes in Table 7.4 of the REF, mangroves are considered marine vegetation under the BC Act and are therefore not offset under a Biodiversity Offset Strategy (BOS) but the FM Act. Note Section 1.4 of the BC Act.-DPI Fisheries requires Transport assess potential offsets strategies that may be implemented to meet the requirements of the DPI Fisheries offset policies in relation to marine vegetation. This can be negotiated with the Department post approval. This offset must meet the 2:1 requirements of DPI Fisheries offset policies for marine vegetation.

Response

Transport notes that the Biodiversity Offset Strategy will address offset requirements under all relevant state and Commonwealth legislation, including offsets under FM Act. Offsets are required for proposed impacts to two saline wetlands formations (mangroves and saltmarsh) in order to meet the NSW DPI policy on 'no net loss' of fisheries habitat (DPI, 2013) which includes 1.23 hectares of vegetation comprised of.

- About 0.51 hectares of Saltmarsh estuarine complex (PCT 1746) (TYPE 1 Key Fish Habitat)
- About 0.72 hectares of Grey Mangrove low closed forest (1747) (TYPE 2 Key Fish Habitat).

Offsets are also required for impacts to 1.58 hectares of marine vegetation in the EIS area. It is recognised that there may also be alternatives to a monetary compensation to provide an adequate offset or compensation (e.g. remediation work) for impacts to saline vegetation types. Consultation with NSW DPI will be carried out to discuss other potential alternative options for compensation that are consistent with meeting the 2:1 offset ratio applied.

3.4 Environment Protection Authority (EPA)

3.4.1 Soils and contamination

Issue description

The following issues were identified in regard to soils and contamination:

- Acid sulfate soils (ASS) require further assessment to characterise and identify all potential acid sulfate material on site and how this will be managed and treated
- Further investigations are required for the REF area where Areas of Environmental Interest (AEI's) have been identified with a potentially high or moderate contamination risk, and a NSW accredited auditor should be engaged. Given the number of potentially high and moderate AEI's within the REF area, and the lack of detailed investigations confirming the extent of contamination in these areas, the EPA recommends that a Sampling and Analysis Quality Plan (SAQP) and a Detailed Site Investigation (DSI) is undertaken in areas which are targeted to the potentially high and moderate AEI's. It is also recommended that a NSW accredited site auditor be engaged throughout the planning, assessment and any proposed remediation to comment on:
 - The appropriateness of a SAQP and the DSI
 - Whether the nature and extent of contamination has been appropriately determined
 - If required, whether the remediation and/or management plans are appropriate and whether a Remediation Action Plan (RAP) or notification under Section 60 of the *Contamination Land Management Act 1997* (CLM Act) is required
- The EPA recommends the processes outlined in State Environmental Planning Policy 55 - Remediation of Land (SEPP55) are to be followed this includes in order to assess the suitability of the land and any remediation required in relation to the proposed use.
 - Transport must ensure the proposed development does not result in a change of risk in relation to any pre-existing contamination
 - The EPA should be notified under section 60 of the CLM Act for any contamination identified which meets the triggers in the *Guidelines for the Duty to Report Contamination*
 - The EPA recommends use of 'certified consultants' in accordance with EPA's *Contaminated Land Consultant Certification Policy* to prepare, review the additional contamination assessment documentation.

Response

Acid sulfate soils

Transport has completed the *Hexham Straight Widening Phase 2 Contamination and Waste Classification Assessment* (Jacobs, 2022) (Phase 2 Contamination and Waste Classification Assessment) for the proposal and the assessment is included as **Appendix F** and summarised in **Section 5.2**. The assessment included sampling that confirmed ASS are present. Transport have prepared a draft Acid Sulfate Soils Management Plan (ASSMP) that includes measures to manage and treat acid sulphate soils during construction of the proposal and the report can be made available upon request.

Further investigations

Transport have undertaken additional investigation and sampling of areas of environmental interest (AEI) and the results are detailed in the Phase 2 Contamination and Waste Classification Assessment, refer

further to **Section 5.2**. The assessment and DSI was based on a sampling and analysis quality plan (SAQP) that is included as Attachment G of the Phase 2 Contamination and Waste Classification Assessment (refer to **Appendix F**). Mitigation measures proposed by the Stage 1 Soils and Contamination Assessment have been updated within the Phase 2 Contamination and Waste Classification Assessment and are detailed in **Section 5.2**.

Site auditor

The analysis completed for the Phase 2 Contamination and Waste Classification Assessment included in **Section 5.2** indicates that the impacts associated with soil and contamination risks identified from the site investigation for the proposal are unlikely to be significant. Consequently, the proposal would not trigger notification requirements under the *Contaminated Land Management Act 1997* and would not require remediation of the site or any subsequent validation reporting. As such an independent site auditor is not required for the proposal.

Mitigation measures proposed by the Stage 1 Soils and Contamination Assessment have been updated within the Phase 2 Contamination and Waste Classification Assessment and are detailed in **Section 5.2**.

SEPP 55 and Contaminated Land Management Act

The requirements of SEPP 55 and these have been considered in the Phase 1 and Phase 2 Contamination Assessments.

Transport has considered the responsibilities under Section 6(2) of CLM Act in regard to any possible change of risk in relation to any pre-existing contamination on the site that result in significant contamination. However as detailed in the Phase 2 Contamination and Waste Classification Assessment the proposal would not result in significant changes in pre-existing risk. Furthermore, land use would essentially stay the same and would continue its use as road infrastructure except for a small area zoned C3 Environmental Management that would be changed to SP2 – Road Infrastructure. Mitigation measures proposed by the Stage 1 Soils and Contamination Assessment have been updated within the Phase 2 Contamination and Waste Classification Assessment and are detailed in **Section 5.2**.

Transports will notify the EPA under Section 60 of the CLM Act if any contamination is identified which meets the triggers in the *Guidelines for the Duty to Report Contamination* www.epa.nsw.gov.au/resources/clm/150164-report-land-contamination-guidelines.pdf. However as discussed in the Phase 2 Contamination and Waste Classification Assessment a notification under Section 60 of the CLM Act is not required based on the results of the DSI.

The EPA recommendation to use 'certified consultants' for the preparation of contamination reports submitted to the EPA under the CLM Act. Has been considered by Transport. While this proposal would not require any reporting under the CLM Act, the Phase 2 Contamination and Waste Classification Assessment has been reviewed by a CEnvP certified Site Contamination Specialist.

3.4.2 Noise and vibration

Issue description

Two issues were raised in regard to noise and vibration including:

- The Noise assessment requires additional justification to clarify how the noise model used in the assessment was validated.
- In relation to operational and construction road noise, all feasible and reasonable noise mitigation measures are required to be considered and applied to minimise noise to the extent that is practicable and suggest the following modifications to measures proposed:

- All feasible and reasonable noise mitigation measures will be applied to minimise construction noise impacts
- Out of standard hours construction works will only be conducted where justification, as outlined in the Interim Construction Noise Guidelines, can be demonstrated
- Noise mitigation measure number - NV6 be amended to include a phrase that: “All feasible and reasonable operational noise mitigation measures will be considered and applied through the detailed design process to minimise operational noise to the extent that is practicable”
- Noise mitigation measure number – NV8 is consistent with normal practice and is an appropriate safeguard
- In relation to operational and construction road noise, all feasible and reasonable noise mitigation measures are required to be considered and applied to minimise noise to the extent that is practicable.

Response

Noise model validation

The measured and predicted noise levels compared in Table 4-4 of the Noise and Vibration Assessment are all free field noise levels, as noise monitoring sites located near to facades do not include the additional +2.5 dBA associated with façade reflection. As such the noise model uses façade corrected noise levels. All other results in the Noise and Vibration Assessment (except for outdoor passive and active recreation areas) include the effects of façade reflections.

Results from the noise model show that 74 sensitive receiver buildings/locations are predicted to have exceedances of the NCG operational road traffic noise criteria and are therefore eligible for consideration of ‘additional noise mitigation’ as shown in Figure 6-3 of the Noise and Vibration Assessment.

Construction noise mitigation measures

In response to EPA’s recommendation regarding construction noise management measures, Transport would update management measure NV1 (refer further to **Section 6.2**), to ensure feasible and reasonable noise mitigation measures will be applied to minimise construction noise impacts and all out of standard hours construction works will only be conducted where they can be appropriately justified as required by the Interim Construction Noise Guideline.

Operation noise mitigation measures

In response to EPA’s recommendation regarding operational noise management measures, Transport would consider all feasible and reasonable noise mitigation measures during detailed design and would implement architectural treatments in consultation with the property owner for noise affected sensitive receivers. This is already stated in the mitigation measures proposed.

In response to the EPA review of the operational noise and vibration mitigation measures Transport are modifying noise and vibration mitigation measure number NV6 (refer further to **Section 6.2**) to ensure that all feasible and reasonable operational noise mitigation measures will be considered and applied through the detailed design process to minimise operational noise to the extent that is practicable.

Transport notes that the EPA considers mitigation measure NV8 to be consistent with normal practice and is an appropriate safeguard.

3.4.3 Surface water

Issue description

The following issues were raised in regard to surface water and groundwater impacts including:

- The REF provided limited information of the proposed dredging of Ironbark Creek. Dredging works require further assessment to detail how water pollution will be minimised and to assess sediment quality within the creek. Further detail is required on how proposed water quality monitoring triggers and responses would be managed, what management measures would be included to mitigate the impacts of dredging within sensitive waterways and to sensitive downstream receptors and how any dredge material would be disposed of
- In relation to any proposed dredging and associated in-stream works within Ironbark Creek, the EPA recommends for Transport to:
 - Provide further details of the practical measures investigated and proposed to avoid or minimise water pollution (e.g. dual silt curtains, closed bucket environmental clam shell, no overflows from hoppers)—including providing justification for the proposed measures.
 - Provide details of the sediment quality within the proposed works areas identifying any potential water pollution risks.
 - Provide details of proposed water quality monitoring and associated water pollution management triggers and responses—this should include turbidity monitoring immediately surrounding works area, and at a background site(s), with management triggers set relative to the background turbidity.
 - Provide further detail as to how any dredge spoil will be disposed of.
- If construction stage stormwater discharges are unavoidable, a water pollution impact assessment commensurate with the potential risk and consistent with the national Water Quality Guidelines is required.

Response

Transport has completed a Phase 2 Contamination and Waste Classification Assessment for the proposal and the assessment is included as **Appendix F** and summarised in Section 5.2 of this Submissions Report. The Phase 2 Contamination and Waste Classification Assessment considered the impacts of disruption of contaminated bed sediments from dredging and in-stream works associated with construction and demolition activities within Ironbark Creek for the proposal. The assessment recommended that a new soils and contamination mitigation measure number SC4 (refer to **Section 5.2.5**) be included that includes the preparation and implementation of a Dredging Environmental Management Plan.

The *Hexham Straight Widening Coastal Processes Assessment* (Jacobs, 2021i) (Coastal Processes Assessment) was also prepared to assess impacts on coastal process from the proposal and is included as Appendix O and summarised in Section 6.5 of the REF. The assessment specifically assessed impacts on coastal processes such as bank stability, coastal landform geomorphology and hydrodynamic processes including tidal associated with the Hunter River Estuary and areas that would be impacted by the proposal. The Coastal Processes Assessment considered in-stream work and bank works associated with the proposal required for the construction of culvert outlets for the stormwater drainage and the activities associated with the construction and demolition of Ironbark Creek Bridge which also included a temporary work platform.

A Surface Water and Groundwater Assessment was also completed for the proposal and is included as Appendix N and summarised within Section 6.3 of the REF. As discussed in Section 5.1 of the Surface

Water and Groundwater Assessment a construction water quality strategy has been developed for the proposal which has considered:

- The existing land use surrounding the construction area and minimising impact on these land uses (including utilities and property owners)
- Landform and topography, which is a key driver for the design of physical controls
- Consideration of all environmental issues, including where implementation of physical controls may have a negative impact on other areas of environmental importance (for example, the requirement to clear native or protected vegetation)
- Consideration of footprint and location of temporary and permanent basins so that they use the same footprint where possible. This approach has reduced the need to build additional basins during construction.

The strategy to minimise impacts to water quality during construction, and in particular to sensitive receiving environments is to provide a combination of water quality treatment measures consisting of erosion control, sediment control, sediment capture and treatment in accordance with:

- *Managing Urban Stormwater, Soils and Construction guidelines, Volumes 1* (Landcom, 2004) and 2 (2008) (known as the Blue Book)
- *Managing Urban Stormwater, Volume 2D: Main Road Construction* (DECC, 2008).

During construction, erosion and sediment controls would be required to manage runoff from all disturbed areas of the proposal before discharging into the receiving waterways. Five temporary sediment basins are proposed and include the use of the five permanent operational basins identified in Section 5.2 of the Surface Water and Groundwater Assessment. Sediment sumps may also be required. The impact assessment of construction impacts associated with the proposal has been based on the implementation of this construction water quality strategy. Any additional impacts to surface water quality would be supported by site specific management measures to be implemented during construction as detailed in Chapter 8.

It is noted that when developing the strategy that the NSW EPA's document *Volume 2D, Soils and Construction for Main Road Construction* (DECC, 2008) was used that indicates on Table 6.2 that when a sediment basin is designed for the 85th percentile 5 Day rainfall depth, it is expected that this basin would have an overflow frequency in the range of 4 to 6 spills per year.

This occurs when the site-specific design rainfall depth is exceeded, for instance if the 85th percentile 5 Day rainfall depth is about 40 millimetres (which means that the sediment basin has been designed to contain the runoff generated from this rainfall), then the basin overflows with a TSS concentration that is likely to be in excess of 50mg/L. When this infrequent but large rainfall event occurs, the background TSS concentrations from surrounding much larger catchments is also likely to be much higher than 50 mg/L.

Consequently, all basins will overflow at some stage will exceed their design capacity in accordance with the requirements of the *Volume 2D Soils and Construction for Main Road Construction* (DECC, 2008).

The Surface Water and Groundwater Assessment also included an assessment of key water quality indicators and related default guideline value (DGV) have been nominated for each water quality objective (WQO) using the Australian and New Zealand Guidelines (ANZG) (2018) *Water Quality Guidelines*. This also included a dilution assessment and the values and indicators from the assessment are provided in Table A.6 of Attachment A of the Surface Water and Groundwater Assessment. In response to EPA's comment the following new surface water management measure number SW6 (refer further to **Section 6.2**), is included:

Practical and reasonable measures will be implemented to minimise discharge from sediment basins during construction such as using sediment basin water for dust suppression where possible. Where discharge from construction basins is required, a water discharge impact assessment consistent with the National Water Quality Guidelines would be prepared.

3.4.4 Groundwater

Issue description

The proposed management measures for groundwater quality are designed to manage uncontaminated runoff and sediment and are unlikely to be appropriate for managing water pollution risks associated with contaminated groundwater. The EPA recommends for Transport to provide:

- Additional or alternate measures such as enhanced erosion and sediment controls should be considered to avoid sediment basin discharges
- Discharges should be avoided to minimise pollution impacts to sensitive receptors where practical and should only occur where alternative options have been exhausted for example, reuse for dust suppression and irrigation, and alternatives to basins such as elongated swales and infiltration trenches
- If discharges to surface waters are required, a water pollution impact assessment commensurate with the potential risks and consistent with the National Water Quality Guidelines would be required to inform licensing considerations consistent with section 45 of the *Protection of the Environment Operations Act 1997*.

Response

Transport notes that the erosion and sediment controls proposed are designed according to the requirements of the NSW EPA's document *Volume 2D, Soils and Construction for Main Road Construction* (DECC, 2008). Groundwater water quality risks would only be present for about a month during the actual construction of the sediment basin as they need to be unlined during construction to allow for localised lowering of the water table around the basin. Once the water table is lowered the basin can be lined and will remain lined during the rest of the construction period and into operation. As such there is only a very short time when groundwater inflows will occur. In addition, Basins B1 and B2 have low modelled total dewatering volumes compared to Basins B3 and B4 which have higher modelled total dewatering volumes as such half the basins have very low to low volumes and inflow rates, meaning lower potential for impacts. Material groundwater discharges into construction basins (and therefore out of these) are not anticipated.

Further to this groundwater interception during construction would likely be limited as the overall proposal area is low-lying and the proposed cut is generally limited to less than about 0.3 metres except about 600 metres north west of Hexham Bridge and near the intersection of Maitland Road and Old Maitland Road where there are some limited sections of cuts that would be up to about 1.5 metres proposed.

To manage potential groundwater impacts during construction the following additional mitigation measure number SW2 (refer further to **Section 6.2**) has been modified to monitor groundwater level responses to dewatering in excavations below the groundwater level.

3.5 State Emergency Services (SES)

3.5.1 Flooding and hydrology

Issue description

The NSW SES – Newcastle Unit thank Transport for their willingness to share flood intelligence that is required to prepare a Flood Action Card and evacuation plan for the residents and businesses of Hexham. The NSW SES – Newcastle Unit requests that Transport provide:

- Indicative tide and river levels associated with moderate flooding, and flooding above habitable dwellings and key community locations where transient populations are likely to gather (Bowling Club and Hexham McDonalds)
- Guidance on river levels which might trigger evacuation preparedness communications, warnings and orders – indicative warning times associated with minor, moderate and major floods from all relevant upstream flood gauges
- Confirmed evacuation routes for the community and businesses of Hexham via major roads
- Key models are provided to agencies or organisations that might be positioned to include the modelling within real time flood forecasting tools, in accordance with data licensing agreements or similar agreements.

Response

Transport will provide the NSW SES with a copy of the model used for the assessment in accordance with relevant data licensing agreements so they can review their Flood Management Plan for the area.

Transport proposes that a new flooding and hydrology mitigation measure number FL3 (refer further to **Section 6.2**) be included for construction in response to the NSW SES submission as follows:

A Flood Management Plan (FMP) will be prepared as part of the CEMP for the proposal and will include:

- Details on the processes for flood preparedness, materials management, weather monitoring, site management and flood incident management
- Responsibilities for flood response (preparation of site upon receipt of flood warning, evacuation of site personnel) during and recovery following a flood event
- Detailed construction planning such that construction phase traffic management and other construction area arrangements do not impact on flood evacuation route traffic capacity.

For operation the following flooding and hydrology mitigation measure number FL10 (refer further to **Section 6.2**) is also proposed:

During detailed design a review of the flood model will be undertaken in consultation with the SES to assess whether changes to evacuation routes proposed in the SES Flood Management Plan require modification.

4. Changes to the proposal

4.1 Change 1: New footpath between Shamrock Street and Old Maitland Road (south)

4.1.1 Description

In response to submissions received Transport is including a new one kilometre long pedestrian footpath along the western side of Maitland Road between the intersection with Shamrock Street near McDonalds and the intersection with Old Maitland Road to the south of the Hexham Bowling Club. This would provide access for residents in Hexham to bus stops located near these two intersections and the Hexham Bowling Club. The work for the new pedestrian footpath is within the REF area assessed under the proposal and would not require the clearance of any native vegetation consequently there would be no additional impacts to biodiversity. The inclusion of the new footpath would have a positive socio-economic outcome for the proposal providing improved pedestrian connectivity and pedestrian safety in the Hexham region. The new pedestrian footpath is shown in **Appendix A**.

4.2 Change 2: Property acquisition

4.2.1 Description

The proposal would require additional property for the northern and southern road accesses into Hexham Station car park. This would require partial acquisition of two small areas of Lot 1013 DP1193512 with a total area of 2,051.94 square metres of rail corridor land to the west of Maitland Road near Hexham Station, refer to **Appendix G**. The change would effectively establish the land as Transport owned road corridor instead of its previous land use rail corridor. The impact associated with the inclusion of the proposed northern and southern road accesses into Hexham Station car park are within the proposal area that has already been assessed as part of the REF.

The property would be acquired by Transport prior to construction in accordance with the provisions of the *NSW Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Reform 2016 process (<https://www.propertyacquisition.nsw.gov.au/>). The Act provides the basis for an appropriate valuation process and the fair assessment of compensation.

5. Further environmental assessment

5.1 Statutory planning framework

5.1.1 Environment Protection and Assessment Regulation 2021

In addition to the clause 228 factors considered in Appendix E of the REF, the following additional two factors identified in **Table 5.1** were introduced into Section 171 of the Environmental Planning and Assessment Regulation 2021, and form part of the consideration as to the likely impact of the proposal.

Table 5.1 Section 171(2) additional factors for consideration

Factor	Impact
q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	<p>The applicable local strategic planning statements, regional or district strategic plans have been considered in Section 2.1 and Section 2.4 of the REF.</p> <p>The REF area when considered as part of the proposal is considered to be consistent with these strategic planning documents.</p> <p>The proposal would improve travel times and relieve congestion, improve road users' safety, integrate with existing and planned transport network and improve economic growth, and would align with key local, regional and NSW transport strategies and plans.</p>
r) Other relevant environmental factors	<p>In considering the potential impacts of this proposal, all relevant environmental factors have been considered, refer to Chapter 6 of the REF.</p>

5.2 Soils and contamination

The potential impacts of the proposal associated with soils and contamination was assessed in the *Hexham Straight Widening Phase 1 Soils and Contamination Assessment* (Phase 1 Assessment) and was provided in Appendix K of the REF and summarised in Section 6.12 of the REF. The assessment recommended that a SAQP be prepared, and a site investigation be completed of potential AEIs.

Transport completed a SAQP and a Stage 2 Contamination and Waste Classification Assessment in 2021 of the AEIs within the proposal area to gather analytical data of contamination risks and complete a waste classification. The Stage 2 Contamination and Waste Classification Assessment is included in **Appendix F**

5.2.1 Methodology

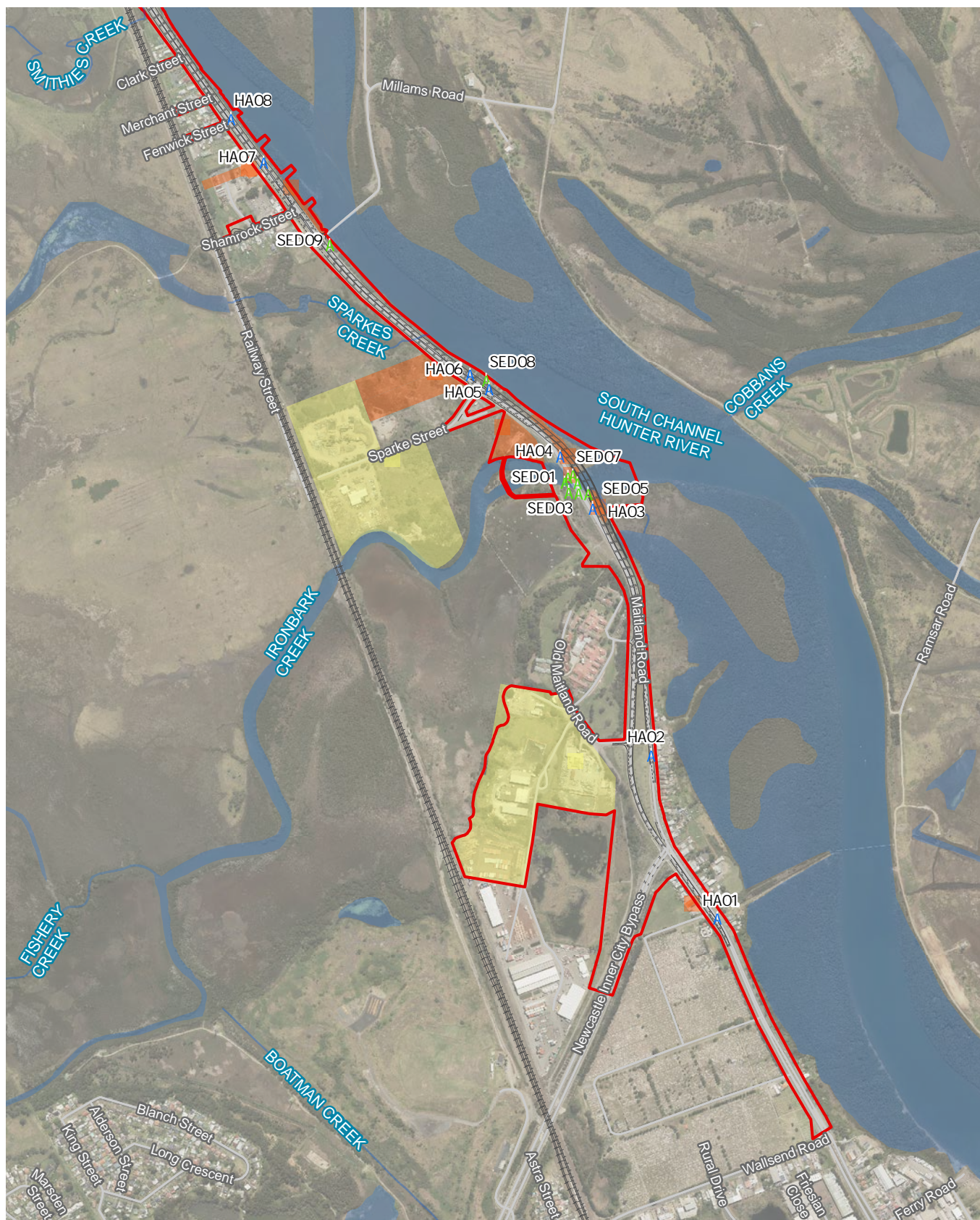
The Stage 2 Contamination and Waste Classification Assessment involved the following:

- A review and update of existing and any new background information from databases, websites, reports and other sources of information

- Development of a Preliminary Conceptual Site Model (PCSM) for the proposal area to develop the SAQP
- Completion of a targeted site inspection and investigative strategy in accordance with the SAQP that included collection of soil and bed sediment samples. The investigation strategy is summarised in **Table 5.2** and shown in **Figure 5.1**
- Analysis of samples collected
- Review of the potential contamination risks within the proposal area based on the assessment of analytical results. To address potential health and environmental impacts within the REF area, analytical test results were compared against a set of health and ecological based soil and sediment investigation levels referred to as Site Assessment Criteria (SAC). In addition, an assessment of impacts to human health and sensitive receiving environments was completed
- Completion of a preliminary in-situ waste classification in accordance with NSW EPA (2014) *Waste Classification Guidelines Part 1 - Classifying Waste*
- Review and update of proposal specific management measures and safeguards based on the results of the investigation.

The Stage 2 Assessment has been prepared and conducted in accordance with the following guidelines (where applicable):

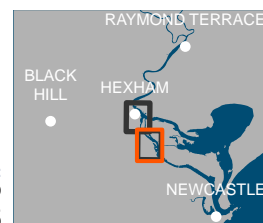
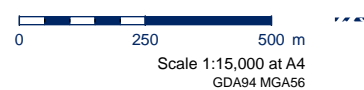
- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999, as revised 2013 (NEPM, 2013)
- *PFAS National Environmental Management Plan – Version 2.0*, January 2020 (PFAS NEMP, 2020)
- NSW Roads and Maritime Services (2013) Guideline for the Management of Contamination.



Legend

- The proposal
- ▭ Construction area
- Road
- +—+—+ Railway
- ▭ Waterway

- A Hand auger
 - A Sediment
- Areas of environmental interest
- Risk
- ▭ High risk
 - ▭ Moderate risk



Data sources:
Jacobs 2020
Department Finance,
Services and Innovation 2020

Figure 5.1a Proposed sampling locations - southern section of proposal

Hexham Straight Widening

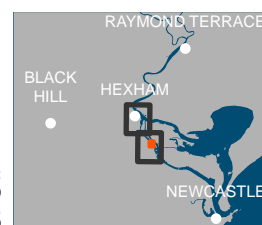
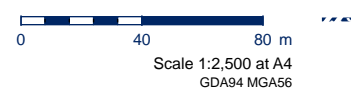


Date: 24/03/2022 Filename: IA301100_F006_AEI_Stage2_v4

Legend

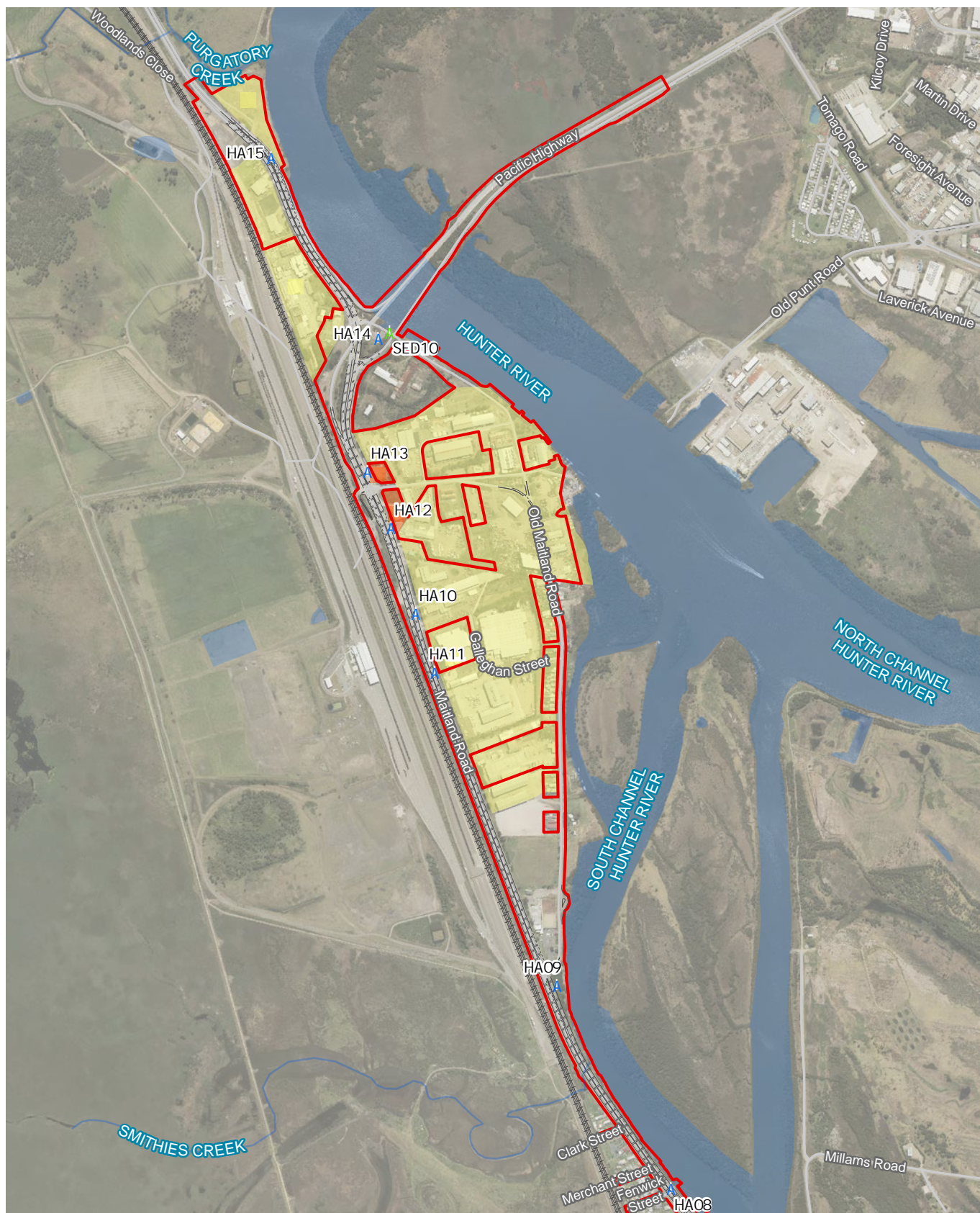
- The proposal
- ▭ Construction area
- Road
- +++ Railway
- Waterway

- A Hand auger
 - A Sediment
- Areas of environmental interest
- Risk
- High risk
 - Moderate risk



Data sources:
 Jacobs 2020
 Department Finance,
 Services and Innovation 2020

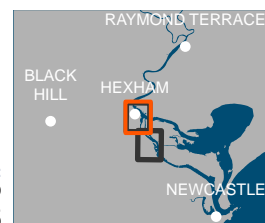
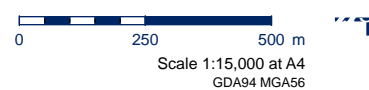
Figure 5.1b Proposed sampling locations - middle section at Ironbark Creek
 Hexham Straight Widening



Date: 24/03/2022 Filename: IA301100_F006_AEL_Stage2_v4

Legend

- The proposal
- ▭ Construction area
- Road
- +++ Railway
- Waterway
- Hand auger
- Sediment
- Areas of environmental interest
- Risk
 - High risk
 - Moderate risk



Data sources:
 Jacobs 2020
 Department Finance,
 Services and Innovation 2020

Figure 5.1c Proposed sampling locations - northern section of proposal

Hexham Straight Widening

Table 5.2 Summary of sample locations

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
Soil samples					
HA01	Southern end of the proposal opposite the Caltex Service Station.	Service stations – Soil downgradient of service station and potential underground fuel tanks.	0.3	0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos. Analytical schedule tailored for respective activity contaminants of potential concern.
HA02	Southern end of the proposal, approximately 50 metres south of the Old Maitland Road and Maitland Road intersection.	Current and historic commercial/industrial activity - Shallow soils next to/ downgradient of current and historic commercial/industrial premises at the southern end of the proposal.	0.5	0.5	
HA03	Eastern road verge of Maitland Road south of the Ironbark Creek Bridge abutments.	Imported fill and discarded waste – Shallow soils within areas of identified imported fill and discarded waste (including potential asbestos containing material (PACM)) surrounding Ironbark Creek Bridge.	0.3	0.1	
HA04	Eastern road verge of Maitland Road north of the Ironbark Creek Bridge abutments.	Imported fill and discarded waste – Shallow soils within areas of identified imported fill and discarded waste (including PACM) surrounding Ironbark Creek Bridge.	0.2	0.2	

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
HA05 and HA06	Eastern road verge of Maitland Road opposite Sparke Street.	Imported fill and discarded waste – Shallow soils within areas of identified imported fill and discarded waste (including PACM). Current and historic commercial/industrial activity - Shallow soils next to/ downgradient of current and historic commercial/industrial premises along Sparke Street at the southern end of the proposal.	0.3; 0.2	0.3; 0.1	
HA07	Eastern road verge of Maitland Road opposite Coles Express Service Station (north of Shamrock Street).	Service stations – Soil downgradient of service station and potential underground fuel tanks.	0.2	0.1	
HA08	Eastern road verge of Maitland Road opposite Fenwick Street.	Imported fill and discarded waste – Shallow soils within areas of identified imported fill and discarded waste (including demolition debris and smelter slag).	0.2	0.2	
HA09	Eastern road verge of Maitland Road south of Hexham Bowling Club.	Current and historic commercial/industrial activity - Shallow soils next to or downgradient from current and historic commercial/industrial premises in the northern end of the proposal.	0.3	0.3	

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
HA10	Eastern road verge of Maitland Road adjacent to industrial/commercial area in the northern portion of the proposal.	Current and historic commercial/industrial activity - Shallow soils next to current and historic commercial/industrial premises in the northern end of the proposal.	0.5	0.45	
HA11	Eastern road verge of Maitland Road adjacent to Cummins Newcastle Facility Hexham within the industrial/commercial area in the northern portion of the proposal.	Current and historic commercial/industrial activity - Shallow soils next to current and historic commercial/industrial premises in the northern end of the proposal.	0.5	0.1	
HA12	Eastern road verge of Maitland Road next to Caltex Diesel Stop in the northern portion of the proposal.	Service stations – Soil adjacent to service station. Current and historic commercial/industrial activity - Shallow soils next to current and historic commercial/industrial premises in the northern end of the proposal.	0.5	0.1	
HA13	Eastern road verge of Maitland Road next to BP service station in the northern portion of the proposal.	Service stations – Soil adjacent to service station. Current and historic commercial/industrial activity - Shallow soils next to current and	0.4	0.4	

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
		historic commercial/industrial premises in the northern end of the proposal.			
HA14	Eastern road verge of Maitland Road east of Brancourts Manufacturing and Processing/former Oak factory site.	Current and historic commercial/industrial activity - Shallow soils adjacent to/downgradient of current and historic commercial/industrial premises near Hexham Bridge at the northern end of the proposal.	0.4	0.4	
HA15	Eastern road verge of Maitland Road at the northern end of the proposal.	Current and historic commercial/industrial activity - Shallow soils next to/ downgradient of historic coal loading wharf.	0.5	0.1	
Sediment samples					
SED01	Centre of Ironbark Creek, below Ironbark Creek Bridge (west side).	Ironbark Creek sediments – Sediments downgradient of rural and commercial/ industrial properties. Sediments beneath potential bridge coated in lead-based paint. Demolition of previous bridge structures.	0.1	0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and tri-butyl tin.

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
SED02	Centre of Ironbark Creek, below Ironbark Creek Bridge (east side).	<p>Ironbark Creek sediments – Sediments downgradient of rural and commercial/industrial properties.</p> <p>Sediments beneath potential bridge coated in lead-based paint.</p> <p>Demolition of previous bridge structures.</p>	0.1	0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC and herbicides.
SED03, SED04 and SED05	Southern bank of Ironbark Creek, adjacent and beneath Ironbark Creek Bridge.	<p>Ironbark Creek sediments – Sediments downgradient of rural and commercial/ industrial properties.</p> <p>Sediments beneath potential bridge coated in lead-based paint.</p> <p>Demolition of previous bridge structures.</p>	0.1; 0.1; 0.1	0.1; 0.1; 0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and tributyl tin (SED04 only).
SED06	Northern bank of Ironbark Creek, below Ironbark Creek Bridge.	<p>Ironbark Creek sediments – Sediments downgradient of rural and commercial/ industrial properties.</p> <p>Sediments beneath potential bridge coated in lead-based paint.</p>	0.1	0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC and herbicides

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
		Demolition of previous bridge structures.			
SED07	Northern bank of Ironbark Creek, below Ironbark Creek Bridge.	Ironbark Creek sediments – Sediments downgradient of rural and commercial/ industrial properties. Sediments beneath potential bridge coated in lead-based paint. Demolition of previous bridge structures.	0.1	0.1	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and tri-butyl tin.
SED08	South Channel Hunter River foreshore opposite Sparke Street.	Current and historic commercial/industrial activity – Sediment downgradient of current and historic commercial/industrial premises along Sparke Street at the southern end of the proposal.	0.1	0.1	
SED09	South Channel Hunter River foreshore south of Ash Bridge.	Imported fill and discarded waste – Sediment downgradient of identified areas of imported fill and discarded waste (including demolition debris and smelter slag).	0.1	0.1	
SED10	Hunter River, beneath Hexham Bridge western	Current and historic commercial/industrial	0.1	0.1	

Sample ID	Location	Rationale	Maximum borehole depth (mbgl)	Sample depths (mbgl)	Analytical schedule
	bridge abutments in the northern portion of the proposal.	activity - Sediment downgradient of current and historic commercial/industrial premises in the northern end of the proposal. Sediments within area of former bridge structures potentially coated in lead-based paint.			

5.2.2 Background information

In addition to the previous investigations that are discussed in Section 2.1 of the Phase 1 Assessment the Stage 2 Assessment (**Appendix F**) identified new studies that had been completed since the display of the REF, which included and are summarised below:

- Draft Geotechnical Interpretive Report (GIR), (Douglas Partners, 2021)
- Draft Acid Sulfate Soil Management Plan (ASSMP), (Douglas Partners, 2021).

Geotechnical Interpretive Report

The GIR investigation identified the following information relating to potential contamination:

- The general top stratigraphic units across the site comprise of fill including a mixture of gravel and sand including slag and ash gravel. Typically including slag cobbles / boulders. Trace glass at some locations. Concrete was also encountered in some pavement cores. A fill clay unit was encountered beneath this which was variable in composition and cohesive. This clay layer included slag and ash gravel, trace glass and brick at some locations
- Two soil domains were identified:
 - A – Fill and residual clays overlying relatively shallow sedimentary rock south of Ironbark Creek Bridge approach embankment
 - B – The remainder of the site comprises compressible soft estuarine soils, up to about 20 m thick but potentially locally deeper. Compressible soils and depth to rock deepen typically to the north east of Ironbark Creek, along the road alignment. Overlying firm or stronger estuarine clay and sedimentary rock at depth.

Draft Acid Sulfate Soil Management Plan

Douglas Partners prepared a draft ASSMP for the proposal and preliminary analytical data associated with soils and sediments collected during the geotechnical investigations in December 2020 and January 2021 indicated elevated concentrations of some metals, polycyclic aromatic hydrocarbons (PAH) and recoverable hydrocarbons at discrete locations that have been historically filled and reclaimed along the existing alignment.

Most of the proposal area is located on Class 2 ASS (high probability of occurrence). There are small areas in the northern and central sections of the proposal, next to the Hunter River and around Ironbark Creek Bridge that are considered to have very high ASS risk (Class 1 ASS). Chemical data associated with ASS sampling for the ASSMP (Douglas Partners June 2020 and January 2021) across the proposal confirms acid sulfate conditions at most of the locations tested or screened (over 100 data points).

Preliminary Conceptual Site Model

A PCSM was developed of the proposal area based on information obtained from the Phase 1 Assessment and additional investigations summarised above. The PCSM summarises the potential contaminant sources, pathways and receptors (SPR) identified within the proposal area that may present a potential risk to human health and/or the environment. The PCSM is detailed in **Table 5.3**.

Table 5.3 Preliminary Conceptual Site Model

Activity / AEC	Potential issues / source	Contaminants of concern	Contamination mechanism	Potential receptors	Data gaps
Ironbark Creek Bridge	<p>Ironbark Creek sediments.</p> <p>Cementitious smelter slag associated with Ironbark Creek Bridge abutments from previous bridge structures.</p> <p>Future demolition of Ironbark Creek Bridge.</p>	<p>Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), Total Recoverable Hydrocarbons (TRH), monocyclic aromatic hydrocarbons (BTEXN), polycyclic aromatic hydrocarbons (PAH), Polychlorinated Biphenyls (PCBs), PFAS (per- and poly-fluoroalkyl substances), organochlorine and organophosphorus pesticides (OPP/OCP), volatile and semi-volatile organic compounds (VOC, SVOC) and herbicides.</p>	<p>Demolition of previous Ironbark Creek Bridge structures.</p> <p>Runoff from local residential, rural and industrial zoned properties. These include nearby industrial recycling facility, adjacent railway activities and land reclamation and agricultural/rural operations runoff.</p> <p>Potential herbicide application in drainage areas.</p>	<p>Future Construction workers</p> <p>Users of Ironbark Creek and downgradient users of other waterways and ecosystems.</p>	<p>Historical aerial imagery indicates the current bridge was constructed between 1954 and 1965, replacing a previously demolished bridge to accommodate road upgrades. There is the potential for the use of lead-based paint on Ironbark Creek Bridge.</p> <p>The Hunter River, South Channel Hunter River and Ironbark Creek transect or run adjacent to the proposal site where herbicides were known to have been used. Herbicides, if present, are likely to be bound to the sediments of waterways.</p> <p>Based on desktop review, the quality of shallow bed sediments within Ironbark Creek is unknown, and therefore is considered a data gap.</p>
Imported fill and discarded waste	<p>Shallow soils in unsealed areas adjacent to the proposed alignment.</p> <p>Various wastes were observed on the surface around areas of infilling</p>	<p>Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos.</p>	<p>Previous filling and land reclamation operations to build the original road elevation and alignment.</p>	<p>Future Construction workers</p> <p>Downgradient users of</p>	<p>Preliminary analytical data associated with soils and sediments collected during the geotechnical investigations in December 2020 and January 2021</p>

Activity / AEC	Potential issues / source	Contaminants of concern	Contamination mechanism	Potential receptors	Data gaps
	<p>consisting primarily of demolition debris within which fragments of PACM were identified.</p> <p>Cementitious smelter slag, demolition waste stockpiles and episodes of scattered fly tipped waste in shallow soils observed east of Maitland Road.</p>			<p>waterways and ecosystems</p> <p>Surrounding site users</p>	<p>(Douglas Partners) indicate elevated concentrations of some metals, PAH and recoverable hydrocarbons at discrete locations that have been historically filled and reclaimed along the existing alignment.</p> <p>The shallow soil analytical quality within areas of the proposal adjacent to and within areas of imported fill and discarded waste on the eastern verge of Maitland Road is considered data gap.</p>
<p>Commercial/Industrial premises (Northern end of the proposal)</p> <p>East and west of the proposed alignment in the northern portion of the proposal. Includes temporary construction facilities west and north of Hexham Bridge (Compound 3 and Compound 4) and the industrial estate located to the east of Maitland Road/Pacific Highway (A43) and the west of Old Maitland Road, Hexham (Compound 2)</p>	<p>Shallow soils adjacent to the commercial/industrial premises.</p> <p>Bed sediments downgradient of Commercial/industrial premises.</p> <p>Historic and current industrial and commercial activities including mechanics, engineering and industrial galvanizers and a dairy processing plant.</p>	<p>Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos.</p>	<p>Previous filling and runoff associated with historic and current industrial and commercial activities.</p> <p>Demolition of former buildings and infrastructure including overhead conveyor and associated buildings relating to former Coal Preparation Plant.</p>	<p>Future Construction workers</p> <p>Downgradient users of waterways and ecosystems</p> <p>Surrounding site users</p>	<p>A number of premises were identified within the proposal area or within around 500 metres of the proposal area that are currently or were historically licensed by the NSW EPA.</p> <p>The shallow soil quality within areas of the proposal adjacent to or within areas of current and historic commercial/industrial activity identified in the Phase 1</p>

Activity / AEC	Potential issues / source	Contaminants of concern	Contamination mechanism	Potential receptors	Data gaps
<p>Commercial/Industrial premises (Southern end of the proposal)</p> <p>West of the proposed alignment in the central and southern portion of the proposal area. Includes areas west of the southern portion of the proposal that will be temporary construction facilities (Compound 1).</p>	<p>Shallow soils adjacent to the commercial/industrial premises.</p> <p>Bed sediments downgradient of commercial/industrial premises</p> <p>Historic and current industrial and commercial activities including recycling plant, mineral/metal supplier and processor and chemical storage.</p>	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEX, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos.	Previous filling and runoff associated with historic and current industrial and commercial activities.		<p>Assessment is considered data gap.</p> <p>The downgradient Hunter Riverbed sediment quality is unknown and therefore considered a data gap.</p>
Service stations	<p>Soil surrounding and downgradient from underground fuel tanks.</p> <p>East of the northern portion of proposal: Caltex Diesel Stop and BP service station.</p> <p>East of the central portion of the proposal, next to McDonald's and Coles Express service station.</p> <p>West of the southern portion of the proposal: Caltex Sandgate service station.</p>	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PCBs, PFAS, OPP/OCP, VOC, SVOC, herbicides and asbestos.	Potential soil and groundwater contamination due to possible fuel tank leaks.	<p>Future Construction workers</p> <p>Downgradient users of waterways and ecosystems</p> <p>Surrounding site users</p>	<p>Four operational petrol stations were identified within the study area with another located 247 metres south east of the proposal area. These service stations are identified as a constraint due to fuel storage and potential soil and groundwater contamination due to possible fuel tank leaks.</p> <p>The shallow soil quality within areas of the proposal adjacent to or within the vicinity of service stations is considered data gap.</p>

5.2.3 Existing environment

A description of the existing environment is included in the Phase 1 Assessment. This includes details on the location of the proposal, the topography, hydrogeology, geology, soil types and whether acid sulphate soils are present in the REF area. Potential contamination sources and AEIs were also identified and these are summarised in Section 6.12 of the REF and shown in Figure 6.14 of the REF.

5.2.4 Potential impacts

Based on the field and analytical results for the Stage 2 Assessment, the following contamination risks were identified:

- Asbestos was identified in some surface and soil sample sites. The asbestos was identified in fragments of bonded cement fibre sheeting (not as individual fibres or fibre bundles within soil). It is likely that asbestos is present in shallow soils and within areas surrounding shallow soils and sediments within the proposal which were not sampled as part of this Stage 2 Assessment
- Copper, lead, and zinc were identified in exceedance of sediment DGV in some of the bank and bed samples taken from Ironbark Creek
- Elevated concentrations of heavy metals was identified in sediments collected from Ironbark Creek and could potentially be associated with runoff from adjacent commercial and industrial activities including nearby industrial recycling facility, adjacent railway activities and land reclamation on the foreshore of Ironbark Creek
- Concentrations of Total Recoverable Hydrocarbons (TRH) was identified in four soil samples and Benzo(a) pyrene was identified in eight soils samples collected from the eastern verge of Maitland Road that were in exceedance of the Ecological Investigation Level (EIL) for Urban Residential/Public Open Space
- Exceedances of petroleum and polycyclic aromatic hydrocarbons were reported in soil samples targeting areas adjacent to or downgradient of service stations and current or historic commercial and industrial activities. This contamination could be associated with possible fuel tank leaks or runoff from service stations and previous filling and runoff associated with historic and current industrial and commercial activities including the former Oak Factory, mechanics, engineering and industrial galvanizers, dairy processing, recycling plant, mineral/metal supplier and processor
- Other analytes were not reported above SAC in the targeted soil and sediment samples collected, however, visual observations of slag and building rubble along the proposal indicate that there remains the potential for other contamination to exist which was not identified as part of this Stage 2 Assessment and would be managed by the implementation of an unexpected finds protocol
- Based on the results of the preliminary waste classification assessment, sub-surface fill materials sampled for the proposal have been classified as General Solid Waste (non-putrescible) in accordance with NSW EPA (2014) guidelines should disposal to landfill be required
- During construction, increased turbidity and the mobilisation and release of contaminants such as heavy metals entrained within the shallow bed sediments at the pile removal locations could create a potential localised risk to water quality and to the receiving aquatic environment, such as fish and benthic organisms within Ironbark Creek and South Channel Hunter River
- The results of the Stage 2 Assessment indicates that the impacts associated with soil and contamination risks identified from the site investigation of the proposal are unlikely to be significant. While exceedances of the SAC are noted, the site condition is considered suitable for the proposal. Consequently, the proposal would not trigger a notification under Section 60 of the Contaminated Land Management Act 1997 and would not require remediation of the site or any subsequent

validation reporting such as a Remediation Action Plan. As such an independent site auditor is not required for the proposal.

A revised conceptual site model was developed following the completion of the analysis of the samples collected from the Stage 2 site investigations and this is summarised in **Table 5.4**.

Table 5.4 Revised Conceptual Site Model

Activity / areas of environmental concern	Potential issues / source	Contaminants of concern	Contamination mechanism	Receptors	Revised risk assessment
Ironbark Creek Bridge	<p>Ironbark Creek sediments.</p> <p>Cementitious smelter slag associated with Ironbark Creek Bridge abutments from previous bridge structures.</p> <p>Future demolition of Ironbark Creek Bridge.</p>	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PFAS, and asbestos	<p>Demolition of previous Ironbark Creek Bridge structures.</p> <p>Runoff from local residential, rural and industrial zoned properties.</p>	<p>Future construction workers</p> <p>Users of Ironbark Creek and downgradient users of other waterways and ecosystems.</p>	<p>High – Concentrations of heavy metals were detected above the SAC in all sediment samples targeting bed sediments below and surrounding Ironbark Creek Bridge with the exception of SED06.</p> <p>Concentrations of lead were detected above the Site Assessment Criteria (SAC) on the northern banks of Ironbark Creek (SED07) and beneath Ironbark Creek Bridge (SED01, SED02).</p> <p>Concentrations of zinc were detected above the SAC on the northern banks (SED07) and southern banks (SED03, SED04 and SED05) of Ironbark Creek and in the centre of the creek beneath Ironbark Creek Bridge (SED01 and SED02).</p> <p>Concentrations of copper were detected above the SAC in the centre of Ironbark Creek beneath Ironbark Creek Bridge (SED01).</p> <p>Lead based paint was observed to have been used on Ironbark Creek Bridge.</p>
Imported fill and discarded waste	Shallow soils in unsealed areas next to the proposal.	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PFAS and asbestos..	Bulk earthworks, structure removal, piling.	Future construction workers.	<p>High – Asbestos was identified along the eastern verge of Maitland Road in the area surrounding four sample locations (SED08, SED09, SED10 and HA08). It is possible that asbestos is</p>

Activity / areas of environmental concern	Potential issues / source	Contaminants of concern	Contamination mechanism	Receptors	Revised risk assessment
	Cementitious smelter slag, demolition waste stockpiles and fly tipped waste on the surface around areas of infilling consisting primarily of demolition debris.			Downgradient users of waterways and ecosystems. Surrounding site users.	present in shallow soils and within areas surrounding shallow soils and sediments within the proposal which were not sampled as part of this Stage 2 Assessment. Concentrations of TPH (HA03_0.1) and PAH (HA03_0.1, HA04_0.2, HA06_0.1 and HA07_0.1) compounds were detected above the SAC in selected soil samples targeting areas of imported fill and discarded waste along the proposal. Other analytes were not reported above SAC in the targeted samples collected, however, visual observations of slag and building rubble indicate that there remains the potential for other contamination to exist which was not identified as part of this Stage 2 Assessment.
Current and historic commercial/industrial activity	Shallow soils adjacent to the commercial/industrial premises. Bed sediments downgradient of commercial/industrial premises.	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PFAS and asbestos.	Previous filling and runoff associated with historic and current industrial and commercial activities. Demolition of former buildings and infrastructure.	Future construction workers. Downgradient users of waterways and ecosystems Surrounding site users.	Moderate – Concentrations of TPH (HA14_0.4 and HA15_0.1) and PAH (HA02_0.5 and HA14_0.4) compounds were detected above the SAC in selected soil samples targeting areas downgradient of current and historic commercial/industrial premises at the northern and southern ends of the site. Other analytes were not reported above SAC in the targeted samples collected, however, slag and building rubble indicate that there remains the potential for other contamination to

Activity / areas of environmental concern	Potential issues / source	Contaminants of concern	Contamination mechanism	Receptors	Revised risk assessment
					<p>exist which was not identified as part of this Stage 2 Assessment.</p> <p>Contamination above the SAC was not reported in the sediment samples downgradient of current and historic commercial/industrial activity.</p>
Service stations	Soil surrounding and downgradient from potential underground fuel tanks.	Heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), TRH, BTEXN, PAH, PFAS, and asbestos.	Potential soil and groundwater contamination due to possible fuel tank leaks.	<p>Future construction workers</p> <p>Downgradient users of waterways and ecosystems.</p> <p>Surrounding site users.</p>	<p>Moderate – Concentrations of TPH (HA01_0.3) and PAH (HA01_0.3 and HA08_0.2) compounds were detected above the SAC in selected samples targeting soil downgradient of service stations and potential underground fuel tanks.</p> <p>Other analytes were not reported above SAC in the targeted samples collected, however, aesthetic issues observed in the soils indicate that there remains the potential for other contamination to exist which was not identified as part of this Stage 2 Assessment.</p>
Acid Sulfate Soils	The majority of the proposal site is located on Class 2 ASS. There are small areas in the northern and central portion of the proposal, next to the Hunter River, South Channel Hunter River and around Ironbark Creek Bridge, located on Class 1 ASS.	Sulfide, sulfate	Class 2 ASS soils are characteristic of the Hunter River floodplain. The exposure of the sulfide in these soils to oxygen by drainage or excavation leads to the generation of sulfuric acid. Direct disturbance or	<p>Future construction workers.</p> <p>Downgradient users of waterways and ecosystems.</p> <p>Surrounding site users.</p>	<p>Moderate – ASS were not investigated as part of this Stage 2 Assessment. Moderate rating unchanged from Phase 1 Assessment.</p>

Activity / areas of environmental concern	Potential issues / source	Contaminants of concern	Contamination mechanism	Receptors	Revised risk assessment
			lowering of the groundwater table in areas containing ASS may result in the production of acidic water which may in turn have water quality impacts, ecosystem impacts and cause damage to infrastructure.		

The Phase 2 Contamination and Waste Classification Assessment has specifically focused on impacts to human health and to sensitive receiving environments during construction of the proposal and has considered risks associated with dredging and piling activities, disturbance of surficial soil contamination and acid sulfate soils. It is noted that the existing condition of soils, imported fill, sediments and associated terrestrial and aquatic environments have been associated with legacy land reclamation and filling activities as part of the original Maitland Road alignment and Ironbark Creek Bridge. The potential risk (human health and environmental) of exposure to site users, site workers and surrounding environments, and the migration of contamination (if present), could be increased if excavation and other construction works take place within the AEIs investigated within the Stage 2 Assessment.

Potential contamination risks associated with the proposal based on the results of the Phase 2 Contamination and Waste Classification Assessment, during construction of activities within the REF area could include:

- Short term mobilisation of surface and sub-surface contaminants including:
 - Shallow bed sediments containing contaminants of concern during demolition and construction activities (including piling and dredging) within the Ironbark Creek waterway. Impacts may include increased turbidity and reduction of water quality to the receiving aquatic environment, potentially impacting fish and benthic organisms living within Ironbark Creek and the South Channel Hunter River. Potential exposure risks to human health and the environment from disturbing sediments is considered to be low
 - Disturbance of shallow (surficial) soil within areas of imported fill along the eastern verge of Maitland Road and adjacent to Ironbark Creek which were found to contain concentrations of petroleum and polycyclic aromatic hydrocarbons above the SAC. These soils could be disturbed during construction of the new bridge abutments and upgrades to the road alignment which could result in these contaminants as well as potentially heavy metals, pesticides and herbicides being exposed to groundwater or surface water. Once within groundwater and/or surface water these contaminants could migrate to receiving environments within Ironbark Creek and the South Channel Hunter River. These contaminants in waterways could negatively impact on the ecological health of aquatic organisms
- Exposure to asbestos containing material (ACM) as ACM shards were identified within the area surrounding soil sample locations along the eastern verge of the Maitland Road and under the western Hexham Bridge abutment. The asbestos was identified in fragments of bonded cement fibre sheeting (not as individual fibres or fibre bundles within soil). It is likely that asbestos is present in shallow soils and within areas surrounding shallow soils and sediments within the proposal which were not sampled as part of this Stage 2 Assessment. This poses a risk to construction workers and site uses during construction that may come into contact with shallow soils
- Exposure of ASS as the majority of the construction area is classed as Class 2 ASS, with Class 1 ASS existing around the northern and central portion of construction area, next to Hunter River and around Ironbark Creek Bridge. Direct disturbance through excavation, vegetation clearing, dredging and piling or lowering of the groundwater table in areas containing ASS may result in the production of acidic water which may in turn have water quality impacts. The acidification could also potentially mobilise heavy metals. Changes to groundwater levels are however anticipated to be negligible as groundwater level reduction when dewatering for the purpose of basin construction works would result in a reduction of less than 0.1 metres, which would only occur for a period of about one month, refer further to the Surface Water and Groundwater Assessment
- Risk of exposure of contaminants described above to site workers, site users and site visitors
- Risk of exposure of contaminants described above to surrounding environmental receptors (i.e. flora, fauna, surrounding ecosystems including groundwater dependent ecosystems).

Operation impacts

During the operation of the REF area, vehicle or plant and equipment leakages or a vehicle crash may cause spills of oils, lubricants, hydraulic fluids and chemicals. Spills and leakages within the REF area have the potential to result in contamination. The severity of the potential impact would depend on the magnitude and/or location of the spill in relation to sensitive receivers, emergency response procedures and/or environmental management measures implemented on site and the nature of the receiving environment. Further, operational water quality basins which have been proposed will capture and treat runoff.

5.2.5 Revised safeguards and management measures

The environmental management measures from the Phase 1 Assessment have been reviewed and updated based on the results of the Stage 2 Assessment. The revised management measures that will be implemented to minimise potential soils and contamination risks proposal within the proposal area, along with the responsibility and timing for those measures, are presented in **Table 5.5**. Measures identified in the Phase 1 Assessment that are no longer required are shown with a strike through the text, and new measures are underlined.

Table 5.5 Safeguards and management measures – soils and contamination Impact

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	<p>A detailed site investigation (Phase 2) will be undertaken in areas of potential contamination identified during the preliminary site investigation (Phase 1), in accordance with the <i>Roads and Maritime Services (2013) Guideline for the Management of Contamination</i>.</p> <p>An in-situ waste classification will be undertaken for any materials which are proposed to be excavated and removed from the proposal as part of a Phase 2 investigation.</p>	Transport	Detailed design / prior to construction	<u>Appendix K of the REF</u>
Contaminated land and groundwater	<p>A Contaminated Land Management Plan will be prepared in accordance with the <i>Guideline for the Management of Contamination</i> (Roads and Maritime Services, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to:</p> <ul style="list-style-type: none"> • Capture and management of any surface runoff contaminated by exposure to the contaminated land • Further investigations required to determine the extent, concentration and type of contamination, as identified in the detailed site investigation (Phase 2) • <u>An 'unexpected finds' protocol to plan for and accommodate potential ACM or other waste during the construction phase.</u> • <u>Application of the <i>Acid Sulfate Soils Management Plan</i> (Douglas Partners, 2021b)</u> • Management of the remediation and subsequent validation of the 	Transport/ Contractor	Detailed design/ prior to construction	Section 4.2 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p>contaminated land, including any certification required</p> <ul style="list-style-type: none"> Measures to ensure the safety of site personnel and local communities during construction. 			
<u>Contaminated land - ACM</u>	<u>An 'emu pick' exercise will be conducted by an occupational hygienist to remove visible asbestos fragments from the surface of areas planned for excavation along the proposal prior to construction.</u>	<u>Contractor</u>	<u>Prior to construction</u>	Appendix B of the REF
Contaminated land – temporary construction compounds	A pre and post lease condition assessment <u>will</u> be conducted for all temporary construction facilities. proposed within sealed areas	Contractor	Prior to construction and post construction	Section 4.15 of QA G36 Environment Protection
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport Environment Manager and/or EPA.	Contractor	<u>Detailed design/ prior to construction</u>	Section 4.2 of QA G36 Environment Protection
<u>Contaminated sediments impacting water quality – Construction of new ironbark Creek Bridge</u>	<p><u>A Dredging Environmental Management Plan (DEMP) will be prepared and implemented for the demolition and construction of Ironbark Creek Bridge. The DEMP will outline:</u></p> <ul style="list-style-type: none"> <u>Dredging methods that minimise the disturbance and mobilisation of sediments</u> <u>Detail of the transport, storage and treatment process of sediments</u> <u>Management measures to mitigate mobilisation of sediment during high risk activities including piling, such as silt curtains or cofferdams</u> <u>Procedures for a sampling and monitoring plan of turbidity and water quality in Ironbark Creek during dredging activities at monitoring points upstream and downstream of the new bridge and considers background conditions and includes stop work measures</u> <u>Photographic evidence and documentation.</u> <u>Undertaking piling activities during appropriate tidal conditions</u> <u>Measures for managing dredging spoil that minimises the disturbance and mobilisation of fugitive sediments such as clam shell bucket dredging or</u> 	<u>Transport/ Contractor</u>	<u>Prior to and during construction</u>	Appendix F

Impact	Environmental safeguards	Responsibility	Timing	Reference
	<p><u>suction dredging and cutting with a storage tank on a barge that allows for collection of disturbed bed sediments</u></p> <ul style="list-style-type: none"> • <u>Sediment dewatering methods that minimise the release of untreated dredge water to the receiving environment</u> • <u>Management and disposal of dredged spoil.</u> 			
Accidental spill	A site specific emergency spill plan will be developed and include spill management measures in accordance with the <i>Transport Code of Practice for Water Management</i> (Roads and Traffic Authority, 1999) and relevant legislation and guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.	Transport/ Contractor	Prior to construction	Section 4.3 of QA G36 Environment Protection

5.3 Cumulative assessment

The Richmond Vale Rail Trail cycleway (DA2020/00641) has been granted conditional approval by the Hunter and Central Coast Regional Planning Panel and is comprised of a 32 kilometre cycling and walking track along the former Richmond Vale railway between Kurri Kurri and Hexham/Shortland. The proposed cycle / walkway route is located to the west of the proposal and goes through Hexham Swamp Nature Reserve. Cumulative impacts associated with this project include biodiversity impacts associated with the clearance of coastal wetlands and other threatened ecology communities, water quality impacts and minor changes to surface water flow, impacts to Aboriginal and non-Aboriginal heritage, and some minor amenity impacts. Mitigation measures have been developed to ameliorate impacts and offsets associated with vegetation clearance would be required in accordance with the *Biodiversity Conservation Act 2016*. There would be a large community benefit for cyclists as the project offers another alternate cycle route that would be off-road and would be available for cyclists within the Hexham area.

6. Environmental management

The REF for the Hexham Straight Widening proposal identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Chapter 7 of the REF).

After consideration of the issues raised in the public submissions and changes to the proposal, the safeguard and management measures have been revised. This includes some new measures for soils and contamination following the completion of the Phase 2 Contamination and Waste Classification Assessment and some revised measures for flooding, surface water, groundwater, traffic and transport, socio-economic land use and property following the review of submissions received.

Should the proposal proceed, environmental management will be guided by the framework and measures outlined below.

6.1 Environmental management plans (or system)

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

A single CEMP will be prepared to describe the safeguards and management measures identified for this REF and the EIS. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation. The CEMP will also provide the roles and responsibilities of key construction personnel and describe how environmental risks associated with the proposal will be managed and be complemented by the various sub-plans included in **Table 6.1** and the EIS. The CEMP will be prepared prior to construction of the proposal and must be reviewed and approved by Transport, prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – *Environmental Protection (Management System)*, QA Specification G38 – *Soil and Water Management (Soil and Water Plan)*, QA Specification G40 – *Clearing and Grubbing*, QA Specification G10 – *Traffic Management*.

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in **Table 6.1**.

6.2 Summary of safeguards and management measures

The REF for the Hexham Straight Widening proposal identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the public submissions, the environmental management measures for the proposal (refer to Chapter 7 of the REF) have been revised where relevant. Should the proposal proceed, the environmental management measures in **Table 6.1** will guide the subsequent phases of the proposal. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been underlined, and deleted measures, or parts of measures that have been updated to remove duplication and provide additional clarity on their implementation, have been struck out.

Table 6.1 Summary of environmental safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
General					
GEN1	General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Transport-Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> Any requirements associated with statutory approvals Details of how the project will implement the identified safeguards outlined in the REF and EIS Issue-specific environmental management plans Roles and responsibilities Communication requirements Induction and training requirements Procedures for monitoring and evaluating environmental performance, and for corrective action Reporting requirements and record-keeping Procedures for emergency and incident management Procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity. 	Transport/ Contractor	Prior to construction/ detailed design	-
GEN2	General - notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Transport/ Contractor	Prior to construction	-
GEN3	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular ‘toolbox’ style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> Areas of Aboriginal heritage sensitivity Threatened species habitat 	Transport/ Contractor	Prior to construction/ detailed design	-

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Coastal Wetlands areas Adjoining residential areas requiring particular noise management measures. 			
Biodiversity					
B1	Impact to surrounding vegetation and threatened ecological communities	<p>A Flora and Fauna Management Plan (<u>FFMP</u>) will be prepared in accordance with the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (Roads and Traffic Authority, 2011a) and implemented as part of the CEMP. The FFMP will provide specific management for flora and fauna species (including threatened species) that will include but not limited to:</p> <ul style="list-style-type: none"> Construction personnel are to be informed of the environmentally sensitive aspects of the site Construction crews will be made aware that any native fauna species encountered must be allowed to leave site without being harassed and a local wildlife rescue organisation must be called for assistance where necessary Delineation of work zones, areas for parking and turning of vehicles and plant equipment prior to commencement of works Establishment of exclusion zones around high-quality vegetation Materials, plant, equipment, work vehicles and stockpiles will be placed to avoid damage to surrounding vegetation and will be outside tree drip-lines. Periodic monitoring will be undertaken to ensure all controls are in place and no inadvertent impacts are occurring. If any damage occurs to vegetation outside of the nominated work area, Transport will be notified so that appropriate remediation strategies can be developed. 	Contractor	Prior to construction	Appendix H of the REF
B2	Impact to native plants and animals including threatened species	<p>A pre-clearing inspection will be carried out in accordance with <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (Guide 1: Pre-clearing process) (Roads and Traffic Authority, 2011a).</p> <p>A post clearance report, including any relevant Geographical Information System files, would also be produced that validates the type and area of vegetation cleared including confirmation of the number of hollows impacted and the corresponding nest box requirements to offset these impacts.</p>	Contractor	Construction	Appendix H of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B3		Clearing of vegetation would follow the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (Guide 1: Pre-clearing process) (Roads and Traffic Authority, 2011a).	Contractor	Construction	Appendix H of the REF
B4		Where possible, hollows would be cut out of hollow-bearing trees and re-established in large trees to mitigate the loss of hollow habitat on fauna. Re-establishing existing hollows into trees is more likely to encourage uptake than use of artificial nest boxes.	Contractor	Construction	Appendix H of the REF
B5		The unexpected species find procedure under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA Projects</i> (Roads and Traffic Authority, 2011a) will be implemented if TECs or threatened fauna, not assessed in the biodiversity assessment, are identified in the construction area of the proposal.	Contractor	Construction	Appendix H of the REF
B6	Impacts to the Southern Myotis	<p>Microbat Management Plan (MMP) will be prepared <u>by a bat specialist</u> as part of the FFMP. The MMP will outline specific mitigation measures to be undertaken during construction of the proposal to minimise impacts on threatened microbat species including:</p> <ul style="list-style-type: none"> • Details on timing of construction and demolition activities <u>to minimise that are likely to impact to microbats, including consideration of breeding season and torpor. The proposed works likely to impact must occur outside of the Southern Myotis breeding season (September – December) and will also avoid winter months when bats may be in torpor due to cold conditions</u> • Roost exclusion and/or translocation methodology • Ecological supervision and survey • Compensatory roost installation in suitable location in the immediate surrounds and/or within the new proposed structure as compensation for the loss of existing roosting habitat • Reporting and monitoring. 	Transport/Contractor	Prior to construction/ Construction	Appendix H of the REF
B7	Impacts from introduction and spread of weeds	Weed species will be managed in accordance with <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (Roads and Traffic Authority, 2011a) (Guide 6: Weed management) and the <i>Biosecurity Act 2015</i>	Contractor	Construction	Appendix H of the REF
B8	Impacts from introduction and spread of plant	A hygiene protocol to be included as part of the FFMP for construction vehicles and equipment to prevent the spread or introduction of weeds, pest and pathogens.	Contractor	Construction	Appendix H of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	pathogens and amphibian chytrid fungus				
B9	Impacts to aquatic habitat including Key Fish Habitat	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (NSW Roads and Traffic Authority 2011a) and Section 3.3.2 Standard precautions and mitigation measures of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (Department of Primary Industries 2013).	Contractor	Construction	Appendix H of the REF
B10		A Biodiversity Offset Strategy (BOS) will be prepared in accordance with the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI, 2013), for impacts to key fish habitat, in consultation with DPI (Fisheries).	Transport/ Contractor	Prior to construction	Appendix H of the REF
B11		Large woody debris will be retained for creek crossing works where practicable. All large woody debris or snags will be relocated instream by a <u>in consultation with a</u> suitably qualified ecologist.	Contractor	Construction	Appendix H of the REF
B12		<u>Implement</u> underwater piling controls <u>that</u> will include (but not be limited too) soft/ <u>flexible</u> starts.	Contractor	Construction	Appendix H of the REF
B13	Impacts to aquatic habitat including Key Fish Habitat	Relevant approvals and permits under Part 7 of the <i>Fisheries Management Act 1994</i> to be obtained prior to impact of mangroves and or saltmarsh. Transport will consult with DPI (Fisheries) under Part 7 of the FM act on the clearing of saltmarsh and mangroves	Transport/ Contractor	Prior to construction	Appendix H of the REF
B14	Temporary obstruction to fish	Temporary obstruction of fish passage may require a NSW Fisheries Permit, subject to assessment by the Department of Planning, Industry and Environment.	Contractor	Construction	Appendix H of the REF
B15	National Parks	No unauthorised works will be undertaken within land managed by the National Parks and Wildlife.	Contractor	Prior to construction	Appendix H of the REF
Flooding and hydrology					
FL1	Potential changes to flood impacts resulting from detailed design	Further flood investigations and detailed hydrological and hydraulic modelling will be carried out during detailed design to ensure the design objectives and performance criteria for the proposal are met <u>for the construction and operation of</u>	Contractor	Detailed design	Appendix L of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		the proposal. The flood model will include a grid sub sampling or refined 2D mesh sections to more accurately assess flood impacts to residents.			
FL2	Flooding impacts on property	Further flood modelling will review building floor level data to identify any data gaps. Where there are gaps, additional survey would be undertaken to obtain floor levels. Landowners will continue to be consulted regarding any changes to flooding and hydrology impacts and mitigation measures in relation to individual properties.	Transport/ Contractor	Detailed design	Appendix L of the REF
FL3	Flooding impacts during construction	<p>A Flood Management Plan (FMP) will be prepared as part of the CEMP for the proposal and will include:</p> <ul style="list-style-type: none"> Details on the processes for flood preparedness, materials management, weather monitoring, site management and flood incident management Responsibilities for flood response (preparation of site upon receipt of flood warning, evacuation of site personnel) during and recovery following a flood event Detailed construction planning such that construction phase traffic management and other construction area arrangements do not impact on flood evacuation route traffic capacity. 	Transport/ Contractor	Prior to construction	Appendix L of the REF
FL4	Flooding impacts of bridges and culverts	Where possible practicable, culvert and bridge design will be further developed to minimise upstream and downstream impacts to wetlands and other sensitive environments.	Contractor	Detailed design	Appendix L of the REF
FL5		Where possible practicable detailed construction staging plans will be developed during detailed design so that bridges and culverts are constructed in a way that minimises flood risk.	Contractor	Detailed design	Appendix L of the REF
FL6	Impacts on existing drainage systems	<p>Activities that may affect existing drainage systems during construction will be carried out so that existing hydraulic capacity of these systems is maintained where practicable. This will continue to be undertaken through appropriate design methodologies and considerations during detailed design.</p> <p>Drainage systems that are upgraded and require scour protection would also consider Roads and Maritime Services (2017) <i>Water Sensitive Urban Design Guideline</i> as part of detailed design.</p>	Contractor	Construction	Appendix L of the REF
FL7	Impacts to river banks downstream of	As part of the Construction Soils and Water Management Plan a measure will be included to monitor waterways (channels and banks) immediately downstream of proposal discharge locations during the construction phase indicate to identify	Contractor	Construction	Appendix L of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	proposal discharge locations during construction	potential downstream impacts (e.g. sedimentation, scour, etc.) then in the first instance <u>then</u> relevant corrective actions outlined in the erosion and sediment control plan (to be developed as part of the CSWMP) will be employed. Further to this, the requirement for remediative and additional preventative actions will be assessed. Physical controls to ensure the stabilisation and continuing integrity of watercourse geomorphic properties will be considered where reasonable and feasible.			
FL8	Unforeseen impact to surface water hydrology	A surface water and groundwater monitoring program will be implemented that includes the collection of baseline data and detailed monitoring during construction. Should unforeseen impacts arise that are not already addressed by the environmental management measures outlined in this table, appropriate responses and management measures will be developed in consultation with the relevant authority.	Transport	Construction	Appendix L of the REF
FL9	<u>Localised flooding</u>	<u>The proposal will further investigate localised flooding impacts related to stormwater drainage during detailed design. This will include but not be limited to:</u> <ul style="list-style-type: none"> <u>A review of design considerations provided by Newcastle Council (refer to Appendix E)</u> <u>Confirm the extent of localised flooding impacts.</u> <u>Where flooding may increase, the proposal would consider amendments to the design to minimise these impacts.</u>	<u>Transport/ Contractor</u>	<u>Detailed design</u>	<u>Appendix L of the REF</u>
FL10	<u>Flood impacts to evacuation routes during construction and operation</u>	<u>During detailed design a review of the flood model will be undertaken in consultation with the SES to assess whether changes to evacuation routes proposed in the SES Flood Management Plan require modification.</u>	<u>Transport/ Contractor</u>	<u>Prior to construction</u>	<u>Appendix L of the REF</u>
Surface water					
SW1	General	A Construction Soils and Water Management Plan (CSWMP) will be developed as a sub plan of the CEMP and will outline measures to manage soil and water quality impacts associated with the construction work, including contaminated land. The CSWMP will include but not be limited to: <ul style="list-style-type: none"> Measures to minimise/manage erosion and sediment transport both within the construction area and offsite including requirements for the preparation of 	Transport/ Contractor	Prior to construction/ construction/ operation	Appendix N of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>erosion and sediment control plans (ESCP) for all progressive stages of construction and the implementation of erosion and sediment control measures</p> <ul style="list-style-type: none"> Erosion and sediment control measures, which will be implemented and maintained in accordance with <i>Managing Urban Stormwater – Soils and Construction, Volume 1</i> (Landcom 2004) and Volume 2D (DECC, 2008) and the NSW Governments' <i>Risk-based Framework for Considering Waterway Health Outcomes</i> Measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation in accordance with the <i>Stockpile Site Management Guideline</i> (Roads and Maritime Services, 2015d) to minimise the potential for mobilisation and transport of dust and sediment in runoff Concrete waste management procedures Measures to manage potential tannin leachate, accidental spills (including the requirement to maintain materials such as spill kits) and potential saline soils A surface water quality monitoring program to monitor the performance of management measures Controls for sensitive receiving environments including Coastal Wetlands (CM SEPP) which may include but not be limited to: <ul style="list-style-type: none"> Designation of 'no go' zones for construction plant and equipment Creation of catch/diversion drains and sediment fences at the downstream boundary of construction activities where practicable to ensure containment of sediment-laden runoff and diversion toward sediment sump treatment areas (not sediment basins) to prevent flow of runoff to the Coastal Wetland. 			
SW2	Erosion, sediment and water quality controls	A soil conservation specialist will be engaged for the duration of construction of the <u>proposal</u> REF area to provide advice on the planning and implementation of erosion and sediment control including review of the CSWMP and ESCP.	Transport/ Contractor	Prior to construction/ construction	Appendix B of the REF
SW3	Spills and leaks	<p>The CSWMP will outline site specific control measures and required procedures to ensure containment of accidental spills and leaks. This will include:</p> <ul style="list-style-type: none"> All fuels, chemicals and liquids will be stored on level ground at least 20 metres away from waterways (including existing stormwater drainage system) and will be stored in a sealed bunded area within ancillary facilities An emergency spill response procedure will be prepared in accordance with 	Transport/ Contractor	Prior to construction/ construction	Appendix B of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>Transport protocols to minimise the impact of accidental spills of fuels, chemicals and fluids during construction</p> <ul style="list-style-type: none"> Regular visual water quality checks (for hydrocarbon spills, turbid plumes and other water quality issues) will be carried out when working near any waterways. 			
SW4	Surface water quality impacts	<p>A Construction Water Quality Monitoring Program (CWQMoP) will be developed in accordance with the <i>Guidelines for Construction Water Quality Monitoring</i> (Roads and Traffic Authority, 2003b) and the <i>Australian Guidelines for Water Quality Monitoring and Reporting</i> (ANZECC/ARMCANZ, 2000b), and will be included in the CSWMP for the proposal area REF area to establish baseline conditions prior to commencement of construction, observe the environmental performance and any changes in surface water and groundwater during construction, and inform appropriate management responses.</p> <p>Should the results of monitoring identify that the water quality management measures are not effective in adequately mitigating water quality impacts, additional management measures will be identified and implemented as required.</p>	Transport/ Contractor	Prior to construction/ construction	Appendix B of the REF
SW5	Dewatering	<p>A Dewatering <u>Environmental Work Method Statement</u> management plan will be prepared as a sub plan of the Construction Soil and Water Management Plan which will outline:</p> <ul style="list-style-type: none"> The methodology for excavation dewatering, dewatering waterways, and wetlands, as well as discharges from temporary construction sediment basins Monitoring of groundwater level responses to dewatering <u>in excavations below the groundwater levels</u> Supervision requirements Staff responsibilities and training Approvals required before any dewatering activity commences. <p>The protocol would be developed in accordance with the <i>RTA Technical Guideline: Environmental management of construction site dewatering</i> (Roads and Traffic Authority, 2011b).</p>	Transport / Contractor	Prior to construction/ construction	Appendix B of the REF
<u>SW6</u>	<u>Stormwater discharge during construction</u>	<u>Practical and reasonable measures will be implemented to minimise discharge from sediment basins during construction such as using sediment basin water for dust suppression where possible.</u>	<u>Transport</u>	<u>Prior to construction</u>	<u>Section 3.4.3</u>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<u>Where discharge from construction basins is required, a water discharge impact assessment consistent with the National Water Quality Guidelines would be prepared.</u>			
Groundwater					
GW1	Groundwater monitoring	Prior to construction, a groundwater quality sampling round will be undertaken at proposal groundwater monitoring bores. Should the results of monitoring identify that the water quality management measures are not effective in adequately mitigating water quality impacts, additional management measures will be identified and implemented as required.	Transport/ Contractor	Prior to construction/ construction	Appendix B of the REF
Coastal processes					
CP1	Bank instability during construction and operation of the proposal	Develop and review bank stability risks to the proposal as part of the detailed design. This will include planning for the management of potential scour effects in Ironbark Creek caused by the new bridges and from the modification of drainage infrastructure within the tidal waterways during construction and operation of the proposal.	Transport	Detailed design	Appendix B of the REF
CP2	Coastal process impacts from in-stream construction works in Ironbark Creek	Develop and implement a Construction Coastal Impacts Management Plan to manage potential coastal process impacts resulting from temporary in-stream works in Ironbark Creek.	Transport/Contractor	Prior to construction	Appendix O of the REF
CP3	Coastal process impacts from in-stream construction works in Ironbark Creek	If <u>Where</u> the design and/or construction methodology changes at Ironbark Creek, a consistency assessment of the coastal process impacts will be undertaken to ensure that <u>any</u> unacceptable impacts to the value of the creek and its surroundings, resulting from the proposal are avoided.	Transport/Contractor	Prior to construction	Appendix O of the REF
Traffic and transport					
TT1	Impacts to traffic during construction	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the <i>Traffic Control at Work</i>	Contractor	Prior to construction/ construction	Appendix P of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p><i>Sites Manual</i> (Roads and Traffic Authority, 2010) and <i>QA Specification G10 Control of Traffic</i>. The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to manage temporary changes to the road network including use of barriers or lane occupancies • Measures to maintain pedestrian and cyclist access (including communication, signage and alternative routes) • Requirements and methods to consult and inform the local community of impacts on the local road network (including for out of hours work) • Access to construction areas including entry and exit locations and measures to prevent construction vehicles queuing on public roads • <u>Minimise the use of local roads during construction and include consideration of alternate U-turn facilities for traffic movements where practicable</u> • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Any licences or permits required before starting activities • Monitoring, review and amendment mechanisms. 			
TT2	Property access during construction	Property access will be maintained at all times during construction. Any changes to access arrangements or alternative access required during construction to be done in consultation with the landowner and will provide the same equivalent pre-existing level of access unless agreed to. Consultation with landowners on property access to continue during detailed design and construction.	Transport/ Contractor	Detailed design/ prior to construction/ construction	Appendix P of the REF
TT3	Access	Where any legal access to property is permanently affected, arrangements for appropriate alternative access will be determined in consultation with the affected landowner and local road authority.	Contractor	Post-Construction	Appendix P of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT4	Pedestrian and cyclist access during construction	Pedestrian and cyclist access will be maintained throughout construction. Where maintaining access is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the local road authority.	Contractor	Construction	Appendix P of the REF
TT5	Access to bus stops and public transport during construction	Access for public transport services, including school bus services, will be maintained where possible. The requirements for any temporary changes will be confirmed following consultation with local bus operators and the community.	Contractor	Prior to construction/ construction	Appendix P of the REF
TT6	Impacts to traffic from construction traffic	Haulage vehicle movements will be planned to minimise movements on the road network during the morning and evening peak periods where practicable.	Contractor	Prior to construction/ construction	Appendix P of the REF
TT7	Road closures, diversions or reconfigurations during construction	During any road closures, diversions or reconfigurations of the road and cycle network relevant consultation will be carried out with Transport, Local Council (where relevant), emergency services and public transport authorities.	Contractor	Prior to construction/ construction	Appendix P of the REF
TT8	Impacts to road users from changed traffic arrangements, traffic delays and disruptions during construction	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays due to construction activities.	Contractor	Prior to construction/ construction	Appendix P of the REF
TT9	Damage or impacts on local road infrastructure during construction	Pre-construction and post construction road condition reports for local roads likely to be used for construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road condition reports will be provided to the local roads authority	Contractor	Prior to construction	Appendix P of the REF
<u>TT10</u>	<u>Operational impacts to drivers exiting Shamrock Street</u>	<u>The traffic signal timing at the intersection of Maitland Road and Shamrock Street, would be reviewed as part of detailed design to see if any improvements in timing for drivers exiting Shamrock Street is feasible.</u>	<u>Contractor</u>	<u>Prior to construction</u>	Appendix P of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage					
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Aboriginal heritage.	Contactor	Detailed design/ prior to construction	Section 4.10 of QA G36 Environment Protection
AH2	Aboriginal heritage	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime Services, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contactor	Detailed design/ prior to construction	Section 4.10 of QA G36 Environment Protection
AH3	Human skeletal remains	The following protocol must be followed in the event that suspected human remains are identified: <ul style="list-style-type: none"> • All works in the immediate vicinity must cease and the area protected by suitable curtilage • The remains will be immediately reported to the work supervisor who will immediately advise the Transport Project Manager, Environment Manager and/or other nominated senior staff member • The Transport Project Manager or Environment Manager will promptly notify the NSW Police (as required for all human remains discoveries) • If the remains are identified as Aboriginal ancestral remains, Transport will coordinate consultation with Heritage NSW and RAPs to discuss ongoing care of the remains. 	Contractor	Construction	Appendix I of the REF
AH4	AHIP	An AHIP application will be made for the overall proposal area.	Transport	Prior to construction	Appendix I of the REF
AH5	Cultural awareness training	Completion of cultural heritage awareness training will be a requirement of the CEMP for all employees and contractors during project construction, <u>this will include a site induction that identifies the Aboriginal cultural heritage significance within the proposal area and outlines obligations under the <i>National Parks and Wildlife Act 1974</i>.</u>	Contractor	Prior to construction/ construction	Appendix I of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH6	Aboriginal cultural heritage	The development of an Aboriginal cultural heritage interpretation plan to promote understanding and awareness of the cultural values of the study area, including, but not limited to, development of interpretative signage.	Contractor	Detailed design/ prior to construction	Appendix I of the REF
Non-Aboriginal heritage					
NH1	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage.	Contractor	Detailed design/ prior to construction	Appendix J of the REF
NH2	Non-Aboriginal heritage	If any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered are discovered during construction, work must stop work immediately and the Heritage Council of NSW contacted, in accordance with section 146 of the <i>Heritage Act 1977</i> and the <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime Services, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / prior to construction	Appendix J of the REF
NH3	Site induction	All personnel working on site will receive training to ensure awareness of requirements of the NAHMP and relevant statutory responsibilities. Site-specific training will be given to personnel when working in the vicinity of identified non-Aboriginal heritage items.	Contractor	Prior to construction	Appendix J of the REF
NH4	Non-Aboriginal heritage	Temporary protection zones (TPZ) such as fencing will be placed around the following heritage items: <ul style="list-style-type: none"> Sandgate Cemetery Former Travellers Rest Hotel Hexham Railway Station Hannel Family Vault. 	Transport	Prior to construction/ construction	Appendix J of the REF
NH5		Archival recording will be completed for the Ironbark Creek crossing point, with particular focus on the location of previous crossings, and original 1875 and 1956 temporary bridges. A report will be prepared in accordance with Transport Heritage	Transport	Detailed design	Appendix J of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Branch's requirements for Archival Recording of Heritage Items and, relevant heritage guidelines by a qualified heritage consultant. A copy of the report is to be provided to City of Newcastle and Newcastle Libraries.			
NH6	Archaeology	Carry out further research and archaeological investigation to confirm the presence of any potential archaeological remains of crossings in use prior to 1875 (such as corduroy crossings) within the construction area of the proposal and confirm the nature and full extent <u>within the construction area</u> of the bridge and roadway remnants identified in this assessment. Any remains identified during this investigation will be recorded within the archival recording for Ironbark Creek crossing point. Following this investigation, the significance assessment of the item should be reviewed and revised as appropriate.	Transport	Detailed design	Appendix J of the REF
NH7	Archaeology	If unexpected archaeological material or relics are discovered during construction work must stop work immediately and the Heritage Council of NSW contacted, in accordance with section 146 of the Heritage Act 1977 and the Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime Services, 2015). The proponent must also inform Transport and the City of Newcastle.	Contractor	Construction	Appendix J of the REF
NH8 NH7	Vibration impacts to heritage items	All feasible and reasonable vibration mitigation measures will be implemented to avoid vibration impacts to: <ul style="list-style-type: none"> Sandgate Cemetery 2HD Studios Former Travellers Rest Hotel Hexham Railway Station Hannel Family Vault. 	Contractor	Construction	Appendix J of the REF
Noise and vibration					
NV1	General construction noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared for the proposal to mitigate and manage noise and vibration impacts during construction and will form part of the CEMP. The CNVMP will be implemented for the duration of construction of the proposal and will: <ul style="list-style-type: none"> Identify nearby sensitive receivers Include a description of the construction equipment and working hours 	Contractor	Prior to construction/ construction	Appendix M of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Identify relevant noise and vibration performance criteria for the REF area and license and approval conditions Identify relevant sleep disturbance screening levels Outline noise and vibration objectives, standard and additional mitigation measures from the CNVG and information about when each will be applied Outline requirements for noise and vibration monitoring that will be carried out to monitor the <u>proposal's REF area</u> performance associated with the noise and vibration criteria Describe community consultation and complaints handling procedures in accordance with the Community Communication Strategy to be developed for the <u>proposal REF area</u> Outline measures to manage sleep disturbance during night time work Outline measures to manage noise impacts associated with construction heavy vehicle movements both on and off site <u>All feasible and reasonable noise mitigation measures will be applied to minimise construction noise impacts</u> <u>Out of standard hours construction works will only be conducted where they can be appropriately justified as required by the Interim Construction Noise Guideline</u> All personnel working on site will receive training to ensure awareness of requirements of the CNVMP. Site-specific training will be given to personnel when working in the vicinity of sensitive receivers. 			
NV2	General vibration	<p>Where works are within the minimum working distances for vibration intensive equipment and considered likely to exceed the cosmetic damage objectives in the CNVG at adjacent receivers, construction work will not proceed unless:</p> <ul style="list-style-type: none"> A different construction method with lower source vibration levels is used, where feasible Attended vibration measurements are carried out to determine any exceedances and if further mitigation is required. 	Contractor	Prior construction/ construction	Appendix M of the REF
NV3	Vibration impacts to buried utilities	<p>Where works are within 25 metres of potentially impacted utilities:</p> <ul style="list-style-type: none"> Consultation will be carried out with the relevant utility authorities A detailed assessment of potential vibration impacts to any buried utilities will be conducted once detailed construction methodologies have been developed 	Contractor	Construction	Appendix M of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> In-situ vibration monitoring may be considered when vibration intensive plant and equipment are to be used on site near buried utilities to establish site specific mitigation measures (e.g. safe working distances). 			
NV4	Vibration impacts to heritage structures	Heritage listed buildings / structures within 50 metres from vibration intensive work are to be considered on a case by case basis to determine the structural integrity (i.e. structurally sound or unsound) of all potentially affected structures and to identify reasonable and feasible mitigation measures.	Contractor	Prior to construction/ construction	Appendix M of the REF
NV5	Vibration impact to existing structures	<u>Where the use of vibration intensive equipment within the relevant minimum working distances cannot be avoided, prior to the commencement of vibration intensive work, Prior to commencing the activity, a detailed inspection will be undertaken and a written and photographic report prepared to document the condition of buildings and structures where required within the minimum working distances.</u> A copy of the report will be provided to the relevant land owner or land manager.	Contractor	Prior to construction	Appendix M of the REF
NV6	Operational road traffic noise impacts	Operational noise and vibration mitigation measures will be confirmed during detailed design as part of the Operational Noise and Vibration Review (ONVR) in accordance with the <i>Noise Mitigation Guideline</i> (NMG) (Roads and Maritime Services, 2015). <u>All feasible and reasonable operational noise mitigation measures will be considered and applied through the detailed design process to minimise operational noise to the extent that is practicable.</u>	Transport/ Contractor	Detailed design	Appendix M of the REF
NV7	Operational road traffic noise impacts	Where feasible and reasonable, implementation of operational noise mitigation will be carried out within 12 months of construction activities commencing.	Contractor	Prior to construction	Appendix M of the REF
NV8	Operational road traffic noise impacts	Within the first year of operation, monitoring of operational noise levels would be compared to predicted noise levels to verify the predictions and to determine the effectiveness of the noise mitigation measures. Additional feasible and reasonable mitigation will be considered at eligible receivers where measured noise levels are found to be significantly different from the predictions.	Transport	Operation	Appendix M of the REF
Socio-economic, property and land use					
SE1	Community consultation	A Community Communication Strategy (CCS) will be prepared <u>for the proposal for the REF area</u> to facilitate communication with the local community including	Transport/ Contractor	Prior to construction	Appendix Q of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<p>relevant Government agencies, Councils, adjoining affected landowners and businesses, residents, motorists and other relevant stakeholders that may be affected by the proposal. The strategy will:</p> <ul style="list-style-type: none"> Identify people, businesses and organisations to be consulted during the delivery of the proposal Set out procedures and mechanisms for the regular engagement with local businesses and organisations (for example, around local events) and distribution of information about the proposal Outline mechanisms to keep relevant stakeholders updated on site construction activities, schedules and milestones Outline avenues for the community to provide feedback (including a 24-hour, toll free project information and complaints line) or to register complaints and through which Transport will respond to community feedback Outline a process to resolve complaints and issues raised. 			
SE2	Property acquisition	All partial and full acquisitions and associated property adjustments will be carried out in accordance with the requirements of the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> and the Land acquisition reform 2016 in consultation with landowners. This will include the provision of monetary compensation determined in accordance with the provisions of the Act.	Transport	Prior to construction	Appendix Q of the REF
SE3		Property adjustments will be completed in consultation with property owners/business managers.	Transport/ Contractor	Prior to construction/ construction	Appendix Q of the REF
SE4	Business impacts	Access will be maintained to local businesses near to construction work. Where temporary access changes are proposed, <u>consultation will be carried out with the affected land owner</u> these will be agreed with the affected business owner.	Contractor	Construction	Appendix Q of the REF
SE5	Social infrastructure	Communication will be undertaken with local communities and recreational fishers about changes to the area near Ironbark Creek that is used informally for recreational fishing, including temporary restrictions during construction and permanent removal of the informal vehicle access road.	Transport	Prior to construction	Appendix Q of the REF
SE6	Emergency vehicle access	Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contractor	Construction	Appendix Q of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE7	Roadside tributes	A review will be undertaken of the corridor prior to construction to confirm the presence of roadside memorials.	Contractor	Prior to construction	Appendix Q of the REF
SE8		Relocation or removal of roadside tributes will be carried out in accordance with Roads and Maritime Roadside Tribute Guidelines (September 2016).	Contractor	Construction	Appendix Q of the REF
SE9	<u>Dirt on roads from construction activities associated with the proposal</u>	<u>Transport would regularly sweep roads within the construction area to remove any dirt from construction activities associated with the proposal.</u>	<u>Contractor</u>	<u>Construction</u>	<u>Appendix Q of the REF</u>
Urban design, landscape character and visual impacts					
LV1	General design integration	The proposal will follow Transport's integrated project development process, including the requirement for urban designers to be part of the project team.	Transport	Detailed design	Appendix C of the REF
LV2		<p>Transport's Urban Design Policy (<i>Beyond the Pavement</i>) and <i>Transport's Urban Design Guidelines</i> will be used to guide future design development of the proposal.</p> <p>The urban design objectives, principles and concept design strategy presented in the urban design report for the proposal will form the basis for future design development and consultation with stakeholders.</p> <p>This <u>The detail design</u> will consider:</p> <ul style="list-style-type: none"> Integrating appropriate grades with adjoining landform, avoiding sharp transition in profile, and blending the formation into its context Minimising clearance extent where possible and clearly defining clearance limits and exclusion zones to protect vegetation cover Progressively implementing revegetation works to limit erosion and to establish vegetation Utilising cleared material as part of revegetation works Providing minimum signage requirements and limit structural elements to provide an open and permeable setting. Looking for opportunities to minimise designed signage. Signage to be set out in accordance with Australian Standards. Limiting the extent of lighting and potential for light spill. Lighting to be set out 	Transport	Detailed design	Appendix C of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<div>in accordance with Australian Standards</div> <ul style="list-style-type: none">Providing visual screening within the road corridor to limit the visual impact of the proposal in areas identified as moderate or high impact.Providing a sense of space and openness associated with the flat open character of the floodplain landscape.			
LV3	Earthworks	Stabilisation and revegetation will be undertaken progressively during construction to limit erosion and visual impacts through early integration with surrounding vegetation	Contractor	Construction	Appendix C of the REF
LV4	Revegetation	Selection of vegetation communities that reflect the existing communities and landscape character. Landscaping to utilise local material where possible.	Transport	Construction	Appendix C of the REF
LV4 LV5	Drainage	Utilise local sedgeland species <u>in sediment basins</u> , where appropriate to aid in the filtration of stormwater and to provide a level of biodiversity within the corridor	Contractor	Construction	Appendix B of the REF
LV5 LV6	Lighting	Lighting towers to <u>will</u> be positioned away from residences where possible.	Contractor	Construction	Appendix C of the REF
LV6 LV7	Ancillary facilities	Maintain compound in a tidy and well-presented manner. Provide and maintain screening and fencing. Works to be carried out in accordance with Roads and Maritime <i>EIA-N04 Guideline for Landscape Character and Visual Impact Assessment</i> .	Contractor	Construction	Appendix C of the REF
LV7 LV8		Progressively throughout the work, where feasible and reasonable, the Ancillary facility sites will be returned to at least their pre-construction state <u>and may include progressive remediation throughout the construction program where practicable, unless otherwise agreed with the landowner. otherwise detailed in the design once construction activities are complete or will be progressively remediated throughout the construction program where practicable</u>	Contractor	Construction	Appendix C of the REF
Soils and contamination					
SC1	Contaminated land	A detailed site investigation (Phase 2) will be undertaken in areas of potential contamination identified during the preliminary site investigation (Phase 1), in accordance with the Roads and Maritime Services (2013) Guideline for the Management of Contamination.	Transport	Detailed design/ prior to construction	Appendix K

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		An in-situ waste classification will be undertaken for any materials which are proposed to be excavated and removed from the proposal as part of a Phase 2 investigation.			
SC1 SC2	Contaminated land	<p>A Contaminated Land Management Plan will be prepared in accordance with the <i>Guideline for the Management of Contamination</i> (Roads and Maritime Services, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to:</p> <ul style="list-style-type: none"> • Capture and management of any surface runoff contaminated by exposure to the contaminated land • Further investigations required to determine the extent, concentration and type of contamination, as identified in the detailed site investigation (Phase 2) • <u>An 'unexpected finds' protocol to plan for and accommodate potential ACM or other waste during the construction phase.</u> • <u>Application of the <i>Acid Sulfate Soils Management Plan</i> (Douglas Partners, 2021b)</u> • Management of the remediation and subsequent validation of the contaminated land, including any certification required • Measures to ensure the safety of site personnel and local communities during construction. 	Transport/ Contractor	Detailed design/ prior to construction	Section 4.2 of QA G36 Environment Protection
<u>SC2</u>	<u>Contaminated land - ACM</u>	<u>An 'emu pick' exercise will be conducted by an occupational hygienist to remove visible asbestos fragments from the surface of areas planned for excavation along the proposal prior to construction.</u>	<u>Contractor</u>	<u>Prior to construction</u>	Appendix F
SC3	Contaminated land – temporary construction compounds	A pre and post lease condition assessment <u>will</u> be conducted for all temporary construction facilities proposed within sealed areas.	Contractor	Prior to construction and post construction	Section 4.15 of QA G36 Environment Protection
SC4	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport Environment Manager and/or EPA.	Contractor	Detailed design/ prior to construction	Section 4.2 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SC4	<u>Contaminated sediments impacting water quality – Construction of new ironbark Creek Bridge</u>	<p><u>A Dredging Environmental Management Plan (DEMP) will be prepared and implemented for the demolition and construction of Ironbark Creek Bridge. The DEMP will outline:</u></p> <ul style="list-style-type: none"> <u>Dredging methods that minimise the disturbance and mobilisation of sediments</u> <u>Detail of the transport, storage and treatment process of sediments</u> <u>Management measures to mitigate mobilisation of sediment during high risk activities including piling, such as silt curtains or cofferdams</u> <u>Procedures for a sampling and monitoring plan of turbidity and water quality in Ironbark Creek during dredging activities at monitoring points upstream and downstream of the new bridge and considers background conditions and includes stop work measures</u> <u>Photographic evidence and documentation.</u> <u>Undertaking piling activities during appropriate tidal conditions</u> <u>Measures for managing dredging spoil that minimises the disturbance and mobilisation of fugitive sediments such as clam shell bucket dredging or suction dredging and cutting with a storage tank on a barge that allows for collection of disturbed bed sediments</u> <u>Sediment dewatering methods that minimise the release of untreated dredge water to the receiving environment</u> <u>Management and disposal of dredged spoil.</u> 	<u>Transport/ Contractor</u>	<u>Prior to and during construction</u>	Appendix F
SC5	Accidental spill	A site specific emergency spill plan will be developed and include spill management measures in accordance with the <i>Transport Code of Practice for Water Management</i> (Roads and Traffic Authority, 1999) and relevant legislation and guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.	Transport/ Contractor	Prior to construction	Section 4.3 of QA G36 Environment Protection
Air quality					
AQ1	Risks to air quality during construction	<p>Preparation and implementation of an Air Quality Management Plan (AQMP) to minimise risks to air quality. The AQMP will identify:</p> <ul style="list-style-type: none"> Potential sources of air pollution (including odours unexpected finds and dust) during construction Air quality management objectives consistent with relevant published guidelines 	Contractor	Prior to construction/ construction	Appendix R of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> • Identification of all dust and odour sensitive receivers • Measures to manage air quality impacts • Community notification and complaint handling, monitoring and incident response procedures. 			
Climate change					
CC1	Climate change	Detailed design should incorporate the full range of temperature projections, as well as expected life of bridge components, when materials are specified.	Transport/ Contractor	Detailed design	Appendix S of the REF
CC2	Climate change risk	Ensure that revegetation and landscaping design: <ul style="list-style-type: none"> • Considers climate change projections in the selection of species (both in and outside the floodplain) • Considers how vegetation will contribute to or support the structural integrity of soils in a changing climate. • Ensures plant/tree species selection (and location of trees) caters for potential impacts if burnt (e.g. falling onto the roadway). 	Transport/ Contractor	Detailed design	Appendix S of the REF
CC3		A material durability report will be prepared and actioned which will specifically review the potential impacts of climate change on concrete durability, including depth of cover over reinforcement.	Transport/ Contractor	Detailed design	Appendix S of the REF
CC4	Flood risk / sea level rise	The climate change scenarios presented in the <i>Hexham Straight Widening Flooding and Hydrology Assessment</i> will be reviewed to confirm whether any design changes are required to provide ongoing resilience to the asset, or to minimise any impact on the surrounding area.	Transport/ Contractor	Detailed design	Appendix S of the REF
Sustainability					
SU1	Sustainability	A Sustainability Management Plan for the proposal will be developed and implemented during detailed design and construction, detailing measures to meet the proposal's sustainability objectives and targets. The sustainability management plan will: <ul style="list-style-type: none"> • Demonstrate leadership and commitments to sustainability • Adopt relevant sustainability performance targets in accordance with the Transport sustainability strategy. 	Transport/ Contractor	Prior to construction/ construction	Appendix T of the REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		<ul style="list-style-type: none"> Establish the roles, responsibilities and resourcing requirements Sustainable procurement measures to prioritise efficient use of resources and conservation of natural resources, and inform the proposal's sustainable procurement requirements from legislation, industry's policies/guidelines, and Transports' corporate requirements Document the process for the identification, assessment and implementation of sustainability initiatives and opportunities Identifies sustainability training and awareness requirements Document the process to be used to monitor and review of sustainability performance against achieving the proposal's sustainability targets Outline the documentation and reporting requirements for sustainability on the proposal. 			
Waste					
WM1	Waste management general	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the proposal Classification of wastes and management options (re-use, recycle, stockpile, disposal) Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions Procedures for storage, transport and disposal Monitoring, record keeping and reporting. <p>The WMP will be prepared considering the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime Services, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contractor	Prior to construction/ construction	-
WM2	Waste management general	<p>Unsuitable fill material and all other wastes will be classified in accordance with the <i>NSW EPA Waste Classification Guidelines</i> (EPA, 2014) and disposed of at an appropriately licenced facility <u>in accordance with the POEO Act</u>.</p>	Contractor	Construction	-

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
<u>WM3</u>	<u>Waste management general</u>	<u>All wastes will be managed and disposed of in accordance with the POEO Act.</u>	<u>Contractor</u>	<u>Construction</u>	-
Other impacts					
UT1	Utilities	<p>Prior to the commencement of work:</p> <ul style="list-style-type: none"> The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners If the scope or location of proposed utility relocation work falls outside of the assessed proposal scope and footprint, further assessment will be undertaken. 	Contractor	Detailed design/ prior to construction	-
HZ1	Hazards and risk management	<p>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:</p> <ul style="list-style-type: none"> Details of hazards and risks associated with the activity Measures to be implemented during construction to minimise these risks Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials A monitoring program to assess performance in managing the identified risks Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or DP4E publications.</p>	Contractor	Detailed design/ prior to construction	-
CU1	Cumulative impacts	Ongoing coordination and consultation will be undertaken with nearby projects as required.	Transport/ Contractor	Prior to construction/ construction	-
CU2	Cumulative impacts	The CEMP will be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Contractor	Construction	-

6.3 Licensing and approvals

Table 6.2 summarises the licenses and approvals required for the proposal and outlines the associated legal instrument and the timing of the license or approval.

Table 6.2 Summary of licensing and approval required

Instrument	Requirement	Timing
Crown Land Act (Division 3.4, 5.5 and 5.6)	Lease or licence to occupy areas of Crown land. Note: Work on Crown land triggers the requirement for a 24KA notice under the Native Title Act 1993. The notice is to be prepared by the legal team and send to NTSCORP. This is required whether there is a claim on the land or not.	Prior to start of the activity
FM Act (s199)	Notification to the Minister for Agriculture and Western NSW prior to any dredging or reclamation work. This notification would be in regard to the construction and removal of a temporary work platform in Ironbark Creek.	A minimum of 28 days prior to the start of work.
FM Act (s205)	Permit to harm marine vegetation from the Minister for Agriculture and Western NSW.	Prior to start of the activity.
FM Act (s219)	If required, Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Agriculture and Western NSW	Prior to start of the activity.
Heritage Act 1977 (s139)	Excavation permit from the Heritage Council of NSW / Minister (where required)	Prior to start of the activity.
NPWS Act 1974 (s90)	Aboriginal heritage impact permit from Heritage NSW.	Prior to start of the activity.
<i>Protection of the Environment Operations Act 1997 (s43)</i>	EPL for scheduled activities e.g. road construction (to be confirmed in detailed design).	Prior to start of the activity.
Water Act 1912 (s10/s18F)	Licence and/or permit for construction or use of a 'work' (e.g. changing the course of a river – specifically the unnamed drainage channel to the southeast of Ironbark Creek) for certain purposes from DPE (Water).	Prior to start of the activity
Water Management Act 2000 (s91)	Notification of controlled activity to DPE (Water Group). Note exemptions under s34-36 of the Water Management (General) Regulation 2018.	30 days prior to the activity
Water Management Act 2000 (s91B)	If required, water supply work approval from DPE (Water).	Prior to start of the activity, where required.
Water Management Act 2000 (s91C)	If required, drainage work approval from DPE (Water).	Prior to start of the activity, where required.
<i>Water Management Act 2000 (s91F)</i>	If required, aquifer interference approval from DPE (Water)	Prior to start of the activity, where required.

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8. Terms and acronyms

Term/ Acronym	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
Acid sulfate soils	Naturally acid clays, mud and other sediments usually found in swamps and estuaries. They may become extremely acidic when drained and exposed to oxygen and may produce acidic leachate run-off that can pollute waters and liberate toxins.
ACM	Asbestos Containing Material
ACV Report	Aboriginal Cultural Values Assessment Report
AEI	Areas of environmental interest
AEP	Annual Exceedance Probability The probability of a rainfall or flood event exceeding a nominated level in a year. A one per cent AEP is the probability of an event exceeding a nominated level in 100 years.
Afflux	An increase in water level resulting from a constriction in the flow path.
AHD	Australian Height Datum The standard reference level used to express the relative height of various features. A height given in metres AHD is essentially the height above sea level. Mean sea level is set as zero elevation.
AHIP	Aboriginal Heritage Impact Permit
AHMP	Aboriginal Heritage Management Plan
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
AQMP	Air Quality Management Plan
ARI	Average recurrence interval Used to describe the frequency or probability of floods occurring. (For example a 100 year ARI flood is a flood that occurs or is exceeded on average once every 100 years).
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARTC	Australian Rail Track Corporation
Arterial road	The main or trunk roads of the State road network that carry predominantly through traffic between regions.
As	Arsenic
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
Aquifer	Geologic formation, group of formations, or part of a formation capable of transmitting and yielding quantities of water.
BAR	Biodiversity Assessment Report
BC Act	<i>Biodiversity Conservation Act 2016</i>
BOS	Biodiversity Offset Strategy

Term/ Acronym	Description
BTEX	Benzene, toluene, ethylbenzene and xylene
CCS	Community Communication Strategy
Cd	Cadmium
CEMP	Construction Environmental Management Plan A site specific plan developed for the construction phase of a project to ensure that all contractors and sub-contractors comply with the environmental conditions of approval for the project and that environmental risks are properly managed.
CLM Act	<i>Contaminated Land Management Act 1997</i>
CM SEPP	<i>State Environmental Planning Policy (Coastal Management) 2016</i>
CNVG	Construction Noise Vibration Guidelines (Roads and Maritime Services, 2016)
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon monoxide
CM Act	<i>Coastal Management Act 2016</i>
Compound site	Facilities used to support the operation of a construction site including site offices, workshops, delivery areas, storage areas, crib sheds, staff vehicle parking, materials, plant and equipment.
Concept design	Initial functional layout design for a road or road system, to establish feasibility, to provide a basis for estimating, and to determine further investigations needed for detailed design.
Construction area	The area to be directly impacted by the proposal. This comprises the future construction footprint of the proposed bridge over Ironbark Creek and the upgrade of Maitland Road, including all roadside cut and fill, construction compound areas and parking areas for oversize and overmass vehicles
Cr	Chromium
Cu	Copper
CSWMP	Construction Soil and Water Management Plan
Cumulative impact	Impacts that, when considered together, lead to a stronger impact than any impact in isolation.
dB(A)	Decibels
DCP	Development Control Plan A subsidiary plan to an environmental planning instrument (most commonly to a local environmental plan) that provides greater detail than the environmental planning instrument.
DEC	Department of Environment and Conservation Former name for the Department of Environment, Energy and Science
DECC	Department of Environment and Climate Change Former name for the Department of Environment, Energy and Science
DECCW	Department of Environment, Climate Change and Water Former name for the Department of Environment, Energy and Science

Term/ Acronym	Description
Detailed design	<p>The detailed design details the final project. It includes designs, plans and construction drawings for all elements, including:</p> <ul style="list-style-type: none"> • Road alignment and geometry • Retaining wall, pavements and traffic signals • Urban design, landscaping and street lighting • Construction staging and traffic management • Drainage and utilities.
DGV	default guideline value
DPE	<p>Department of Planning and Environment</p> <p>Former name for the Department of Planning, Industry and Environment</p>
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (now the Department of Planning and Environment)
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
EIL	Ecological Investigation Level
EIS	<p>Environmental Impact Statement</p> <p>An environmental impact assessment document prepared in accordance with the requirements of Division 4 of the Environmental Planning and Assessment Regulation 2000. Any application for designated development under Part 4 of the Environmental Planning and Assessment Act or any activity assessed under Part 5 of the Act as being likely to significantly affect the environment must be accompanied by an environmental impact statement.</p>
EIS area	The areas of the proposal to be assessed by the EIS and within land subject to the CM SEPP.
Environment	All aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings (from EP&A Act).
EPA	Environment Protection Authority
EP&A Act	<i>Environmental Protection and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ESCP	Erosion and sediment control plan
Estuary	The mouth or lower course of a river in which its current meets the sea's tides and is subject to tidal effects.
FFMP	Flora and Fauna Management Plan
FM Act	<i>Fisheries Management Act 1994</i>
FMP	Flood Management Plan
GIR	Geotechnical Interpretive Report
GPS	Global Positioning System

Term/ Acronym	Description
Greenhouse gases/emissions	Atmospheric gases that enhance the natural greenhouse effect, including carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone and water vapour.
Grubbing	The removal of roots or stumps from below ground level.
Heavy truck / vehicle	A heavy vehicle at least 15 tonnes gross. A heavy vehicle is classified as a Class 3 vehicle (a two axle truck) or larger, in accordance with the Austroads Vehicle Classification System.
HRMP	Hazard and Risk Management Plan
ICNG	Interim Construction Noise Guideline (DECC, 2009b)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007 now State Environmental Planning Policy (Transport and Infrastructure) 2021
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
LCVIA	Landscape Character and Visual Impact Assessment
LEP	Local Environment Plan
LGA	Local Government Area
Local road	Roads that have a low speed limit, have a small footprint, serve local communities and that are generally conducive to walking and cycling. A road or street used primarily for access to abutting properties.
LoS	Level of service A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
mAHD	Metres above height datum
Midden deposit	A mound consisting of shells of edible molluscs and other refuse, marking the site of prehistoric human habitation.
MMP	Microbat Management Plan
NAHMP	Non-Aboriginal Heritage Management Plan
NCG	<i>Noise Criteria Guidelines</i> (Roads and Maritime Services, 2015a)
NEPM	National Environmental Protection Measures
NIA	Noise Impact Assessment
NICB	Newcastle Inner City Bypass
NMG	<i>Noise Mitigation Guideline</i> (Roads and Maritime Services, 2015b)
NOX	Oxides of nitrogen
NO ₂	Nitrogen dioxide
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Services
NSW	New South Wales
NTSCORP	NTSCORP Ltd

Term/ Acronym	Description
OCP	Organic Crop Protectants
ONVR	Operational Noise and Vibration Review
OPP	Organophosphorus Pesticides
OSOM	Oversize and overmass
PACHCI	Procedure for Cultural Heritage Consultation and Investigation
PACM	Potential asbestos containing materials
PAH	Polycyclic Aromatic Hydrocarbon
PCSM	Preliminary Conceptual Site Model
PCT	Plant Community Type
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
PMF	Probable Maximum Flood Largest flood that could theoretically occur at a particular location and defines the extent of flood prone land (the floodplain).
PM _{2.5}	Particulate matter less than 2.5 microns in diameter
PM ₁₀	Particulate matter less than 10 microns in diameter.
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Pollutant	Any measured concentration of solid or liquid matter that is not naturally present in the pristine environment.
Proposal	The proposed widening of a six kilometre section of the Maitland Road from four lanes to six lanes, starting about 290 metres south of the intersection with the Newcastle Inner City Bypass at Sandgate, and extending through to about 760 metres north of Hexham Bridge, in Hexham, NSW
Proposal local area	The area within 10 kilometres of the proposal.
Ramsar	An intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
RAP	Remediation Action Plan
RAPs	Registered Aboriginal Parties
REF	Review of Environmental Factors A report that documents the environmental impact assessment process and is prepared to satisfy Transport's obligations under section 111 of the Environmental Planning and Assessment Act 1979.
REF area	The areas of the proposal to be assessed by the REF and this covers all other aspects of the proposal included in Section 1.1.1 that are outside the footprint of the EIS area described in Section 1.1.2
RTA	Roads and Traffic Authority
SAC	Site Assessment Criteria
SAQP	Sampling, Analysis and Quality Plan

Term/ Acronym	Description
Sediment basin	An area where runoff water is ponded to allow sediment to be deposited.
SEPP	<i>State Environmental Planning Policy</i>
SEPP 55	<i>State Environmental Planning Policy no. 55 – Remediation of Land</i>
SES	State Emergency Service
SO ₂	Sulfur dioxide
SoHI	Statement of Heritage Impact
SPR	sources, pathways and receptors
Study area	The construction area of the proposal and additional areas that are likely to be affected by the proposal, either directly or indirectly
SVOC	semi-volatile organic compounds
TEC	Threatened Ecological Community
TMP	Traffic Management Plan
TPH	total petroleum hydrocarbons
TRH	total recoverable hydrocarbons
TSS	Total Suspended Solids
Turbidity	A measure of light penetration through a water column containing particles of matter in suspension.
Urban design	The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.
VOC	volatile organic compounds
WAE	Works As Executed
WASTOP	The Wastop® unique patented construction stops backflow in drains, providing flood and odour protection, and preventing infiltration of the pipeline by insects, small animals, flotsam & gases
Waterway	Any flowing stream of water, whether natural or artificially regulated (not necessarily permanent).
Wetland	A swamp or marsh in which the soil is frequently or permanently saturated with water, or under water.
WMP	Waste Management Plan
WQO	Water Quality Objectives
WSUD	Water Sensitive Urban Design

