Newcastle Inner City Bypass – Rankin Park to Jesmond

Modification report: additional construction compounds

May 2021

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Transport for NSW

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Modification report: additional construction compounds

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Glossary of terms and abbreviations

Term	Meaning
AHIMS	Aboriginal heritage information management system
BAM	Biodiversity Assessment Method
CEMP	Construction environmental management plan
CNVMP	Construction noise and vibration management plan
DP&E	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EIS	Environmental impact statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment protection licence
GHD	GHD Pty Ltd
ICNG	Interim construction noise guideline
Newcastle LEP	*Newcastle Local Environmental Plan 2012*
NML	Noise management level
OOHW	Out of hours work
POEO Act	NSW *Protection of the Environment Operations Act 1997*
Proposed modification	The establishment and use of four additional construction compounds for the purpose of construction of the project
SEARs	Secretary's environmental assessment requirements
SPIR	Submissions and preferred infrastructure report
SSD	State significant development
SSI	State significant infrastructure
The project	Newcastle Inner City Bypass between Rankin Park and Jesmond

Executive Summary

Introduction

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project). The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. The project is located in the Newcastle local government area, about 11 kilometres west of the Newcastle central business district and about 160 kilometres north of Sydney.

The main function of the Newcastle Inner City Bypass is to provide improved traffic flow in the inner western suburbs of the city. The bypass would ultimately provide improved connectivity between key regional destinations such as Bennetts Green, Charlestown and Jesmond shopping centres, John Hunter Hospital, The University of Newcastle and the Pacific Highway. The project is needed to improve connectivity and overall performance of the road network and to deliver improved travel times and safety for road users in the project area.

An environmental impact statement (EIS) was prepared by Transport for NSW in November 2016 (*Newcastle Inner City Bypass – Rankin Park to Jesmond Environmental Impact Statement* (GHD, 2016a)) to assess the potential impacts of the project. Following public exhibition of the EIS, Transport for NSW prepared the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* (SPIR) (GHD, 2018) to respond to submissions and describe project design refinements. Approval for the project was granted on 15 February 2019 by the Minister for Planning (application number SSI 6888) and was subject to a number of conditions of approval.

The proposed modification

Transport for NSW is requesting the following proposed modification to the project:

- Establishment and use of an additional four construction compounds at Peatties Road, Cardiff Road, Astra Street and Lookout Road, by the addition of a reference to this modification report in Condition A1 to enable the establishment and use of four additional construction compounds during construction of the project
- Removal of Conditions A29 - A33 ‘compliance monitoring and reporting program’ conditions and replacement with standard ‘Notification of commencement’ conditions to align with recent approvals.
- In Condition E63 update the reference to ‘EIS and the SPIR’ to ‘documents listed in condition A1’ to enable the use of local roads for the proposed additional construction compounds to be approved by the Planning Secretary via approval of this proposed modification.

There would be no change to the strategic context for the project, with the proposed modification required to facilitate and enable the project to be constructed safely.

Community and stakeholder consultation

The key consultation activities carried out for the proposed modification include:

- A letterbox drop to about 17 neighbouring properties in the vicinity of the Peatties Road and Cardiff Road sites.
- Consultation with the adjacent resident to the Lookout Road site, including an initial letter provided on 26 February 2021 giving an overview of the proposed modification and requesting an on-site meeting with the landowner. Following an on-site meeting, the resident signed an Adjacent Property Access and Use Agreement in accordance with Condition A14.

Should the proposed modification be approved, ongoing consultation would be carried out with the surrounding sensitive receivers and key stakeholders in accordance with the planning approval and *Community Communications Strategy Newcastle Inner City Bypass – Rankin Park to Jesmond* (Roads and Maritime Services, 2019) approved under Condition B3.

Assessment of impacts

Potential environmental impacts associated with the proposed modification have been assessed and compared to the environmental impacts assessed in the EIS and SPIR through completion of an environmental screening and preparation of additional assessments. The main environmental impacts from the proposed modification are summarised below.

Biodiversity

The modification area has been heavily modified and is comprised of mainly exotic vegetation. Native vegetation is only present at one site, Peatties Road. At Peatties Road, 0.2 hectares of low condition native vegetation associated with an artificial wetland would be removed by the proposed modification. This vegetation does not meet the definition of any threatened ecological communities.

A biodiversity development assessment report has been prepared to assess this impact, which concluded that the proposed modification would not have any direct or indirect impacts on threatened species, populations or communities. No impacts to threatened species or threatened species habitat for aquatic species or matters of national environmental significance were identified. No offset credit requirements were identified for the proposed modification.

Traffic and transport

Most of the roads used for construction access are regional roads with very high existing traffic volumes. The additional construction traffic on these would result in a negligible increase in traffic volumes. Local roads use for construction access include Peatties Road, Astra Street and Marshall Street. Marshall Street is the only local road that would require movements past residential dwellings.

While the proposed modification would result in some minor changes in local traffic conditions, with the implementation of standard environmental management measures and ongoing consultation these impacts are expected to be minor and not cause any significant impacts.

Noise and vibration

The majority of construction would be carried out during standard working hours. However, the Peatties Road, Astra Street and Lookout Road would be used periodically to support work outside standard working hours.

An assessment of the potential noise impacts identified construction noise is likely to exceed the criteria at a number of receivers during several construction scenarios at all compounds, during standard working hours and during out of hours work. Stockpiling activities are expected to have the greatest impact based on the number of exceedances and duration of the activity.

There are predicted exceedances of the structural vibration criteria at the Cardiff Road site, and exceedances of the human comfort vibration criteria at all compounds except Lookout Road.

Due to the predicted exceedances the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable.

Socio-economic, land use and property

Use of the compounds would result in reduced amenity associated with construction noise, visual and traffic impacts for nearby residential receivers. Use of the Astra Street site would also result in minor changes in traffic conditions and visual impacts for visitors to the Newcastle Golf Practice Centre.

The greatest amenity impacts would occur at the Cardiff Road site where there are residences located directly next to the site. This compound would be used as a stockpile site and would not involve any work outside standard construction hours. With the implementation of standard environmental management measures and ongoing consultation no significant impacts are expected.

Soils, contamination and water quality

The Astra Street site is identified on the EPA Contaminated Land Record and List of Identified Sites as the former Astra Street Landfill. The site has an existing voluntary management proposal. An additional management measure (SW21 in Appendix H) has been recommended to prevent use of the site until the remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound.

Air quality

There is potential for additional air quality impacts from the use of the additional compound sites. The main dust generating activities would occur at the Astra Street and Peatties Road sites. Due to intervening topography, distance to sensitive receivers, surrounding vegetation and infrastructure the impacts are expected to be minimal.

Summary of positive and negative impacts

The modification report has identified there would only be minor adverse impacts associated with the proposed modification. The proposed modification is required to facilitate and enable the project to be constructed safely. It would enable the project to meet the project objectives and the strategic context by providing safer road conditions and support future growth and tourism. Therefore, on balance the benefits are considered to outweigh the minor impacts.

Justification and conclusion

The proposed modification is required as construction of the project is likely to coincide with the upgrade to the John Hunter Health and Innovation Precinct (SSD-9351535). Some of the work associated with SSD-9351535 includes additions to the hospital road network within the area proposed as the main construction compound in the EIS and SPIR. This would significantly reduce the usable area available and not provide sufficient area for the project.

Due to a lack of space and the sensitive nature of the surrounding natural environment, no suitable sites are available within or adjoining the construction footprint for the project. Following a review of available and suitable land near the project, four additional construction compounds have been identified. These additional construction compounds are justified as they are required to construct the project safely.

While there would be some adverse impacts to the local environment and community, avoidance and minimisation of impacts wherever possible was applied during development of the modification and implementation of environmental management measures summarised in Appendix H, will be applied during construction.

1 Introduction

1.1 Background

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project). The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. The project is located in the Newcastle local government area, about 11 kilometres west of the Newcastle central business district and about 160 kilometres north of Sydney (Figure 1.1).

The project was determined to be state significant infrastructure requiring approval under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with the Secretary's Environmental Assessment Requirements (SEARs) (dated 3 March 2015) and Supplementary SEARs (dated 19 November 2015), an environmental impact statement (EIS) was prepared by Transport for NSW in November 2016 (*Newcastle Inner City Bypass – Rankin Park to Jesmond Environmental Impact Statement* (GHD, 2016a)) to assess the potential impacts of the project. The EIS was exhibited by the former Department of Planning and Environment (DP&E) (now known as Department of Planning, Industry and Environment (DPIE)) for 30 days from 16 November 2016 to 16 December 2016.

Following public exhibition of the EIS, Transport for NSW prepared the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* (SPIR) (GHD, 2018) to respond to submissions and describe project design refinements.

Approval for the project was granted on 15 February 2019 by the Minister for Planning (application number SSI 6888) and was subject to a number of conditions of approval.

The project was referred to the Australian Government Minister for the Environment and Energy under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 7 September 2015 due to the presence of listed threatened species and communities and wetlands of international significance that could be impacted by the project. The Australian Minister for the Environment confirmed the project would be a controlled action requiring approval in accordance with the bi-lateral assessment agreement between the Australian Government and the NSW State Government. The EIS was prepared to assess the potential impacts of the project in accordance with the requirements of the EP&A Act and EPBC Act.

The Minister for Planning's Notice of Decision notes that assessment of biodiversity impacts was carried out in accordance with the Framework for Biodiversity Assessment, and offsetting of biodiversity impacts must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects.

Following project approval, Transport for NSW has made a number of project design refinements. These have arisen due to review of the concept design, development of the detailed design, stakeholder consultation and evaluation of construction methodologies. These design refinements resulted in minor changes to the construction footprint and as such were subject to two consistency assessments as follows:

- Consistency assessment 1 - *Newcastle Inner City Bypass Rankin Park to Jesmond – Bridge 7 Early Work: Division 5.2 and EPBC Act Approval Consistency assessment report Detailed Design Changes* (Aurecon, 2019)
- Consistency assessment 2 - *Newcastle Inner City Bypass Rankin Park to Jesmond – Stage 3, Package 1 detailed design changes: Division 5.2 and EPBC Act approval (SSI 6888) consistency review* (Bowditch Group, 2020).

The consistency assessments determined that the design refinements were consistent with the project approval and as such, further assessment or modification to the project approval was not required.

1.2 Purpose of this report

The proposed modification (Modification 1) described in this report would be carried out in accordance with Section 5.25(2) of the EP&A Act, which requires the proponent to lodge a request to the Minister to modify the Minister's approval for the project. As the project is declared state significant infrastructure and approved under Division 5.2 of the EP&A Act, the Minister for Planning and Public Spaces is the consent authority for the proposed modification.

An overview of the project and the proposed modification is shown on Figure 1.2 and includes establishment and use of four additional construction compounds during construction of the project. A detailed description of the proposed modification, including the need for the proposed modification, is provided in section 2.

This modification report provides the environmental assessment for the proposed modification to the project in accordance with the EP&A Act and the EPBC Act approval.

1.3 Report structure

This report is structured as follows:

- Chapter 1 (Introduction) provides an overview of the proposed modification and purpose of this report
- Chapter 2 (Description of the proposed modification) provides a detailed description of the proposed modification of the project
- Chapter 3 (Strategic context)
- Chapter 4 (Statutory context)
- Chapter 5 (Engagement) outlines the consultation activities carried out to date and in the future
- Chapter 6 (Assessment of Impacts) identifies the relevant environmental issues, assesses the potential impacts of the proposed modification, and presents environmental management measures in response to those impacts
- Chapter 7 (Evaluation of merits)
- Chapter 8 References

This report includes the following supporting appendices:

- Appendix A – Secretary's environmental assessment requirements and checklist
- Appendix B – DPIE correspondence
- Appendix C – Consultation materials
- Appendix D – Biodiversity development assessment report
- Appendix E – Construction noise and vibration assessment
- Appendix F – Aboriginal archaeological assessment
- Appendix G – Summary project description
- Appendix H – Updated environmental management measures.



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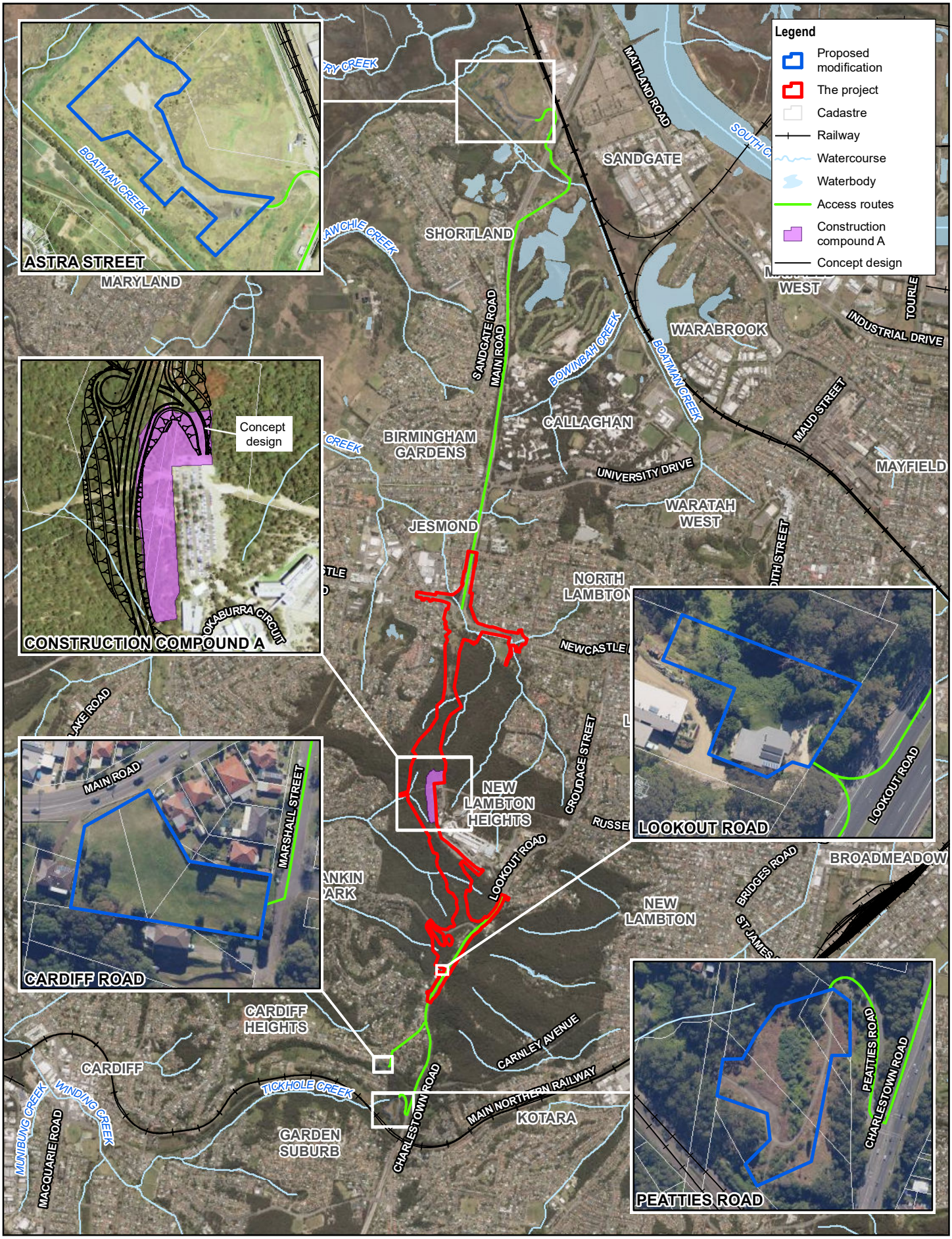
Rankin Park to Jesmond

Figure 1-1

Project locality

Data source: Geoscience Australia: 250k Topographic Data Series 3, 2006; TfNSW / Aurecon: The Project, 2018; LPI: DTDB / DCDB, 2017 .

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Rankin Park to Jesmond

Figure 1-2

Project and proposed modification overview

Data source: TfNSW / Aurecon: The Project, 2018; LPI: DTDB / DCDB, 2017 © Department of Customer Service 2020.

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2 Description of the proposed modification

2.1 Proposed modification

A review of the Conditions of Approval for the project was carried out to identify the conditions that would require either amendment or deletion as part of the proposed modification. Table 2-1 presents these changes and justification for the proposed modification.

Table 2-1 Changes to SSI-6888

Condition	Proposed modification	Justification
A1	Addition of a reference to this modification report	To allow for the establishment and use of four additional construction compounds to support construction of the project as detailed in sections 2.3 and 2.4.
A29-A33	Removal of 'compliance monitoring and reporting program' conditions and replacement with standard 'Notification of commencement' conditions	This change is requested following consultation with DPIE and aims to align with recent approvals including: • Coffs Harbour Bypass (SSI 7666) • Western Harbour Tunnel & Warringah Freeway Upgrade (SSI 8863) • Sydney Gateway Project (SSI 9737). Following the removal of these conditions, compliance, monitoring and reporting on the project would be managed via the independent auditing program prepared in accordance with Conditions A34 - A36.
E63	Update the reference to 'EIS and the SPIR' to 'documents listed in condition A1'	To enable the use of local roads for the additional construction compounds to be approved by the Planning Secretary via approval of this proposed modification.

2.2 Need for the proposed modification

Health Infrastructure NSW is planning and preparing an EIS for the John Hunter Health and Innovation Precinct project (SSD-9351535). Consultation with Health Infrastructure NSW and Hunter New England Health District has determined construction of SSD-9351535 will occur sooner than originally anticipated and construction is likely to coincide with construction of the project.

This change to construction timing would impact construction compound A (as shown on Figure 1.2), identified in the EIS and SPIR as the primary compound during main works. SSD-9351535 includes additions to the hospital road network within the area proposed for construction compound A. This would result in a major reduction to the useable area of the compound. Due to a lack of space within the construction footprint for the project and the sensitive nature of the surrounding natural environment, no suitable sites are available within or adjoining the construction footprint for the project.

In order to ensure the safe construction of the project, Transport for NSW proposes the establishment and use of four additional construction compounds to support the construction of the project (refer to sections 2.3 and 2.4). The additional construction compounds are located at:

- Astra Street
- Lookout Road
- Cardiff Road
- Peatties Road.

These sites have been identified following a review of available and suitable land near the project. The locations improve separation between office-based light vehicles and heavy vehicle movements for construction. Office staff would be able to enter and leave the road network from a more controlled area, providing a safer work environment.

The conditions of approval (condition A14) for the project allow for additional construction compounds not specified in the EIS and SPIR only when they meet a number of criteria. Due to the construction compounds not being located within or immediately adjacent to the construction boundary, and residences near the Cardiff Road site, the construction compounds require a modification to the project.

2.3 Overview

Approved construction activities, including construction compound locations for the project were described in section 5.4.5 of the EIS and section 5.4.4 of the SPIR.

The proposed modification involves the establishment and use of four additional construction compounds to support construction of the project. The additional construction compounds are located outside of the project boundary identified in the EIS and SPIR (see Figure 1.1 and Figure 1.2).

A comparison of the project and the modified project (ie combined features of the project and proposed modification) is summarised in Table 2-2. A detailed description of the proposed modification is provided in section 2.4.

The proposed modification would not result in any changes to the design of the project. A summary of the proposed activities to be carried out at the additional construction compounds is provided in Table 2-3.

Table 2-2 Comparison of the project and modified project

Element	Project	Modified project
Construction footprint	About 63.6 hectares (total)	About 74 hectares (total)
Native vegetation clearing	About 43.5 hectares [1]	About 43.7 hectares

Element	Project	Modified project
Construction compounds	A total of six construction compounds as follows: • Construction compound A – main site compound • Construction compound B • Construction compound C • Construction compound D • Construction compound E • Construction compound F Compounds A, B and C would be used for the full duration of project construction. Compounds D and E would only be required during the early work phase associated with construction of the shared path bridge (Bridge 7) over Newcastle Road. Compound F would be used during both the early work and main construction phases.	A total of ten construction compounds as follows: • Construction compound A • Construction compound B • Construction compound C • Construction compound D • Construction compound E • Construction compound F • Astra Street • Lookout Road • Cardiff Road • Peatties Road – main site compound The Peatties Road compound would replace construction compound A as the main construction compound for the project.
Compound access	• Compound A – main access via construction access road 1, with secondary accesses via Kookaburra Circuit, construction access road 2 and construction access road 4. • Compound B –via a temporary access arrangement from or near the existing Jesmond roundabout. • Compound C –via a temporary access arrangement from or near the existing Jesmond roundabout. • Compound D –via Robinson Avenue and/or temporary access arrangement from Newcastle Road • Compound E –via Steel Street, Coles Street and/or temporary access arrangement from Newcastle Road • Compound F –via Lookout Road and/or McCaffrey Drive.	• Compound A – no change. • Compound B – no change. • Compound C – no change. • Compound D – no change. • Compound E – no change. • Compound F – no change. • Astra Street – access to this site compound would be via the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and Astra Street. • Cardiff Road – via the Newcastle Inner City Bypass (Lookout Road), Cardiff Road and Marshall Street. • Lookout Road– via Newcastle Inner City Bypass (Lookout Road). • Peatties Road – via the Newcastle Inner City Bypass (Lookout Road and Charlestown Road) and Peatties Road.

Note 1: the consistency assessments prepared by Transport for NSW following project approval resulted in a negligible amount of native vegetation clearing of 0.08 hectares outside of the project boundary. This removal would not result in net increase in native vegetation clearing beyond that documented in section 6.2.2 of the SPIR (in accordance with Condition E3).

2.4 Details of the proposed modification

2.4.1 The site

The combined area of the proposed additional construction compounds is about 10.1 hectares. A brief description of the sites are as follows (refer to Figure 2.1):

- **Astra Street site:** located within Lot 16 of DP 1149782, this site is located within the former Astra Street landfill site within part of 2 and 28 Astra Street, Shortland, NSW. The site is owned by the City of Newcastle. The former Astra Street landfill site is subject to an approved Voluntary Management Proposal issued under Section 17 of the *Contaminated Land Management Act 1997*. The area of the proposed construction compound is 8.1 hectares. The site is zoned E3 environmental management under the *Newcastle Local Environmental Plan 2012* (Newcastle LEP).
- **Lookout Road site:** located within Lot 222 of DP 840728, this site is a residential dwelling. The site is located at 136 Lookout Road, New Lambton Heights, NSW. The area of the proposed construction compound is about 0.1 hectares. The site is zoned R2 low density residential under the Newcastle LEP.
- **Cardiff Road site:** located within Lots A-C of DP 347568, this site is located on disturbed vacant land at 10 and 12 Main Road, Cardiff Heights and 60 Marshall Street, New Lambton Heights. The site is owned by Transport for NSW. The area of the proposed construction compound is about 0.4 hectares. The site is zoned R2 low density residential under the *Lake Macquarie Local Environmental Plan 2014*.
- **Peatties Road site:** located within Lot 1 of DP 330006, Lots 32 and 33 of DP 734569, and Lot 1 of DP 910200, this site is located at 1/6 Peatties Road, Kotara. The site has been subject to historical disturbance from a former quarry cut into the hillside, with roads built along terraces cut during quarrying activities. The site is owned by the City of Newcastle and Sydney Trains. The area of the proposed construction compound is about 1.7 hectares. The site is zoned E3 environmental management and SP2 railway under the Newcastle LEP.

The sites were selected based on their proximity to the project, as well as the suitability of the existing conditions (ie pre-existing disturbed nature) with minimal environmental and social constraints (see section 6). The Peatties Road site is the only site with direct impacts to biodiversity associated with the removal of 0.2 hectares of low-condition native vegetation (artificial wetland). As the proposed modification is for construction compounds during construction, there would be no ongoing impacts as a result of the project or impacts to future use of these sites.

2.4.2 Site establishment

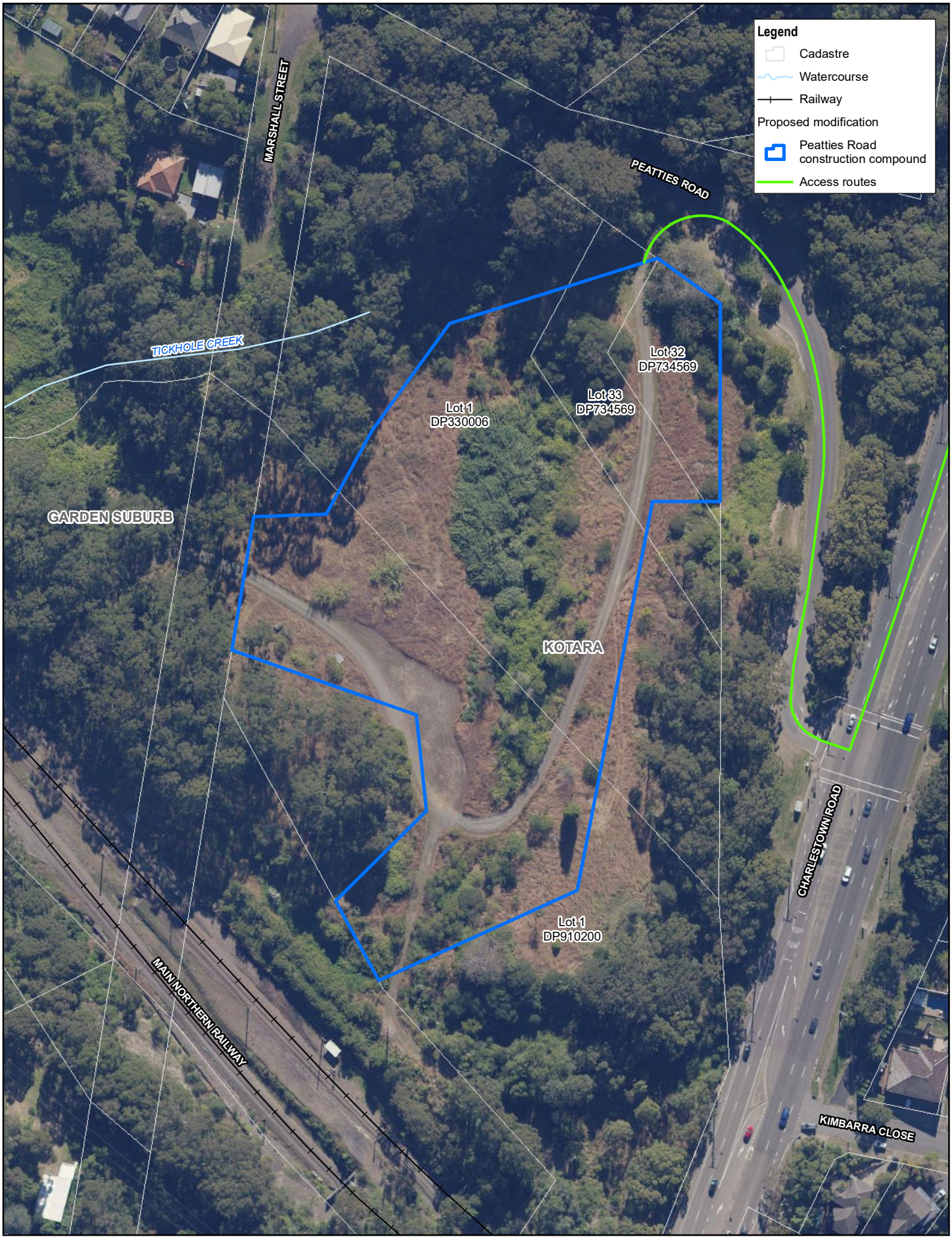
Site establishment would involve the following activities:

- Erection of a temporary boundary fence and traffic management (as required)
- Installation of erosion and sediment controls
- Vegetation clearing and grubbing (as required)
- Minor earthworks to establish the compounds
- Installation of site facilities
- Connection to utilities.

2.4.3 Use of the construction compounds

A range of activities would be carried out at each construction compound identified for the proposed modification, as summarised in Table 2-3.

The Peatties Road compound would replace construction compound A as the main construction compound for the project.



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Rankin Park to Jesmond

Figure 2-1a

Proposed modification - Peatties Road

Data source: LPI: DTDB / DCDB, 2017 © Department of Customer Service 2020.

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Rankin Park to Jesmond

Figure 2-1b

Proposed modification - Cardiff Road

Data source: LPI: DTDB / DCDB, 2017 © Department of Customer Service 2020.

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Figure 2-1c

Proposed modification - Lookout Road

Data source: LPI: DTDB / DCDB, 2017 © Department of Customer Service 2020.

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Rankin Park to Jesmond

Figure 2-1d

Proposed modification - Astra Street

Data source: LPI: DTDB / DCDB, 2017 © Department of Customer Service 2020.

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Table 2-3 Proposed activities

Activity	Peatties Road	Cardiff Road	Astra Street	Lookout Road
Main site compound area	Yes [1]			
Materials handling	Yes	Yes	Yes [1]	
Establishment of temporary fencing and traffic management	Yes	Yes	Yes	
Installation of erosion and sediment controls	Yes	Yes	Yes	
Establishment of compounds	Yes	Yes	Yes	
Vegetation clearing and grubbing	Yes	Yes	Yes	
Crushing plant			Yes	
Stockpile site	Yes	Yes	Yes [1]	
Batching plant			Yes [1]	
Bridge girder laydown			Yes [1]	
Site offices	Yes [1]			Yes [1]
Deliveries	Yes [1]		Yes [1]	
Parking	Yes [1]			Yes [1]
Construction support activities	Yes [1]		Yes [1]	
Demobilisation and rehabilitation	Yes	Yes	Yes	
Average worst case vehicle movements – daily (two way)				
Light vehicles	100	2	20	10
Heavy vehicles	20	2	30	2

Note 1: identifies proposed out of hours work (OOHW). Refer to section 2.4.9 for further information.

2.4.4 Access and acquisition

The additional construction compounds would have the following access points for both light and heavy vehicles:

- **Astra Street site:** access from the project site would be via the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and Astra Street
- **Cardiff Road site:** access from the project site would be via the Newcastle Inner City Bypass (Lookout Road), Cardiff Road and Marshall Street
- **Lookout Road site:** access from the project site would be via Newcastle Inner City Bypass (Lookout Road)
- **Peatties Road site:** access from the project site would be from the Newcastle Inner City Bypass (Lookout Road and Charlestown Road) and Peatties Road.

A summary of daily light and heavy vehicle movements is provided in Table 2-3.

No acquisition is required for the proposed modification. Transport for NSW owns the Cardiff Road site. Where the land is not owned by Transport for NSW use of the sites would be undertaken in accordance with the terms and conditions of the lease agreement with relevant landowners.

2.4.5 Site demobilisation and reinstatement

Demobilisation would involve removal of all temporary construction materials, plant and equipment installed for the proposed modification. The sites would be reinstated and returned to the relevant landowner in accordance with the terms and conditions of the lease agreement, where the land is not owned by Transport for NSW.

2.4.6 Construction methodology

The proposed modification would not require any changes to the construction methodology or additional plant and equipment. However, the additional construction compounds are located in areas not previously assessed as part of the EIS and SPIR. Therefore, additional assessment has been completed in section 6 for the use of these sites during the construction period.

2.4.7 Construction program

There would be no change to the construction program as a result of the proposed modification. As discussed in section 4.7.7 of the SPIR main works construction is expected to take about 30 months, weather permitting. The additional construction compounds are proposed to be used for the duration of construction.

2.4.8 Construction workforce

There would be no increase in the construction workforce as a result of the proposed modification.

2.4.9 Construction hours

Construction hours for the proposed modification would generally be in accordance with Condition E26 of SSI-6888, which identifies construction hours as:

Work must only be carried out during the following construction hours:
(a) 7:00 am to 6:00 pm Mondays to Fridays
(b) 8:00 am to 5:00 pm Saturdays
(c) at no time on Sundays or public holidays.

However, some out of hours work (OOHW) activities (refer to Table 2-3) are proposed at the Astra Street, Peatties Road and Lookout Road sites during the evening (6pm to 10pm Monday to Friday and Saturday 1pm to 10pm) and night (10pm to 7am Monday to Saturday) periods.

Any OOHW would be carried out in accordance with the conditions of approval (conditions E27, E28, E29 and E30). In particular, condition E27(c) permits OOHW to be carried out if it complies with the environment protection licence (EPL) (yet to be obtained) under the *Protection of the Environment Operations Act 1997* for the project.

The reasons for carrying out OOHW include:

- Ensuring the safety of the public and construction workforce
- Minimising disruption to the existing road network and the network level of service
- Minimising disruption to road users and pedestrians
- In support of approved OOHW assessed in the EIS and SPIR.

3 Strategic context

3.1 Overview

The strategic context for the project was detailed in section 3.2 of the EIS. A review of key strategic planning and policy documents relevant to the proposed modification that have been prepared since completion of the EIS was carried out and is summarised in the following sections. There would be no change to the overall strategic context or strategic need for the project, with the proposed modification required to facilitate and enable the project to be constructed safely. The proposed modification would also facilitate the project meeting the objectives as described in section 3.4 of the EIS.

3.2 NSW Government Priorities

The NSW Government has identified a number of priorities to enhance the quality of life for the people of NSW. These priorities have ambitious targets to deliver on the Government's key policy priorities including a strong economy and well connected communities with quality local environments. Transport projects allow local communities across NSW to have access to better connected infrastructure and services including safer and better-quality roads and highways.

The project and the proposed modification meets the overarching aims of these priorities by providing sufficient road capacity to meet traffic demand and by providing better road connections and safer conditions.

3.3 NSW State Infrastructure Strategy

The *State Infrastructure Strategy 2018 – 2038* (Infrastructure NSW 2018) is a 20-year infrastructure investment plan for the NSW Government. The strategy identifies policies and strategies needed to provide the infrastructure that meets the needs of a growing population and a growing economy.

The project and the proposed modification meets the objectives of the strategy by providing sufficient road capacity to meet traffic demand and by providing travel time savings for traffic, including freight, and would provide safer road conditions to support future growth and tourism.

3.4 Future Transport Strategy 2056

The *Future Transport Strategy 2056* (Transport for NSW 2018a) provides an overarching strategy, underpinned by a number of plans, to achieve a 40-year vision for the NSW transport system. The strategy is underpinned by several plans including:

- *Regional NSW Services and Infrastructure Plan* (NSW Government 2017)
- *NSW Freight and Ports Plan 2018-2023* (Transport for NSW 2018b)
- *Road Safety Plan 2021* (Transport for NSW 2018c).

The project and the proposed modification meets the objectives of the strategy and supporting plans by improving accessibility within Newcastle and the Hunter region, providing a more efficient freight route through Newcastle (including connections to the Port of Newcastle) and would address existing road safety issues along the existing route.

3.5 Greater Newcastle Metropolitan Plan 2036

The *Greater Newcastle Metropolitan Plan 2036* (Department of Planning and Environment 2018) establishes goals, outcomes and strategies to drive sustainable growth across the area of Greater Newcastle. The plan also helps to achieve the vision set in the *Hunter Regional Plan 2036* (Department of Planning and Environment 2016), 'for the Hunter to be the leading regional economy in Australia with a vibrant new metropolitan city at its heart'.

The project's central interchange at the John Hunter Hospital is an outcome in the plan for the John Hunter Hospital catalyst area.

4 Statutory context

4.1 Approval framework

4.1.1 Project approval

The project was declared as SSI and therefore assessed and approved under Part 5, Division 5.2 of the EP&A Act. An EIS was prepared and placed on public exhibition from 16 November 2016 to 16 December 2016.

Following the public exhibition, submissions were received from the community and from NSW Government agencies and local councils. A SPIR was produced to document the responses to the issues raised and to assess design changes in response to the submissions received. The SPIR was lodged with the DPIE in June 2018.

Planning approval was granted by the NSW Minister for Planning on 15 February 2019 (application number SSI 6888) and was subject to a number of conditions of approval.

Section 5.25(2) of the EP&A Act notes the Minister's approval for a modification is not required if the infrastructure as modified will be consistent with the existing approval under Division 5.2 of the EP&A Act. However, where there would be a change, the proponent is required to lodge a request to the Minister to modify the Minister's approval.

Following project approval, Transport for NSW has made a number of project design refinements. These have arisen due to review of the concept design, development of the detailed design, consultation with government agencies and other stakeholders and evaluation of construction methodologies and delivery program. These design refinements resulted in minor changes to the construction footprint and as such were subject to two consistency assessments.

The proposed modification would be carried out in accordance with Section 5.25(2) of the EP&A Act, which requires the proponent lodge a request to the Minister to modify the Minister's approval for SSI.

4.1.2 Modification application

As an SSI project approved under Division 5.2 of the EP&A Act, the Minister for Planning and Public Spaces is the consent authority for the modification application.

Section 5.25(3) states that *'*the request for the Minister's approval is to be lodged with the Planning Secretary. The Planning Secretary may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister*'*. DPIE confirmed the SEARs issued for SSI-6888 remain relevant to the proposed modification on 9 December 2020 (Appendix B). However, DPIE advised that 'in relation to impacts on the biodiversity values of the proposal a biodiversity development assessment report must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM)*'*.

Section 5.25(4) states that *'*the Minister may modify the approval (with or without conditions) or disapprove of the modification*'*.

4.2 Environmental planning instruments

Relevant environmental planning instruments are discussed in section 2.1.1 of the EIS. The relevance of these instruments to the proposed modification remains valid, and as such they have not been repeated below. Additional environmental planning instruments relevant to the proposed modification are discussed below.

4.2.1 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016.* The objectives of the Coastal Management SEPP are to manage development in the coastal zone and establish a framework for land use planning and decision making in the coastal zone.

The proposed modification is not located within land mapped as coastal wetlands or littoral rainforest. However, the Astra Street site marginally extends into the mapped proximity area for coastal wetlands, and is located within the mapped coastal use area and mapped coastal environment area (Figure 4.1).

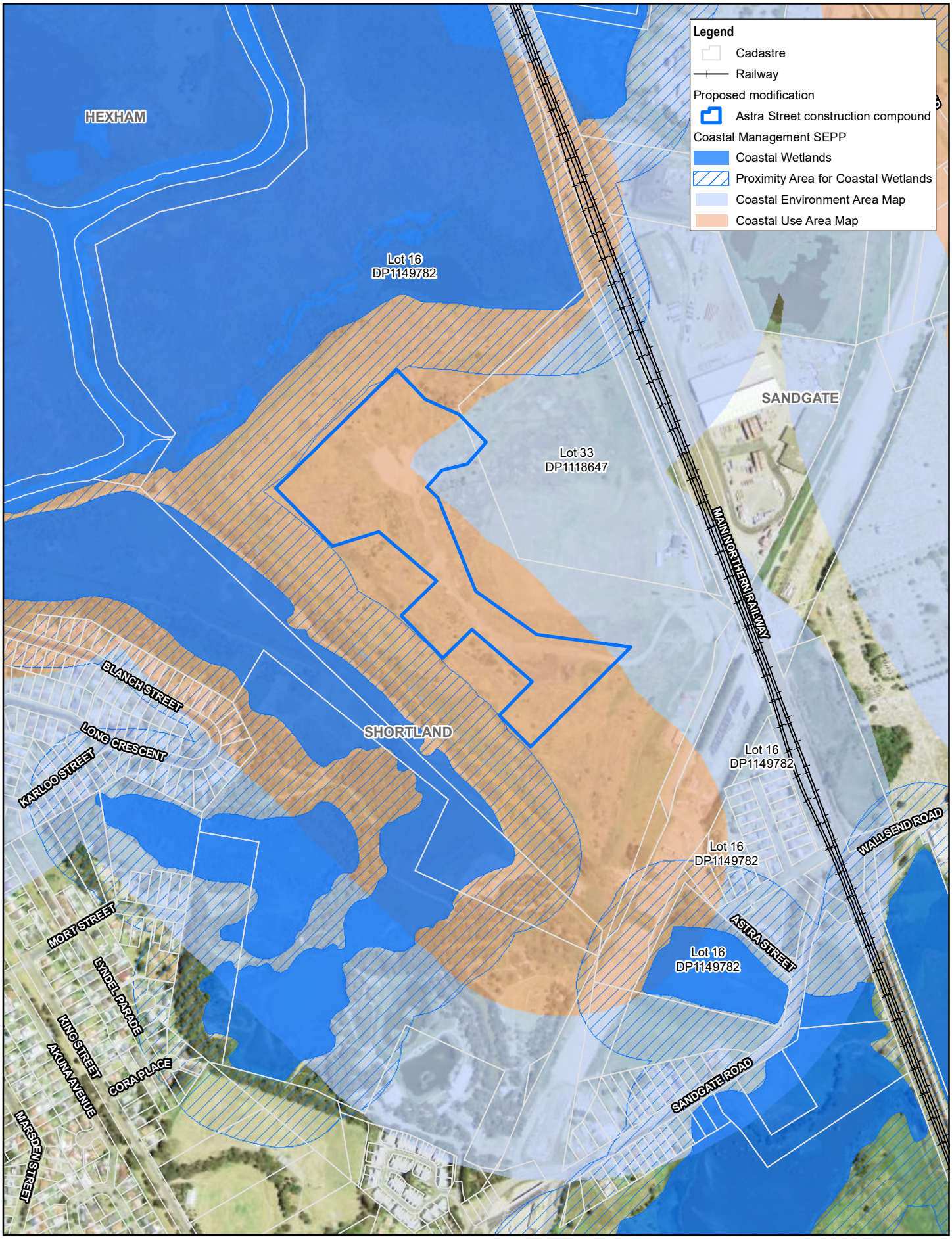
Table 4-1 provides a summary of the relevant considerations under the Coastal Management SEPP based on the detailed assessments provided in sections 6.2.1, 6.2.4 and 6.2.5.

Table 4-1 Impacts to be considered under the Coastal Management SEPP

Consideration	Discussion
Clause 11 (1)	
(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or	The biodiversity development assessment report (Appendix D) and assessment of potential water quality impacts (section 6.2.4) identified there would be no biophysical, hydrological or ecological impacts to the wetland near the Astra Street site. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.	The assessment of potential water quality impacts (section 6.2.4) and groundwater impacts (section 6.1) identified there would be no impacts to the wetland near the Astra Street site. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
Clause 13(1)	
(a) The integrity and resilience of the biophysical hydrological and ecological environment	The biodiversity development assessment report (Appendix D) and assessment of potential water quality impacts (section 6.2.4) identified there would be no impacts that could affect the integrity and resilience of the biophysical, hydrological or ecological environment of the wetland near the Astra Street site. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
(b) Coastal environmental values and natural coastal processes	The proposed modification involves the temporary use of disturbed land at the Astra Street site. The proposed modification would not involve any activities that would affect coastal environmental values or natural coastal processes.

Consideration	Discussion
(c) The water quality of the marine estate, in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	The wetlands near the Astra Street site are not listed in Schedule 1 of the Coastal Management SEPP.
(d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	The proposed modification would not impact any marine vegetation, undeveloped headlands or rock platforms. A biodiversity development assessment report (Appendix D) has been prepared and identified no native vegetation, fauna or fauna habitat would be impacted at the Astra Street site. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
(e) Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposed modification involves the temporary use of disturbed land at the Astra Street site. As the Astra Street site is not available to public access, the proposed modification would not affect existing public open space or safe access to any foreshore, beach, headland or rock platform.
(f) Aboriginal cultural heritage, practices and places	An Aboriginal archaeological assessment (Appendix F) has been prepared for the proposed modification and identified there would be no impact to any Aboriginal archaeological objects, sites or areas of archaeological potential. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
(g) The use of the surf zone	The proposed modification is not located within the surf zone.
Clause 14(1)	
(a)(i) Existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	The proposed modification involves the temporary use of disturbed land at the Astra Street site. As the Astra Street site is not available to public access, the proposed modification would not affect existing public open space or safe access to any foreshore, beach, headland or rock platform.
(a)(ii) Overshadowing, wind funnelling and the loss of views from public places to foreshores	The proposed modification involves the temporary use of disturbed land at the Astra Street site. It would not involve any activities that would cause overshadowing or wind funnelling. The site is not located in an area that would affect any foreshore views.
(a)(iii) The visual amenity and scenic qualities of the coast, including coastal headlands	The proposed modification involves the temporary use of disturbed land at the Astra Street site. As the Astra Street site is not available to public access, the proposed modification would not affect the visual amenity and scenic qualities of the coast, including coastal headlands.

Consideration	Discussion
(a)(iv) Aboriginal cultural heritage, practices and places	An Aboriginal archaeological assessment (Appendix F) has been prepared for the proposed modification and identified there would be no impact to any Aboriginal archaeological objects, sites or areas of archaeological potential. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).
(a)(v) Cultural and built environment heritage	The proposed modification involves the temporary use of disturbed land at the Astra Street site. The non-Aboriginal heritage assessment (section 6.1) identified there would be no impact to any listed heritage items or places. Standard environmental management measures would be implemented to minimise potential impacts (Appendix H).



Paper Size ISO A4

0 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Rankin Park to Jesmond

Figure 4-1

Coastal Management SEPP Mapping

Data source: LPI: DTDB / DCDB, 2017; OEH, Coastal Management SEPP © Department of Customer Service 2020.

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4.3 Other NSW legislation

Section 2.2.1 of the EIS provides an overview of the other NSW legislation relevant to the project. The relevance of most of the legislation to the proposed modification remains valid, and as such they have not been repeated below. Additional legislation relevant to the proposed modification is discussed below. The proposed modification does not require any additional approvals/licences from those already identified.

4.3.1 Biodiversity Conservation Act 2016

Biodiversity assessment reports (GHD, 2016b and GHD, 2018b) were prepared to support the EIS and SPIR. The reports were prepared in accordance with the *Threatened Species Conservation Act 1995*, which has now been repealed and replaced by the *Biodiversity Conservation Act 2016*.

In accordance with the letter from DPIE on 9 December 2020, a biodiversity development assessment report (Appendix D) has been prepared as summarised in section 6.2.1, to fulfil the obligations under the *Biodiversity Conservation Act 2016*.

4.3.2 Contaminated Land Management Act 1997

The proposed Astra Street construction compound is located within the former Astra Street landfill site that was operated by the City of Newcastle from 1974, before it was closed and capped in 1995. The site is currently listed on the EPA contaminated land register and is subject to an approved Voluntary Management Proposal issued under Section 17 of the *Contaminated Land Management Act 1997*. The City of Newcastle has current remediation plans. The remediation work would include final capping and reprofiling of the site, and improving drainage to aid in management of surface water and sediment runoff.

The establishment and use of the Astra Street site as a construction compound would not occur until remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound. It will comply with:

- City of Newcastle's Voluntary Management Proposal under the *Contaminated Land Management Act 1997*
- Relevant outcomes of consultation with the City of Newcastle.
- Relevant EPA guidelines.

4.3.3 Protection of the Environment Operations Act 1997

The project is a scheduled activity under the *Protection of the Environment Operations Act 1997* (POEO Act). This means that an environmental protection licence (EPL) for 'road construction' is required under chapter 3 (clause 35, schedule 1) of that Act. In accordance with section 5.24 of the EP&A Act, such a licence cannot be refused for an approved project and is to be substantially consistent with the Division 5.2 approval.

Clause 56 (2) of the POEO Act specifies that the premises to which an EPL applies are to be the whole of the premises at which the activities authorised or controlled by the licence (and ancillary activities) are carried on. As such, the use of the additional construction compounds would be carried out in accordance with the EPL for the project.

4.4 Commonwealth legislation

Section 2.2.2 of the EIS provides an overview of Commonwealth legislation that is relevant to the project. It considered the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

As described in the EIS, the project was considered against potential EPBC Act triggers and was referred to the Commonwealth Department of the Environment on 7 September 2015.

On 15 October 2015, the Australian Minister for the Environment confirmed the project would be a controlled action. The referral decision identified that the following matters of national environmental significance were of relevance to the project:

- Listed threatened species and communities (section 18 and 18A of the EPBC Act)
- Wetlands of international importance (sections 16 and 17B of the EPBC Act).

In February 2015, the Australian Government and the NSW State Government signed a bilateral assessment agreement under section 45 of the EPBC Act. This agreement accredits the assessment process of Part 5.1 (now Division 5.2) under the EP&A Act, so the Australian Minister would need to issue a separate approval for the project to the State Minister's approval as it is a controlled action.

Following consultation between DPIE and the Commonwealth Department of the Environment, additional environmental assessment requirements (in the form of Supplementary SEARs) were issued on 19 November 2015.

In accordance with the letter from DPIE on 9 December 2020 confirming the SEARs issued for SSI-6888 remain relevant to the proposed modification, the requirements of the Supplementary SEARs have been considered for the proposed modification. In particular, a biodiversity development assessment report (Appendix D) has been prepared as summarised in section 6.2.1.

5 Engagement

5.1 Consultation during the preparation of the proposed modification

5.1.1 Summary of consultation activities and tools

Table 5-1 provides a summary of the community notifications and community engagement that has occurred, and the relevant feedback received.

5.1.2 Consultation with local, state and commonwealth government agencies

The proposed modification does not require any consultation with State or Commonwealth agencies. Transport for NSW has carried out consultation with the City of Newcastle and Sydney Trains in relation to proposed use of the Astra Street and Peatties Road sites, and to arrange access for field surveys for the proposed modification.

5.2 Ongoing consultation

During DPIE's assessment of the proposed modification and up to and following determination, Transport for NSW and the construction contractor will continue to engage and/or consult with the community and relevant stakeholders in accordance with the approved conditions of the project approval.

This will include a letterbox drop to about 100 residents near the sites, advising of the exhibition of the modification report for comment. This will also include consultation with City of Newcastle and Lake Macquarie City Council.

Ongoing consultation would be carried out in accordance with the *Community Communications Strategy Newcastle Inner City Bypass – Rankin Park to Jesmond* (Roads and Maritime Services, 2019) approved under Condition B3.

Table 5-1 Community engagement summary

Construction compound	Activity/Tool	Timing	Feedback
Peatties Road / Cardiff Road	Letterbox drop conducted to about 17 properties including those in Marshall Street, Wimbledon Grove and Cardiff Road. The letter from Transport for NSW and the distribution area of this letterbox drop are provided in Appendix C.	27 November 2020	One enquiry was received following the letter box drop. A meeting was held with the resident on 5 February 2021. Concerns included: • Impacts on investment (ie tenant complaints, impact to land). • Social impacts of workers and offices/crib rooms in vicinity of home. Transport for NSW advised the site would be used for the limited purposes identified in Table 2-3 and only during standard construction hours. Transport for NSW's contact details were provided for further queries and concerns.
Astra Street	There are no residential neighbours at this location; therefore, no community consultation has occurred to date. However, Transport for NSW will enter into a lease agreement with City of Newcastle as the relevant landowner prior to use of the site	N/A	N/A
Lookout Road	In compliance with Condition A14(b) of SSI-6888, Transport for NSW carried out consultation with the adjacent resident to the Lookout Road site. This consultation commenced in February 2021, with an initial letter provided on 26 February 2021 giving an overview of the proposed modification and requesting an on-site meeting with the landowner to discuss the proposed use of the construction compound at the adjacent property and review Transport for NSW's *Adjacent Property Access and User Agreement*. Consultation letter provided in Appendix C.	February/ March 2021	The signed *Adjacent Property Access and Use Agreement* was received on 2 March 2021 from the owner and occupier of the property adjacent to the Lookout Road site. This allows use and access of the site for the operation of site office for construction of the project for a period of up to 5 years.

6 Assessment of impacts

6.1 Screening assessment of environmental issues

To assist in identifying the key environmental issues which require further assessment as a result of the proposed modification, an environmental screening and scoping process has been completed. Table 6-1 identifies the environmental issues potentially relevant to the proposed modification, consistent with the EIS (GHD, 2016a) and SPIR (GHD, 2018a) reports, and assesses whether or not a detailed assessment is required for these issues as part of this modification report.

Table 6-1 Potential environmental impacts associated with the proposed modification

Aspect	Environmental impact screening	Further assessment required?
Biodiversity	Due to impacts to areas not previously considered during the preparation of the biodiversity assessment reports (GHD, 2016b and GHD, 2018b) for the EIS and SPIR, a biodiversity development assessment report GHD (2021a) has been prepared for the proposed modification.	Yes, see section 6.2.1 and Appendix D
Traffic and transport	Due to impacts to areas not previously considered during the preparation of the traffic and transport assessments (Aurecon, 2016a and Aurecon, 2018a) for the EIS and SPIR, an updated assessment has been completed for potential traffic and transport issues related to the proposed modification. As the proposed modification relates only to the use of construction compounds during construction, there would be no change to operational traffic and transport impacts.	Yes, see section 6.2.2
Noise and vibration	Due to impacts to areas not previously considered during the preparation of the noise and vibration assessment reports (GHD, 2016c and GHD, 2018c) for the EIS and SPIR a construction noise and vibration assessment (GHD, 2021b) has been prepared for the proposed modification.	Yes, see section 6.2.3 and Appendix E

Aspect	Environmental impact screening	Further assessment required?
Landscape character and visual impact	The potential landscape character and visual impacts of the project were assessed in the urban design and landscape character and visual impact assessments (Ki Studio, 2016 and Ki Studio, 2018) for the EIS and SPIR. These assessments noted that while nearby residents would have views of construction activities, the visual impacts would be low as the work is temporary in nature and set against a backdrop of existing infrastructure. While the proposal would impact areas not considered in these assessments, the visual impact would be temporary only and would not result in any long term visual impacts or changes to landscape character. The Astra Street site is located within the former Astra Street Landfill and would not be visible from any nearby residential areas due to intervening topography, vegetation and infrastructure such as the Newcastle Inner City Bypass (Jesmond to Sandgate). While the compound would be partially visible from the Newcastle Golf Practice Centre, any visual impacts for short term users of this facility are likely to be low to negligible. Similarly, the Peatties Road site would not be visible from any nearby residential areas due to intervening topography and vegetation. While there is a residential property next to the Lookout Road site, this compound would only be used as an office and would not result in any visual impacts. The Cardiff Road site would be visible for residents located next to the compound, and for pedestrians and road users along Marshall Street and Cardiff Road. This compound would be used as a stockpile site and would not involve any work outside standard construction hours which would limit the visual impacts. A range of environmental management measures were proposed in the EIS and SPIR to manage impacts during the construction phase and these would be implemented as relevant. As a result, with the implementation of the safeguards and measures included in the EIS and SPIR (reproduced in Appendix H), the visual impacts of these activities is considered low with no ongoing impacts following completion of construction.	No further assessment required

Aspect	Environmental impact screening	Further assessment required?
Socio-economic	The potential socio-economic impacts of the project were assessed in the socio-economic assessment (GHD, 2016d) for the EIS and section 6.6 of the SPIR. The proposed modification would not change the overall economic benefits of the project. Similarly, it would not impact on any employment opportunities, community values, access and connectivity or social infrastructure. Use of the compounds would result in reduced amenity associated with construction noise, visual and traffic impacts for nearby residential receivers. Use of the Astra Street site would also result in minor changes in traffic conditions and visual impacts for visitors to the Newcastle Golf Practice Centre. While there is a residential property next to the Lookout Road site, this compound would only be used as an office and would not result in any significant socio-economic impacts. The greatest amenity impacts would occur at the Cardiff Road site where there are residences located directly next to the site. This compound would be used as a stockpile site and would not involve any work outside standard construction hours. A range of environmental management measures were proposed in the EIS and SPIR to manage impacts during the construction phase and these would be implemented as relevant. Consultation would be carried out in accordance with the approved *Community Communications Strategy Newcastle Inner City Bypass – Rankin Park to Jesmond* (Roads and Maritime Services, 2019). As there are no socio-economic significant impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required

Aspect	Environmental impact screening	Further assessment required?
Land use and property	The potential land use and property impacts of the approved project were assessed in section 11 of the EIS and section 6.6 of the SPIR. Impacts on land use and property associated with the proposed modification would be minor in nature, with all land impacted by the four additional construction compounds owned by Transport for NSW (Cardiff Road), public authorities (Astra Street – owned by the City of Newcastle, and Peatties Road – owned by the City of Newcastle and Sydney Trains) or private landowners (Lookout Road). Where the land is not owned by Transport for NSW, access and use of the sites would be carried out in accordance with the terms and conditions of lease agreements with the relevant landowners. No acquisition is required for the proposed modification. As the proposed modification involves work which is temporary in nature there would be no significant impacts to land use and property. All land would be returned to pre-existing condition on completion of construction works, in accordance with relevant lease agreements. Consultation would be carried out in accordance with the approved *Community Communications Strategy Newcastle Inner City Bypass – Rankin Park to Jesmond* (Roads and Maritime Services, 2019). As there are no significant land use and property impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required
Flooding and drainage	The potential flooding and drainage impacts of the project were assessed in the flooding and drainage assessments (Aurecon, 2016b and Aurecon, 2018b) for the EIS and SPIR. As all construction compounds associated with the proposed modification are located outside all flood extents, including the probable maximum flood (BMT WBM, 2012), the proposed modification would not result in any flooding or drainage impacts. As there are no flooding or drainage impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required

Aspect	Environmental impact screening	Further assessment required?
Soils, contamination and water quality	The potential soils, contamination and water quality impacts of the project were assessed in the: • water quality and watercourse assessments (GHD, 2016e and GHD, 2018d) for the EIS and SPIR • contamination assessment (GHD, 2016e) for the EIS • soils assessment (chapter 13 of the EIS). Due to impacts to areas not previously considered during the preparation of the EIS and SPIR, an updated assessment has been completed for potential impacts related to the proposed modification. As the proposed modification relates only to construction compounds during construction, there would be no change to operational soils, contamination or water quality impacts.	Yes, see section 6.2.4
Groundwater	The potential groundwater impacts of the project were assessed in the groundwater assessment (GHD, 2016g) for the EIS and section 6.9 of the SPIR. The proposed modification would only involve minor ground disturbance and minor changes to overland flows. As such, there are no expected impacts to groundwater. Potential groundwater impacts at the Astra Street site in relation to the former landfill would be managed by implementation of a new management measure (refer to section 6.2.4). As there are no groundwater impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required
Aboriginal heritage	Due to impacts to areas not previously considered during the preparation of the Aboriginal heritage assessments (EIS chapter 15 and Kelleher Nightingale Consulting, 2018) for the EIS and SPIR an Aboriginal archaeological assessment (Kelleher Nightingale Consulting, 2021) has been prepared for the proposed modification.	Yes, see section 6.2.5 and Appendix F

Aspect	Environmental impact screening	Further assessment required?
Non-Aboriginal heritage	The potential non-Aboriginal heritage impacts of the project were assessed in the non-Aboriginal heritage assessment (Baker Archaeology, 2016) for the EIS. Relevant non-Aboriginal heritage databases were searched for each site (ie for the suburbs of Rankin Park, New Lambton, New Lambton Heights, Cardiff Heights, Kotara, Garden Suburb and Shortland) as follows: • NSW State Heritage Register (date 23 February 2021) • Newcastle Local Environmental Plan 2012 (date 23 February 2021) • Australian Heritage Database (date 23 February 2021). The modification area has been heavily modified. There are no listed non-Aboriginal heritage items located in the proposed modification area. The closest listed heritage items to the proposed modification include Sandgate Cemetery listed in the *Newcastle Local Environmental Plan 2012* located about 200 metres east of the Astra Street site, and the Great Northern Railway listed in the *Lake Macquarie Local Environmental Plan 2014* located about 50 metres south-west of the Peatties Road site. These sites would not be impacted by the proposed modification, either directly or indirectly (eg construction vibration as discussed in section 6.2.3). As there are no non-Aboriginal heritage impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.

Aspect	Environmental impact screening	Further assessment required?
Air quality	The potential air quality impacts of the project were assessed in chapter 17 of the EIS and section 6.11 of the SPIR. The Astra Street site is located within the former Astra Street Landfill. While the compound would involve activities (such as crushing and stockpiling) that could impact on nearby air quality the nearest sensitive receptors are the Newcastle Golf Practice Centre (located about 150 metres away) and residences (located about 300 metres away). The residential receptors are shielded from the proposed Astra Street sites by to the intervening topography, vegetation and infrastructure such as the Newcastle Inner City Bypass (Jesmond to Sandgate), as such no significant air quality impacts are expected as a result of activities at the site. Similarly, the Peatties Road site is located about 100 metres from the nearest sensitive receptor and is separated by a patch of vegetation which is to be retained. The site is also located within a depression formed by previous activity at the site. Due to the intervening topography and vegetation no significant air quality impacts are expected as a result of activities at the site. While there is a residential property next to the Lookout Road site, this compound would only be used as an office and would not result in any air quality impacts. The greatest potential impacts would occur at the Cardiff Road site, where there are multiple residences located next to the compound. Activities at this site would be limited to stockpiling and potential air quality impacts would be minimised by the implementation of standard environmental management measures. As the proposed modification relates only to construction compounds during construction, there would be no change to operational air quality impacts. As there are no significant air quality impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.

Aspect	Environmental impact screening	Further assessment required?
Resource use and waste management	The potential resource use and waste management impacts of the project were assessed in chapter 19 of the EIS and section 6.12 of the SPIR. The proposed modification is seeking the approval of additional construction compounds to support the construction of the project. While the use of these sites would involve resource use and waste generation, this is not expected to be an increase to that already assessed as part of the project. As there are no resource use and waste management impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.
Hazards and risks	The potential hazards and risks of the project were assessed in chapter 18 of the EIS. The proposed modification would result in negligible change to hazards and risks from those assessed in the EIS. As the proposed modification relates only to construction compounds during construction, there would be no change to operational hazards and risks. As there are no hazards and risks associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.

Aspect	Environmental impact screening	Further assessment required?
Greenhouse gas and climate change	The potential greenhouse gas and climate change impacts of the project were assessed in chapter 20 of the EIS and section 6.13 of the SPIR. The proposed modification will result in negligible changes to greenhouse gas emissions. As the proposed modification relates only to the use of construction compounds during construction, there would be no change to operational greenhouse gas emissions. As there are no greenhouse gas and climate change impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.
Cumulative impacts	The potential cumulative impacts of the project were assessed in chapter 21 of the EIS. Potential cumulative impacts could occur associated with the proposed modification and other projects in the local area if construction were to occur at the same time. A review of potential projects which could interact with the proposed modification was carried out. This included a review of projects listed on the DPIE and City of Newcastle websites and other Transport for NSW projects. Based on this review two projects not previously considered in the EIS were identified as follows: • Health Infrastructure NSW is currently preparing an EIS for the John Hunter Health and Innovation Precinct project (SSD-9351535) • Transport for NSW is in the early stages of planning for improvements to the Pacific Highway at Hexham. Both projects are in the early stages of planning and no information is currently available to confirm potential cumulative impacts. However, as the proposed modification would not result in any significant additional impacts, no adverse cumulative impacts are expected. As there are no significant cumulative impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.	No further assessment required.

6.2 Assessment of key issues

6.2.1 Biodiversity

Due to impacts to areas not previously considered during the preparation of the biodiversity assessment reports (GHD, 2016b and GHD, 2018b) for the EIS and SPIR, a biodiversity development assessment report GHD (2021a) has been prepared for the proposed modification and is provided in Appendix D.

Field surveys completed by GHD ecologists on 9 and 10 February 2021 of the four sites determined that the Astra Street, Cardiff Road and Lookout Road are heavily modified, comprising exotic vegetation and not containing suitable habitat to support any threatened species. Therefore, it was concluded there would be no impact to biodiversity values at these sites requiring further assessment under the BAM. However, field survey of the Peatties Road site determined the presence of native vegetation requiring further assessment under the BAM. In addition, due to the presence of the wetland at the Peatties Road site and near the Astra Street site, targeted surveys for threatened frogs were also carried out as described below.

Existing environment

Plant community types and threatened ecological communities

One plant community type was observed in the Peatties Road site, with a small area (0.2 hectares) of low condition PCT 1071- *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* identified. This is identified as a natural or man-made water body, drainage line and depression across a wide variety of environments, including modified former wetlands.

No threatened ecological communities were identified within any of the proposed construction compounds.

Threatened flora species

Targeted survey was carried out for the following threatened species identified as having potential to occur within the Peatties Road site:

- Biconvex Paperbark (*Melaleuca biconvexa*)
- *Maundia triglochinoides*
- Tall Knotweed *(Persicaria elatior)*

Targeted surveys for threatened flora did not detect any threatened species within the Peatties Road site.

Threatened fauna species and habitat

Targeted survey was carried out for the following threatened species identified as having potential to occur within the Peatties Road site:

- Wallum Froglet (*Crinia tinnula*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Southern Myotis (*Myotis Macropus*)
- Mahony's Toadlet (*Uperoleia mahonyi*).

Targeted survey was also carried out for Green and Golden Bell Frog (*Litoria aurea*) at the Astra Street site. These surveys did not detect any threatened species within the Peatties Road site, or the Astra Street site.

Migratory species

The absence of suitable habitat for threatened biota and migratory species allowed most predicted threatened species, communities and migratory species to be readily discounted from further assessment.

Aquatic species

Detailed aquatic assessment was not required for the site at Peatties Road (or other proposed construction compounds). The site does not contain areas mapped as key fish habitat and no habitat for threatened aquatic species was identified.

Although native wetland vegetation is present at the Peatties Road site, this vegetation occurs in such density that there was no standing water present to support the presence of aquatic species, or terrestrial species associated with wetland environments (such as water birds, amphibians).

No threatened species or threatened species habitat for aquatic species was identified.

Groundwater dependent ecosystems

The Groundwater Dependent Ecosystems Atlas indicates that the native vegetation within the Peatties Road site is likely to contain vegetation that represents a high potential terrestrial groundwater dependent ecosystem.

The associated vegetation that the atlas identifies as being a high potential terrestrial groundwater dependent ecosystem is PCT 1071- *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* as described above.

Impact assessment

The proposed modification would result in the removal of 0.2 hectares of low condition native vegetation at the Peatties Road site associated with PCT 1071, which was determined not to meet the definition of any threatened ecological communities.

Impacts of this clearing will result in the removal of an area of artificially created wetland and associated vegetation. While direct impacts to this vegetation may result in the removal of habitat for common fauna and flora species, it does not contain habitat for threatened species, and no threatened species were recorded during targeted surveys. Further, this area does not contain any hollow bearing trees, fallen logs or leaf litter.

No impacts to threatened species or threatened species habitat for aquatic species were identified. In addition, with the implementation of standard management measures and specific management measures for the proposed modification (Appendix H) no impacts to groundwater dependent ecosystems are expected.

An assessment of potential impacts to the following relevant matters of national environmental significance was carried out:

- Wetlands of international significance – while all sites are located upstream of Ramsar wetlands, as there would be no change in water quality or hydrology as a result of the proposed modification, with the implementation of standard management measures no significant impacts are expected.
- Threatened species – Green and Golden Bell Frog (*Litoria aurea*) which is listed as a vulnerable species under the EPBC Act has been previously recorded within the Hunter Wetlands Centre that is located to the west of the Astra Street site and Hexham Swamp located to the north. Targeted surveys did not detect this species at the Astra Street site. Based on the vegetation surveys the site does not contain suitable habitat and given the elevation of the site (20 metres above sea level) no significant impacts are expected.

Environmental management measures

There are no credit requirements for impacts on native vegetation, or threatened species and their habitat associated with the clearing of 0.2 hectares of native vegetation at Peatties Road. In addition, there are no aquatic offsets associated with the proposed modification.

Environmental management measures section 7 of the SPIR includes specific environmental management measures to minimise potential impacts to biodiversity associated with construction areas for the proposal. As there are no significant biodiversity impacts associated with the proposed modification, no further environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.

6.2.2 Traffic and transport

Due to impacts to areas not previously considered during the preparation of the traffic and transport assessments (Aurecon, 2016a and Aurecon, 2018a) for the EIS and SPIR, an updated assessment has been completed for potential traffic and transport issues related to the proposed modification.

As the proposed modification relates only to the use of construction compounds during construction, there would be no change to operational traffic and transport impacts. As such, these are not considered further in this report.

Existing environment

Traffic movements near the project are dominated by the north-south traffic flows on the existing sections of the Newcastle Inner City Bypass (to the south and north of the project), Lookout Road and Croudace Street. The dominant east-west traffic flows are along Newcastle Road. The road network surrounding the project currently experiences high levels of traffic congestion and delays at key intersections, particularly during peak periods. There are a number of constraints along the existing route including traffic lights, uncontrolled intersections with local and regional roads, driveways to private properties and a public school. These constraints reduce the actual traffic speeds below the posted speed limit (of either 70 kilometres per hour or 60 kilometres per hour) and contribute to traffic congestion.

A brief description of the roads that would be used for access between the construction compounds and the project is provided in Table 6-2.

Table 6-2 Existing road network

Key roads	Description
Newcastle Inner City Bypass - Jesmond to Sandgate (A37)	This existing part of Newcastle Inner City Bypass is comprised of the Jesmond to Shortland and Shortland to Sandgate sections. It comprises high standard four lane divided dual carriageway generally with two lanes in each direction. There is a full interchange at University Drive, partial interchange at Sandgate Road and an at-grade intersection with the Pacific Highway at Sandgate. The posted speed limit is 90 kilometres per hour. It carries about 36,100 vehicles per day (weekday daily traffic, two-way) (Aurecon, 2016a and Aurecon, 2018a).

Key roads	Description
Newcastle Inner City Bypass - Charlestown Road and Lookout Road (A37)	This existing part of Newcastle Inner City Bypass is comprised of Charlestown Road and Lookout Road. These roads form part of the main north-south route near the project. These roads typically comprise a divided four lane configuration. The posted speed limit varies between 60 and 70 kilometres per hour with the exception of 40 kilometres per hour school zones. It carries between about 47,200 to 55,100 vehicles per day (weekday daily traffic, two-way) (Aurecon, 2016a and Aurecon, 2018a).
Main Road/Cardiff Road (MR 223)	Main Road/Cardiff Road provides a regional road connection to the suburbs of Cardiff, Glendale and Boolaroo to the west of Lookout Road. The road typically consists of a two-lane, undivided carriageway that services residential and commercial areas, as well as the Cardiff industrial complex. The posted speed limit is 60 kilometres per hour. It carries about 14,700 vehicles per day (weekday daily traffic, two-way) (Aurecon, 2016a and Aurecon, 2018a).
Sandgate Road	Sandgate Road provides a busy connection between the Pacific Highway at Sandgate and suburbs to the west such as Shortland and Wallsend. Between the Newcastle Inner City Bypass and Pacific Highway it is typically an undivided two-lane road. The posted speed limit is 60 kilometres per hour. No recent traffic data is available however, it was reported to carry about 14,400 vehicles per day (weekday daily traffic, two-way in 2012 (Roads and Maritime Services, 2012).
Marshall Street	Marshall Street is a local no through road providing access to for residences (about 60 residences) along Marshall Street. It is an undivided two-lane road with a speed limit of 50 kilometres per hour. No traffic data is available however, daily traffic volumes would be low.
Peatties Road	Peatties Road is a no through road which provides access to residential properties along Wimbledon Grove. It is an undivided narrow two-lane road with a speed limit of 50 kilometres per hour. A traffic light controlled intersection is located where it joins Charlestown Road. No traffic data is available however, daily traffic volumes would be very low, being limited to residents of Wimbledon Grove.
Astra Street	Astra Street is a local no through road providing access to a small residential area (about 21 residences) and Sandgate Railway Station. It is an undivided narrow two-lane road with a speed limit of 50 kilometres per hour. Access to the former Astra Street Landfill and Newcastle Golf Practice Centre is provide via an unnamed narrow access road that intersects with Astra Street about 100 meters from the intersection of Astra Street and Sandgate Road. No traffic data is available however, daily traffic volumes would be low.

Impact assessment

The potential impacts of the project were assessed in the traffic and transport assessments (Aurecon, 2016a and Aurecon, 2018a) for the EIS and SPIR.

While the proposed modification would not result in a change to overall construction traffic volumes beyond those assessed as part of the project, access to the sites would involve construction traffic movements on additional roads, including:

- **Astra Street site:** access via the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and Astra Street
- **Cardiff Road site:** access via the Newcastle Inner City Bypass (Lookout Road), Cardiff Road and Marshall Street
- **Lookout Road site:** access via Newcastle Inner City Bypass (Lookout Road)
- **Peatties Road site:** access via the Newcastle Inner City Bypass (Lookout Road and Charlestown Road) and Peatties Road.

A summary of worst-case daily vehicle movements (two way – light and heavy vehicles) for the proposed modification in comparison to the existing daily two-way traffic flows (Aurecon, 2016a and Aurecon, 2018a) for proposed access roads is provided in Table 6-3.

Table 6-3 Worst-case daily vehicle movements vs existing daily traffic flow

Site	Average worst case vehicle movements – daily (two way)		Existing daily traffic flows for proposed access/transport routes – weekday daily traffic (two-way)[1]
	Light vehicles	Heavy vehicles	
Astra Street	20	30	Newcastle Inner City Bypass (Jesmond to Sandgate) – 36,100 Sandgate Road – 14,400 Astra Street – no data
Cardiff Road	2	2	Newcastle Inner City Bypass (Lookout Road) – 47,200 Cardiff Road – 14,700 Marshall Street – no data
Lookout Road	10	2	Newcastle Inner City Bypass (Lookout Road) – 47,200 to 49,400
Peatties Road	100	20	Newcastle Inner City Bypass (Lookout Road and Charlestown Road) – 55,100 Peatties Road – no data

Note 1: Relevant volumes have been sourced from Aurecon, 2016a and Aurecon, 2018a.

As shown in Table 6-3 for most of the roads proposed to be used for access (eg Newcastle Inner City Bypass, Sandgate Road and Cardiff Road) have very high existing traffic volumes and the additional construction traffic would result in a negligible increase and would not be noticeable.

Construction traffic on Marshall Street would result in an average increase of four two-way movements per day and is not expected to cause a noticeable increase.

Construction traffic accessing the Peatties Road site would turn into the site prior to passing any residential dwellings. The construction traffic impacts at this location would be limited to the additional traffic using the traffic light controlled intersection of Peatties Road and Charlestown Road. This impact would be limited to the residents of Wimbledon Grove. As such, the construction traffic movements on Peatties Road are only expected to cause a minor impact.

While Astra Street is a no through road it provides access to about 21 residential properties and Sandgate Railway Station. The additional construction movements (about six two-way movements per hour) are unlikely to result in any significant traffic impacts with implementation of standard environmental management measures (Appendix H). In addition, the access route deviates from Astra Street (where the residential properties and railway station are located) about 100 metres from its intersection with Sandgate Road. As such, there would be no construction movements along the parts of Astra Street where residences are located.

Construction traffic movements along the unnamed access road that also provides access to the Newcastle Golf Practice Centre. Users of this facility during construction hours would notice additional traffic movements however, these are not expected to result in any significant traffic impacts with implementation of standard environmental management measures (Appendix H).

As detailed in section 5, consultation with residents near the Peatties Road and Cardiff Road sites has been carried out. Further consultation would occur pre and during construction, including with all residents near the construction compounds, to minimise impacts.

While the proposed modification would result in some minor changes in local traffic conditions, these impacts would be minor with the implementation of standard environmental management measures. Construction staging would be developed to minimise impacts on the road network. Where possible, construction activities which could substantially affect traffic congestion would be carried out outside peak periods, as far as is practicable.

Environmental management measures

Environmental management measures in section 7 of the SPIR includes specific environmental management measures to minimise potential impacts to traffic and transport associated with construction areas for the proposal. As there are no significant traffic and transport impacts associated with the proposed modification, no further environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.

6.2.3 Construction noise and vibration

Due to impacts to areas not previously considered during the preparation of the noise and vibration assessment reports (GHD, 2016c and GHD, 2018c) for the EIS and SPIR a construction noise and vibration assessment (GHD, 2021b) has been prepared for the proposed modification and is provided in Appendix E.

Existing environment

As three of the construction compounds are geographically separated from the project, a 600 metre buffer from each construction compound was used to identify additional noise sensitive receivers for consideration in the assessment. Additional receivers identified within the buffer include 1037 residential receivers, two active recreation receivers, seven passive recreation receivers, one community facility, 10 commercial receivers, two educational receivers and two worship receivers.

Due to the similar distance from existing transportation noise sources, noise monitoring conducted during the EIS is considered representative of the study area for this assessment, therefore no additional noise monitoring was carried out for this updated assessment.

Assessment methodology

The methodology for the construction noise and vibration assessment included:

- The construction noise management levels (CNML) were adopted from the EIS and SPIR construction noise and vibration assessments.
- A list of likely construction activities and machinery was established for the proposed construction compounds. Representative sound power levels for the selected equipment were obtained from relevant standards and guidelines.
- Noise propagation calculations were carried out for the anticipated activities.
- Where noise levels were predicted to exceed the construction noise management levels, appropriate construction noise and vibration mitigation measures are provided to minimise impacts.

The assessment was carried out in accordance with relevant guidelines including:

- *Interim Construction Noise Guideline* (DECC 2009
- *Road Noise Policy* (DECCW 2011)
- *Noise Policy for Industry* (EPA 2017)
- *Assessing vibration: A technical guideline* (DEC 2006).
- *Environmental Criteria for Road Traffic Noise* (EPA 1999)
- *Construction Noise and Vibration Guideline* (Roads and Maritime Services 2016)
- *Environmental Noise Management Manual* (RTA 2001)
- *Construction Noise Strategy* (Transport for NSW 2017).

Table 6-4 shows which activities are proposed for each of the construction compounds along with the time of day that these activities are proposed. With reference to the hours of work these are defined as:

- Standard hours:
  - Monday to Friday 7am to 6pm
  - Saturday 8am-1pm
- Out of hours works period 1 (OOHW1):
  - Day: Saturday 7am to 8am and 1pm to 6pm, Sunday and public holidays 8am to 6pm
  - Evening: Monday to Saturday 6pm to 10pm
- Out of hours works period 2 (OOHW2):
  - Monday to Saturday 10pm to 7am
  - Sunday and public holidays 6pm to 8am.

Table 6-4 Assessment scenarios

Compound	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	**MOD09**	**MOD10**	**MOD11**	**MOD12**	**MOD13**
		Establishment of temporary fencing and traffic	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	**Materials handling**	**Crushing plant**	**Stockpile site**	**Batching plant**	**Bridge girder laydown**	**Deliveries**	**Construction support activities**	**Removal of compounds and rehabilitation**
Peatties Road	Standard hours	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	Y
	Day/Evening (OOHW1)	N	N	N	N	Y	N	N	N	N	N	Y	Y	N
	Night (OOHW2)	N	N	N	N	Y	N	N	N	N	N	Y	Y	N
Cardiff Road	Standard hours	Y	Y	Y	Y	N	Y	N	Y	N	N	N	N	Y
	Day/Evening (OOHW1)	N	N	N	N	N	N	N	N	N	N	N	N	N
	Night (OOHW2)	N	N	N	N	N	N	N	N	N	N	N	N	N
Astra Street	Standard hours	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	Day/Evening (OOHW1)	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	N
	Night (OOHW2)	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	N
Lookout Road	Standard hours	N	N	N	N	Y	N	N	N	N	N	N	N	N
	Day/Evening (OOHW1)	N	N	N	N	Y	N	N	N	N	N	N	N	N
	Night (OOHW2)	N	N	N	N	Y	N	N	N	N	N	N	N	N

Impact assessment

Construction noise impacts

Noise impacts are predicted for sensitive residential and sensitive non-residential receivers as summarised in Table 6-5. Therefore the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable and all potentially impacted receivers would be informed of the nature of the work, expected noise levels, duration of work and a method of contact.

Table 6-5 Summary of noise impacts

Site	Construction hours	Assessment outcomes
Peatties Road	Standard hours	Up to 347 residential receivers with potential exceedances up to 26 dB(A) over the CNML. The predicted worst case activity is vegetation clearing and grubbing (MOD04) which will occur over a period of up to 2 weeks. The predicted worst-case activity for the main construction period of up to 30-months is stockpile site (MOD08) with potential exceedances of the CNML at up to 226 residential receivers. Predicted levels exceed the CNML by up to 22 dB(A) at the worst affected receivers. No impacts to non-residential receivers are predicted. No receivers are predicted to exceed the 75 dB(A) highly affected level for any of the assessed scenarios.
	Day (OOHW1)	Up to 322 residential receivers were identified with potential exceedances up to 25 dB(A) over the CNML. The predicted worst case activity during this period is construction support activities (MOD12), which will occur periodically over the construction period of 30 months.
	Evening (OOHW1)	Up to 333 residential receivers were identified with potential exceedances up to 25 dB(A) over the CNML. The predicted worst case activity during this period is construction support activities (MOD12), which will occur periodically over the construction period of 30 months.
	Night (OOHW2)	Up to 637 residential receivers were identified with potential exceedances up to 31 dB(A) over the CNML. The predicted worst case activity during this period is construction support activities (MOD12), which will occur periodically over the construction period of 30 months.

Site	Construction hours	Assessment outcomes
Cardiff Road	Standard hours	Up to 663 residential receivers were identified with potential exceedances up to 58 dB(A) over the CNML. The predicted worst case activity is vegetation clearing and grubbing (MOD04) which will occur over a period of up to 2 weeks. The predicted worst-case activity for the main construction period of up to 30-months is stockpile site (MOD08) with potential exceedances of the CNML at up to 426 residential receivers. Predicted levels exceed the CNML by up to 50 dB(A) at the worst affected receivers. Two non-residential receivers (one place of worship and one commercial) were identified with potential exceedances up to 13 dB(A) and 8 dB(A) over the CNML respectively. Up to 17 residential receivers were identified with potential exceedances up to 29 dB(A) over the 75 dB(A) highly affected level. The predicted worst case activity is vegetation clearing and grubbing (MOD04) which will occur over a period of up to 2-weeks. For the main construction period of up to 30-months, the worst-case activity in relation to the highly affected level is stockpile site (MOD08) with potential exceedances of the highly affected level at up to 15 residential receivers by up to 21 dB(A).
	Day/Evening (OOHW1)	No operations are proposed for OOHW periods.
	Night (OOHW2)	
Astra Street	Standard hours	Up to 67 residential receivers were identified with potential exceedances up to 9 dB(A) over the CNML. The predicted worst case activity is crushing plant (MOD07), which will occur over a period of up to 30 months. Three non-residential receivers including one passive recreation receiver, one active recreation receiver and one educational facility were identified with potential exceedances of the relevant construction noise management level. Impacts of up to 4 dB(A) were identified for the activity of crushing plant (MOD07). No residential receivers are predicted to exceed the 75 dB(A) highly affected level for any of the assessed scenarios.
	Day (OOHW1)	Up to 67 residential receivers were identified with potential exceedances up to 9 dB(A) over the CNML. The predicted worst case activity during this period is stockpile site (MOD08), which will occur periodically over the construction period of 30 months.
	Evening (OOHW1)	Up to 166 residential receivers were identified with potential exceedances up to 15 dB(A) over the CNML. The predicted worst case activity during this period is stockpile site (MOD08), which will occur periodically over the construction period of 30 months.

Site	Construction hours	Assessment outcomes
	Night (OOHW2)	Up to 167 residential receivers were identified with potential exceedances up to 23 dB(A) over the CNML. The predicted worst case activity during this period is stockpile site (MOD08), which will occur periodically over the construction period of 30 months.
Lookout Road	Standard hours	One residential receiver adjacent to the compound was identified with potential exceedances up to 14 dB(A) over the CNML. The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05) which will occur over the construction period of 30 months. No other exceedances of the daytime CNML are predicted. No impacts to non-residential receivers are predicted. One residential receiver adjacent to the compound is predicted to exceed the 75 dB(A) highly affected level by up to 5 dB(A). The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05) which will occur over the construction period of 30 months.
	Day (OOHW1)	Up to 48 residential receivers were identified with potential exceedances up to 19 dB(A) (at the residential receiver adjacent to the compound) over the CNML. The next highest exceedance is predicted to be 4 dB(A) over the CNML for this period. The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05) which will occur periodically over the construction period of 30 months.
	Evening (OOHW1)	Up to 93 residential receivers were identified with potential exceedances up to 26 dB(A) (at the residential receiver adjacent to the compound) over the CNML. The next highest exceedance is predicted to be 7 dB(A) over the CNML for this period. The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05) which will occur periodically over the construction period of 30 months.
	Night (OOHW2)	Up to 160 residential receivers were identified with potential exceedances up to 42 dB(A) (at the residential receiver adjacent to the compound) over the CNML. The next highest exceedance is predicted to be 21 dB(A) over the CNML for this period. The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05) which will occur periodically over the construction period of 30 months.

Sleep disturbance

Sleep disturbance and awakening noise predictions for the compounds are as follows:

- **Peatties Road site:** Exceedance of the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria is predicted at up to 391 and 89 residential receivers respectively during the following proposed night-time activities:
  - General compound activities (MOD05)
  - Deliveries (MOD11)
  - Construction support activities (MOD12).
- **Cardiff Road site:** No operations are proposed for OOHW periods. Therefore, there would be no sleep disturbance or awakening impacts at this site.
- **Astra Street site:** Exceedance of the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria is predicted at up to 167 and 51 residential receivers respectively during the following proposed night-time activities:
  - Materials handling (MOD06)
  - Stockpile site (MOD08)
  - Batching plant (MOD09)
  - Bridge girder laydown (MOD10)
  - Deliveries (MOD11)
  - Construction support activities (MOD12).
- **Lookout Road site:** Exceedance of the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria is predicted at up to 85 and 3 residential receivers respectively during the following proposed night-time activities:
  - General compound activities (MOD05).

Due to the predicted impacts the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable. All potentially impacted receivers would be informed of the nature of the work, expected noise levels, duration of work and a method of contact.

Construction vibration impacts – structural damage

At the Cardiff Road site, six receiver structures were identified within the 18 metre buffer associated with vibratory roller activities and three receiver structures were identified within the four metre buffer associated with excavator activities. No sensitive receiver structures were identified within these buffers for Astra Street or Peatties Road compounds. Due to the Lookout Road site being used as an office, no vibration impacts are expected.

There would not be impacts to non-Aboriginal heritage items or places due to construction vibration.

Due to the predicted impacts the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable. All potentially impacted receivers would be informed of the nature of the work, expected noise levels, duration of work and a method of contact.

Construction vibration impacts – human comfort and perception

Table 6-6 summarises the findings of the human comfort vibration assessment. Due to the predicted impacts the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable. All potentially impacted receivers would be informed of the nature of the work, expected noise levels, duration of work and a method of contact.

Table 6-6 Summary of human comfort vibration impacts

Site	Assessment outcomes
Peatties Road	• 210 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period. • No residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period. • No non-residential receivers were identified within the applicable 130 metre buffer distance for vibratory rolling or 24 metre buffer for excavator activities.
Cardiff Road	• 239 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period. • 19 residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period. • One commercial non-residential receiver was identified within the applicable 130 metre buffer distance for vibratory rolling.
Astra Street	• 14 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period. • No residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period. • One non-residential receiver (the golf range) was identified within the applicable 130 metre buffer distance. • No non-residential receivers were identified within the applicable 24 metre buffer for excavator activities.
Lookout Road	• Due to the Lookout Road site being used as an office, no vibration impacts are expected.

Construction traffic impacts

The proposed modification is predicted to result in negligible effect on traffic noise levels due to compound related traffic at all additional construction compounds.

Environmental management measures

Environmental management measures section 7 of the SPIR includes specific environmental management measures to minimise potential noise and vibration impacts associated with construction areas for the proposal. While the assessment has identified additional noise and vibration impacts, the existing measures specify appropriate controls for the avoidance and minimisation of the identified impacts. As such, no new mitigation measures are recommended beyond those summarised in section 7 of the SPIR and reproduced in Appendix H.

6.2.4 Soils, contamination and water quality

Existing environment

Soils

Soils landscapes at the compound sites are comprised of the following:

- Peatties Road – Killingworth, Gateshead and Stockrington (variant a)
- Cardiff Road – Gateshead
- Astra Street – Disturbed terrain
- Lookout Road – Gateshead

Dominant soils in these soil landscapes include brownish black pedal loam (topsoil), bleached hard setting loamy sand to sandy clay loam (topsoil) and pedal yellowish brown clay (subsoil). All the natural soil landscapes are generally limited by water erosion hazard, seasonal waterlogging on lower slopes and localised high run-on, mine subsidence, foundation hazard, shallow soils, low fertility, and rock outcrops.

None of the sites are mapped as being likely to contain acid sulfate soils.

Contamination

Database searches of the NSW Environment Protection Authority database for notices was carried out on 24 February 2021. This identified there are no known contamination issues at the Peatties Road, Cardiff Road and Lookout Road sites. While there are no known contaminated sites at Peatties Road there could be potential for contamination associated with historical quarrying activities. As described in section 4.3.2, the Astra Street site is identified on the EPA Contaminated Land Record and List of Identified Sites as the former Astra Street Landfill (located at 2 Astra Street, Shortland (Lot 16 DP 1149782 and Lot 33 DP 1118647)).

Watercourses and water quality

All of the proposed compound sites are located in the Ironbark Creek catchment, which has an area of about 12,500 hectares. Ironbark Creek is generally characterised by permanent yet variable flows of water in second and third order waterways. It flows through a mix of land uses including residential, modified open space and commercial and industrial centres.

There are limited natural drainage lines near the Peatties Road, Cardiff Road and Lookout Road sites. The Peatties Road site includes a small artificial wetland area dominated by *Phragmites australis* (Common Reed). The Astra Street site is located on disturbed and elevated terrain associated with the former Astra Street Landfill. A modified drain, Boatmans Creek, is located on the western boundary of the landfill and drains directly into Ironbark Creek.

As discussed in the EIS, limited water quality data is available for the Ironbark Creek catchments. However, due to the extensively developed nature of the catchment it is expected to be heavily influenced by urban pollution. Based on the available data, water quality is typically fresh to brackish and slightly acidic to slightly alkaline. There is wide variability in electrical conductivity (EC), turbidity, dissolved oxygen and nutrient concentrations.

The lower reaches of the Ironbark Creek catchment contain extensive areas of wetlands associated with the Hunter River floodplain:

- Hunter Estuary Wetlands Ramsar site (EPBC Act) – this is comprised of the Kooragang Nature Reserve (located on the north arm of the Hunter River) and Hunter Wetlands Centre which is located about 140 metres to the south west of the Astra Street site
- Hunter Wetlands National Park (*National Parks and Wildlife Act 1974*) – this site is comprised of a number of areas on the south and north arms of the Hunter River, the nearest of which is located about 240 metres to the north west of the Astra Street site. This area is also mapped as a nationally important wetland

- There are a number of coastal wetlands mapped under Coastal Management SEPP on the south and north arms of the Hunter River, the nearest of which is located about 110 metres to the south west and north west of the Astra Street site.

Impact assessment

Soils

The proposed modification would require minor disturbance of soils associated with site establishment, ongoing compound activities and decommissioning / rehabilitation activities. With the implementation of standard management measures no significant impacts to soils are expected.

Contamination

There is no known contamination at the Peatties Road, Cardiff Road and Lookout Road sites. Any unexpected finds would be managed in accordance with the Unexpected Contaminated Land and Asbestos Finds Procedure required under Condition E59.

However, as described in section 4.3.2, the former Astra Street Landfill site is subject to a voluntary management proposal under the *Contaminated Land Management Act 1997*. In 2008, the EPA identified the site as a remediation site presenting a potential risk of harm to the environment, through:

- Groundwater and the surface water ponds at the site are contaminated at levels exceeding trigger values for the protection of aquatic ecosystems with ammonia in particular and the other contaminants to a lesser extent.
- The contaminants are migrating from the site in groundwater and surface water to sensitive and valuable aquatic ecosystems comprising coastal wetlands under the Coastal Management SEPP and Ramsar wetlands where threatened and protected species may be exposed to the contaminants.

The site operated as a landfill for about 21 years, from July 1974 to August 1995, but is currently capped, with the City of Newcastle having current remediation plans in place. The establishment and use of the Astra Street site as a construction compound would not occur until remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound. It will comply with:

- City of Newcastle's Voluntary Management Proposal under the *Contaminated Land Management Act 1997*
- Relevant outcomes of consultation with the City of Newcastle.
- Relevant EPA guidelines.

Therefore, an additional management measure (SW21 in Appendix H) has been recommended.

Water quality

A small artificial wetland would be removed at the Peatties Road site during site establishment. Standard erosion and sediment controls would be established to ensure clean water does not enter the construction compound area and impact downstream water quality. Similarly, standard erosion and sediment controls would be implemented at the Cardiff Road and Astra Street sites. Existing buffer vegetation at the Peatties Road and Astra Street sites would also assist to minimise any risks to water quality of downstream watercourses. There are no expected water quality impacts associated with the use of the Lookout Road site as an office.

These controls would be in accordance with the measures identified in the EIS and SPIR (reproduced in Appendix H) and as such, no significant impacts to water quality upstream or downstream of any of the construction compounds are expected.

Environmental management measures

An additional management measure (SW21 in Appendix H) has been recommended for contamination at the Astra Street site. No other changes to environmental management measures detailed in the EIS and SPIR (reproduced in Appendix H) are required as a result of the proposed modification.

6.2.5 Aboriginal heritage

Due to impacts to areas not previously considered during the preparation of the Aboriginal heritage assessments (EIS chapter 15 and Kelleher Nightingale Consulting, 2018) for the EIS and SPIR an Aboriginal archaeological assessment (Kelleher Nightingale Consulting, 2021) has been prepared for the proposed modification and is provided in Appendix F.

Existing environment

Database searches

A search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 18 February 2021.

No previously registered Aboriginal archaeological sites have been recorded within the study area. One Aboriginal archaeological site Richmond Vale Rail Trail Isolated Find 11 (AHIMS 38-4-1925) comprised an isolated artefact recorded approximately 245 metres south-west of the Astra Street site.

In addition, a search was carried out of the following statutory and non-statutory heritage registers for Aboriginal heritage items:

- State Heritage Register and State Heritage Inventory
- Newcastle Local Environmental Plan 2012
- Lake Macquarie Local Environmental Plan 2014
- Section 170 Heritage and Conservation Registers
- National Heritage List
- Commonwealth Heritage List
- Australian Heritage Database (Register of the National Estate – Non-statutory archive) and
- Australian Heritage Places Inventory (Register of the National Estate – Non-statutory archive).

No Aboriginal heritage items were identified on these registers within the study area.

Site inspection

A site inspection of the additional compounds was conducted on 18 February 2021 with observations summarised below:

- **Astra Street site:** the majority of the site consisted of fill material (most likely comprising industrial rubble or mine site materials) and overlooks the altered drainage line of Boatmans Creek which runs along the south-west boundary. Archaeological survey confirmed that very little of the natural topography of the area had survived. No Aboriginal objects, sites or areas of potential were identified.
- **Lookout Road site:** the flatter portion of the inspected area had been disturbed by building structures, a driveway and landscaped gardens. The slopes were landscaped, steep and contained colluvial material. No Aboriginal objects, sites or areas of archaeological potential were identified.
- **Cardiff Road site:** mostly comprised moderate grassed upper hillslopes, apart from a level section at the north-west end, alongside Cardiff Road. The levelled area had been disturbed by machinery and was determined likely to be the site of a demolished house, or an old stockpile area. Due to disturbance and unfavourable landforms, this area was assessed as having no archaeological potential.

- **Peatties Road site:** likely comprising a revegetated quarry site, which had been cut into the hillside, with roads built along terraces cut during mining activities. The entirety of this site had been significantly disturbed and subsequently revegetated. No archaeological potential or Aboriginal sites were identified.

Impact assessment

No Aboriginal archaeological objects, sites or areas of archaeological potential were identified within the proposed construction compounds. As a result, it is expected that no Aboriginal heritage would be impacted by the proposed modification.

The findings of this Aboriginal archaeological assessment are consistent with the archaeological findings of the *Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Cultural Heritage Assessment Report – Technical Paper 10* (Kelleher Nightingale Consulting, 2018).

Environmental management measures

The SPIR includes environmental management measures to minimise impacts associated with the project, including construction areas. These include an unexpected finds procedure. These measures are sufficient to minimise temporary impacts associated with the proposed modification. As there are no anticipated impacts associated with the proposed modification, no additional environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix H,.

6.3 Summary of impacts associated with the proposed modification

Based on the environmental screening (section 6.1) and additional assessments (section 6.2), changes in impacts as a result of the proposed modification are summarised in Table 6-7.

Table 6-7 Summary of impacts associated with the proposed modification

Aspect	Additional impacts	Additional management required?
Biodiversity	The modification area has been heavily modified and is comprised of mainly exotic vegetation. Native vegetation is only present at one site, Peatties Road. At Peatties Road, 0.2 hectares of low condition native vegetation associated with an artificial wetland would be removed by the proposed modification. This vegetation does not meet the definition of any threatened ecological communities. A biodiversity development assessment report (Appendix D) has been prepared to assess this impact, which concluded that the proposed modification would not have any direct or indirect impacts on threatened species, populations or communities. No impacts to threatened species or threatened species habitat for aquatic species or matters of national environmental significance were identified. No offset credit requirements were identified for the proposed modification.	No

Aspect	Additional impacts	Additional management required?
Traffic and transport	Most of the roads (eg Newcastle Inner City Bypass, Sandgate Road and Cardiff Road) used for construction access are regional roads with have very high existing traffic volumes. The additional construction traffic on these roads would result in a negligible increase in traffic volumes. Local roads use for construction access include Peatties Road, Astra Street and Marshall Street. Marshall Street is the only local road that would require movements past residential dwellings. While the proposed modification would result in some minor changes in local traffic conditions, with the implementation of standard environmental management measures and ongoing consultation these impacts are expected to be minor and not cause any significant impacts.	No
Noise and vibration	The majority of construction would be carried out during standard working hours. However, the Peatties Road, Astra Street and Lookout Road would be used periodically to support work outside standard working hours. An assessment of the potential noise impacts identified construction noise is likely to exceed the criteria at a number of receivers during several construction scenarios at all compounds, during standard working hours and during out of hours work. Stockpiling activities are expected to have the greatest impact based on the number of exceedances and duration of the activity. There are predicted exceedances of the structural vibration criteria at the Cardiff Road site, and exceedances of the human comfort vibration criteria at all compounds except Lookout Road. Due to the predicted exceedances the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable.	No

Aspect	Additional impacts	Additional management required?
Landscape character and visual impact	There would be no visual impacts associated with the Peatties Road site or to residential receivers at the Astra Street site due to intervening topography, vegetation and infrastructure. While the Astra Street compound would be partially visible from the Newcastle Golf Practice Centre, any visual impacts for short term users of this facility are likely to be low to negligible. While there is a residential property next to the Lookout Road site, this compound would only be used as an office and would not result in any visual impacts. The Cardiff Road site would be visible for residents located next to the compound, and for pedestrians and road users along Marshall Street and Cardiff Road. This compound would be used as a stockpile site and would not involve any work outside standard construction hours which would minimise the visual impacts. With the implementation of standard environmental management measures and ongoing consultation no significant impacts are expected.	No
Socio-economic	Use of the compounds would result in reduced amenity associated with construction noise, visual and traffic impacts for nearby residential receivers. Use of the Astra Street site would also result in minor changes in traffic conditions and visual impacts for visitors to the Newcastle Golf Practice Centre. While there is a residential property next to the Lookout Road site, this compound would only be used as an office and would not result in any significant socio-economic impacts. The greatest amenity impacts would occur at the Cardiff Road site where there are residences located directly next to the site. This compound would be used as a stockpile site and would not involve any work outside standard construction hours. With the implementation of standard environmental management measures and ongoing consultation no significant impacts are expected.	No

Aspect	Additional impacts	Additional management required?
Land use and property	Impacts on land use and property associated with the proposed modification would be minor in nature, with all land impacted by the four additional construction compounds owned by Transport for NSW, other public authorities (City of Newcastle and Sydney Trains) or a private landowner. Where the land is not owned by Transport for NSW, access and use of the sites would be carried out in accordance with the terms and conditions of lease agreements with the relevant landowners. No acquisition is required for the proposed modification All land would be returned to pre-existing condition on completion of construction works, in accordance with relevant lease agreements.	No
Flooding and drainage	All construction compounds associated with the proposed modification are located outside all flood extents, including the probable maximum flood (BMT WBM, 2012). As such, the proposed modification would not result in impacts.	No
Soils, contamination and water quality	The Astra Street site is identified on the EPA Contaminated Land Record and List of Identified Sites as the former Astra Street Landfill. The site has an existing voluntary management proposal. The establishment and use of the Astra Street site as a construction compound would not occur until remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound. It will comply with: • City of Newcastle's Voluntary Management Proposal under the *Contaminated Land Management Act 1997* • Relevant outcomes of consultation with the City of Newcastle. • Relevant EPA guidelines. A small artificial wetland would be removed at the Peatties Road site during site regrading activities, erosion and sediment controls would be established to ensure clean water does not enter the construction compound area and impact downstream water quality. Similarly, standard erosion and sediment controls would be implemented at the Cardiff Road and Astra Street sites. Existing buffer vegetation at the Peatties Road and Astra Street sites would also assist to minimise any risks to water quality of downstream watercourses. There are no expected water quality impacts associated with the use of the Lookout Road site as an office.	Yes, see SW21 of Appendix H

Aspect	Additional impacts	Additional management required?
Groundwater	The proposed modification would only involve minor ground disturbance and minor changes to overland flows. As such, there are no expected impacts to groundwater.	No
Aboriginal heritage	The modification area has been heavily modified. An Aboriginal archaeological assessment (Appendix F) has been prepared for the proposed modification and no Aboriginal archaeological objects, sites or areas of archaeological potential were identified within the proposed construction compounds. As a result, it is expected that no Aboriginal heritage would be impacted by the proposed modification.	No
Non-Aboriginal heritage	There are no listed non-Aboriginal heritage items within or near the proposed modification area that could be directly or indirectly (eg construction vibration) impacted.	No
Air quality	There is potential for additional air quality impacts from the use of the additional compound sites. The main dust generating activities would occur at the Astra Street and Peatties Road sites. Due to intervening topography, distance to sensitive receivers, surrounding vegetation and infrastructure the impacts are expected to be minimal.	No
Resource use and waste management	The proposed modification is seeking the approval of additional construction compounds to support the construction of the project. While the use of these sites would involve the use of resources and generation of waste however, this is not expected to be an increase to that already assessed as part of the project.	No
Hazards and risks	The proposed modification would result in negligible change to hazards and risks from those assessed in the EIS.	No
Greenhouse gas and climate change	The proposed modification will result in negligible changes to greenhouse gas emissions.	No
Cumulative impacts	A review of nearby projects identified two projects in the early stages of planning that were not considered in the EIS. No information is currently available to confirm potential cumulative impacts. However, as the proposed modification would not result in any significant additional impacts no adverse cumulative impacts are expected.	No

7 Evaluation of merits

7.1 Need for the proposed modification

The proposed modification is required as construction of the project and the John Hunter Health and Innovation Precinct project (SSD-9351535) are likely to coincide, with SSD-9351535 including additions to the hospital road network within the area proposed for construction compound A. This would significantly reduce the usable area available for construction compound A (identified in the EIS and SPIR as the primary compound during main works).

Due to a lack of suitable space within and adjoining the construction footprint for the project, and given the sensitive nature of the surrounding natural environment, four additional construction compounds have been identified following a review of available and suitable land near to the project.

The locations improve separation between office-based light vehicles and heavy vehicle movements for construction. Office staff would be able to enter and leave the road network from a more controlled area, providing a safer work environment.

The conditions of approval (condition A14) for the project allow for additional construction compounds not specified in the EIS and SPIR only when they meet a number of criteria. Due to the construction compounds not being located within or immediately adjacent to the construction boundary, and residences near the Cardiff Road site, the construction compounds require a modification to the project.

7.2 Environmental assessment

Based on the environmental screening (section 6.1) and additional assessments (section 6.2), negligible to minor changes in impacts as a result of the proposed modification were identified as summarised below.

Biodiversity

The modification area has been heavily modified and is comprised of mainly exotic vegetation. Native vegetation is only present at one site, Peatties Road. At Peatties Road, 0.2 hectares of low condition native vegetation associated with an artificial wetland would be removed by the proposed modification. This vegetation does not meet the definition of any threatened ecological communities. A biodiversity development assessment report (Appendix D) has been prepared to assess this impact, which concluded that the proposed modification would not have any direct or indirect impacts on threatened species, populations or communities. No impacts to threatened species or threatened species habitat for aquatic species or matters of national environmental significance were identified. No offset credit requirements were identified for the proposed modification.

Traffic and transport

Most of the roads used for construction access are regional roads with very high existing traffic volumes. The additional construction traffic on these roads would result in a negligible increase in traffic volumes. Local roads use for construction access include Peatties Road, Astra Street and Marshall Street. Marshall Street is the only local road that would require movements past residential dwellings.

While the proposed modification would result in some minor changes in local traffic conditions, with the implementation of standard environmental management measures and ongoing consultation these impacts are expected to be minor and not cause any significant impacts.

Noise and vibration

The majority of construction would be carried out during standard working hours. However, the Peatties Road, Astra Street and Lookout Road would be used periodically to support work outside standard working hours.

An assessment of the potential noise impacts identified construction noise is likely to exceed the criteria at a number of receivers during several construction scenarios at all compounds, during standard working hours and during out of hours work. Stockpiling activities are expected to have the greatest impact based on the number of exceedances and duration of the activity.

There are predicted exceedances of the structural vibration criteria at the Cardiff Road site, and exceedances of the human comfort vibration criteria at all compounds except Lookout Road.

Due to the predicted exceedances the construction noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable.

Socio-economic, land use and property

Use of the compounds would result in reduced amenity associated with construction noise, visual and traffic impacts for nearby residential receivers. Use of the Astra Street site would also result in minor changes in traffic conditions and visual impacts for visitors to the Newcastle Golf Practice Centre.

The greatest amenity impacts would occur at the Cardiff Road site where there are residences located directly next to the site. This compound would be used as a stockpile site and would not involve any work outside standard construction hours. With the implementation of standard environmental management measures and ongoing consultation no significant impacts are expected.

Soils, contamination and water quality

The Astra Street site is identified on the EPA Contaminated Land Record and List of Identified Sites as the former Astra Street Landfill. The site has an existing voluntary management proposal. An additional management measure (SW21 in Appendix H) has been recommended to prevent use of the site until the remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound.

Air quality

There is potential for additional air quality impacts from the use of the additional compound sites. The main dust generating activities would occur at the Astra Street and Peatties Road sites. Due to intervening topography, distance to sensitive receivers, surrounding vegetation and infrastructure the impacts are expected to be minimal.

Summary of positive and negative impacts

The modification report has identified there would only be minor adverse impacts associated with the proposed modification. The proposed modification is required to facilitate and enable the project to be constructed safely. It would enable the project to meet the project objectives and the strategic context by providing safer road conditions and support future growth and tourism. Therefore, on balance the benefits are considered to outweigh the minor adverse impacts.

7.3 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration in the development of the project and proposed modification.

ESD requires the effective integration of economic and environmental considerations in decision making processes. The four main principles supporting the achievement of ESD are discussed in the following sections.

7.3.1 Precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

The precautionary principle has guided the assessment of environmental impacts for the proposed modification and the development of management and mitigation measures.

This report has identified minor environmental risks associated with the proposed modification and the management measures to be implemented to avoid or mitigate those risks. Implementation of the identified measures would result in acceptable residual risks and no significant risk of serious or irreversible environmental harm.

Impacts on biodiversity have been minimised as far as possible through refinement of the construction compounds and minimising the construction footprint.

7.3.2 Inter-generational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations. It requires that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

For this project, the environmental aspects that are most relevant are waste and resources, socio-economics, biodiversity, water quality, air quality, climate change and cumulative impacts. These have been considered and negligible to minor impacts have been identified as a result of the proposed modification.

The proposed modification is required in order for construction of the project safely. Should the project not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service from the existing road network and resultant socio-economic impacts. Travel times and congestion would increase on the existing route as the volume of traffic increases over time.

7.3.3 Conservation of biological diversity and ecological integrity

This principle states that ‘the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival’. It is also expressed as requiring that ‘conservation of biological diversity and ecological integrity should be a fundamental consideration’.

A comprehensive assessment of the existing biodiversity values has been carried out for the proposed modification. Impacts on biodiversity have been minimised as far as possible through refinement of the construction compounds and minimising the construction footprint. These have been considered and negligible to minor impacts have been identified as a result of the proposed modification.

Where overall project impacts would be unavoidable, a range of management and mitigation measures have been identified with the emphasis being on conserving biodiversity values locally where practicable.

7.3.4 Improved valuation and pricing of environmental resources

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things. It states that:

> *'*environmental factors should be included in the valuation of assets and services such as:
> (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
> (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
> (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*'*

The EIS, SPIR and this report has examined the environmental consequences of the project and proposed modification and identified management and mitigation measures for environmental resources which have the potential to be adversely impacted. Management and mitigation measures to minimise the negligible to minor impacts as a result of the proposed modification have been identified. Requirements imposed from implementing these measures would result in an economic cost to Transport for NSW.

7.4 Community and stakeholder consultation

Consultation has been carried out with the community, local councils, government agencies and other stakeholders during the preparation of the proposed modification as outlined in Chapter 5 (Engagement). Ongoing consultation would be carried out in accordance with the *Community Communications Strategy Newcastle Inner City Bypass – Rankin Park to Jesmond* (Roads and Maritime Services, 2019) approved under Condition B3.

7.5 Justification and conclusion

The proposed modification is required as construction of the project is likely to coincide with the upgrade to the John Hunter Health and Innovation Precinct (SSD-9351535). Some of the work associated with SSD-9351535 includes additions to the hospital road network within the area proposed as the main construction compound A in the EIS and SPIR. This would significantly reduce the usable area available and not provide sufficient area for the project.

Due to a lack of space and the sensitive nature of the surrounding natural environment, no suitable sites are available within or adjoining the construction footprint for the project. Following a review of available and suitable land near the project, four additional construction compounds have been identified following a review of available and suitable land near to the project. These additional construction compounds are justified as they are required to construct the project safely.

While there would be some adverse impacts to the local environment and community, avoidance and minimisation of impacts wherever possible was applied during development of the modification and implementation of environmental management measures summarised in Appendix H, will be applied during construction.

The conditions of approval for SSI-6888 (condition A14) for the project allow for additional construction compounds not specified in the EIS and SPIR only when they meet a number of criteria. Due to the construction compounds not being located within or immediately adjacent to the construction boundary, and residences near the Cardiff Road site, the construction compounds require a modification to the project.

As there are no significant impacts associated with the proposed modification, no additional environmental management measures are considered necessary. However, SW21 (provided in Appendix H and shown as blue italics text) has been identified in relation to potential impacts at the Astra Street site in relation to the former landfill.

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Appendix A

Secretary’s environmental assessment requirements and checklist

Secretary's environmental assessment requirements and checklist

SEARs – general requirements

Secretary's environmental assessment requirements	Where addressed
The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation* 2000 (the Regulation), including: 1. the information required under clause 6 of Schedule 2 of the Regulation. 2. the content listed in clause 7 of Schedule 2 of the Regulation, including but not limited to:	Refer to EIS and SPIR
• a statement of the objectives of the proposal, including a description of the strategic need, justification, objectives and outcomes for the proposal, taking into account existing and proposed transport infrastructure and services within the adjoining subregions, and as relevant the outcomes and objectives of relevant strategic planning and transport policies, including, but not limited to, *NSW 2021*, *NSW Government State Infrastructure Strategy*, *NSW Long Term Transport Master Plan* (December 2012) and any other relevant plans (including the draft *Regional Growth Plan for the Lower Hunter* if it is placed on public exhibition prior to finalisation of the EIS)	Section 3
• an analysis of feasible alternatives to the carrying out of the proposal and proposal justification, including:	
• an analysis of alternatives/options considered (including interchange and intersection options for a western access to John Hunter Hospital) having regard to proposal objectives, including an assessment of the environmental costs and benefits of the proposal relative to alternatives and the consequences of not carrying out the proposal, and whether or not the proposal is in the public interest	Refer to EIS and SPIR
• justification for the preferred proposal taking into consideration the objects of the *Environmental Planning and Assessment Act 1979*	Refer to EIS and SPIR
• a detailed description of the proposal, including:	
• design of road works, including interchange and intersection treatment, property access, pedestrian and cyclist facilities (including appropriate locations for overbridges and/or underpasses)	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• land use changes, including resumption of residential, commercial and/or industrial lands, and impacts to Council and Crown land	Sections 2.4.1 and 6.1
• location and operational requirements of construction ancillary facilities and access	Sections 2.3 and 2.4
• relationship and/or interaction with existing public transport services (including bus traffic and bus stops)	Refer to EIS and SPIR
• an analysis of the proposal including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with clause 7(1)(d) of Schedule 2 of the Regulation (where relevant), including an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing management/mitigation measures	Sections 3 and 6
• detail how the principles of ecologically sustainable development will be incorporated in the design, construction and ongoing operation phases of the proposal	Section 7.3
• identification of whether the proposal is a scheduled activity under the *Protection of the Environment (Operations) Act* 1997	Section 4.3.3
Where relevant, the assessment of key issues below, and any other significant issues identified in the risk assessment, must include: • adequate baseline data • measures to avoid, minimise and if necessary, offset the predicted impacts, including detailed contingency plans for managing any significant risks to the environment.	Section 6

SEARs – key issues

Secretary's environmental assessment requirements	Where addressed
The EIS must also address the following specific matters:	
Biodiversity – including but not limited to:	
• an assessment of the potential ecological impacts of the proposal, with specific reference to vegetation and habitat clearing, connectivity, edge effects, weed dispersal, riparian and aquatic habitat impacts, soil and water quality impacts and operational impacts. The assessment must:	Section 6.2.1 and Appendix D
• make specific reference to impacts on landscape values, biodiversity values of native vegetation and threatened species or populations, including worst case estimates of vegetation clearing and operational impacts	Section 6.2.1 and Appendix D

Secretary's environmental assessment requirements	Where addressed
• demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance, and be consistent with the 'avoid, minimise or offset' principle	Section 6.2.1 and Appendix D
• be undertaken in accordance with the *Framework for Biodiversity Assessment* (Office of Environment and Heritage (OEH) 2014) and the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014), and by a person accredited in accordance with section 42B(1)(c) of the *Threatened Species Conservation Act 1995*. Impacts on species, populations and ecological communities that will require further consideration and provision of information specified in section 9.2 of the *Framework for Biodiversity Assessment* include those identified by the OEH. Species specific surveys shall be undertaken for those species and in accordance with the survey requirements specified by the OEH (including during further consultation with the OEH)	N/A
• in relation to aquatic biodiversity be consistent with the draft *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (DPI 2013)	Section 6.2.1 and Appendix D
• where there are potential impacts to the OEH estate reserved under the National Parks and Wildlife Act 1974 or where the proposal is located upstream of OEH estate, an assessment of the matters to be considered outlined in the Guidelines for developments adjoining land and water managed by DECCW (DECCW 2010).	Section 6.2.1 and Appendix D
Traffic and Transport – including but not limited to:	
• detailed assessment and modelling of operational traffic and transport impacts. This must consider: • key intersections and interchanges, and the level of service/performance of intersections upstream and downstream of the project area • impacts on property access and on street parking provision, including permanent changes to access and parking • impacts on access to and from John Hunter Hospital • maintenance of existing cycle routes and consideration of opportunities to integrate recreational and commuter cycleway and pedestrian elements with existing and proposed networks, including those identified in the Newcastle Cycling Strategy and Action Plan, and maintenance of existing pedestrian paths between residential neighbourhoods • operational implications for public transport and opportunities to improve public transport services and patronage • safety and access impacts on road users (including cyclists and pedestrians)	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• assessment of construction traffic and transport impacts of the proposal (including ancillary facilities) and associated management measures, in particular: • impacts to the road network (including safety and level of service, pedestrian and cyclist access, maintenance of access to John Hunter Hospital, and disruption to public transport services, access to properties, and parking) • route identification and scheduling of transport movements, including movements to transport spoil • the number, frequency and size of construction related vehicles (both passenger, commercial and heavy vehicles) • the nature of existing traffic on construction access routes (including consideration of peak traffic times) • the need to close, divert or otherwise reconfigure elements of the road network associated with construction of the proposal	Section 6.2.2
• details of stakeholder consultation regarding access disruption, including John Hunter Hospital and emergency services.	Sections 2.2 and 5
Noise and Vibration – including but not limited to:	
• a detailed assessment of the noise impacts of the proposal during operation, consistent with the *NSW Road Noise Policy* (DECCW 2011), The assessment must include specific consideration of impacts (including impacts from compression brake noise) to sensitive receivers (residential, child care centres, educational establishments, hospitals, motels, nursing homes, or places of worship) and commercial and industrial land uses, as relevant and identify feasible and reasonable mitigation measures (including measures to quantify and minimise impacts of compression brake noise on sensitive receivers)	Refer to EIS and SPIR
• an assessment of construction noise and vibration impacts, consistent with the *Interim Construction Noise Guideline* (DECCW 2009), and *Assessing Vibration: a technical guideline* (DEC 2006)	Section 6.2.3 and Appendix E
• the construction noise assessment must present, as relevant, an indication of the potential for work outside standard construction hours, including predicted levels and exceedances of the construction noise goals, justification for the activity and discussion of available mitigation and management measures	Section 6.2.3 and Appendix E
• details of stakeholder consultation, including John Hunter Hospital, regarding disruptions due to construction noise and vibration impacts (if any)	Refer to EIS and SPIR
• details of any required construction and/or operational noise abatement measures.	Section 6.2.3 and Appendix E

Secretary's environmental assessment requirements	Where addressed
Visual Amenity, Built Form and Urban Design – including but not limited to:	
• rationale for the overall design of the integrated engineering and urban design proposal in terms of: • scale, length, height, width, materials, lighting and relationship of elements that affects the form and appearance of the proposal in its context for users and the community • views to and from the proposal • design relationship to the existing State road network and adjoining recreational areas, built forms and streetscapes	Refer to EIS and SPIR
• an assessment of the visual and amenity impacts of the proposal on the local and regional area, particularly on: • landscape, particularly trees and vegetation within the bushland within which the site is located • existing and future residential properties adjacent to the proposal alignment • the John Hunter Hospital • character precincts • adjoining commercial, industrial, educational, cultural and recreational land uses • significant vantage points in the public domain	Section 6.1
• how the proposal will be integrated into the adjacent environment and how visual and amenity impacts are to be mitigated, including how noise mitigation measures and significant civil engineering works are to be mitigated through design, the use of planting and other measures	Refer to EIS and SPIR
• incorporation of water sensitive urban design where possible.	Refer to EIS and SPIR

SEARs – other issues

Secretary's environmental assessment requirements	Where addressed
Land Use, Social and Economic – including, but not limited to:	
• a description of the existing socio-economic environment	Refer to EIS and SPIR
• social and economic impacts to businesses and to the community within the vicinity of the proposal including those associated with property acquisition, traffic, access, property, public domain and amenity related changes	Section 6.1

Secretary's environmental assessment requirements	Where addressed
• impacts on recreational use of surrounding land and measures to maintain availability for recreational uses during construction and operation. Assessment should consider (but not be limited to) actual and perceived impacts on Jesmond Park during construction and operation	Section 6.1
• impacts on the management of residual publicly owned land in the vicinity of the project	Refer to EIS and SPIR
• impacts on mineral resources, including operating mines, extractive industries, known mineral or petroleum resources, and exploration activities in the vicinity of the proposed development	Refer to EIS and SPIR
• identification of properties required to be acquired for the works (full and partial acquisition) and an assessment of the scale of impact of this acquisition	Section 2.4.4
• potential impacts on utilities (including communications, electricity, gas and water) and the relocation of these utilities	Refer to EIS and SPIR
• a draft Community Consultation Framework identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder (including John Hunter Hospital) and community complaints during construction and operation. Key issues that should be addressed in the draft Strategy shall include: • traffic management (including property access, pedestrian access) • landscaping/urban design matters • construction activities including out of hours work • noise and vibration mitigation and management • disruption to the operation of the hospital.	Refer to EIS and SPIR
Soils, Water and Waste – including but not limited to:	
• erosion, sediment and water quality impacts, including an assessment of:	
• potential water quality impacts and mitigation measures to manage water pollution during construction and operation, with reference to relevant public health and environmental water quality criteria, including those specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC / ARMCANZ 2000), and any applicable regional, local or site-specific guidelines	Section 6.2.4
• proposed storm water management system and management measures for the containment of pollutants and minimisation of leachate and sediment mobilisation	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• impacts on soil and slope stability resulting from vegetation clearing	Refer to EIS and SPIR
• impacts on watercourses, including bed and bank stability	Refer to EIS and SPIR
• potential erosion and sediment controls consistent with *Managing Urban Stormwater – Soils and Construction* (Landcom 2004)	Section 6.2.4
• water quantity and stormwater impacts, including:	
• potential impacts of road construction and decreased permeability on downstream catchments and wetlands	Refer to EIS and SPIR
• impacts on existing and planned stormwater infrastructure including condition, function and maintenance of such assets	Refer to EIS and SPIR
• details of any works likely to intercept, connect with or infiltrate groundwater resources and of any proposed groundwater extraction	Section 6.2.4
• impacts on groundwater recharge and flow path	Refer to EIS and SPIR
• measures to mitigate or prevent an increase in downstream stormwater flows	Refer to EIS and SPIR
• impacts on water sources, sharing and licensing, including:	
• consistency with relevant water sharing plans	Refer to EIS and SPIR
• details of water supply sources and the purpose, location, construction and expected annual extraction volumes	Refer to EIS and SPIR
• potential cumulative impacts on water sources and mitigation measures to manage the cumulative impacts	Refer to EIS and SPIR
• hydrological impacts, including an assessment, taking into account the *Floodplain Development Manual* (Department of Natural Resources 2005), of the following:	
• changes to existing flood regimes, with particular reference to the northern end of the proposal at Jesmond	Refer to EIS and SPIR
• impacts to existing receivers and infrastructure and the future development potential of affected land	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• identifying the potential impacts on surface water flow velocities and directions, and impacts on the bed and bank stability, with particular reference to construction of the watercourse crossings	Refer to EIS and SPIR
• an assessment of the effects of sea level rise as a result of climate change on the project.	Refer to EIS and SPIR
• management of waste, including:	
• quantification of bulk earthworks and spoil balance, and reuse or disposal of excess spoil	Refer to EIS and SPIR
• classification of waste taking into account the *Waste Classification Guidelines* (DECCW 2009)	Section 6.1
• waste handling, stockpiling and transportation, including identification of on-site waste facilities and off-site waste disposal	Refer to EIS and SPIR
• details of procedures for the assessment of all hazardous waste used, stored, processed or disposed of at the site	Refer to EIS and SPIR
• impacts from construction activities on contaminated land, including an assessment of potential contamination and a description of proposals for site remediation, if required, with reference to contaminated land planning legislation and guidelines.	Section 6.2.4
Heritage – including but not limited to:	
• impacts to non-Aboriginal heritage (including heritage items and archaeology) should be assessed, including through survey where appropriate. Where impacts are identified, the assessment shall:	Section 6.1
• outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the guidelines in the NSW Heritage Manual (Heritage Office and DUAP 1996)	Section 6.1
• be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria)	Refer to EIS and SPIR
• include a statement of heritage impact for all heritage items (including significance assessment)	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• consider impacts from vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment	Section 6.2.3 and Appendix E
• where required, develop an appropriate archaeological assessment methodology, including research design, in consultation with the Department and the Heritage Council of New South Wales, to guide physical archaeological test excavations and include the results of these excavations	Refer to EIS and SPIR
• impacts to Aboriginal heritage (including cultural and archaeological significance), in particular impacts to Aboriginal objects and potential archaeological deposits (PAD), should be assessed. Where impacts are identified, the assessment shall:	Section 6.2.5 and Appendix F
• outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) and other relevant guidelines and requirements • be undertaken by a suitably qualified heritage consultant(s) • demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures) • assess and document the archaeological and cultural significance of cultural heritage values of affected sites • undertake appropriate archaeological investigations generally in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010), to establish the full spatial extent and significance of any archaeological evidence across each site/area of PAD, and include the results of these excavations. If an alternative excavation method is proposed, it shall be developed in consultation with OEH.	Section 6.2.5 and Appendix F
Air Quality – including but not limited to:	
• potential construction and operational impacts on local and regional air quality, including:	
• potential for impacts on local and regional air quality, including on sensitive receivers	Section 6.1
• a construction air quality impact assessment	Section 6.1
• details of the proposed mitigation measures to prevent the generation and emission of dust.	Section 6.1

Secretary's environmental assessment requirements	Where addressed
Hazards and Risks – including but not limited to:	
• impacts on bushfire risk including changes to access for emergency services	Refer to EIS and SPIR
• impacts associated with the management of mine subsidence, including void management.	Refer to EIS and SPIR
Environmental Risk Analysis	
notwithstanding the above assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the proposal (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the EIS.	Refer to EIS and SPIR

SEARs – consultation

Secretary's environmental assessment requirements	Where addressed
During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.	
• local, State and Commonwealth government authorities, including the: • Department of the Environment (Cth) • Environment Protection Authority • Office of Environment and Heritage (including Heritage Division) • Department of Primary Industries (including the Mine Subsidence Board) • Hunter Local Land Services • NSW Health (Hunter New England Local Health District) • Fire and Rescue NSW, Ambulance Service of NSW and other emergency services • Newcastle Buses • Newcastle City Council • Lake Macquarie City Council	Section 5
• specialist interest groups, including Local Aboriginal Land Councils, Aboriginal stakeholders, environmental groups, and pedestrian and bicycle user groups	Refer to EIS and SPIR
• utilities and service providers	Refer to EIS and SPIR

Secretary's environmental assessment requirements	Where addressed
• the public, including community groups and adjoining and affected landowners, and licence holders (including PEL holders).	Section 5
The EIS must describe the consultation process and the issues raised, and identify where the design of the proposal has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Section 5
Further consultation after 2 years	
If you do not lodge an EIS for the proposal within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.	Not applicable

Supplementary Secretary's environmental assessment requirements and checklist

Supplementary SEARs – general requirements

Secretary's environmental assessment requirements	Where addressed
1. On 15 October 2015 it was determined the Newcastle bypass will impact upon the following matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): • threatened species and communities • Ramsar wetlands	
2. These guidelines provide information on assessment requirements in relation to MNES, if the project is being assessed under the *NSW Assessment Bilateral Agreement* (February 2015). It is a requirement of the Agreement that the project be assessed in the manner specified in Schedule 1 of that Agreement, including the matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). These guidelines do not stand alone but should be considered in conjunction with the Department of Planning and Environment's Secretary's Environmental Assessment Requirements. The Guidelines are intended to ensure there is sufficient information in the Assessment Report relevant to MNES such that the Commonwealth decision-maker may make a determination on whether or not to approve the action.	
3. The proponent must undertake an assessment of all the protected matters that may be impacted by the development under the controlling provision identified in paragraph 1 (above). A list of specific protected matters that the Department of the Environment considered likely to be significantly impacted is provided at Attachment A to these Guidelines. Note that this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under each controlling provision (refer paragraph 1), likely to be significantly impacted, are assessed for the Commonwealth decision-maker's consideration.	
Listed threatened species and communities (Attachment A)	
The Department of the Environment considers impacts potentially arise in relation to the following: • Black-eyed Susan (*Tetratheca juncea*) - vulnerable • Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable.	Section 6.2.1 and Appendix D
The Department considers there is some risk there may be significant impacts on the following matters: • Leafless Tongue-orchid (*Cyrptostylis hunteriana*) - vulnerable • Newcastle Doubletail (*Diuris praecox*) - vulnerable.	Section 6.2.1 and Appendix D

Secretary's environmental assessment requirements	Where addressed
Ramsar wetlands	
The Department of the Environment considers impacts potentially arise in relation to the following: • The Hunter Estuary Wetlands Ramsar site. Resulting in: • a substantial and measurable change in the hydrological regime of the wetland • a substantial and measurable change in the water quality of the wetland.	Section 6.2.1 and Appendix D
General requirements	
The EIS must address the following issues:	
4. the precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES).	Section 2
5. an assessment of the likely impacts of the development on each EPBC Act-listed species and/or ecological community where there is likely to be a significant impact from the proposed development.	Section 6.2.1 and Appendix D

Supplementary SEARs – key issues

Secretary's environmental assessment requirements	Where addressed
Key issues – biodiversity	
6. The EIS must address the following issues in relation to Biodiversity including:	
• identification of all EPBC Act listed threatened species and communities likely to be located in the project area or in the vicinity	Section 6.2.1 and Appendix D
• identification of all EPBC Act listed threatened species and communities likely to be significantly impacted by the development in accordance with the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Significant Impact Guidelines).	Section 6.2.1 and Appendix D
7. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:	

Secretary's environmental assessment requirements	Where addressed
• a description of the environment (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans	Section 6.2.1 and Appendix D
• details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.	Section 6.2.1 and Appendix D
Impacts	
8. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a description of the impacts of the action having regard to the full national extent of the species or community's range including:	
• a detailed assessment of the extent, nature and consequence of the likely direct, indirect and consequential impacts - refer to the Significant Impact Guidelines for guidance on the various types of impact that need to be considered	Not applicable
• a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible	Not applicable
• a description of any likely cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other proponents in the region and vicinity).	Not applicable
Avoidance and mitigation	
9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including:	
• a description of proposed avoidance and mitigation measures to deal with relevant impacts of the action	Section 6.2.1 and Appendix D
• assessment of the expected or predicted effectiveness of the mitigation measures	Section 6.2.1 and Appendix D
• a description of the outcomes that the avoidance and mitigation measures will achieve.	Section 6.2.1 and Appendix D

Secretary's environmental assessment requirements	Where addressed
10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide reference to, and consideration of relevant Commonwealth guidelines and policy statements including conservation advice, recovery plans, threat abatement plans and wildlife conservation plans.	Not applicable
Residual impacts and offsets	
11. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:	
• identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts is taken into account	Not applicable
• details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts	Not applicable
• details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites. [Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities]	Not applicable
12. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy*. http://www.environment.qov.au/epbc/publications/epbc-act-environmental-offsets-policy. [Note if the EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community you may wish to seek further advice from the Department of Planning and Environment]	Not applicable

Supplementary SEARs – environmental record of person proposing to take the action

Secretary's environmental assessment requirements	Where addressed
13. The information provided must include details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the person proposing to take the action; and for an action for which a person has applied for a permit, the person making the application.	Refer to EIS and SPIR
14. If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must also be included.	Refer to EIS and SPIR

Proposed modification - Secretary's environmental assessment requirements and checklist

SEARs - Proposed modification

Secretary's environmental assessment requirements	Where addressed
The Department has reviewed the proposed approach to preparing a modification application and requires the proposal to be assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the NICB Rankin Park to Jesmond project dated 3 March 2015.	Refer to above tables
In relation to impacts on the biodiversity values of the proposal a biodiversity development assessment report must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM).	Appendix D

Appendix B

DPIE correspondence

Planning, Industry & Environment

Mr Peter Wood
Senior Project Manager
Northern Project Office – Hunter
Transport for NSW
Locked Bag 2030
NEWCASTLE NSW 2300

Our ref: SSI-6888 Mod 1

Attention: Ms Melissa Mayfield-Smith

09/12/2020

Dear Mr Wood

Newcastle Inner City Bypass (NICB) - Rankin Park to Jesmond Bypass (SSI-6888)
Modification 1 - Additional Ancillary Facilities

I refer to your correspondence concerning a proposed modification to the NICB Rankin Park to Jesmond Bypass project. Reference is also made to the meeting held on 13 October 2020 which discussed the proposed ancillary facilities and the assessment approach which would be undertaken by Transport for NSW.

The Department has reviewed the proposed approach to preparing a modification application and requires the proposal to be assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the NICB Rankin Park to Jesmond project dated 3 March 2015. In relation to impacts on the biodiversity values of the proposal a biodiversity development assessment report must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM).

Your next step will be to lodge your modification application through your dashboard on the major projects website (http://www.planningportal.nsw.gov.au/major-projects).

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of Agriculture, Water and the Environment to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 1111).

If you have any questions, please contact Michael Young on 9274 6437.

Yours sincerely,



Glenn Snow
Director
Transport Assessments

Appendix C

Consultation materials

November 2020

Dear resident

Re: Newcastle Inner City Bypass – Rankin Park to Jesmond Project.
Proposed work compound sites

Transport for NSW is continuing to plan for the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond.

Early work on the project is continuing and we aim to start construction work on the main project in late 2021, weather permitting.

Proposed work compound sites
A number of work compound sites are needed during construction. Where possible, compound sites are established within or next to the project area. However, suitable locations are not always available and external sites close to the project may need to be used.

Compound sites are typically used for storage and stockpiling of equipment, supplies and materials to allow for space on site to construct, as well as for temporary site offices and parking for project staff.

Transport for NSW is intending to use areas within the main project area as compound sites where possible. We have identified during planning that there is not enough space available for all required compounds within the project area. A recent investigation has identified further sites which may be suitable for use as compounds which lie outside the approved project area.

Two sites near your property are located at:

- 10-12 Main Road/60 Marshall Street, Cardiff Heights
- 6 Peatties Road, Kotara.

We have included a map to show where the potential sites are located.

As the two potential compound sites are located outside of the approved project area, we will be lodging an application to use the sites with the Department of Planning, Industry and Environment. We will be carrying out formal consultation on the sites as part of our application in early 2021.

Our visit today and this letter is early notification of the proposed application. We would be happy to meet with you to discuss the proposed sites further and next steps for the project, either online, in person or over the phone at a time convenient to you.

If you would like to meet to discuss the project, please contact Senior Communications and Engagement Officer, Michael Turner Michael.turner2@transport.nsw.gov.au or 0475 977 768.

Transport for NSW
266 King Street, Newcastle NSW 2300
P 02 4908 7584 | **W** roads-maritime.transport.nsw.gov.au | ABN 18 804 239 602

I would also be pleased to take your call on 0409 286 061.

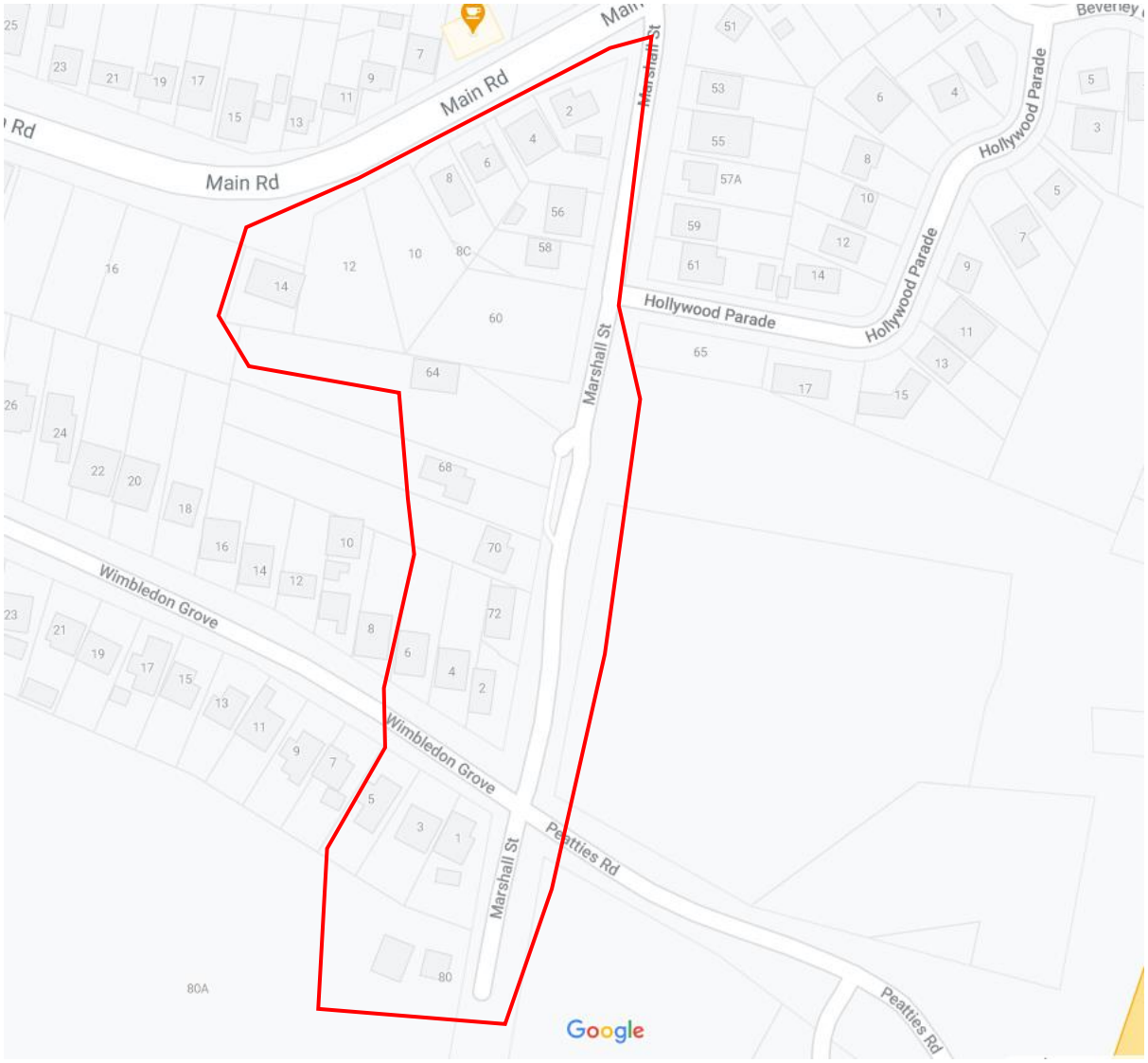
Yours sincerely

Antonn Russek
Project Manager
Newcastle Inner City Bypass – Rankin Park to Jesmond

Potential compound site locations, Cardiff Heights and Kotara



Transport for NSW
266 King Street, Newcastle NSW 2300
P 02 4908 7584 | **W** roads-maritime.transport.nsw.gov.au | ABN 18 804 239 602



Letterbox drop area (27 November) for possible ancillary sites at Peatties Road and Main Road/Cardiff Road.

Mr Geoffrey King
138 Lookout Road
New Lambton Heights
NSW 2305

26 February 2021

Dear Geoffrey

Newcastle Inner City Bypass – Rankin Park to Jesmond Project – Agreement for Transport use of adjacent property for site facility

Transport for NSW (Transport) is progressing the upgrade of the Newcastle Inner City Bypass – Rankin Park to Jesmond Project. The project is continuing the delivery of early work packages over the coming months along Lookout Road, south of McCaffrey Drive in preparation for the main bypass work in the future.

The early work packages involve the demolition of houses on Lookout Road, and the relocation of utility services adjacent to Lookout Road and McCaffrey Drive. To enable the early work to be carried out and to minimise the impact of the work on adjacent residents and stakeholders, Transport propose to utilise an existing residential property, 136 Lookout Road, as a site office.

Transport acknowledges 136 Lookout Road is adjacent to your property, and our proposed operations could impact you. As such, and prior to making any further arrangements regarding the use of this property, Transport request to meet with you and carry out a consultation process to ensure both parties understand the details of the proposed use. Transport also propose to formally agree with yourself to the terms and conditions of use of 136 Lookout Road by Transport, to be discussed and reviewed during our meeting.

It would be appreciated if you could review, sign and return the attached property access and use agreement form either in person at the conclusion of our meeting, or by 5 March 2021 to enable Transport to continue preparing the early work as proposed.

Please return the completed form by 5 March 2021 to michael.turner2@transport.nsw.gov.au or RP2J Project Team, Attn: Antonn Russek, Transport for NSW, Locked Bay 2030, Newcastle NSW 2300.

If you have any further queries, or would like more information on the proposed Transport site office facility at 136 Lookout Road please contact me on 0409 286 061 during business hours or email antonn.russek@transport.nsw.gov.au.

Yours sincerely



Antonn Russek
Project Manager

Newcastle Inner City Bypass
Rankin Park to Jesmond

Transport Roads & Maritime Services

Adjacent Property Access and Use Agreement

Name of Property owner	**Geoffrey King**
Lot/DP	
Address of property/ies adjacent to TfNSW facility	**138 Lookout Road, New Lambton Heights NSW 2305**
Phone number	**0419126152**
Fax number	
Email address	gkingarty@gmail.com

Type of facility use: Site office occupation of existing home for nearby Site works
Property use period: up to 5 years

I am the:
- ☑ owner of the above property
- ☐ tenant of the above property

If tenant, please provide contact details of owner or real estate agent for the tenancy

Name _____
Address _____
Phone _____

I agree / do not agree (please circle)

to allow the TfNSW site team to access and use the property at 136 Lookout Road, New Lambton Heights for the specified access period in order to operate a site office to carry out the construction of the project as outlined above. I would like the project team to adhere to the conditions described below.

Conditions of access and use by TfNSW

1 TfNSW to adhere to project environmental noise requirements as approved by the Department of Planning, Industry and Environment.

2

3

If you have not already done so, would you like to be on the mailing list for future community updates on this project? Yes ☑ No ☐

I understand my details will be held solely for the purposes of providing information on this project Yes ☑

Signed: _____ Date 2-3-21

Print name: G. KING Lisa KING

Please complete this form and return to the project team either in person, by fax to 02 4379 7032 or email to RP2J@transport.nsw.gov.au

Appendix D

Biodiversity development assessment report

Newcastle Inner City Bypass – Rankin Park to Jesmond

Biodiversity development assessment report – modification for additional construction compounds

May 2021

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26 May 2021

Our ref: 12528155-25667-29
Your ref:

Dear Approver

Newcastle Inner City Bypass - RP2J Enviro Advice
Certification under Section 6.15 of the Biodiversity Conservation Act 2016

I, Arien Quin (BAAS17098), certify that this Biodiversity Development Assessment Report and the accompanying finalised credit report dated 26 May 2021 has been prepared in accordance with the requirements of (and information provided under) the Biodiversity Assessment Method 2020.

Sincerely
GHD



Arien Quin
Team Leader - Ecology
+61 2 49799959

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Executive summary

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project), that was approved on 15 February 2019. Transport for NSW now propose to modify the project. The proposed modification to the project involves the establishment and use of four additional ancillary facilities (construction compounds) for the purpose of construction of the project. The additional ancillary facilities are located at:

- Astra Street
- Lookout Road
- Cardiff Road
- Peatties Road.

This biodiversity development assessment report (BDAR) forms part of the modification report for the project under section 5.25 of the EP&A Act and the EPBC Act approval. For the proposed modification, DPIE issued a letter on 9 December 2020 advising that it be assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the project and that a BDAR must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM) to assess impacts on the biodiversity values of the proposal.

The purpose of this BDAR is to assess the likely impacts of the establishment and use of the four additional ancillary facilities on biodiversity values.

The modification area has been heavily modified and is comprised of mainly exotic vegetation. The only site containing relevant biodiversity values, in the form of native vegetation, was Peatties Road. The proposed facility at this site would involve the removal of 0.2 hectares of native vegetation in the form of PCT 1071- *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion*. There would be no direct or indirect impacts the threatened species, populations or communities as a result of this vegetation removal. The BAM calculator found that no offsets would be required for the removal of this vegetation.

No impacts to matters of national environmental significance would occur as a result of the proposed modification. The sites are located upstream of the Hunter Estuary Wetlands Ramsar site, with the Astra Street site being located about 140 metres from the Hunter Wetlands Centre which forms part of the listed Ramsar site. The proposed modification would not result in any changes to water quality or hydrology downstream therefore no impacts to the wetland are expected.

Glossary

Definitions	
Assessment area	Assessment area: includes the subject land and the area of land within the 1500 m buffer zone surrounding the subject land (or 500 m buffer zone for linear proposals) that is determined as per Subsection 3.1.2 (DPIE 2020).
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020).
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020)
Bionet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by the Department and available at www.environment.nsw.gov.au/research/Visclassification.htm.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020).
Calculator or BAM-C	Biodiversity Assessment Method Calculator – a tool that applies the BAM to calculate the number and type of credits required to offset the impacts of development on biodiversity or credits generated at a biodiversity stewardship site.
Cumulative impact	The extent to which the development or activity contributes to the cumulative impacts of existing and planned developments or activities on threatened species, ecological communities, habitats, Areas of Outstanding Biodiversity Value and key threatening processes.

Definitions	
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020)
Ecosystem credit	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020).
MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act (Cth)
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020).
Mitigation	Action to reduce the severity of an impact (OEH 2014).
Native vegetation	(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act).

Definitions	
PlantNET NSW	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020).
Spatial datasets	Spatial databases required to prepare a BDAR ○ BioNet NSW (Mitchell) Landscapes – Version 3.1 ○ NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 ○ NSW soil profiles ○ hydrogeological landscapes ○ acid sulfate soils risk ○ digital cadastral database ○ Vegetation Information Systems maps ○ Geological sites of NSW.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Species credits	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020).
Target species	A species has been identified within the assessment area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities. Part of the BioNet database, published by EES and accessible from the BioNet website at www.bionet.nsw.gov.au.

Abbreviations	
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and the Environment
DIWA	Directory of Important Wetlands in Australia
DPIE	Department of Planning, Industry and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EES	NSW Environment Energy and Science Group within the Department of Planning, Industry and Environment
EP&A Act	Environment Planning and Assessment Act 1979 (NSW)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).
Fisheries NSW Policy and Guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection

Abbreviations	
TEC	Threatened ecological community
WoNS	Weed of National Significance
VIS	Vegetation information system

1 Introduction

1.1 Project background

1.1.1 Approval background

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project), approved 15 February 2019. The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. The project is located in the Newcastle local government area, about 11 kilometres west of the Newcastle central business district and about 160 kilometres north of Sydney.

The project was determined to be state significant infrastructure requiring approval under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with the Secretary's Environmental Assessment Requirements (SEARs) (dated 3 March 2015) and Supplementary SEARs (dated 19 November 2015), an environmental impact statement (EIS) was prepared by Transport for NSW in November 2016 (*Newcastle Inner City Bypass – Rankin Park to Jesmond Environmental Impact Statement*) to assess the potential impacts of the project. The EIS was exhibited by the former Department of Planning and Environment (DP&E) (now known as Department of Planning, Industry and Environment (DPIE)) for 30 days from 16 November 2016 to 16 December 2016.

Following public exhibition of the EIS, Transport for NSW prepared the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* in June 2018 to respond to submissions and describe project design refinements.

Approval for the project was granted on 15 February 2019 by the Minister for Planning (application number SSI 6888) and was subject to a number of conditions of approval.

The project was referred to the Australian Government Minister for the Environment and Energy under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 7 September 2015 due to the presence of listed threatened species and communities and wetlands of international significance that could be impacted by the project. The Australian Minister for the Environment confirmed the project would be a controlled action requiring approval in accordance with the bi-lateral assessment agreement between the Australian Government and the NSW State Government. The EIS was prepared to assess the potential impacts of the project in accordance with the requirements of the EP&A Act and EPBC Act.

The Minister for Planning's Notice of Decision notes that assessment of biodiversity impacts was carried out in accordance with the Framework for Biodiversity Assessment, and offsetting of biodiversity impacts must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects.

Following project approval, Transport for NSW has made a number of project design refinements. These have arisen due to review of the concept design, development of the detailed design, stakeholder consultation and evaluation of construction methodologies. These design refinements resulted in minor changes to the construction footprint and as such were subject to two consistency assessments as follows:

- Consistency assessment 1 - Newcastle Inner City Bypass Rankin Park to Jesmond – Bridge 7 Early Work: Division 5.2 and EPBC Act Approval Consistency assessment report Detailed Design Changes (Aurecon, 2019)
- Consistency assessment 2 - Newcastle Inner City Bypass Rankin Park to Jesmond – Stage 3, Package 1 detailed design changes: Division 5.2 and EPBC Act approval (SSI 6888) consistency review (Bowditch Group, 2020).

The consistency assessments determined that the design refinements were consistent with the project approval and as such, further assessment or modification to the project approval was not required.

1.1.2 Proposed modification

The proposed modification involves the establishment and use of four additional ancillary facilities (construction compounds) for the purpose of construction of the project, shown on Table 2.1 and described further in section 2. The additional ancillary facilities are located at:

- Astra Street
- Lookout Road
- Cardiff Road
- Peatties Road.

1.1.3 Purpose and scope of this report

This biodiversity development assessment report (BDAR) has been prepared to support the proposed modification. The purpose of this BDAR is to assess the likely impacts of the establishment and use of the four additional ancillary facilities on biodiversity values, in particular threatened species and communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and *Fisheries Management Act 1994* (FM Act); and relevant Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), namely threatened species and communities, migratory species and important wetlands.

This BDAR has been prepared in accordance with the Biodiversity Assessment Methodology (BAM). The BAM has been established by the Biodiversity Assessment Method Order 2017 under the provisions of Part 6, Division 2 of the BC Act. The preparation of a BDAR in accordance with the BAM is required by Section 7.9 of the BC Act.

1.1.4 Presence of biodiversity values

Field assessments completed by GHD ecologists of the four ancillary facilities determined that the proposed sites at Astra Street, Cardiff Road and Lookout Road were heavily modified, comprised of exotic vegetation, and could be readily discounted as containing suitable habitat to support any threatened species (Figure 4-3). Preliminary BAM Credit Calculations did not identify any threatened species as having potential to occur at these sites due to the lack of native vegetation present and absence of any habitat for threatened species. Consequently, there were no impacts to biodiversity values at the Astra Street, Cardiff Road and Lookout Road sites requiring further assessment under the BAM. A brief description of the vegetation at these sites is provided in section 4.7.

The only site containing habitats with potential to support threatened species based on preliminary BAM calculations was Peatties Road. The focus of this BDAR therefore primarily relates to the proposed ancillary site at Peatties Road.

A brief summary of the biodiversity values at each of the proposed ancillary facilities is provided in Table 1-1.

Table 1-1: Biodiversity values

Site	Brief site description	Native vegetation present	Potential habitat for threatened fauna	Subject to assessment under the BAM	Justification
Peatties Road	Site subject to historical disturbance resulting in creation of an artificial wetland at its centre. Native vegetation occurs around the boundary of the site.	Yes	Yes	Yes	Impacts to native vegetation require further assessment under the BAM. Direct and indirect impacts to adjacent native vegetation and other biodiversity values have been avoided by including a three metre buffer between the modification area and adjacent vegetation.
Cardiff Road	The site is entirely comprised of exotic grassland vegetation in an urban setting and is devoid of suitable habitat for threatened species.	No	No	No	No native vegetation or threatened species habitats will be impacted
Astra Street	The site is a former landfill that has been capped. The impact area is entirely comprised of exotic vegetation. Small patches of degraded native vegetation occur adjacent to the site. The site is located near to wetland areas (Ramsar, wetlands of national importance and State Environmental Planning Policy (Coastal Management) 2018).	No	No	No	No native vegetation or threatened species habitats will be impacted. Direct and indirect impacts to adjacent native vegetation has been avoided by including a three metre buffer between the modification area and adjacent vegetation. Impacts to MNES under the EPBC Act have been considered in section 6. No change in water quality or hydrology will occur and no impacts to Ramsar, nationally important or State listed wetlands are expected.
Lookout Road	The site consists of a planted urban garden comprised of largely exotic species. No suitable habitat for threatened fauna was identified.	No	No	No	No native vegetation or threatened species habitats will be impacted.

1.2 SEARs

This BDAR forms part of the modification report for the project (as described in section 1.1) under section 5.25 of the EP&A Act and the EPBC Act approval.

The EIS for the project was prepared in accordance with:

- the Secretary's Environment Assessment Requirements (SEARs) issued on 3 March 2015. These SEARs required a biodiversity assessment report to be prepared
- Supplementary SEARs relating to assessment of impacts on matters protected under the Commonwealth EPBC Act issued on 19 November 2015.

For the proposed modification, DPIE issued a letter on 9 December 2020 advising that the modification 'be assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the NICB Rankin Park to Jesmond project dated 3 March 2015. In relation to impacts on the biodiversity values of the proposal a biodiversity development assessment report must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM)'.

Annexure D contains a copy of the original SEARs for the project, supplementary SEARs relating to MNES, and advice from DPIE regarding assessment for the proposed modification. Table 1-2 summarises the requirements relevant to the scope of works subject to this modification and where they have been addressed in this report.

Table 1-2: DPIE Secretary's Environmental Assessment Requirements for biodiversity

Environmental assessment requirements	Section addressed
The environmental impact statement must include the following:	
An assessment of the potential ecological impacts of the project, with specific reference to vegetation and habitat clearing, connectivity, edge effects, weed dispersal, riparian and aquatic habitat impacts, soil and water quality impacts and operational impacts. The assessment must:	
• Make specific reference to impacts on landscape values, biodiversity values of native vegetation and threatened species or populations, including worst case estimates of vegetation clearing and operational impacts	Section 8
• Demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance, and be consistent with the 'avoid, minimise or offset' principle	Section 7
• Be undertaken in accordance with the Framework for Biodiversity Assessment (Office of Environment and Heritage (OEH) 2014) and the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014e), and by a person accredited in accordance with section 142B(1)(c) of the Threatened Species Conservation Act 1995. Impacts on species, populations and ecological communities that will require further consideration and provision of information specified in section 9.2 of the Framework for Biodiversity Assessment include those identified by the OEH. Species specific surveys shall be undertaken for those species and in accordance with the survey requirements specified by the OEH (including during further consultation with the OEH)	N/A
• In relation to aquatic biodiversity be consistent with the draft Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013 (DPI 2013)	Sections 5.3 and 8.5

Environmental assessment requirements	Section addressed
• where there are potential impacts to the OEH estate reserved under the *National Parks and Wildlife Act 1974* or where the proposal is located upstream of OEH estate, an assessment of the matters to be considered outlined in the *Guidelines for developments adjoining land and water managed by DECCW* (DECCW 2010).	Section 8.7

1.3 EPBC Act Assessment Requirements

Under the EPBC Act proposed 'actions' that have the potential to significantly impact on matters of national environmental significance, significantly impact the environment of Commonwealth land, or are being carried out by a Commonwealth agency and would result in a significant impact on the environment, must be referred to the Australian Government. If the Australian Minister for the Environment determines that a referred project is a 'controlled action', the approval of that Minister would be required for the project in addition to the NSW Minister for Planning's approval.

The project was referred to the Commonwealth Department of the Environment on 7 September 2015. On 15 October 2015, the Australian Minister for the Environment confirmed the project would be a controlled action (EPBC Ref 2015-7550). The referral decision identified that the following matters of national environmental significance were of relevance to the project:

- Listed threatened species and communities (section 18 and 18A of the EPBC Act)
- Wetlands of international importance (sections 16 and 17B of the EPBC Act).

In February 2015, the Australian Government and the NSW State Government signed a bi-lateral assessment agreement under section 45 of the EPBC Act. This agreement accredits the assessment process of Part 5.1 (now Division 5.2) under the EP&A Act, so that the Australian Minister would need to issue a separate approval for the project to the State Minister's approval as it is a controlled action.

Following consultation between NSW DP&E (now DPIE) and the Commonwealth Department of the Environment (now the Commonwealth Department of the Environment and Energy), additional environmental assessment requirements (in the form of Supplementary SEARs) were issued on 19 November 2015 (Annexure D).

Table 1-3 summarises the requirements relevant to the scope of works subject to this modification and where they have been addressed in this report.

Assessment for MNES for the proposed modification have been considered in sections 6 and 8. The proposed modification would not result in any significant impacts to any MNES listed under the EPBC Act. A referral for impacts to MNES is not required for the proposed modification.

Table 1-3: EPBC Act Environmental Assessment Requirements for biodiversity

Commonwealth assessment requirements	Section addressed
These guidelines provide information on assessment requirements in relation to Matters of National Environmental Significance (MNES), if the project is being assessed under the NSW Assessment Bilateral Agreement (February 2015). It is a requirement of the Agreement that the project be assessed in the manner specified in Schedule 1 of that Agreement, including the matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). These guidelines do not stand alone but should be considered in conjunction with the Department of Planning and Environment's Secretary's Environmental Assessment Requirements. The Guidelines are intended to ensure there is sufficient information in the Assessment Report relevant to MNES such that the Commonwealth decision-maker may make a determination on whether or not to approve the action.	Refer below

Commonwealth assessment requirements	Section addressed
The proponent must undertake an assessment of all the protected matters that may be impacted by the development under the controlling provision identified in paragraph 1 and Attachment A.	
Paragraph 1 • Threatened species and communities • Ramsar wetlands	Refer below
Attachment A – listed threatened species and communities: The Department of the Environment considers impacts potentially arise in relation to the following matters: • Black-eyed Susan (*Tetratheca juncea*) – vulnerable • Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable The Department considers there is some risk there may be significant impacts on the following matters: • Leafless Tongue-orchid (*Cryptostylis hunteriana*) - vulnerable • Newcastle Doubletail (*Diuris praecox*) - vulnerable	Sections 6 and 8.4
Attachment A – Ramsar wetlands: The Department of the Environment considers impacts potentially arise in relation to the following: • The Hunter Estuary Wetlands Ramsar site Resulting in: • A substantial and measurable change in the hydrological regime of the wetland • A substantial and measurable change in the water quality of the wetland	Sections 6 and 8.4
General requirements	
The EIS must address the following issues:	
• The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES).	Sections 1, 2 and 8.4
• An assessment of the likely impacts of the development on each EPBC Act-listed species and/or ecological community where there is likely to be a significant impact from the proposed development.	N/A
Key issues – biodiversity	
The EIS must address the following issues in relation to Biodiversity including:	
• Identification of all EPBC Act listed threatened species and communities likely to be located in the Construction footprint or in the vicinity; and	Section 5.1
• Identification of all EPBC Act listed threatened species and communities likely to be significantly impacted by the development in accordance with the Matters of National Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Significant Impact Guidelines).	Sections 6 and 8.4

Commonwealth assessment requirements	Section addressed
For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:	
• a description of the environment (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;	Sections 6 and 8.4
• details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.	Section 5.2.2
Impacts	
For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a description of the impacts of the action having regard to the full national extent of the species or community's range including:	
• A detailed assessment of the extent, nature and consequence of the likely direct, indirect and consequential impacts – refer to the Significant Impact Guidelines for guidance on the various types of impact that need to be considered;	N/A
• A statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; and	N/A
• A description of any likely cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other proponents in the region and vicinity).	N/A
Avoidance and mitigation	
For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including:	
• A description of proposed avoidance and mitigation measures to deal with relevant impacts of the action;	N/A
• Assessment of the expected or predicted effectiveness of the mitigation measures, and	N/A
• A description of the outcomes that the avoidance and mitigation measures will achieve.	N/A
For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide reference to, and consideration of relevant Commonwealth guidelines and policy statements including conservation advice, recovery plans, threat abatement plans and wildlife conservation plans.	N/A
Residual impacts and offsets	
For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:	
• Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts is taken into account.	N/A

Commonwealth assessment requirements	Section addressed
• Details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts.	N/A
• Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.	N/A
[Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.]	N/A
Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy. http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy	N/A

1.4 Assessment guidelines used in this report

The assessment presented in this BDAR was carried out in accordance with the BAM and other relevant survey guidelines. These are listed below.

NSW survey guidelines

Department of Environment and Conservation (2004) Threatened biodiversity survey and assessment. Guidelines for developments and activities (working draft). Available on the EES website. https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-biodiversity-survey-and-assessment

Department of Environment and Climate Change (2009) Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians. Available on the EES website http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf

DPI (2013), Policy and Guidelines for Fish Habitat Conservation and Management. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf

DPIE (EES) (2020), Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method. Available from: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/surveying-threatened-plants-and-habitats-nsw-survey-guide-biodiversity-assessment-method-200146.pdf

DPIE (EES) (2020), NSW Survey Guide for Threatened Frogs. A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method

OEH (2018), Biodiversity Assessment Method Operational Manual – Stage 1. Available from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-1-180276.pdf

OEH (2018), 'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method. Available on the DPIE website at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf

National survey guidelines

Commonwealth of Australia (2011) Survey Guidelines for Australia's Threatened Frogs. Available on the DAWE website http://www.environment.gov.au/system/files/resources/ff3eb752-482d-417f-8971-f93a84211518/files/survey-guidelines-frogs.pdf

1.5 Personnel

This BDAR was carried out by appropriate qualified and experienced environmental professionals, ecologists and accredited people as demonstrated in Table 1-4.

Table 1-4: Personnel

Name	Role	Qualifications
Arien Quin	BAM assessment Technical review	BA/BSc BAM accredited
Luke O'Brien	Targeted fauna survey Targeted flora survey	BEnvSc BSc (Hons)
Felicity Williams	Field survey Reporting	BSc (Hons)
Alejandro Barreto	Field survey	BBiotech BAM accredited
Alexandria Yates	Field survey	BEnvSc&Man (Hons)

1.6 Structure of this report

The report is structured as follows:

- Chapter 1 (Introduction) provides an overview of the project and proposed modification and its scope and purpose
- Chapter 2 (The proposed modification) provides a detailed description of the proposed modification
- Chapter 3 (Landscape features) includes the landscape assessment component of the BDAR
- Chapter 4 (Native vegetation) describes the methodology and results of vegetation assessments
- Chapter 5 (Threatened species) describes the methodology and results of threatened species surveys
- Chapter 6 (Matters of National Environmental Significance) includes a summary of relevant MNES
- Chapter 7 (Avoid and minimise impacts) describes measures used to avoid and minimise impacts to biodiversity
- Chapter 8 (Impact Assessment) includes an assessment of potential impacts to biodiversity
- Chapter 9 (Mitigation) summarises mitigation measures to avoid potential impacts to biodiversity
- Chapter 10 (Offsetting) summarises the offsetting requirements of the proposed modification
- Chapter 11 (References) lists all references used in this report.

2 The proposed modification

Transport for NSW is seeking to modify the approved project to allow for the establishment and use of four additional ancillary facilities (construction compounds) for the purpose of construction of the project, identified as:

- Astra Street: located within Lot 16 of DP 1149782, this construction compound is located within the former Astra Street landfill site within part of 2 and 28 Astra St, Shortland, NSW. The site is, owned by the City of Newcastle. The former Astra Street landfill site is subject to an approved Voluntary Management Proposal issued under Section 17 of the *Contaminated Land Management Act 1997*.
- Lookout Road: located within Lot 222 of DP 840728, this site is a residential dwelling. The site is located at 136 Lookout Road, New Lambton Heights, NSW.
- Cardiff Road: located within Lots A-C of DP 347568, this construction compound is located on disturbed vacant land at 10 and 12 Main Road, Cardiff Heights and 60 Marshall Street, New Lambton Heights. The site is owned by Transport for NSW.
- Peatties Road: located within Lot 1 of DP 330006, Lots 32 and 33 of DP 734569, and Lot 1 of DP 910200, this construction compound is located at 1/6 Peatties Road, Kotara. The site has been subject to historical disturbance from a former quarry cut into the hillside, with roads built along terraces cut during quarrying activities. The site is owned by the City of Newcastle and Sydney Trains.

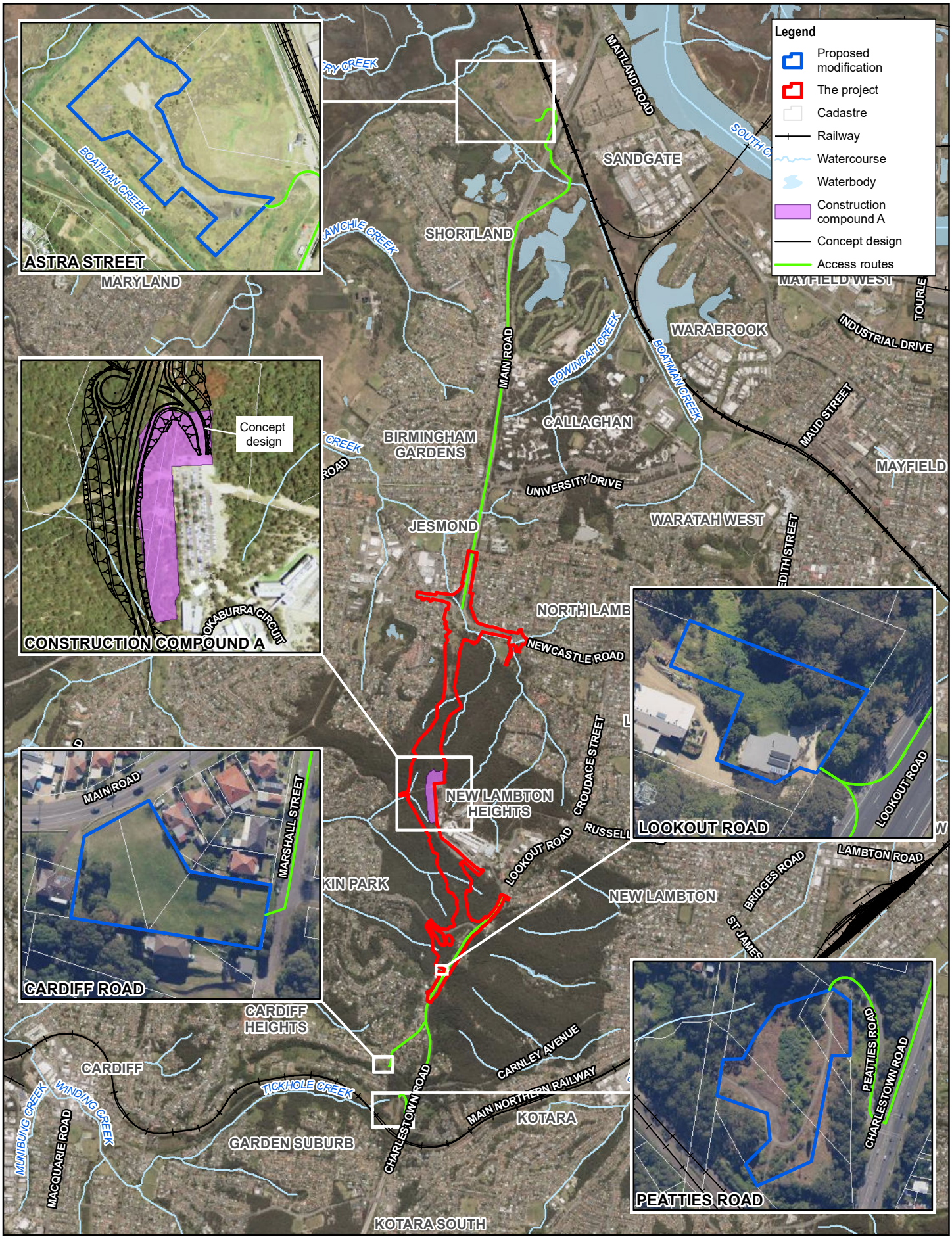
The additional ancillary facilities are located outside of the approved project boundary as shown on Figure 2.1. The proposed modification is needed to ensure the safe construction of the project. Proposed activities at the ancillary facilities are summarised in Table 2-1.

Table 2-1: Proposed activities

Activity	Peatties Road	Cardiff Road	Astra Street	Lookout Road
Main site compound area	Yes	-	-	-
Materials handling	Yes	Yes	Yes	-
Establishment of temporary fencing and traffic management	Yes	Yes	Yes	-
Installation of erosion and sediment controls	Yes	Yes	Yes	-
Establishment of compounds	Yes	Yes	Yes	-
Vegetation clearing and grubbing	Yes	Yes	Yes	-
Crushing plant	-	-	Yes	-
Stockpile site	Yes	Yes	Yes	-
Batching plant	-	-	Yes	-
Bridge girder laydown	-	-	Yes	-
Site offices	Yes	-	-	Yes
Deliveries	Yes	-	Yes	-

Activity	Peatties Road	Cardiff Road	Astra Street	Lookout Road
Parking	Yes	-	-	Yes
Construction support activities	Yes	-	Yes	-
Demobilisation and rehabilitation	Yes	Yes	Yes	-

Construction hours for the proposed modification would be in accordance with the project approval. There would be some out of hours activities required at Peatties Road, Astra Street and Lookout Road sites.



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Metres

Map Projection: Transverse Mercator
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The project and proposed modification

Figure 2-1

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Print date: 20 May 2021 - 10:27

Data source: TfNSW / Aurecon: The Project, 2018; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay

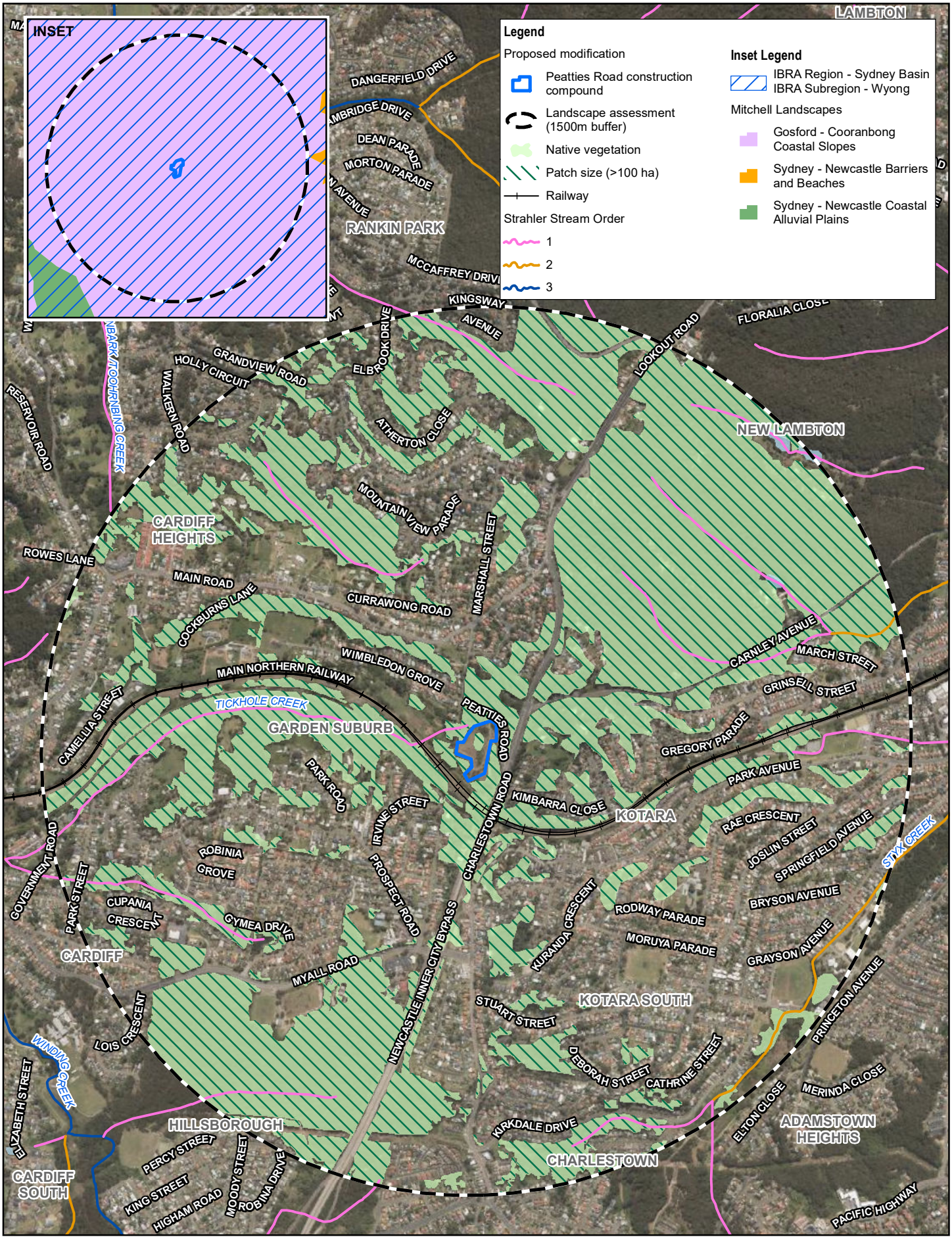
3 Landscape features

3.1 Identified features

A landscape assessment was completed for the proposed ancillary site at Peatties Road. The details of this assessment are described in Table 3-1 and shown in Figure 3.1.

Table 3-1: Landscape features (Peatties Road)

Landscape feature	Subject land
IBRA bioregions and subregions	Sydney Basin Bioregion. Wyong subregion.
NSW landscape regions (Mitchell landscapes)	Gosford – Cooranbong Coastal Slopes
Native vegetation extent in the buffer area	313.99 ha consisting of 11 PCTs
Cleared areas	480.21 ha
Rivers and streams	No watercourses occur in the Peattie's Road project area. The closest watercourse to the project area is Tickhole Creek, a first order stream. Other unnamed first and second order streams occur within the buffered assessment area, as well as the named watercourses of Styx Creek and Blue Wren Creek.
Wetlands	The project area contains a small wetland area dominated by *Phragmites australis* (Common Reed). Historical aerial imagery indicates that this is an artificially created wetland associated with previous quarrying disturbance at the site (see section 4.5). There are no wetlands in the buffered assessment area, including Ramsar or Nationally important wetlands. It is noted that the Peatties Road site occurs about 8 kilometres upstream of the Hunter Estuary Wetlands Ramsar site, Hunter Wetlands National Park and wetland areas protected under the *State Environmental Planning Policy (Coastal Management) 2018.*
Connectivity features	The buffered assessment area contains the Wallsend, Cardiff and Blackbutt – Glenroe subregional fauna corridors. Patch size of the site is >101 ha, with adjacent vegetation occurring <30 m to the north-west and extending to the north-east where it connects with Blackbutt Reserve.
Areas of Geological Significance and Soil Hazard Features	There are no karst, caves, cervices, cliffs or other areas of geological significance located within the project area or buffer area surrounding the project area.
Areas of outstanding biodiversity value (AOBV)	AOBV mapping indicates a small area mapped along Tickhole Creek on the northern boundary of the site. This is outside of the impact area.



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Kilometers

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Native vegetation extent

Figure 3-1

G:\22\12528155\GIS\Maps\Deliverables\BDAR\12528155_BDAR003_LandscapeAssessment_0.mxd
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Data source: DSEWPaC: IBRA Regions, 2013; OEH: Vegetation, 2013; Mitchell Landscapes, 2017; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

4 Native vegetation

4.1 Method

4.1.1 Background research

Vegetation was assessed with reference to the BAM (OEH, 2017a). The Lower Hunter vegetation mapping (DPIE, 2017) was ground-truthed in the field to verify community type and boundaries, floristic and structural homogeneity within patches and to update mapping as required.

Previous ecological studies associated with the proposed modification that were reviewed include:

- GHD (2016) Newcastle Inner City Bypass – Rankin Park to Jesmond: Technical Paper 1 – Biodiversity Assessment Report
- GHD (2018) Newcastle Inner City Bypass – Rankin Park to Jesmond: Biodiversity Assessment Report.

4.1.2 Vegetation survey

This section provides detail on the vegetation survey carried out in accordance with Section 5 of the BAM (DPIE 2020).

Site surveys were conducted by GHD ecologists on 9 and 10 February 2021. Site surveys included:

- Initial site stratification and vegetation mapping
- Sampling of vegetation integrity plots
- Habitat assessment
- Opportunistic flora observations.

To determine the appropriate Plant Community Types (PCTs) for the site the following data was collected in the field and then compared against PCTs outlined in the BioNet Vegetation Classification Database (OEH 2020b):

- Soil type
- Landscape position
- Floristics data and structural composition.

Other things considered when determining the PCT types include:

- Lower Hunter regional vegetation mapping (DPIE, 2017)
- Site disturbance history.

4.1.3 Vegetation integrity survey plots (assessing site condition)

Plots were located to comply with the minimum number of plots required by Table 4 in the BAM (OEH, 2017a). The location of survey plots is shown on Figure 4.11 and the minimum plot survey requirements are summarised in Table 4-1.

The site value was determined by assessing ten attributes used to assess function, composition and structure of vegetation. The site value is measured using replicate 400 m^2 plots nested within 1,000 m^2 plots. These attributes were then assessed against benchmark values. Benchmarks are quantitative measures that represent the ‘best-attainable’ condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance (OEH, 2020a).

Attributes assessed within each plot include:

- Native plant species richness
- Percentage foliage cover for each species
- Estimated number of individuals for each species
- Number of large trees
- Tree regeneration (presence/absence)
- Tree stem size class
- Total length of fallen logs
- Litter cover
- High threat exotic vegetation cover
- Hollow bearing trees.

All flora species were identified according to the nomenclature of the Royal Botanic Gardens and Domain Trust (RBGT, 2018). Each species identified was allocated a growth form group and designated as either native, exotic or high threat exotic in accordance with the lists provided in the BAM calculator.

The overall condition of vegetation was assessed through general observation and comparison against the PCT condition benchmark data as well as using parameters such as species diversity, history of disturbance, weed invasion and canopy health.

Opportunistic and incidental observations of flora species were recorded during field surveys. Survey effort focused on areas of suitable habitat; although it is noted that habitat within the majority of the proposed modification is substantially degraded and lacked significant habitat features such as fallen timber, mature trees and stags. Species lists are provided in Annexure A.

Field surveys confirmed the presence of one PCT within the Peatties Road site represented by one vegetation zone. Other vegetation within the site is dominated by exotic species and therefore not representative of any native PCTs. No plots are required in areas of exotic vegetation at the Cardiff Road, Astra Street or Lookout Road sites. The remainder of the Peatties Road site consists of vehicle tracks and cleared areas shown collectively as ‘cleared’. The PCT and vegetation zones within the Peatties Road site are shown in Figure 4.1, and described in section 4.3. Plant species lists and plot data are provided in Annexures A and C along with benchmark values for the PCT.

Table 4-1: Minimum number of plots required and completed per zone area

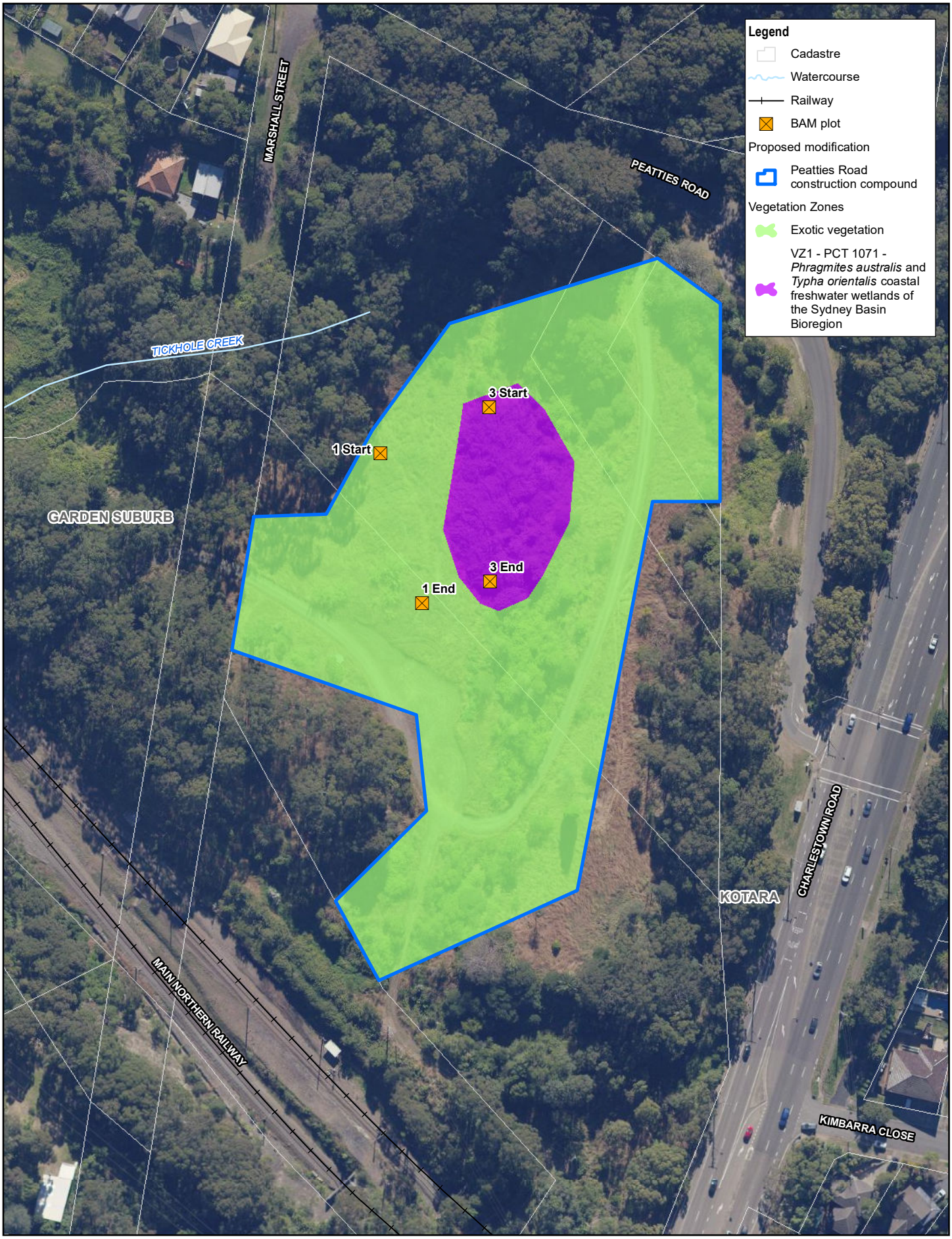
Site location	Vegetation zone PCT	Vegetation zone area (ha)	Plots required	Plots completed	Plot id/s
Peatties Road	1071	0.195	1	1	Plot 3

4.1.4 Floristic analysis

Native vegetation communities within the site boundaries were assigned to the closest equivalent PCT (where relevant) held in the BioNet Vegetation Classification database (OEH, 2020b). The closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot/transect data collected from each site. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the sites were also compared to the descriptions in the database in order to determine the most suitable PCT. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation were also reviewed.

Native vegetation, where present, was then stratified into vegetation zones in accordance with Section 4.3 of the BAM (OEH, 2020a). A vegetation zone is defined in the BAM as a relatively homogenous area that is of the same vegetation type and broad condition. Vegetation zones are discussed in section 4.3 of this BDAR.

Vegetation mapping and BAM plots were assessed in accordance with Section 4.3 and 4.4 of the BAM (OEH, 2020a). Following stratification into vegetation zones, plot surveys were conducted to obtain vegetation integrity data for the calculation of biodiversity credits.



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Peatties Road construction compound vegetation zones

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Figure 4-1a

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Data source: LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



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Map Projection: Transverse Mercator
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Cardiff Road construction compound vegetation zones

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Figure 4-1b

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Lookout Road construction compound vegetation zones

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Figure 4-1c

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Astra Street construction compound vegetation zones

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Figure 4-1d

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4.1.5 Limitations

Threatened flora and fauna species can be present in any given area on a permanent, seasonal or transient basis. Floral and faunal assemblages can change in response to variations in season and environmental conditions and not all species will be present during surveys. Notwithstanding the above, as most of the proposed modification contains degraded habitat the survey approach and effort carried out was suitable for determining the quality of habitat present.

The likely occurrence of threatened species have been evaluated with due consideration of a combination of desktop data and field assessment of the environmental conditions of the proposed modification at the time of preparing this report.

4.2 Vegetation mapping

Lower Hunter regional vegetation mapping (DPIE, 2017) was reviewed prior to field survey. Field survey at each of the four proposed ancillary sites revealed that only the Peatties Road site contained native vegetation consistent with any PCT. Native vegetation community mapping, including the results of ground-truthing, is shown in Figure 4.2.

4.3 Vegetation zones

Field survey at each of the four proposed ancillary sites determined that only the Peatties Road site contained native vegetation consistent with any PCT. The remaining sites at Astra Street, Cardiff Road and Lookout Road did not contain vegetation consistent with any native PCTs within the proposed disturbance footprints.

The Astra Street site contained two small, isolated patches of degraded native vegetation. The impact area was refined so as to avoid these patches and a three metre buffer included to ensure there would be no direct or indirect impacts to this vegetation.

The Peatties Road site contained one PCT, PCT 1071- *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion*, located in the centre of the site and surrounded by exotic vegetation. This PCT represents one vegetation zone due to its consistent condition within the site boundary. A full floristic description of this vegetation zone is described in section 4.4.

PCTs and vegetation zones within the proposed modification are shown in Figure 4.1 and summarised in Table 4-2 and described in section 4.4.

Table 4-2: Plant community types by vegetation zone

Plant community type (PCT)	Vegetation zone	Vegetation integrity score	Patch size (ha) [1]	Threatened ecological community?
1071	1	16.3	310.59	Not commensurate with any TEC

Note 1: A patch is an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation. A patch may extend onto adjoining land.

4.4 Plant community types

The Peatties Road site supports a small area of PCT 1071- *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* (Photograph 1). The PCT was determined based on the descriptions provided in the Vegetation Classification Database (OEH, 2020b). This native vegetation community is associated with an artificially created wetland at the centre of the site, and vegetation is regrowth following historical disturbance.

PCT 1071- *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion

Vegetation formation: Freshwater wetlands

Vegetation class: Coastal Freshwater Lagoons

PCT: 1071

Other mapping sources: Lower Hunter regional vegetation mapping (DPIE, 2017)

Conservation status: Not commensurate with the Sydney Freshwater Wetlands in the Sydney Basin Bioregion EEC (BC Act). Not listed under the EPBC Act

Estimate of percent cleared: 75%

Condition: Low

Extent in the assessment area: 0.2 ha

Plots completed: Plot 3

Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
3.1	86	n/a	16.3

Growth form	Typical species
Trees	N/A
Shrubs	N/A
Grass and grass like	Dominated by *Phragmites australis* (Common Reed)
Forb	N/A
Fern	N/A
Other	N/A
Trees	N/A
Exotic	Occurrences of *Ricinus communis* (Castor Oil Plant), *Solanum mauritianum* (Wild Tobacco Bush), *Senna pendula*, *Melinis repens* (Red Natal Grass), *Lantana camara* (Lantana), *Ipomoea indica* (Morning Glory), *Megathyrus maximus*, *Ipomoea cairica* (Coastal Morning Glory) and *Pavonia hastata*.

Description:

The Bionet Vegetation Classification database describes PCT 1071 as a natural or man-made water body, drainage line and depression across a wide variety of environments, including modified former wetlands. PCT 1071 is located within the Sydney Basin IBRA bioregion and is associated with coastal plains, valleys, lagoons, and other sites of poor drainage. The PCT description includes two species which are representative of the community, *Phragmites australis* (Common Reed) and *Ludwigia peploides* subsp*. montevidensis* (Water Primrose) (not recorded on site).

The PCT condition within the site is considered low, based on the low diversity of native species and high diversity of exotic flora species within the vegetation zone. *Phragmites australis* (Common Reed) was the dominant species while minor occurrences of *Ricinus communis* (Castor Oil Plant), *Solanum mauritianum* (Wild Tobacco Bush), *Senna pendula*, *Melinis repens* (Red Natal Grass) and *Lantana camara* (Lantana) were observed. A full flora species list is provided in Annexure A.

Photograph 1 PCT 1071- *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion, located at the Peatties Road site.



The remaining vegetation across the four ancillary sites was determined to be exotic vegetation. This vegetation is not consistent with any PCTs, and is described in section 4.7.

4.5 Threatened ecological communities

No TECs were identified within any of the proposed ancillary sites.

PCT 1071 identified at the Peatties Road site was assessed against the endangered ecological community (EEC) description for *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (NSW Threatened Species Scientific Committee 2010) description and was determined not to be commensurate with the EEC, due to assessment determining that the wetland was artificially created. Historical aerial imagery indicates that previous disturbance works at the site resulted in the construction of this artificial wetland (Photograph 2). As it does not contain a naturally occurring wetland, the PCT does not meet the definition of the EEC *Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (NSW Threatened Species Scientific Committee 2010).

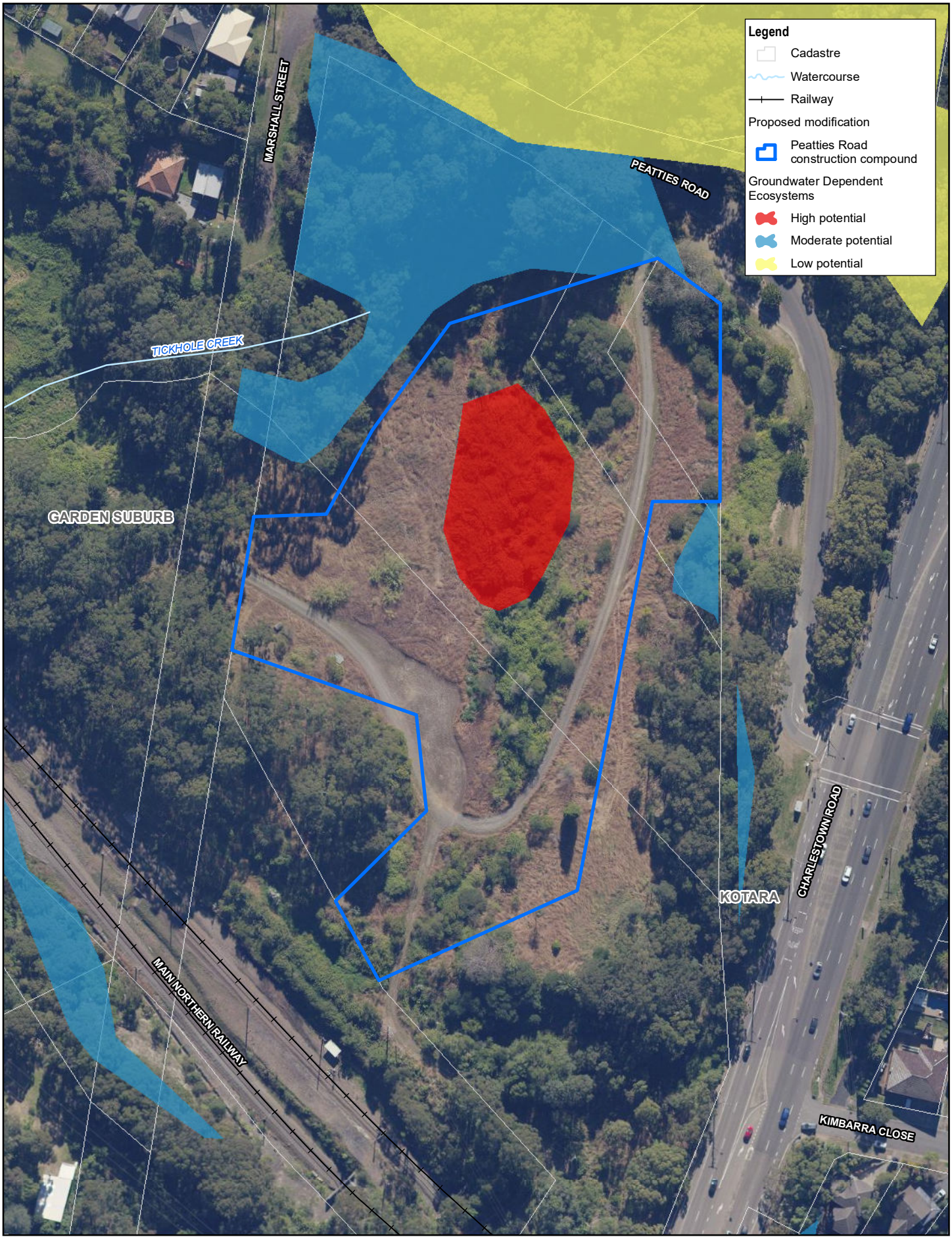
Photograph 2: Historical aerial imagery from 1954 showing disturbance at Peatties Road



4.6 Groundwater dependent ecosystems

The Groundwater Dependent Ecosystems Atlas indicates that the native vegetation within the Peatties Road site is likely to contain vegetation that represents a high potential terrestrial GDE. The associated vegetation that the atlas identifies as being a high potential terrestrial GDE is PCT 1071 *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* (BOM, 2020a).

The Atlas mapped distribution of potential terrestrial GDEs as it relates to the proposed modification is shown in Figure 4.2.



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Metres

Map Projection: Transverse Mercator
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Groundwater dependent ecosystems

Figure 4-2

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Print date: 20 May 2021 - 10:28

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

4.7 Other vegetation

Remaining vegetation across the four ancillary sites was assessed as exotic vegetation. Exotic species recorded are listed in Table 4-3. These species are classified as high threat weeds for the purposes of the BAM.

All weed species are regulated with a general biosecurity duty under the *Biosecurity Act 2015* to,

> '…prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.'

Three priority weeds that are declared for the Hunter region (which includes the Newcastle Local Government Area) were recorded including *Lantana camara* (Lantana), *Hyparrhenia hirta* (Coolatai Grass) and *Rubus fruticosus* agg. (Blackberry). The species, their relevant weed objectives (HLLS, 2017) and related regulatory measures are summarised in Table 4-3.

The National Weed Strategy (IPAC, 2016; AWC, 2019) identifies Weeds of National Significance, which recommends that their spread should be minimised to protect priority assets. Specific assets have not been identified in the national strategy but Priority 3.3 of the strategy identifies that asset assessments should be carried out to assess which assets need to be protected and from which weed species (IPAC, 2016).

A brief description of the exotic vegetation at each site is as follows:

- Peatties Road (Photograph 3): Exotic vegetation consisted of exotic grasses such as *Hyparrhenia hirta* (Coolatai grass) and *Megathyrus maximus* (Guinea Grass), as well as species such as *Verbena bonariensis* (Purpletop) and *Plantago lanceolata* (Lamb's Tongues. Dense thickets of *Rubus fruticosus agg.* (Blackberry) were also present along with *Ligustrum sinense* (Small leaf Privet).
- Cardiff Road (Photograph 4): This site was dominated by exotic grasses such as *Megathyrus maximus* (Guinea Grass) and *Stenotaphrum secundatum* (Buffalo Grass), and also included a range of other exotic weeds such as *Sonchus oleraceus* (Milk Thistle), *Plantago lanceolata* (Lamb's Tongues) and *Verbena bonariensis* (Purpletop).
- Astra Street (Photograph 5): The Astra Street site is dominated by exotic grasses such as *Hyparrhenia hirta* (Coolatai grass), *Megathyrus maximus* (Guinea Grass) and *Stenotaphrum secundatum* (Buffalo Grass). Also present was *Cynodon dactylon* (Common Couch). Other exotic groundcover species included *Sonchus oleraceus* (Milk Thistle), *Plantago lanceolata* (Lamb's Tongues), *Hydrocotyle bonariensis* (Largeleaf Pennywort) and *Verbena bonariensis* (Purpletop). Exotic shrub species included thickets of *Rubus fruticosus agg.* (Blackberry) and *Lantana camara* (Lantana), as well as *Olea europaea* subsp*. Cuspidate* (African Olive) and *Ricinus communis* (Castor Oil Plant). There are also areas of bare ground and gravel as a result of previous disturbance at the site.
- Lookout Road (Photograph 6): This site was primarily composed of decorative planted garden species and fruit trees. Exotic vegetation included *Megathyrus maximus* (Guinea Grass), *Stenotaphrum secundatum* (Buffalo Grass), *Lantana camara* (Lantana), *Ipomoea indica* (Morning Glory) and *Ricinus communis* (Castor Oil Plant). A row of planted *Callistemon salignus* (Willow Bottlebrush) was also present.

Photograph 3: Exotic vegetation within Peatties Road Site (also visible is area of PCT 1071 in photo centre)



Photograph 4: Exotic vegetation within Cardiff Road Site



Photograph 5: Exotic vegetation within Astra Street Site



Photograph 6: Exotic / planted vegetation within Lookout Road



Table 4-3: High threat, priority weed species and Weeds of National Significance (WoNS) recorded within the proposed modification area

Family	Scientific name	Common name	High threat weed	Priority weed	Weed objective and control measure	WoNS	Site recorded
Euphorbiaceae	*Ricinus communis*	Castor Oil Plant	Y	-	-	-	Peatties Road Astra Street
Fabaceae (Caesalpinioideae)	*Senna pendula*	-	Y	-	-	-	Peatties Road
Verbenaceae	*Lantana camara*	Lantana	Y	Y	Prohibition on dealings - Must not be imported into the State or sold	Y	Peatties Road Astra Street Lookout Road
Convolvulaceae	*Ipomoea indica*	Morning Glory	Y	-	-	-	Peatties Road
Convolvulaceae	*Ipomoea cairica*	Coastal Morning Glory	Y	-	-	-	Peatties Road Astra Street
Poaceae	*Megathyrus maximus*	-	Y	-	-	-	Peatties Road Astra Street Lookout Road Cardiff Road
Poaceae	*Stenotaphrum secundatum*	Buffalo Grass	Y	-	-	-	Peatties Road Astra Street Lookout Road Cardiff Road
Poaceae	*Paspalum dilatatum*	Paspalum	Y	-	-	-	Peatties Road Astra Street Lookout Road
Poaceae	*Sorghum halapense*	Johnson's Grass	Y	-	-	-	Cardiff Road

Family	Scientific name	Common name	High threat weed	Priority weed	Weed objective and control measure	WoNS	Site recorded
Poaceae	*Hyparrhenia hirta*	Coolatai Grass	Y	Y	Regional Recommended Measure - The plant should not be bought, sold, grown, carried or released into the environment. Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread from their land. Land managers to reduce impacts from the plant on priority assets.	-	Peatties Road Astra Street
Rosaceae	*Rubus fruticosus agg.*	Blackberry complex	Y	Y	Prohibition on dealings - Must not be imported into the State or sold Regional Recommended Measure - The plant should not be bought, sold, grown, carried or released into the environment. Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread from their land. Land managers to reduce impacts from the plant on priority assets.	Y	Peatties Road Astra Street
Malaceae	*Cotoneaster glaucophyllus*	-	Y	-	-	-	Peatties Road

5 Threatened species

5.1 Method

5.1.1 Background research

Desktop assessment

A desktop database review was carried out to identify threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act, FM Act, and EPBC Act, that could be expected to occur in the locality, based on previous records, known distribution ranges, and habitats present. These were also used to obtain the necessary site data to perform BAM calculations.

Following collation of database records, species predicted to occur by the BAM calculator and threatened species and community profiles, a 'likelihood of occurrence' assessment was completed for threatened biota and migratory species with reference to the broad vegetation types and habitats contained within the proposed modification (Annexure B). This was further refined following field surveys and verification of vegetation types and identification and assessment of habitat present within the proposed modification. A likelihood of occurrence ranking was attributed to these biota based on this information.

In order to assess the suitability of the habitat within the site for threatened species and ecological communities, the desktop assessment evaluated the following baseline data:

- Landscape-scale features of the study area in accordance with Section 3.1 of the BAM (DPIE 2020)
- Site context of the study area that includes assessing vegetation cover and patch size as required under Subsections 3.2 and 4.1 of the BAM (OEH, 2017a)
- The likely distribution of native vegetation and threatened ecological communities (TECs), based on previous mapping and aerial photograph interpretation, for targeted field verification as required under Section 4 of the BAM (OEH, 2017a)
- A list of predicted and candidate threatened species and populations of flora and fauna to assess the habitat suitability and threatened biodiversity data collection as required under Section 5 of the BAM (OEH, 2017a)
- Evaluate baseline information to determine whether additional surveys, mapping and reporting is required to support approval of the proposed modification.

Identifying threatened species for assessment

The BAM calculator automatically generates a list of threatened species that must be assessed for ecosystem credits ('predicted' threatened species) or species credits ('candidate' threatened species). These are species that are considered likely to occur within, or to use habitats within a site. This list is generated based on information entered into the landscape assessment component of the BAM calculator (eg IBRA subregion, percent native vegetation cover, patch size class) and information from the threatened biodiversity data collection (TBDC) regarding species' geographic limitations.

Predicted threatened species include species that can be reliably predicted to occur at a site based on habitat surrogates ('predicted' threatened species or 'ecosystem credit entities'). These species are assumed to be present within certain PCTs, given a certain patch size and condition.

Candidate threatened species include species that cannot be reliably predicted through habitat surrogates ('candidate' threatened species or 'species credit entities'). For these species, a targeted survey or an expert report is required to confirm the presence or absence of the species at a site.

Dual credit species (those that require assessment as both ecosystem and species credits) are species where part of the habitat is assessed as a species credit entity, typically breeding or nesting habitat, and the remainder of the habitat is assessed for as ecosystem credits (such as foraging habitat). Targeted survey is only required for the species credit component.

Refinement of list of threatened species for assessment

Once the list of potential predicted and candidate threatened species have been identified, this list can be further refined by carrying out an additional assessment of the habitat constraints or microhabitats within the site.

Predicted threatened species can be removed from assessment for ecosystem credits if any habitat constraints described for the species in the TBDC are absent from the site, otherwise the species must be retained for assessment of ecosystem credits. Targeted survey is not required for predicted threatened species (Section 6.2.1.1, OEH, 2017a).

Candidate threatened species can be removed from assessment for species credits if:

- Any habitat constraints described for the species in the TBDC are absent from the site
- Where habitat is determined to be significantly degraded
- Where vegetation is missing key structural elements.

No targeted survey is required for species that are removed from the list of candidate threatened species. For species that are retained, targeted survey is required to determine presence on site in order to assess for species credits.

The following sections present the list of predicted and candidate species identified for the assessment of ecosystem and species credits. It also identifies and provides justifications for the exclusion of any threatened species from further assessment where applicable.

5.1.2 Predicted threatened species

The list of predicted threatened species associated with ecosystem credits required for the proposed modification and with relevant habitat resources present on the site are listed in Table 5-1. For each predicted threatened species a sensitivity class rating is also provided.

As the site does not contain any areas of mapped important habitat areas from DPIE, species with this habitat constraint have been excluded from further assessment. One additional species, the Comb-crested Jacana (*Irediparra gallinacea*), has also been removed from further assessment due to the absence of identified habitat constraints at the site (wetlands with good surface cover of floating aquatic vegetation).

Targeted surveys are not required for predicted threatened species.

Table 5-1: Predicted threatened species

Common name	Scientific name	Vegetation types(s)	Sensitivity to potential gain class	Habitat constraint	Excluded from further assessment	Justification for exclusion
Australasian Bittern	*Botaurus poiciloptilus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	Brackish or freshwater wetlands	No	n/a
Australian Painted Snipe	*Rostratula australis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Black Bittern	*Ixobrychus flavicollis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	Land within 40 m of freshwater and estuarine wetlands in areas of permanent water and dense vegetation	No	n/a
Black-necked Stork	*Ephippiorhynchus asiaticus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Black-tailed Godwit (foraging)	*Limosa limosa*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	As per mapped areas provided by OEH	Yes	The site does not contain any mapped area of habitat for this species.
Blue-billed Duck	*Oxyura australis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a

Common name	Scientific name	Vegetation types(s)	Sensitivity to potential gain class	Habitat constraint	Excluded from further assessment	Justification for exclusion
Broad-billed Sandpiper (foraging)	*Limicola falcinellus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	As per mapped areas provided by OEH	Yes	The site does not contain any mapped area of habitat for this species.
Comb-crested Jacana	*Irediparra gallinacean*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	Waterbodies. Freshwater wetlands with a good surface cover of floating aquatic vegetation	Yes	Site does not contain waterbodies or freshwater wetlands with a good surface cover of floating aquatic vegetation
Curlew Sandpiper (foraging)	*Calidris ferruginea*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	As per mapped areas provided by OEH	Yes	The site does not contain any mapped area of habitat for this species.
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	-	No	n/a
Eastern Osprey (foraging)	*Pandion cristatus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a

Common name	Scientific name	Vegetation types(s)	Sensitivity to potential gain class	Habitat constraint	Excluded from further assessment	Justification for exclusion
Freckled Duck	*Stictonetta naevosa*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Great Knot (foraging)	*Calidris tenuirostris*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	As per mapped areas provided by OEH	Yes	The site does not contain any mapped area of habitat for this species.
Great Knot (foraging)	*Calidris tenuirostris*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	As per mapped areas provided by OEH	Yes	The site does not contain any mapped area of habitat for this species.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	-	No	n/a
Large Bent-winged Bat (foraging)	*Miniopterus orianae oceanensis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	-	No	n/a
Little Bent-winged Bat (foraging)	*Miniopterus australis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	-	No	n/a
Little Eagle (foraging)	*Hieraaetus morphnoides*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a

Common name	Scientific name	Vegetation types(s)	Sensitivity to potential gain class	Habitat constraint	Excluded from further assessment	Justification for exclusion
Magpie Goose	*Anseranas semipalmata*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Spotted Harrier	*Circus assimilis*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
Spotted-tailed Quoll	*Dasyurus maculatus*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	-	No	n/a
Square-tailed Kite (foraging)	*Lophoictinia isura*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	High	Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines	No	n/a
White-fronted Chat	*Epthianura albifrons*	1071-*Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion	Moderate	-	No	n/a

5.1.3 Candidate threatened species

In accordance with section 5 of the BAM (OEH 2020a), after carrying out the field assessment of habitat constraints and microhabitats at Peatties Road, the habitat was deemed to be substantially degraded. For this reason most candidate species were excluded from further assessment. Targeted survey was carried out for threatened candidate species identified as having potential to occur within the site. This included flora species where marginal potential habitat was present, and threatened fauna associated with wetland habitats, even though that habitat was considered heavily degraded and the species were unlikely to occur. A conservative approach was taken in order to reliably exclude these species from further assessment.

The candidate threatened species that were generated by the BAM calculator to be considered for further assessment of species credits are listed in Table 5-2.

Table 5-2: Candidate threatened species

Common name	Scientific name	Sensitivity to potential gain class	Habitat constraint	Species requiring survey	Habitat degraded	Excluded from further assessment	Justification for exclusion
Biconvex Paperbark	*Melaleuca biconvexa*	High		Yes	Yes	No	n/a
Black-tailed Godwit	*Limosa limosa*	High	As per mapped areas	No	Yes	Yes	No important habitat areas as mapped by OEH present
Broad-billed Sandpiper	*Limicola falcinellus*	High	As per mapped areas	No	Yes	Yes	No important habitat areas as mapped by OEH present
Bush Stone-curlew	*Burhinus grallarius*	High	Fallen/standing dead timber including logs	No	Yes	Yes	No suitable fallen/standing dead timber and logs present.
Cotton Pygmy-Goose	*Nettapus coromandelianus*	Moderate	Waterbodies, Deep permanent freshwaters on floodplains with floating and submergent vegetation	No	Yes	Yes	No suitable permanent freshwater bodies on floodplains with floating and submergent vegetation present
Curlew Sandpiper	*Calidris ferruginea*	High	As per mapped areas	No	Yes	Yes	No important habitat areas as mapped by OEH present
Eastern Osprey (breeding)	*Pandion cristatus*	Moderate	Living and dead trees (>15 m) or artificial structures within 100 m of a floodplain for nesting	No	Yes	Yes	No suitable living or dead trees, or artificial structures suitable for nesting present.

Common name	Scientific name	Sensitivity to potential gain class	Habitat constraint	Species requiring survey	Habitat degraded	Excluded from further assessment	Justification for exclusion
Giant Burrowing Frog	*Heleioporus australiacus*	Moderate	-	No	Yes	Yes	Critical habitat components absent. Site does not contain suitable habitat within 300 metres of suitable breeding habitat (ephemeral flowing streams, pools or upland swamps located within native vegetation associated with sandstone geology).
Great Knot	*Calidris tenuirostris*	High	As per mapped areas	No	Yes	Yes	No important habitat areas as mapped by OEH present
Green and Golden Bell Frog	*Litoria aurea*	High	Within 1 km of semi-permanent / ephemeral wet areas, swamps and waterbodies	Yes	Yes	No	The Peatties Road site contains marginal potential wetland habitat, likely to be unsuitable due to the density of aquatic vegetation.
Green-thighed Frog	*Litoria brevipalmata*	Moderate	-	Yes	Yes	No	Marginal potential aquatic habitat present, however there is no suitable rainforest, eucalypt forest or heathland habitat present for this species.
Large Bent-winged Bat (breeding)	*Miniopterus orianae oceanensis*	Very high	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	No	Yes	Yes	No cave, tunnel, mine, culvert, stormwater pipes or other structures known or suspected to be used for breeding.

Common name	Scientific name	Sensitivity to potential gain class	Habitat constraint	Species requiring survey	Habitat degraded	Excluded from further assessment	Justification for exclusion
Little Bent-winged Bat (breeding)	*Miniopterus australis*	Very High	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	No	Yes	Yes	No cave, tunnel, mine, culvert, stormwater pipes or other structures known or suspected to be used for breeding.
Little Eagle (breeding)	*Hieraaetus morphnoides*	Moderate	Nest trees - live (occasionally dead) large old trees within vegetation	No	Yes	Yes	No suitable breeding habitat in the form of living or dead mature trees recorded.
Mahony's Toadlet	*Uperoleia mahonyi*	High	-	Yes	Yes	No	No suitable heath or wallum habitat present. Species almost exclusively associated with leached (highly nutrient impoverished) white sand that is not present at the site.
Maundia triglochinoides	*Maundia triglochinoides*	High	Riparian areas/drainage lines, water ponding, man-made dams and drainage channels up to 1 m deep	Yes	Yes	No	Targeted surveys did not detect this species. Habitat considered marginal for this species and is highly degraded due to artificial nature of the wetlands at Peatties Road and dominance of exotic species.
Red-backed Button-quail	*Turnix maculosus*	High	-	No	Yes	Yes	No suitable habitat present. This species inhabits grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas.

Common name	Scientific name	Sensitivity to potential gain class	Habitat constraint	Species requiring survey	Habitat degraded	Excluded from further assessment	Justification for exclusion
Southern Myotis	*Myotis macropus*	High	Hollow-bearing trees. Land within 200 m of riparian zone Bridges, caves or artificial structures within 200 m of riparian zone	Yes	Yes	No	The site does contain possible roosting habitat within 200 m of a riparian zone. The riparian habitat (wetland) is unsuitable for this species as it is covered by dense vegetation that renders any standing water unsuitable for foraging by this species. The species requires a waterbody with pools / stretches 3 metres or wider, which are not present on site.
Square-tailed Kite (breeding)	*Lophoictinia isura*	Moderate	Nest trees	No			No suitable mature trees present.
Tall Knotweed	*Persicaria elatior*	High	Within 50 m of semi-permanent/ephemeral wet areas, swamps and waterbodies	Yes	Yes	Yes	Targeted surveys did not detect this species. Habitat considered marginal for this species and is highly degraded due to artificial nature of the wetlands at Peatties Road and dominance of exotic species.
Wallum Froglet	*Crinia tinnula*	Moderate	-	Yes	Yes	No	No suitable heath or wallum habitat present.

Common name	Scientific name	Sensitivity to potential gain class	Habitat constraint	Species requiring survey	Habitat degraded	Excluded from further assessment	Justification for exclusion
White-bellied Sea-Eagle (breeding)	*Haliaeetus leucogaster*	High	Living or dead mature trees within suitable vegetation within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines	No	Yes	Yes	No suitable breeding habitat in the form of living or dead mature trees recorded.
Zannichellia palustris	*Zannichellia palustris*	High	Waterbodies, freshwater or slightly brackish estuarine areas	No	Yes	Yes	No suitable permanent waterbodies or freshwater or slightly brackish estuarine areas present.

5.2 Threatened species survey

5.2.1 Terrestrial flora surveys

Terrestrial flora surveys (Table 5-3) were completed in accordance with methods described in *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020a) by two ecologists walking transects spaced five metres apart within areas of suitable habitat during appropriate survey periods as described in the Threatened Biodiversity Data Collection and Calculator for each candidate flora species. This was in addition to random meander surveys completed during initial site survey and vegetation plot data collection.

Table 5-3: Targeted threatened flora survey details

Site	Species	Minimum survey requirements	Survey completed
Peatties Road	*Maundia triglochinoides*	Survey period November – March.	Targeted survey was completed by two GHD ecologists on 24 February 2021.
Peatties Road	Biconvex Paperbark (*Melaleuca biconvexa*)	Survey period January - December	Targeted survey was completed by two GHD ecologists on 24 February 2021.
Peatties Road	Tall Knotweed (*Persicaria elatior*)	Survey period December - May	Targeted survey was completed by two GHD ecologists on 24 February 2021.

5.2.2 Terrestrial fauna surveys

Methodology

Fauna habitat assessments were carried out at each site, including searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, density of understorey vegetation, composition of ground cover, soil type, presence of hollow-bearing trees, leaf litter and ground debris were noted. Artificial structures, such as culverts, stormwater drains and pipes, were also noted (if present).

Indicative habitat criteria for targeted threatened species (ie those determined as having the potential to occur within the site following the desktop review) were identified prior to fieldwork. Habitat criteria were based on information provided in BCD and DAWE threatened species profiles, field guides, and the knowledge and experience of GHD field ecologists.

Habitat assessments included recording (if present) resources of potential value to threatened fauna including:

- Trees with bird nests or other potential fauna roosts
- Rock outcrops or overhangs providing potential shelter sites for fauna
- Burrows, dens and warrens
- Distinctive scats or latrine sites, owl white wash and regurgitated pellets under roost sites
- Tracks or animal remains
- Evidence of activity such as feeding scars, scratches and diggings
- Specific food trees and evidence of foraging (eg chewed Allocasuarina cones).

The locations and quantitative descriptions of significant habitat features were captured with a handheld GPS unit and photographed where appropriate.

Targeted threatened fauna survey

Targeted survey was carried out for threatened candidate species identified as having potential to occur within the Peatties Road site including:

- Wallum Froglet (*Crinia tinnula*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Green-thighed Frog (*Litoria brevipalmata*)
- Southern Myotis (*Myotis Macropus*)
- Mahony's Toadlet (*Uperoleia mahonyi*).

Surveys were conducted in accordance with the 'Threatened species survey and assessment guidelines: field survey methods for fauna- Amphibians' (DECC, 2009), and ''Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method' (OEH 2018). Details of targeted threatened fauna survey are outlined in Table 5-4.

Surveys for Green and Golden Bell Frog were also conducted at Astra Street in order to assess potential impacts to this MNES under the EPBC Act.

The location of threatened species surveys are shown in Figure 5.1.

Table 5-4: Targeted threatened fauna survey details

Site	Species	Minimum survey requirements [1]	Survey completed
Peatties Road	Wallum Froglet (*Crinia tinnula*)	Aural – visual surveys following flooding rains. Total effort of 480 minutes for a 500 m transect. Four repeat surveys with the first and last surveys at least 14 days apart.	Four surveys carried out in favourable weather conditions including spotlighting and call playback by two GHD ecologists over a minimum two hour period each night over four nights (24/2/21, 25/2/21, 16/3/21, 18/3/21)
Peatties Road Astra Street (see section 6)	Green and Golden Bell Frog (*Litoria aurea*)	Aural – visual surveys conducted between November – March. Total effort of 480 minutes for a 500 m transect. Four repeat surveys with the first and last surveys at least 14 days apart.	Four surveys carried out in favourable weather conditions including spotlighting and call playback by two GHD ecologists over a minimum two hour period each night over four nights (24/2/21, 25/2/21, 16/3/21, 18/3/21)
Peatties Road	Green-thighed frog (*Litoria brevipalmata*)	Aural – visual surveys Spring – Autumn after flooding rains. Total effort of 240 minutes. Two repeat surveys	Four surveys carried out in favourable weather conditions including spotlighting and call playback by two GHD ecologists over a minimum two hour period each night over four nights (24/2/21, 25/2/21, 16/3/21, 18/3/21)
Peatties Road	Mahony's toadlet (*Uperoleia mahonyi*)	Aural – visual surveys October – March. Total effort of 480 minutes for a 500 m transect. Four repeat surveys with the first and last surveys at least 14 days apart.	Four surveys carried out in favourable weather conditions including spotlighting and call playback by two GHD ecologists over a minimum two hour period each night over four nights (24/2/21, 25/2/21, 16/3/21, 18/3/21)

Site	Species	Minimum survey requirements [1]	Survey completed
Peatties Road	Southern Myotis (*Myotis Macropus*)	Acoustic detection October – March. Total effort of 16 detector nights over a minimum of four nights.	One Anabat detector was deployed 25/2/2021 and collected 16/3/2021 for a total of 19 detector nights. The site did not contain suitable habitat to conduct harp trapping / mist netting for this species as there was no habitat within 200 m of a waterbody with pools / stretches 3 m or wider.

Survey conditions

Bureau of Meteorology records for the relevant survey dates are outlined in Table 5-5. These records were taken at the Williamtown RAAF weather station (ID 061078). In the week preceding targeted surveys for threatened frogs which were carried out on the 24 and 25 February, the site received a total of 86.8 mm rainfall. In the week preceding targeted surveys for threatened frogs which were carried out on the 16 and 18 March, the site received a total of 99.2 mm rainfall.

Table 5-5: Survey conditions

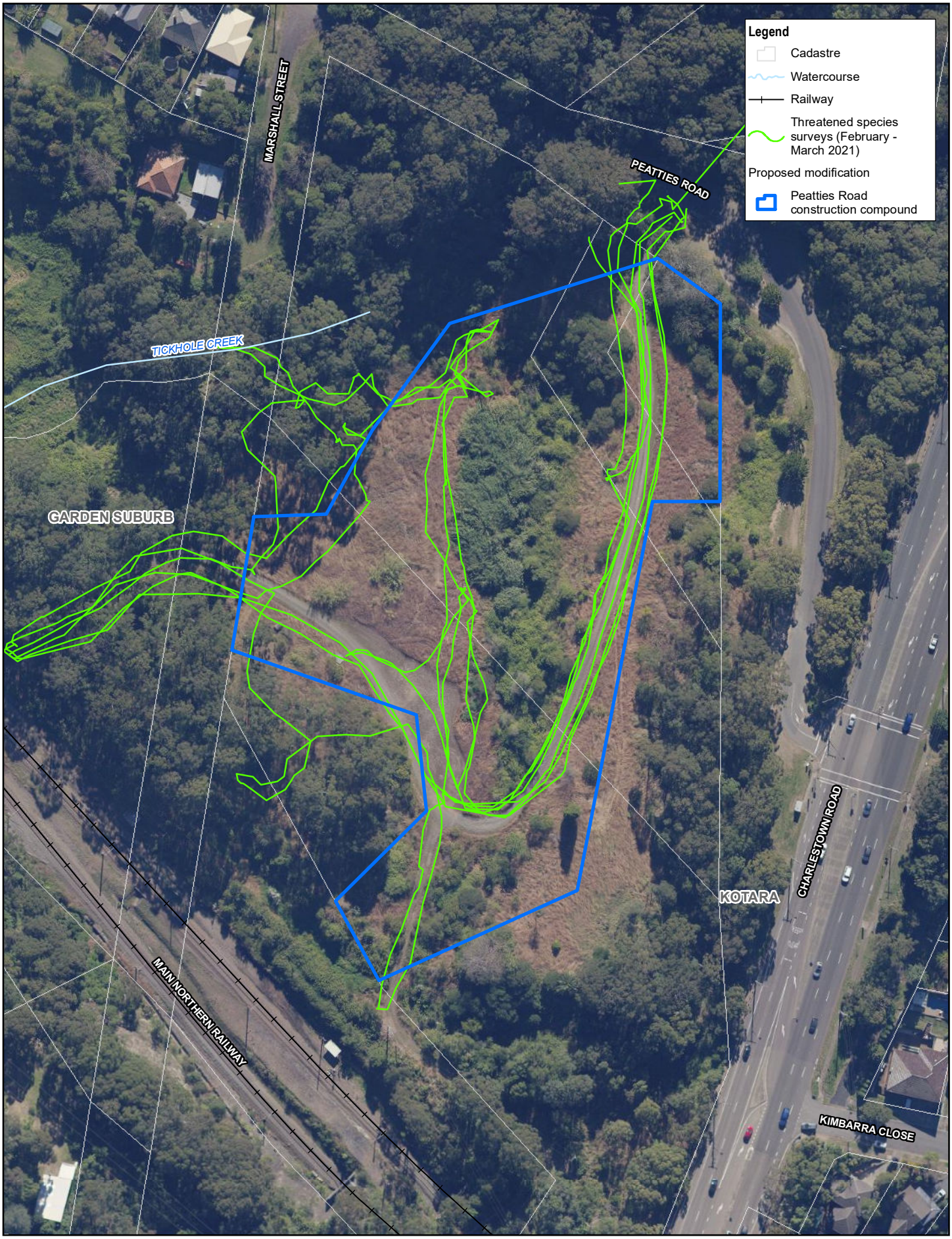
Date	Rain in last 24 hours (mm)	Temp at start (Deg Celsius)	Temp at finish (Deg Celsius)	Humidity	Cloud cover	Wind (km/hr)
24/2/2021	9.2	17	17	95	90	Calm
25/2/2021	3.6	19	19	78	80	Calm
16/3/2021	1.0	20	19	95	100	Light
18/3/2021	43.6	19	19	100	100	Calm

5.2.3 Limitations

Threatened flora and fauna species can be present in any given area on a permanent, seasonal or transient basis. Floral and faunal assemblages can change in response to variations in season and environmental conditions and not all species will be present during surveys. Although survey timing has been designed to fall within recommended survey months outlined in the TBDC for targeted species, this does not guarantee that the species will be detected even if suitable habitat is present.

Notwithstanding the above, as most of the proposed modification contains degraded habitat the survey approach and effort carried out was matched to the quality of habitat present. Survey was carried out in optimal conditions during the recommended survey window and following the recommended survey effort.

The likely occurrence of threatened species have been evaluated with due consideration of a combination of desktop data and field assessment of the environmental conditions of the proposed modification at the time of preparing this report.



Paper Size ISO A4

0 9.5 19 28.5 38

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Biodiversity Development Assessment Report

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Threatened species survey locations

Figure 5-1

G:\22\12528155\GIS\Maps\Deliverables\BDAR\12528155_BDAR006_ThreatSpecies_0.mxd
Print date: 20 May 2021 - 10:28

Data source: LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay

5.2.4 Threatened species results

Targeted surveys for threatened flora and fauna did not detect any threatened species within the sites.

5.3 Aquatic habitat and threatened species

Detailed aquatic assessment was not required for the site at Peatties Road (or other proposed ancillary sites). The site does not contain areas mapped as key fish habitat and no habitat for threatened aquatic species was identified.

Although native wetland vegetation is present at the Peatties Road site, this vegetation occurs in such density that there was no standing water present to support the presence of aquatic species, or terrestrial species associated with wetland environments (such as water birds, amphibians).

No threatened species or threatened species habitat for aquatic species was identified.

6 Matters of National Environmental Significance

The following MNES protected under the EPBC Act were considered for their relevance to the proposed modification (Table 6-1). Relevant MNES are discussed below.

Table 6-1 Consideration of MNES

MNES	Relevance to project
World Heritage Properties	None present
National Heritage Places	None present
Wetlands of international importance	All four sites occur upstream of the Hunter Estuary Wetlands Ramsar site
Listed threatened species and communities	Historical records for the Green and Golden Bell Frog (*Litoria aurea*) occur to the west and north of the Astra Street site
Listed migratory species	None present or likely to occur
Commonwealth land	None present

Wetlands of international importance

A portion of the Hunter Estuary Wetlands Ramsar site (Site number 24) associated with the Hunter Wetlands Centre occurs about 140 metres south west of the Astra Street site. In addition, the Peatties Road, Cardiff Road and Lookout Road sites are located about eight kilometres upstream of the Hunter Estuary Wetlands complex. This Ramsar site forms part of the internationally important wetland complex associated with the Hunter Wetlands National Park. Several nationally important wetlands also occur within the Hunter Wetlands National Park including Hexham Swamp, Kooragang Nature Reserve and the Shortland (Hunter) Wetlands Centre. The park is also part of the Hunter Estuary Important Bird Area (IBA) (Dutson et al. 2014).

The Hunter Estuary Wetlands complex is considered to be of exceptional conservation value, providing critical habitat for a range of threatened and migratory fauna as well as supporting large populations of waterbirds.

The Astra Street site itself, does not contain habitat that is consistent with vegetation types associated with the Hunter Estuary Wetlands complex. It is not mapped as important habitat for any threatened species by OEH mapping, nor does it appear on the AOBV mapping. The elevation, as well as historical disturbance at the site, differentiates it from the surrounding habitat contained within the National Park and Hunter Wetlands Centre, and limits its suitability to support the diversity of species contained within the Hunter Estuary Wetlands complex. The site is separated from both the National Park and the Hunter Wetlands Centre by Ironbark Creek and Boatman Creek respectively.

Despite its proximity to wetlands of international importance, the Astra Street site is considered unsuitable to support either foraging or breeding habitat for threatened species, particularly waterfowl, migratory shorebirds and wetland specialist species known to rely on habitats contained within the Hunter wetlands complex. At most, these species may commute through or over the site in order to access more preferable habitats contained in the surrounding landscape.

Listed threatened species

The absence of suitable habitat for threatened biota and migratory species at the proposed sites allowed most predicted threatened species, communities and migratory species to be readily discounted from further assessment under the EPBC Act (see Annexure B).

One threatened species listed under the EPBC Act was determined to be relevant to the Astra Street site. The Green and Golden Bell Frog (*Litoria aurea*), which is listed as a Vulnerable species under the EPBC Act has been previously recorded within the Hunter Wetlands Centre that is located to the west of the Astra Street site and Hexham Swamp located to the north.

7 Avoid and minimise impacts

The four ancillary facilities have been selected due to the presence of minimal biodiversity values within the sites and in accordance with the following considerations:

- Proximity and access to the project
- The sites have been subject to historical disturbance activities
- There is sufficient cleared / disturbed land to accommodate the required facilities.

The Peatties Road site is the only site with potential impacts to biodiversity associated with the removal of 0.2 hectares of native vegetation (refer to section 8.1.1).

Following the identification of native vegetation and potential threatened fauna habitat on site, the proposed modification footprint at Peatties Road and Astra Street were refined to minimise impacts to native vegetation as much as possible. Native vegetation at the margins of the Peatties Road site provides a buffer to sensitive receivers near to the facility, and has been purposefully excluded from the ancillary facility boundary to minimise noise and visual disturbance, as well as maintain habitat for native flora and fauna and habitat connectivity with adjacent vegetation. The disturbance footprint at the site has been located in areas of the site containing the least biodiversity values, such as areas of exotic grassland, that do not contain habitat for threatened species.

Similarly the ancillary facility boundary at Astra Street excludes areas of regrowth native vegetation in order to minimise biodiversity impacts.

A minimum buffer of three metres will be maintained between the ancillary facility boundaries and adjacent areas of native vegetation to ensure accidental direct impacts are avoided, and to minimise indirect impacts to vegetation and habitat.

8 Impact assessment

8.1 Removal of native vegetation and habitat

8.1.1 Direct impacts on native vegetation and habitat

The proposed modification will result in the removal of 0.2 hectares of native vegetation associated with vegetation zone 1 as shown in Table 8-1. Vegetation zone 1 contains PCT 1071, which was determined not to be commensurate with any threatened ecological communities (section 4.5).

Impacts in this vegetation zone would result in the removal of an area of artificially created wetland and associated vegetation. Direct impacts to this vegetation may result in the removal of habitat for common fauna and flora species. This wetland does not contain habitat for threatened species, and no threatened species were recorded during targeted surveys. This vegetation zone does not contain any hollow bearing trees, fallen logs or leaf litter.

Table 8-1: Direct impacts to native vegetation

Vegetation zone	Status (BC Act)	Area to be impacted (ha)	Future value	Change (loss) in vegetation integrity score	Number of hollow bearing trees impacted
1	n/a	0.2	0	-16.3	0

8.1.2 Indirect impacts on native vegetation and habitat

The proposed modification has potential to result in indirect impacts to adjacent vegetation, including native vegetation types, as outlined below. As described in section 7, a minimum buffer of three metres will be maintained between the ancillary facility boundaries and adjacent areas of native vegetation to ensure accidental direct impacts are avoided, and to minimise indirect impacts to vegetation and habitat.

Erosion and sedimentation

The proposed modification would require minor disturbance of soils associated with site establishment, and ongoing management of surface runoff during use. With the implementation of standard erosion and sedimentation management measures no significant impacts are expected. Measures to mitigate sedimentation would be implemented as described in section 9.

Weed invasion

Weed species are effective competitors for food and habitat resources and have the potential to exclude native species and modify the composition and structure of vegetation communities.

Disturbance associated with proposed activities at the ancillary facility sites increase the potential for the spread, introduction and establishment of high threat weed species identified at the site.

Measures to mitigate the risk of weed spread to nearby native vegetation, would be implemented as described in section 9.

Pathogens

Construction activities have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) into adjacent native vegetation through vegetation disturbance and increased visitation. Phytophthora and Myrtle Rust may result in the dieback or modification of native vegetation and damage to fauna habitats. Chytrid fungus affects both tadpoles and adult frogs and can wipe out entire populations once introduced into an area.

Diseases and pathogens can be introduced or spread to site via dirt or organic material attached to machinery, vehicles, equipment and employees. Measures to mitigate the risk of pathogens being brought onto and/or spread through the site would be implemented as described in section 9.

Potential for fauna injury and mortality during construction

The site contains limited habitat for native fauna however, common and mobile species may still occur. The risk of injury or mortality of individual fauna during operations is likely to be low. Less mobile fauna such as nestlings and terrestrial fauna such as lizards, frogs and snakes are more at risk of injury and mortality. Measures to mitigate the risk of fauna injury and mortality would be implemented as described in section 9.

Artificial lighting

Artificial lighting will be required for night work. Although light pollution is known to have negative impacts on wildlife, given that no threatened species are considered at risk of impacts and that the project is short term and temporary in nature, indirect impacts of artificial lighting are likely to be mitigated through following best practice lighting design guidelines to minimise light spill into surrounding environments. Measures to mitigate the risk of artificial lighting would be implemented as described in section 9.

8.1.3 Impacts to threatened species

Targeted survey did not detect any threatened species or their habitats at the site. Impacts to threatened species as a result of the proposed modification are considered unlikely to occur. Any unexpected finds would follow measures described in section 9.

8.2 Serious and irreversible impacts

The proposed modification would not result in any impacts to entities at risk of serious and irreversible impacts.

8.2.1 Threatened ecological communities

The proposed modification would not result in any direct impacts to threatened ecological communities.

8.2.2 Threatened species

The proposed modification would not result in any impacts to threatened species.

8.3 Prescribed biodiversity impacts

No prescribed impacts have been identified as a result of the proposed modification

8.4 Matters of National Environmental Significance

Wetlands of international importance

The Lookout Road, Cardiff Road and Peatties Road sites occur about eight kilometres upstream of the internationally important Hunter Estuary Wetlands complex (comprised of Kooragang Nature Reserve and Hunter Wetlands Centre). As there would be no change in water quality or hydrology as a result of the proposed modification, with the implementation of standard management measures no significant impacts are expected.

The Astra Street site is not consistent with the nearby Hunter Wetlands Centre, and as a former landfill has been extensively modified. The site is hydrologically connected to the wetlands however, as there would be no change in water quality or hydrology as a result of the proposed modification, with the implementation of standard management measures no significant impacts are expected.

Listed threatened species

Although there is no suitable habitat for the Green and Golden Bell Frog (*Litoria aurea*) within the Astra street site and therefore this species does not require assessment under the BAM, review of the EPBC Act significant impact guidelines for this species indicated that the proposed modification may meet the criteria for potential significant impacts to this species (DEWHA (2009).

The significant impact guidelines state that a proposal could have a significant impact on the Green and Golden Bell Frog if it results in:

- **Threshold 1**. The removal or degradation of aquatic or ephemeral habitat either where the Green and Golden Bell Frog has been recorded since 1995 or habitat that has been assessed as being suitable according to these guidelines. This can include impacts from Chytrid fungus or Gambusia originating off-site.
- **Threshold 2**. The removal or degradation of terrestrial habitat within 200 metres of habitat identified in threshold 1.
- **Threshold 3**. Breaking the continuity of vegetation fringing ephemeral or permanent waterways or other vegetated corridors linking habitats meeting the criteria in threshold 1 (DEWHA (2009).

Although the Astra Street site does not contain suitable aquatic habitat for the species as described in threshold 1, the proposed modification may meet the criteria for threshold 2, due to the proximity of the Astra Street site to threshold 1 habitat associated with the Hunter Wetlands Centre to the west and Hexham Swamp to the north. These locations have historically supported the Sandgate / Hexham key population of the Green and Golden Bell Frog (DEC 2005, DECC 2007). However, the Sandgate/Hexham key population is not always detectable and there is some conjecture as to whether it is still extant (DEC 2005; DECC 2007). Accessible records of this population are from 1990 or earlier however, a reintroduction program for the Green and Golden Bell Frog was carried out after this time at Hunter Wetlands Centre but is believed to have been unsuccessful (pers. comm. J. Clulow 2021).

The Astra Street site is already heavily degraded, as a result of its former use as a landfill. Although the species is known to travel through damp exotic grassland for foraging and dispersal such as that found at the Astra Street site, the gradient of the site (rising from 0 to 20 metres ASL) is likely to limit its suitability for this purpose, particularly given the absence of connecting threshold 1 habitats (including ephemeral wetlands) within the site that would encourage movement of individuals from surrounding habitats. The creeks surrounding the site are also likely to be too saline to readily support movement of the species from areas of potential habitat to the site at Astra Street.

Notwithstanding the above, given the proposed modification may meet the criteria for threshold 2 if the terrestrial habitat present was found to support the species, targeted survey for Green and Golden Bell Frog was carried out at the Astra Street site to determine whether the species was present and guide any impact assessment requirements. Details of survey effort and timing can be found in section 5.2.2.

These surveys did not detect any Green and Golden Bell Frog within suitable habitat surrounding the Astra Street site. This is consistent with field habitat assessments that found the site was unlikely to contain suitable habitat for the species despite its proximity to potential threshold 1 habitat. Surveys were completed at a favourable time following suitable rainfall, which would maximise available habitat for the species. This increases confidence that had the species been present at the site (or immediate surrounds), it would have been detected. It is therefore considered highly unlikely that the Green and Golden Bell Frog would occur at the Astra Street site given that:

- Targeted survey in favourable weather conditions did not detect the species
- There are no recent records for the species in proximity to the site (within 10 years) and there is conjecture as to whether the population is still extant
- The site does not contain suitable aquatic habitat (as described in threshold 1)
- The site does not represent a movement corridor linking suitable aquatic habitats described in threshold 1
- The site gradient is likely to be unfavourable for dispersal
- The site is heavily degraded following historical disturbance associated with landfill operations.

It is therefore considered that the site does not contain suitable terrestrial habitat, and that the proposed modification would not meet the criteria for threshold 2. No impacts to GGBF at the Astra Street site would be anticipated as a result of the proposed modification.

8.4.1 Avoidance of impacts on MNES

The site at Astra Street was chosen due to the low level of environmental risk given that:

- The site was a former landfill and has been subject to historical disturbance
- There is sufficient cleared / disturbed land to accommodate the required facilities
- There is an existing access road

Following the identification of native vegetation on site, the proposed modification footprint was refined to avoid all direct impacts to native vegetation. As a result, the disturbance footprint at the site is wholly located in cleared areas and areas of exotic grassland vegetation, with a buffer of at least three metres from native vegetation to prevent direct and indirect impacts.

8.5 Aquatic impacts

Although native wetland vegetation is present at the Peatties Road site, this vegetation occurs in such density that there was no standing water present to support the presence of aquatic species. Suitable alternative drainage arrangements would be provided to ensure there are no downstream impacts associated with the removal of this wetland.

No threatened species or threatened species habitat for aquatic species was identified.

Removal of native wetland vegetation is unlikely to result in aquatic impacts such as fauna displacement, changed hydrology or obstruction of fish passage.

There is not aquatic habitat present at the Lookout Road, Astra Street or Cardiff Road sites.

The Astra Street site is located near to wetlands listed as nationally important (DIWA) and under State Environmental Planning Policy (Coastal Management) 2018.

The proposed modification would require minor disturbance of soils associated with site establishment, and ongoing management of surface runoff during use. With the implementation of standard management measures no significant impacts are expected.

8.6 Groundwater dependent ecosystems

The proposed modification would require minor disturbance of soils associated with site establishment, and ongoing management of surface runoff during use. With the implementation of standard management measures no changes to downstream hydrology are expected that could impact any groundwater dependent ecosystems.

A small artificial wetland would be removed at the Peatties Road site and during site regrading activities suitable alternative drainage arrangements would be provided to ensure there are no downstream impacts. As such, there are no expected impacts to groundwater dependent ecosystems.

8.7 National park estate

The original project SEARs required an assessment of potential impacts to land reserved under the *National Parks and Wildlife Act 1974* in accordance with the *Guidelines for developments adjoining land and water managed by DECCW* (DECCW 2010). These guidelines have now been replaced by *Developments adjacent to NPWS lands: Guidelines for consent and planning authorities* (NPWS 2020).

The Peatties Road, Cardiff Road and Lookout Road sites all drain to Ironbark Creek, which in turn drains to the Hunter Wetlands National Park about eight kilometres downstream. The Astra Street site is located about 240 metres from the Hunter Wetlands National Park at its closest point. As such, an assessment against the relevant biodiversity considerations in the new guidelines is provided in Table 8-2.

Table 8-2: Potential impacts to national park estate

Consideration	Assessment
Erosion and sediment runoff	The proposed modification would require minor disturbance of soils associated with site establishment, and ongoing management of surface runoff during use. With the implementation of standard management measures no significant impacts are expected (refer to section 8.1.2).
Stormwater runoff	The proposed modification involves temporary use of land and would not require the installation of a stormwater system that could impact national park estate.
Wastewater	The proposed modification involves temporary use of land and would not require the establishment of a wastewater system. Temporary facilities would be provided as required and would be serviced by licensed contractors.
Pests, weeds and edge effects	The proposed modification could increase the potential for the spread, introduction and establishment of high threat weed species and spread pathogens. With the implementation of standard management measures no significant impacts are expected (refer to section 8.1.2).
Fire and location of asset protection zones	The proposed modification would not increase the risk of fire within a national park or require the establishment of an asset protection zone within any national park.
Boundary encroachments and access through NPWS land	The proposed modification would not encroach on the boundary of any national park.
Visual, odour, noise, vibration, air quality and amenity impacts	The proposed modification involves temporary use of land and would not result in any significant temporary or ongoing visual, odour or amenity impacts. Artificial light required for night works is unlikely to result in any disruption to fauna within or near a national park with the implementation of standard management measures. The proposed modification would result in a short term increase in noise levels that would be noticeable within the national park near to the Astra Street site. However, no significant impacts to threatened fauna is expected. The extent of national park near to the Astra Street site is not an active public recreation area.
Threats to ecological connectivity and groundwater dependent ecosystems	The proposed modification would not impact on fauna connectivity (refer to sections 8.1 and 8.3) to any national park estate or any groundwater dependent ecosystem within a national park (refer to section 8.6).
Access to parks	The proposed modification involves temporary use of land and would not affect access to any national park.

8.8 Cumulative impacts

Cumulative impacts of the proposed modification beyond those already assessed as part of the broader project, would be negligible as a result of the proposed modification. The proposed modification would result in the removal of only 0.2 hectares of native vegetation, with no expected impacts to any threatened species or communities. Use of the ancillary sites will be short term and temporary, with no long term impacts anticipated.

9 Mitigation

Environmental management measures in section 7 of the SPIR detail specific environmental management measures to minimise potential impacts to biodiversity associated with construction areas for the proposal. As there are no significant biodiversity impacts associated with the proposed modification, no further environmental management measures are considered necessary beyond those summarised in section 7 of the SPIR and reproduced in Appendix G of the Newcastle Inner City Bypass – Rankin Park to Jesmond: Modification Report.

10 Offsetting

10.1 Ecosystem credits

The Biodiversity credit report (Annexure E) found that there are no credit requirements for impacts on native vegetation associated with the removal of 0.2 hectares of native vegetation at Peatties Road.

Table 10-1: Ecosystem credits

Vegetation zone	Plant community type (PCT)	Area impacted (ha)	Ecosystem credits required
1	1071 (good)	0.2	0

10.2 Species credits

There are no credit requirements for impacts on threatened species and threatened species habitat associated with the removal of 0.2 hectares of native vegetation at Peatties Road.

10.3 Aquatic offsets

There are no aquatic offsets associated with the proposed modification.

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Annexure A – Species recorded

Recorded flora

Family	Exotic	Scientific name	Common Name	Peatties Road						Cardiff Road				Astra Street								Lookout Road
				1		2		3		4		5		6		7		8		9		n/a
				%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	n/a
Oxalidaceae	-	*Oxalis* spp.	-							0.1	3					0.1	3					
Apocynaceae	-	*Parsonsia straminea*	Common Silkpod													0.1	1					
Verbenaceae	*	*Verbena bonariensis*	Purpletop	3	15							0.5	3	8	500	0.2	5	2	10	1	10	
Poaceae	*	*Paspalum dilatatum*	Paspalum	0.9	10							2	20			0.2	2	8	50	5	100	
Vitaceae	-	*Cayratia clematidea*	Native Grape													0.2	2					
Poaceae	*	*Hyparrhenia hirta*	Coolatai Grass	85	1000	0.2	10			5	50			8	50	0.3	4			65	1000	
Poaceae	*	*Stenotaphrum secundatum*	Buffalo Grass							2	100	5	500	50	1000	0.5	10					X
Poaceae	-	*Cynodon dactylon*	Common Couch	1	100									20	500	0.8	50	25	500	5	100	
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne													1	5					
Asteraceae	*	*Bidens pilosa*	-											0.5	50	2	20	3	50			
Oleaceae	*	*Ligustrum sinense*	Small leaf Privet													2	3					
Arecaceae	*	*Syagrus romanzoffiana*	Cocos Palm													6	3					
Myrtaceae	-	*Callistemon salignus*	Willow Bottlebrush													8	4					
Oleaceae	*	*Olea europaea* subsp. *cuspidata*	African Olive											6	1	10	2					
Verbenaceae	*	*Lantana camara*	Lantana			5	10	2	3	2	4					20	10					X
Casuarinaceae	-	*Casuarina glauca*	Swamp Oak											0.1	1	30	20					

Family	Exotic	Scientific name	Common Name	Peatties Road						Cardiff Road				Astra Street								Lookout Road
				1		2		3		4		5		6		7		8		9		n/a
				%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	n/a
Poaceae	*	*Megathyrus maximus*	-	0.5	10	0.5	6	0.5	10	90	500	75	500	10	100	90	1000	35	500	7	30	X
Caryophyllaceae	-	*Spergularia marina*	Lesser Sea-spurrey																	0.1	2	
Asteraceae	*	*Sonchus oleraceus*	Milk Thistle									10	100	2	50					0.2	3	
Convolvulaceae	-	*Ipomoea cairica*	Coastal Morning Glory					0.2	3											0.7	3	
Poaceae	*	*Axonopus fissifolius*	-																	3	100	
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues	0.5	30							3	50	15	1000			5	500	6	1000	
Poaceae	*	*Setaria pumila*	Pigeon Grass	0.1	10									2	30			15	200	8	100	
Poaceae	*	*Chloris gayana*	Rhodes Grass															25	100	15	100	
Euphorbiaceae	*	*Ricinus communis*	Castor Oil Plant					3	5									0.1	1			X
Poaceae	*	*Eragrostis curvula*	African Lovegrass															20	500			
Fabaceae (Mimosoideae)	-	*Acacia maidenii*	Maiden's Wattle			8	1															
Fabaceae (Mimosoideae)	-	*Acacia pendula*	Weeping Myall	0.5	1																	
Adiantaceae	-	*Adiantum aethiopicum*	Common Maidenhair			25	100															
Adiantaceae	-	*Adiantum hispidulum*	Rough Maidenhair			0.1	1															
Asteraceae	*	*Ambrosia artemisiifolia*	Annual Ragweed	1	50					0.7	20			3	20							
Poaceae	*	*Briza subaristata*	-	0.2	20																	

Family	Exotic	Scientific name	Common Name	Peatties Road						Cardiff Road				Astra Street								Lookout Road	
				1		2		3		4		5		6		7		8		9		n/a	
				%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	n/a	
Poaceae	-	*Capillipedium spicigerum*	Scented-top Grass	5	50																		
Lauraceae	-	*Cassytha pubescens*	Downy Dodder-laurel							2	4												
Myrtaceae	-	*Corymbia maculata*	Spotted Gum							1	1												
Malaceae	*	*Cotoneaster glaucophyllus*	-	0.8	2																		
Lauraceae	-	*Cryptocarya glaucescens*	Jackwood			2	4																
Fabaceae (Faboideae)	*	*Dipogon lignosus*	Dolichos Pea							0.8	20												
Myrtaceae	-	*Eucalyptus grandis x saligna*	-			15	2																
Myrtaceae	-	*Eucalyptus paniculata*	Grey Ironbark							2	1												
Myrtaceae	-	*Eucalyptus pilularis*	Blackbutt							10	4												
Myrtaceae	-	*Eucalyptus umbra*	Broad-leaved White Mahogany							8	3												
Myrtaceae	-	*Eucalyptus saligna*	Sydney Blue Gum							1	1												
Apiaceae	*	*Foeniculum vulgare*	Fennel									0.7	2	0.8	3								
Fabaceae (Faboideae)	-	*Glycine tabacina*	Variable Glycine							0.1	20												
Sapindaceae	-	*Guioa semiglauca*	Guioa							2	2												
Apiaceae	*	*Hydrocotyle bonariensis*	Largeleaf Pennywort											0.5	20								

Family	Exotic	Scientific name	Common Name	Peatties Road						Cardiff Road				Astra Street								Lookout Road
				1		2		3		4		5		6		7		8		9		n/a
				%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	n/a
Convolvulaceae	-	*Ipomoea indica*	Morning Glory			2	5	0.5	3	0.5	10											X
Bignoniaceae	*	*Jacaranda mimosifolia*	Jacaranda			3	2															
Oleaceae	*	*Ligustrum lucidum*	Large-leaf Privet			80	50			15	4											
Poaceae	*	*Lolium perenne*	Perennial Ryegrass									2	50									
Poaceae	*	*Melinis repens*	Red Natal Grass					2	20													
Davalliaceae	-	*Nephrolepis cordifolia*	Fishbone Fern			4	50			0.5	10											
Apocynaceae	*	*Nerium oleander*	Oleander											0.2	1							
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant			8	50															
Poaceae	*	*Paspalum urvillei*	Vasey Grass											7	50							
Malvaceae	*	*Pavonia hastata*	-					0.1	1													
Poaceae	-	*Phragmites australis*	Common Reed					85	500													
Pittosporaceae	-	*Pittosporum undulatum*	Sweet Pittosporum			15	20			5	3											
Polygonaceae	*	*Polygala virgata*	-	0.2	10																	
Dennstaedtiaceae	-	*Pteridium esculentum*	Bracken							0.3	4											
Ripogonaceae	-	*Ripogonum album*	White Supplejack			2	3															
Rosaceae	*	*Rubus fruticosus* agg.	Blackberry complex	30	50																	
Menispermaceae	-	*Sarcopetalum harveyanum*	Pearl Vine			0.5	2															

Family	Exotic	Scientific name	Common Name	Peatties Road						Cardiff Road				Astra Street								Lookout Road
				1		2		3		4		5		6		7		8		9		n/a
				%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	%	Ab	n/a
Fabaceae (Caesalpinioideae)	*	*Senna pendula*	-					2	1													
Poaceae	*	*Setaria sphacelata*	South African Pigeon Grass	0.1	3							0.8	10									
Smilaceae	-	*Smilax australis*	Lawyer Vine			5	10															
Solanaceae	*	*Solanum mauritianum*	Wild Tobacco Bush					2	3													
Solanaceae	*	*Solanum nigrum*	Black-berry Nightshade	0.1	1																	
Poaceae	*	*Sorghum halapense*	Johnson's Grass									0.7	10									
Commelinaceae	*	*Tradescantia fluminensis*	Wandering Jew			75	1000															
Poaceae	*	*Triticum aestivum*	Wheat	0.1	2																	
Myrtaceae	-	*Callistemon salignus*	Willow Bottlebrush																			X
Basellaceae	*	*Anredera cordifolia*	Madeira Vine																			X

Note: *Cover was determined in accordance with the BAM.

Recorded fauna

Common Name	Scientific Name	Peatties Road	Astra Street	Cardiff Road	Lookout Road
Superb Fairy-Wren	*Malurus cyaneus*	X	X	-	-
Australian Raven	*Corvus coronoides*	-	X	-	-
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	X	-	-	-
Brown Thornbill	*Acanthiza pusilla*	X	-	-	X
Eastern Whipbird	*Psophodes olivaceus*	X	-	-	-
Little Grassbird	*Megalurus gramineus*	X	-	-	-
Dollarbird	*Eurystomus orientalis*	X	-	-	-
Lewin's Honeyeater	*Meliphaga lewinii*	X	-	-	-
Bell Miner	*Manorina melanophrys*	X	-	-	-
White-browed Scrubwren	*Sericornis frontalis*	X	-	-	-
Brown-striped Frog	*Limnodynastes peronii*	X	X	-	-
Common Eastern Froglet	*Crinia signifera*	X	X	-	-
Australian White Ibis	*Threskiornis molucca*	-	X	-	-
Australian Magpie	*Cracticus tibicen*	-	X	-	-
Spotted Turtle-Dove	*Streptopelia chinensis*	-	X	-	-
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	-	X	-	-
Little Wattlebird	*Anthochaera chrysoptera*	-	X	-	-
Golden-headed Cisticola	*Cisticola exilis*	-	X	-	-
Australian Pipit	*Anthus novaeseelandiae*	-	X	-	-
Swamp Harrier	*Circus approximans*	-	X	-	-
Noisy Miner	*Manorina melanocephala*	-	X	-	-
Little Black Cormorant	*Phalacrocorax sulcirostris*	-	X	-	-

Common Name	Scientific Name	Peatties Road	Astra Street	Cardiff Road	Lookout Road
Pied Cormorant	*Phalacrocorax varius*	-	X	-	-
Whistling Kite	*Haliastur sphenurus*	-	X	-	-
Willie Wagtail	*Rhipidura leucophrys*	-	X	-	-
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	-	X	-	-
Sulphur-crested Cockatoo	*Cacatua galerita*	-	-	-	X
European Hare	*Lepus europaeus*	-	X	-	-

Annexure B – Likelihood of occurrence

Habitat suitability Assessment criteria

Likelihood	Criteria
Recorded	The species was observed in the assessment area during the current survey
High	It is highly likely that a species inhabits the assessment area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the assessment area. Also includes species known or likely to visit the assessment area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the assessment area. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the assessment area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the assessment area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	No suitable habitat present or presence of low value suitable habitat (e.g. disturbed conditions; isolated small habitat area; fragmented movement corridors). The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the assessment area. Not recorded.

Note strictly marine and pelagic species have been removed from the assessment as there is no habitat for these species contained within the sites.

CE=Critically Endangered, E = Endangered, V = Vulnerable, C, J and K denote migratory species listed under the CAMBA, JAMBA or ROKAMBA conventions.

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Litoria aurea	Green and Golden Bell Frog	E	V	-	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Found in differing habitat throughout NSW and Victoria. Likely to occur in areas where Juncus kraussii, Schoenoplectus litoralis and Sporobolus virginicus are present (Pyke et. al, 2002). Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (Gambusia holbrooki), have a grassy area nearby and diurnal sheltering sites available but can occupy disturbed habitat. Breeds in permanent or ephemeral ponds during late winter to early autumn, but generally during September–February with a peak around January–February after heavy rain or storms (Daly 1995; White 2001).	Low
Crinia tinnula	Wallum Froglet	V	-	2	Inhabits acid paperbark swamps and sedge swamps along the northern and central coast regions of NSW. It is generally not associated with disturbed habitats (Renwick 2006).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Heleioporus australiacus	Giant Burrowing Frog	V	V	-	A slow growing, long-lived species occurring along the coast and eastern slopes of the Great Dividing Range in NSW. Appears that the NSW population is distinct from the Victorian population, and is confined to the sandstone geology of the Sydney Basin. Found in heath, woodland and open dry sclerophyll forest with sandy soils. Species spends the majority of its time in non-breeding habitat up to 300 m from breeding sites where it burrows below the soil surface or in the leaf litter. Breeding habitat is generally soaks or pools within first or second order streams or 'hanging swamp' seepage lines and where small pools form from the collected water. Giant Burrowing Frogs emerge to feed or breed after rain. Diet includes mainly invertebrates including ants, beetles, cockroaches, spiders, centipedes and scorpions. Breeds mainly in autumn, but has been recorded calling throughout the year.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Mixophyes balbus	Stuttering Frog	E	V	-	Occurs along the east coast of Australia in eastern-flowing streams of the Great Dividing Range. Has undergone a massive range reduction particularly in the south of its range: within the Sydney Basin, White (2008a) located only 3 populations south of Sydney (Macquarie Pass and Mt Werong) and Daly et al. (2002, in White 2008a) found only 2 extant populations between Macquarie Pass and Victoria. Inhabits rainforest and wet, tall, open forest. Adult frogs shelter in deep leaf litter and thick understorey vegetation on the forest floor, but actively move about above ground at night after heavy rainfall. Feeds on insects and smaller frogs. Is an obligate stream breeder, breeding in from early Spring to mid-Autumn, usually after heavy rain. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts (Mahony et al 1997).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Oxyura australis	Blue-billed Duck	V	-	1	Partly migratory, travels short distances between breeding swamps and over-wintering lakes. Young birds disperse in April-May from breeding swamps in inland NSW to Murray River system and coastal lakes. Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. Nests in Cumbungi over deep water or in trampled Lignum, sedges or spike-rushes. Completely aquatic, swimming along the edge of dense cover.	Low
Apus pacificus	Fork-tailed Swift	-	C,J,K	2	The Fork-tailed Swift is a non-breeding visitor to all Australian states and territories and has been recorded in all regions of NSW, particularly east of the Great Divide. Almost exclusively aerial while in Australia, they forage up to 300 metres above ground level, often around cliffs where they utilise the updraughts to assist with flight. Occur mostly over inland plains and dry or open habitats but also recorded above foothills and coastal areas as well as towns, urban areas and cities.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Hirundapus caudacutus	White-throated Needletail	-	V,C,J,K	2	Recorded along NSW coast to the western slopes and occasionally from the inland plains. Breeds in northern hemisphere. Almost exclusively aerial while in Australia. Occur above most habitat types, but are more frequently recorded above more densely vegetated habitats (rainforest, open forest and heathland) than over woodland or treeless areas.	Low
Charadrius bicinctus	Double-banded Plover	-	-	-	Found in both coastal and inland areas. During the non-breeding season, it is common in eastern and southern Australia. Breeds only in New Zealand. Found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Charadrius leschenaultii	Greater Sand-plover	V	V,C,J,K	-	Does not breed in Australia. In NSW, recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Occurs mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; forage on wet ground at low tide.	Low
Charadrius mongolus	Lesser Sand-plover	V	E,C,J,K	-	Does not breed in Australia. Found along the entire coast of Australia, most common in northern NSW, QLD and the Gulf of Carpentaria. Rarely recorded south of the Shoalhaven. In NSW almost entirely coastal, on beaches of sheltered bays, harbours and estuaries with large intertidal sand or mudflats, occasionally on sandy beaches, coral reefs and rock platforms.	Low
Pluvialis fulva	Pacific Golden Plover	-	C,J,K	-	Breeds in the northern hemisphere. In Australia occurs mainly in coastal areas but also recorded inland. Important sites in NSW include the Hunter and Shoalhaven River estuaries. Usually occur on beaches, mudflats and sandflats in sheltered areas.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Pluvialis squatarola	Grey Plover	-	C,J,K	-	Breed in the northern Hemisphere. Widespread on Australian coast in the non-breeding season. Occur almost entirely in coastal areas, usually in sheltered embayments with mud or sandflats and occasionally on rocky coasts or near-coastal lakes and swamps. Very occasionally recorded further inland. Forage on exposed mudflats and beaches.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Thinornis cucullatus cucullatus	Hooded Plover (eastern)	CE	V	-	The Hooded Plover is endemic to southern Australia and is nowadays found mainly along the coast from south of Jervis Bay. In the late 1920s and early 1930s the species was recorded from Port Stephens but are now considered locally extinct. It has not been seen in the Sydney area since the 1940s. Occasionally, individual birds are sighted slightly further north to the Shoalhaven River and Comerong Beach and one bird was sighted at Lake Illawarra in March 2001. Hooded Plovers prefer sandy ocean beaches backed by sparsely vegetated sand-dunes for shelter and nesting. Hooded Plovers display high nest site fidelity and nest solitarily. Occasionally Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Irediparra gallinacea	Comb-crested Jacana	V	-	1	Occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW – some recorded in south-eastern NSW potentially in response to unfavourable conditions (OEH 2012).	Low
Anous stolidus	Common Noddy	-	C,J	-	#N/A	Low
Gelochelidon nilotica	Gull-billed Tern	-	C	1	Nomadic species found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. Only rarely found over the ocean. Although primarily an inland species, outside breeding season i prefers saltmarshes and lagoons near the coast.	Low
Onychoprion fuscata	Sooty Tern	V	-	1	Occurs over tropical and subtropical seas and islands around northern NSW. Occasionally seen along coastal NSW, especially after cyclones. Breeds in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Sternula albifrons	Little Tern	E	C,J,K	-	In NSW occurs mainly north of Sydney, with smaller numbers south to VIC. Almost exclusively coastal, preferring sheltered environments; may occur several kilometres from the sea in harbours, inlets and rivers . Nests in low dunes or sandy beaches just above high tide mark near estuary mouths/ adjacent to coastal lakes and islands. Forage in shallow waters of estuaries, coastal lagoons and lakes, also along open coasts, less often at sea, and usually within 50 m of shore.	Low
Sternula nereis	Australian Fairy Tern	-	V	-	Occurs along NSW coast. Inhabit offshore, estuarine or lake islands, wetlands, beaches and spits. Nests on coral shingle on continental islands or coral cays, on sandy islands and beaches inside estuaries and on open sandy beaches.	Low
Thalasseus bergii	Crested Tern	-	-	1	Distributed around the Australian coast, including Tasmania. It occurs on ocean beaches, estuaries and coastal lagoons and occasionally on salt lakes. The species is known to rest on sand spits, low points and reefs along coastal beaches and inlets. It rarely flies far from shore out to sea or inland on bodies of fresh water.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Rostratula australis	Australian Painted Snipe	E	E	-	Occurs widely but unevenly across the continent. Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. Nests on the ground amongst tall reed-like vegetation near water. Feeds on mudflats and the water's edge taking insects, worm and seeds. Prefers fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	Low
Actitis hypoleucos	Common Sandpiper	-	C,J,K	-	Breeds in Eurasia, usually occurring in Australia from July until early June. When in Australia it is found on all coastlines and some inland wetlands, but is concentrated in the north and west with important areas in WA, the NT and Qld. Utilises a wide range of coastal and inland wetlands with varying salinity levels. Mostly found around muddy margins that are narrow and may be steep, or rocky shores and rarely mudflats. Often associated with mangroves. Forages in shallow water and bare soft mud, often around obstacles such as rocks or mangrove roots. May also venture into grassy areas adjoining wetlands. Typically roosts on rocks or in roots or branches of vegetation, especially mangroves. Known to also perch on posts, jetties and other artificial structures.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Arenaria interpres	Ruddy Turnstone	-	C,J,K	-	Breeds in northern Hemisphere. In non-breeding season, widespread in most coastal regions of Australia with occasional inland records. Strongly prefers rocky shores or beaches with large seaweed deposits.	Low
Calidris acuminata	Sharp-tailed Sandpiper	-	C,J,K	2	Breeds in Siberia but most of the population spends the non-breeding season in Australia, mostly in the south-east. Sharp-tailed Sandpiper are widespread in both inland and coastal locations and in both freshwater and saline habitats. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coasts and dams, waterholes, soaks , bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They use flooded paddocks, sedgelands and other ephemeral wetlands but leave when they dry. Sometimes occurring on rocky shores and rarely on exposed reefs. They forage on seeds, worms, molluscs, crustaceans and insects at the edge of the water of wetlands or intertidal mudflats either on bare wet mud or sand, or in shallow water. Also forage among inundated vegetation of saltmarsh, grass or sedges. Roosting occurs at the edges of wetlands, on wet open	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
					mud or sand, in shallow water or in short sparse vegetation.	
Calidris canutus	Red Knot	-	E,C,J,K	-	Breeds in northern hemisphere. Occurs in coastal areas around Australia, with important sites in VIC, SA, WA, NT and Qld. Mainly inhabits intertidal mudflats, sandflats and sandy beaches. Occasionally seen in terrestrial saline wetlands but rarely in freshwater wetlands. Forage in soft substrates in intertidal areas.	Low
Calidris ferruginea	Curlew Sandpiper	E	CE,C,J,K	-	Breeds in northern hemisphere. In Australia generally occupies littoral and estuarine habitats. In NSW mainly found in intertidal mudflats on sheltered coasts. Roosts on beaches, spits or islands on the coast/in wetlands, or in saltmarsh on rocky shores.	Low
Calidris melanotos	Pectoral Sandpiper	-	J,K	-	Widespread but scattered records across NSW, east of the divide and in the Riverina and Lower Western regions. Breeds in the northern hemisphere. In Australasia, prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Usually in coastal or near-coastal habitats, and prefers wetlands with open mudflats and low emergent or fringing vegetation such as grass or samphire.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Calidris ruficollis	Red-necked Stint	-	C,J,K	-	Distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. Breeds in Siberia and sporadically in north and west Alaska. In Australasia, mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals.	Low
Calidris tenuirostris	Great Knot	V	CE,C,J,K	-	Breeds in northern hemisphere. In Australia, prefers sheltered coastal habitats with large intertidal mud or sandflats, including inlets, bays, harbours, estuaries and lagoons. Occasionally found on exposed reefs or rock platforms, mangroves, saltwork ponds, near-coastal swamps, salt lakes and non-tidal lagoons. Rarely occurs on inland lakes and swamps. Roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding areas.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Gallinago hardwickii	Latham's Snipe	-	C,J,K	3	Cryptic, non-breeding visitor to Australia. Occurs along the coast and west of the Great Dividing Range in permanent and ephemeral wetlands up to 2000 m asl. Highly mobile and distribution is naturally fragmented due to the patchy nature of preferred habitat. Found in a range of freshwater habitats, usually with low, dense vegetation nearby including flooded meadows, seasonal swamps, open waters, bogs, waterholes, billabongs, lagoons, lakes, creek margins and floodplains. Can also occur in saline/brackish habitats and in modified or artificial habitats close to human activity. Vegetation structure and composition not important in determining habitat suitability and the species may be found in a variety of vegetation types or communities including tussock grasslands with rushes, reeds, sedges, lignum, tea-tree scrub, button-grass plains, alpine herb fields and open forest. Forages in mud or shallow waters with some form of dense vegetation cover. Roosts in sheltered areas on the ground near foraging grounds.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Gallinago megala	Swinhoe's Snipe	-	C,J,K	-	Swinhoe's Snipe is recorded in north Australia, particularly the Kimberley region, from October–April. It is a non-breeding migrant to Australia and occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands, drier cultivated areas (including crops of rapeseed and wheat) and market gardens (Higgins & Davies 1996).	Low
Gallinago stenura	Pin-tailed Snipe	-	C,J,K	-	The species distribution within Australia is not well understood. There are confirmed records from NSW, south-west Western Australia, Pilbara and the Top End. In NSW a single banded bird was reported near West Wyalong. During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands (Higgins & Davies 1996).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Limicola falcinellus	Calidris falcinellus	V	C,J,K	-	Breeds in the northern hemisphere. In the non-breeding season most common in north and north west of Australia, but is a regular visitor in small numbers to the NSW coast from Ballina to Shoalhaven Heads. Occurs on sheltered parts of the coast, favouring estuarine mudflats but also occasionally in saltmarshes, freshwater lagoons, saltworks and sewerage farms. Forage on exposed mudflats or wet sand.	Low
Limosa lapponica	Bar-tailed Godwit	-	C,J,K	-	Has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Breeds in the north of Scandinavia, Russia and north-west Alaska. Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Low
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	-	V,C,J,K	-	Subspecies most frequently recorded along major coastal river estuaries and sheltered embayments when in NSW. Occurs around beds of seagrass, and sometimes in nearby saltmarsh. Roost areas are on sandy beaches, sandbars, spits and near-coastal saltmarsh.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Limosa limosa	Black-tailed Godwit	V	C,J,K	-	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Numenius madagascariensis	Eastern Curlew	-	CE,C,J,K	-	Within Australia, the species has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Breeds in Russia and north-eastern China. Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Numenius minutus	Little Curlew	-	C,J,K	-	Generally spend the non-breeding season in northern Australia. In NSW, most records are scattered east of the Great Dividing Range, from Casino, south to Greenwell Point with a few scattered records west of the Great Dividing Range. Recorded breeding in Siberia. Most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Numenius phaeopus	Whimbrel	-	C,J,K	-	A regular migrant to Australia and New Zealand, with a primarily coastal distribution. There are also scattered inland records in all regions. It is found in all states but is more common in the north. It is found along almost the entire coast of Queensland and NSW. Breeds in north and west Alaska, Eurasia and Iceland. Often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Philomachus pugnax	Ruff	-	C,J,K	-	In NSW the species has been recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. The species has also found around the Riverina, including Windouran Swamp, Wanganella, Fivebough Swamo and the Tullakool Saltworks. Most NSW records come from the Sydney region. In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. They are occasionally seen on sheltered coasts, in harbours, estuaries, seashores and are known to visit sewage farms and saltworks. They are sometimes found on wetlands surrounded by dense vegetation including grass, sedges, saltmarsh and reeds.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Tringa brevipes	Grey-tailed Tattler	-	C,J,K	-	Non-breeding visitor to Australia. In NSW occurs along the coast from the Queensland border south to Tilba Lake, and has been recorded as far south as Gippsland. In NSW it is recorded more frequently north of Sydney. Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Inland records are rare. Forages in shallow water in intertidal areas. Usually roosts in the branches of mangroves or rocks which may be partly submerged. Also rarely recorded in dense shrubs, on driftwood or sand dunes.	Low
Tringa nebularia	Common Greenshank	-	C,J,K	-	Does not breed in Australia, but occurs in all types of wetlands. In NSW has been recorded in most coastal regions and is widespread west of the Great Dividing Range, particularly in the north-west, Macquarie Marshes and areas between the Lachlan and Murray Rivers and Darling River drainage basin. The Hunter River estuary is an internationally important site for the species. In coastal areas typically occurs in sheltered habitats with large mudflats and saltmarsh, mangroves or seagrass.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Tringa stagnatilis	Marsh Sandpiper	-	C,J,K	1	Breeds in N Hemisphere. Occurs in coastal and inland wetlands, including freshwater and estuarine habitats, throughout Australia. All regions of NSW but particularly central and south coasts and western slopes and plains. Sites of national importance in NSW include Parkes wetlands, Macquarie Marshes and Tullakool Evaporation Ponds.	Low
Xenus cinereus	Terek Sandpiper	V	C,J,K	-	The two main sites for this species in NSW are the Richmond River and Hunter River estuaries. Inhabits coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks near mangroves, also observed on rocky pools and reefs and up to 10 km inland around brackish pools. Roost communally in mangroves or dead trees. Forages in open intertidal mudflats.	Low
Botaurus poiciloptilus	Australasian Bittern	E	E	-	Widespread but uncommon over most NSW except the northwest. Favours permanent freshwater wetlands with tall dense reedbeds particularly Typha spp. and Eleocharis spp., with adjacent shallow, open water for foraging. Roosts during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Ixobrychus flavicollis	Black Bittern	V	-	1	Occurs from southern NSW to Cape York and the Kimberley, and southwest WA. Inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. May occur in flooded grassland, forest, woodland, rainforest and mangroves as long as there is permanent water. Roosts by day in trees or within reeds on the ground. Nests in branches overhanging water and breeds from December to March.	Low
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	1	In NSW, becomes increasingly uncommon south of the Northern Rivers region, and rarely occurs south of Sydney. Breeding recorded as far south as Bulahdelah, though most breeding in NSW occurs in the north-east. Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. Breeds during summer, nesting in or near a freshwater swamp.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Plegadis falcinellus	Glossy Ibis	-	C	3	Occurs throughout eastern and northern Australia, east of the Kimberley and Eyre Peninsula. Largest areas of prime habitat are inland and northern floodplains, with largest numbers in the Top End and Channel Country. Preferred habitats are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Breeds at limited locations, with most records from the Murray Darling Basin (NSW), western Riverina (VIC), south-east (SA), Channel Country (Qld/ SA) and lower Ord/Keep Rivers (WA).	Low
Ptilinopus magnificus	Wompoo Fruit-Dove	V	-	3	Occurs from Hunter River to Cape York, but rare south of Coffs Harbour. No recent records from Illawarra where it once occurred. Inhabits rainforest, low elevation moist eucalypt forest and brush box forests, mostly in mature forest but also remnant and regenerating rainforest. Feeds on fruit and is locally nomadic following food availability. Builds nest platform on thin branch or palm frond, often over water, usually 3-10m above ground.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Ptilinopus regina	Rose-crowned Fruit-Dove	V	-	5	Occurs from Newcastle north to Cape York, with vagrants occasionally as far south as Victoria. Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. Thought to be locally nomadic in response to fruit availability.	Low
Ptilinopus superbus	Superb Fruit-Dove	V	-	4	Occurs mainly north from NE NSW, much less common further south and largely confined to pockets of habitat south to Moruya. Vagrants occur south to VIC and TAS. Inhabits rainforest and closed forests, may also forage in eucalypt or acacia woodland with fruit-bearing trees. Nests 5-30 m above ground in rainforest/rainforest edge tree and shrub species. Part of the population migratory/nomadic.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Merops ornatus	Rainbow Bee-eater	-	J	2	Distributed across much of mainland Australia, and several near-shore islands. Occurs in a range of habitats, including open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia. Nests are made in sandy banks.	Low
Cuculus optatus	Oriental Cuckoo	-	-	2	Migrates to Australia from northern Asia from September until May. Mainly seen in Northern Australia, but has been recorded along the NSW coast as far as the Shoalhaven area. Arboreal and unobtrusive, rarely calling when non-breeding. Uses a wide range of dense to open woodlands and forests, especially edges of riparian forest and sometimes gardens.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Erythrotriorchis radiatus	Red Goshawk	CE	V	-	Very rare in NSW, generally confined to the Northern Rivers bioregion with most records in the Clarence River catchment with few around the lower Richmond and Tweed Rivers. In habitat open woodland and forest, preferring mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers. Preferred habitats include a mosaic of vegetation types, a large population of birds (prey) and permanent water. Adults have large home ranges (up to 120 km^2 in NT), and in NSW appear to move from nesting areas in the ranges to coastal areas to coastal plains. Generally breed in tall trees within 1 km of a river or wetland.	Low
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	C	4	Primarily coastal but may extend inland over major river systems. Breeds close to water, mainly in tall open forest/woodland but also in dense forest, rainforest, closed scrub or remnant trees. Usually forages over large expanses of open water, but also over open terrestrial habitats (e.g. grasslands).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Hieraaetus morphnoides	Little Eagle	V	-	1	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites Little Eagle require a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	Low
Lophoictinia isura	Square-tailed Kite	V	-	1	Occurs across NSW, resident in North, northeast and along west-flowing rivers. Summer breeding migrant to southeast of state. Inhabits a variety of habitats including dry woodlands and open forests, with preference for timbered watercourses. Favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains. In Sydney area nests in mature living trees within 100m of ephemeral/permanent watercourse. Large home range > 100 km2. Specialist hunter of passerines and insects. Breeding is from July to February, building nests in the tree forks or large horizontal limbs along or near timbered watercourses.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Pandion cristatus	Eastern Osprey	V	-	-	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. Breeding takes place from July to September in NSW, with nests being built high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea, though there are a handful of records from inland areas.	Low
Falco hypoleucos	Grey Falcon	E	V	-	Inhabits shrubland, grassland and wooded watercourses of arid and semi-arid regions, and occasionally open woodlands throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Breeding only occurs within arid areas of the Great Dividing Range. Its diet consists of other birds, especially parrots and pigeons, reptiles and small mammals. Nesting occurs in disused nests of other birds of prey and ravens, high in a living eucalypt near water or a watercourse. Breeding occurs in late winter and early spring.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	1	The Dusky Woodswallow is widespread from the coast to inland, including the western slopes of the Great Dividing Range and farther west. It is often recorded in woodlands and dry open sclerophyll forests, and has also been recorded in shrublands, heathlands regenerating forests and very occasionally in moist forests or rainforests. The understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, often with coarse woody debris. It is also recorded in farmland, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. The nest is an open shallow untidy cup frequently built in an open hollow, crevice or stump. Although Dusky Woodswallows have large home ranges, individuals may spend most of their time in about a 2 ha range and defend an area about 50 m around the nest. Dusky Woodswallows prefer larger remnants over smaller remnants. Competitive exclusion by Noisy Miners (Manorina melanocephala) is a significant threat to this species.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Anthochaera phrygia	Regent Honeyeater	CE	CE	3	Distribution extends from south-east Queensland to central Victoria. Preferred habitat is dry open forests and woodlands, particularly box-ironbark eucalypt woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes. Also uses remnant patches including travelling stock routes and roadside reserves when moving between habitat and areas of flowering eucalypt. Feeds on invertebrates and nectar from mistletoe and eucalypts. Breeding corresponds with flowering Eucalypts. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. Nest is an open cup-shaped nest is constructed of bark, grass, twigs and wool by the female. In NSW confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees,	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
					high canopy cover and abundance of mistletoes.	
Epthianura albifrons	White-fronted Chat	V	-	1	This species occurs from southern Queensland to Western Australia and down to Tasmania, mostly in temperate to arid climates and very rarely in sub-tropical areas. It is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands. Along the coast they are found in estuarine and marshy habitats with vegetation <1m tall, and in open grasslands and areas bordering wetlands. Inland, they are often observed in grassy plains, salt lakes and saltpans along waterway margins.	Low
Grantiella picta	Painted Honeyeater	V	V	-	Nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Inhabits Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests. Specialist forager on the fruits of mistletoes, preferably of the Amyema genus. Nests in outer tree canopy.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Monarcha melanopsis	Black-faced Monarch	-	-	14	Found along the coast of eastern Australia, becoming less common further south. Found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. Resident in the north of its range, but is a summer breeding migrant to coastal south-eastern Australia, arriving in September and returning northwards in March. It may also migrate to Papua New Guinea in autumn and winter.	Low
Symposiachrus trivirgatus	Spectacled Monarch	-	-	-	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. Prefers thick understorey in rainforest, wet gullies and waterside vegetation as well as mangroves.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Myiagra cyanoleuca	Satin Flycatcher	-	-	-	Occurs on the east coast of Australia from far northern Queensland to Tasmania. Not a commonly seen species, particularly in the far south of its range where it is a summer breeding migrant. In NSW the species is widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabits wetter habitats such as heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses but generally not in rainforests. Aerial forager, hawking insects from perches in the mid to upper canopy.	Low
Symposiachrus trivirgatus	Spectacled Monarch	-	-	1	The Spectacled Monarch is found in coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. It is much less common in the south. Prefers thick understorey in rainforest, wet gullies and waterside vegetation as well as mangroves.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Motacilla flava	Yellow Wagtail	-	C,J,K	-	This species breeds in temperate Europe and Asia, occurring in Australia between September and April. Mostly recorded in northern Australia, rarely further south. Small numbers in recent years have been detected in NSW but restricted to the Newcastle area. They occur in open country habitat with disturbed ground and some water and have been recorded in short grass and bare ground, swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and town lawns.	Low
Daphoenositta chrysoptera	Varied Sittella	V	-	2	Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Rhipidura rufifrons	Rufous Fantail	-	-	24	Found along NSW coast and ranges. Inhabits rainforest, dense wet forests, swamp woodlands and mangroves. During migration, it may be found in more open habitats or urban areas (Birds Australia 2008).	Low
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	2	Restricted to the south-eastern coast and highlands, from the lower Hunter and northern Blue Mountains to the Southwestern Slopes, south to and contiguous with the Victorian population. Inhabits eucalypt open forests and woodlands with an acacia understorey. In summer it lives in moist highland forest types, and in winter it moves to more open types at lower elevations. The Gang-Gang Cockatoo nests in hollows in the trunks, limbs or dead spouts of tall living trees, especially eucalypts, often near water. The Gang-gang Cockatoo feeds on seeds obtained in trees and shrubs, mostly from eucalypts and wattles.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	3	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Allocasuarina species. Prefers woodland and open forests, rarely away from Allocasuarina. Roost in leafy canopy trees, preferably eucalypts, usually <1 km from feeding site. Nests in large (approx. 20 cm) hollows in trees, stumps or limbs, usually in Eucalypts (Higgins 1999).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Glossopsitta pusilla	Little Lorikeet	V	-	6	Occurs from coast to western slopes of the Great Dividing Range. Inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands Eucalyptus albens and E. melliodora are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3 cm) hollows in living, smooth-barked eucalypts, especially Eucalyptus viminalis, E. blakelyi and E. dealbata. Most breeding records are from the western slopes.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Lathamus discolor	Swift Parrot	E	CE	8	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps. In NSW, larger numbers are recorded on the coast, particularly during drought conditions inland. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat. Preferentially forages in large, mature trees with more reliable nectar resources.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Neophema pulchella	Turquoise Parrot	V	-	1	Occurs from coast to inland slopes. In coastal area, most common between Hunter and Northern Rivers, and further south in S Coast. Inhabits open eucalypt woodlands and forests, typically with a grassy understorey. Favours edges of woodlands adjoining grasslands or timbered creek lines and ridges. Feeds on the seeds of native and introduced grasses and other herbs. Grasslands and open areas provide important foraging habitat for this species while woodlands provide important roosting and breeding habitat. Nests in tree hollows, logs or posts from August to December.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Ninox connivens	Barking Owl	V	-	2	Occurs from the coast to the inland slopes and plains in open woodlands and the edges of forests, often adjacent to farmland. Flexible in its habitat use, although suitable habitat is usually dominated by Eucalyptus species, including Eucalyptus camaldulensis, Eucalyptus albens, Eucalyptus polyanthemos and Eucalyptus blakelyi. They nest in hollows of large, old eucalypts, particularly along timbered waterways or wetlands. Usually associated with mature forests with a high density of large trees that support preferred prey species. Requires large territories in most habitats, which can be 2000 - 6000 hectares in NSW due to sparse prey densities.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Ninox strenua	Powerful Owl	V	-	131	Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha. Forages within open and closed woodlands as well as open areas.	Low
Tyto novaehollandiae	Masked Owl	V	-	7	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40 cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Tyto tenebricosa	Sooty Owl	V	-	6	Occurs in the coastal, escarpment and tablelands regions of NSW. More common in the north and absent from the western tablelands and further west. Inhabits tall, moist eucalypt forests and rainforests, and are strongly associated with sheltered gullies, particularly those with tall rainforest understorey. Roosts in tree hollows, amongst dense foliage in gullies or in caves, recesses or ledges of cliffs or banks. Nest in large (>40 cm wide, 100 cm deep) tree hollows in unlogged/unburnt gullies within 100m of streams or in caves.	Low
Saccolaimus flaviventris	Yellow-bellied sheathtail bat	V	-	1	Migrates from tropics to SE Australia in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts communally in large tree hollows and buildings (Churchill 2008).	Low
Mormopterus norfolkensis	East-coast freetail bat	V	-	15	Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark (Churchill 2008).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	287	Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Will also forage in urban gardens and cultivated fruit crops.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	1	Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley (Hoye and Schulz 2008). Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that flies over the canopy or along creek beds (Churchill 2008). In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.	Low
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	1	Occurs on southeast coast and ranges. Prefers tall (>20 m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts in hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12 km foraging movements recorded) (Churchill 2008, Law et al 2008).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Miniopterus australis	Little Bentwing-bat	V	-	83	Occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats (Churchill 2008, Hoye and Hall 2008).	Low
Miniopterus orianae oceanensis	Eastern Bentwing-bat	V	-	41	Generally occurs east of the Great Dividing Range along NSW coast (Churchill 2008). Inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. Only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females may travel hundreds of kilometres to the nearest maternal colony (Churchill 2008).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	6	Occurs on the east coast and Great Dividing Range. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks, typically below 500m asl. Forages in relatively uncluttered areas, using natural or man-made openings in denser habitats. Usually roosts in tree hollows or fissures but also under exfoliating bark or in the roofs of old buildings. Females congregate in maternal roosts in suitable hollow trees (Hoye and Richards 2008, Churchill 2008).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Vespadelus troughtoni	Eastern Cave Bat	V	-	1	Occurs in NE NSW south to Kempsey and west to the Warrumbungles. Inhabits rainforest margins, wet and dry sclerophyll forests through to drier forests and woodlands in semi-arid environments. All records are within close proximity to sandstone or volcanic escarpments. Roosts in overhangs and caves, mines, boulder piles, abandoned Fairy Martin nests and occasionally in buildings, and regularly switches between alternate roost colonies. Forages over a small area, but are capable of flying 500 m over clear paddocks (Churchill 2008, Parnaby et al 2008).	Low
Dasyurus maculatus	Spotted-tailed Quoll	V	E	3	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, usually traversed along densely vegetated creek lines.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Cercartetus nanus	Eastern Pygmy-possum	V	-	1	Occurs along the east coast of NSW, and inland to the Pilliga, Dubbo, Parkes and Wagga Wagga. Inhabits range of habitats from coastal heath and woodland though open and closed forests, subalpine heath and rainforest (Tulloch and Dickman 1995). Inhabits rainforest, sclerophyll forests and heath. Banksia spp. and myrtaceous shrubs and trees are favoured food sources and nesting subject sites in drier habitats. Diet mostly pollen and nectar from Banksia spp., Eucalyptus spp., Callistemon spp. and insects (Ward and Turner 2008). Nests in hollows in trees, under the bark of Eucalypts, forks of tea-trees, abandoned bird nests and Xanthorrhoea bases (Ward and Turner 2008, Tulloch and Dickman 2006).	Low
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	-	Occurs from the Shoalhaven north to the Queensland border. Now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. Occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Diet consists of vegetation in adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Petaurus norfolcensis	Squirrel Glider	V	-	77	Occurs along the drier inland slopes as well as coastal habitats. Inhabits woodland and open forest with a Eucalyptus, Corymbia or Angophora overstorey and a shrubby understorey of Acacia or Banksia. Key habitat components include reliable winter and early-spring flowering Eucalypts, Banksia or other nectar sources, and hollow-bearing trees for roost and nest sites (van der Ree and Suckling 2008, Quin et al 2004), with social groups moving between multiple hollows. Social groups include one or two adult males and females with offspring, and have home ranges of 5-10 ha within NSW (van der Ree and Suckling 2008, Kavanagh 2004).	Low
Phascolarctos cinereus	Koala	V	V	3	Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares.	Low
Potorous tridactylus	Long-nosed Potoroo	V	V	-	Restricted to east of the Great Dividing Range, with annual rainfall >760 mm. Inhabits coastal heath and dry and wet sclerophyll forests. Requires relatively thick ground cover and appears restricted to areas of light and sandy soil (Johnston 2008). Feeds on fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Pseudomys novaehollandiae	New Holland Mouse	-	V	-	Occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes (Wilson and Bradtke 1999). Populations may recolonise/ increase in size in regenerating native vegetation after wildfire, clearing and sandmining. Presence strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath (Lock and Wilson 1999).	Low
Cynanchum elegans	White-flowered Wax Plant	E	E	-	Occurs from Gerroa (Illawarra) to Brunswick Heads and west to Merriwa in the upper Hunter. Most common near Kempsey. Usually occurs on the edge of dry rainforest or littoral rainforest, but also occurs in Coastal Banksia Scrub, open forest and woodland, and Melaleuca scrub. Soil and geology types are not limiting.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Rutidosis heterogama	Heath Wrinklewort	V	V	-	This species has been recorded in several patches from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. On the Central Coast it is located north from Wyong to Newcastle. There are north coast populations between Wooli and Evans Head in Yuraygir and Bundjalung National Parks. It also occurs on the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes.	Low
Tetratheca glandulosa	-	V	-	1	Restricted to The Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong LGAs. Associated with shale-sandstone transition habitat (shale-cappings over sandstone). Occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils generally shallow, yellow, clayey/sandy loam, commonly with lateritic fragments. Vegetation varies from heath to open forest and is broadly equivalent to Sydney Sandstone Ridgetop Woodland community.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Tetratheca juncea	Black-eyed Susan	V	V	2969	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 50 km to edge of Sugarloaf Range. Occurs predominately in areas of over 1000 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.	Low
Acacia bynoeana	Bynoe's Wattle	E	V	-	Endemic to central eastern NSW, known a limited number of locations, often comprising populations of few plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches. Flowers September to March, and fruit matures in November.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Commersonia prostrata	Dwarf Kerrawang	E	E	-	Dwarf Kerrawang occurs on the Southern Highlands and Southern Tablelands (one plant at Penrose State Forest, one plant at Tallong, a small population near the Corang and about 2000 plants at Rowes Lagoon), a larger population in the Thirlmere Lakes area (particularly among the dying reeds at the edge of the water), and on the North Coast (less than 100 plants at the Tomago sandbeds north of Newcastle). Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum (Eucalyptus pauciflora) Woodland and Ephemeral Wetland floor at Rowes Lagoon; Blue leaved Stringybark (E. agglomerata) Open Forest at Tallong; and in Brittle Gum (E. mannifera) Low Open Woodland at Penrose; Scribbly Gum (E. haemostoma)/ Swamp Mahogany (E. robusta) Ecotonal Forest at Tomago	Low
Angophora inopina	Charmhaven Apple	V	V	-	Endemic to the Central Coast of NSW. Occurs in four main vegetation communities: Eucalyptus haemastoma - Corymbia gummifera - Angophora inopina woodland/forest; Hakea teretifolia–Banksia oblongifolia wet heath; Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina sedge woodland; and Eucalyptus capitellata–Corymbia gummifera–Angophora inopina woodland/forest.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Callistemon linearifolius	Netted Bottle Brush	V	-	3	Recorded from the Georges to Hawkesbury Rivers in Sydney, and north to Nelson Bay. There is also a recent record from the northern Illawarra. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Low
Eucalyptus camfieldii	Camfield's Stringybark	V	V	-	Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Eucalyptus parramattensis subsp. *decadens*	-	V	V	-	A woodland tree up to 15 m. There are two separate meta-populations consisting of the Kurri Kurri meta - population bordered by Cessnock - Kurri Kurri in the north and Mulbring - Abedare in the south, and the Tomago Sandbeds meta - population, which is bounded by Salt Ash and Tanilba Bay in the north and Williamtown and Tomago in the south. Generally occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.	Low
Melaleuca biconvexa	Biconvex Paperbark	V	V	9	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Rhodamnia rubescens	Scrub Turpentine	CE	CE	13	Shrub or small tree to 25 m high with reddish/brown fissured bark. Occurs in coastal districts north from Batemans Bay to areas inland of Bundaberg in Queensland. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m in areas with rainfall of 1000 – 1600 mm.	Low
Rhodamnia rubescens	Scrub Turpentine	CE	CE	-	Shrub or small tree to 25 m high with reddish/brown fissured bark. Occurs in coastal districts north from Batemans Bay to areas inland of Bundaberg in Queensland. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m in areas with rainfall of 1000 – 1600 mm.	Low
Rhodomyrtus psidioides	Native Guava	CE	CE	-	A shrub or small tree to 12 m high with brown scaly bark. Occurs from Broken Bay NSW to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Syzygium paniculatum	Magenta Lilly Pilly	E	V	5	Occurs in narrow coastal strip from Bulahdelah to Conjola State Forest. Grows in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.	Low
Caladenia tessellata	Thick Lip Spider Orchid	E	V	-	Occurs from Central Coast NSW to southern Victoria. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils (Duncan 2010).	Low
Corunastylis insignis	Wyong Midge Orchid 1, Variable Midge Orchid 1	CE	CE	-	A terrestrial orchid with a solitary cylindrical leaf that encloses the flowering stem. Appears to be associated with PCT 1636 - Scribbly Gum - Red Bloodwood - Angophora inopina (not always present) heathy woodland on lowlands of the Central Coast and variations containing Angophora costata (Smooth-barked Apple). Recent and historic disturbance regimes appear to influence above ground emergence. Typically flowers from September to October.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	-	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with Large Tongue Orchid and the Bonnet Orchid. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	Low
Diuris praecox	Rough Doubletail	V	V	2327	Occurs between Ourimbah and Nelson Bay, NSW. Grows on hills and slopes near the coast, in heathy open forest which have a dense grassy understorey.	Low
Phaius australis	Southern Swamp Orchid	E	E	-	Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Grows in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (OEH 2012).	Low
Prasophyllum sp. *Wybong*	-	-	CE	-	Endemic to NSW, known from seven populations within the Border Rivers, Central Rivers and Central West NRM regions. Known to occur in open eucalypt woodland and grassland (DotE 2014b).	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Pterostylis gibbosa	Illawarra Greenhood	E	E	-	Known from a small number of populations in the Illawarra, Nowra and Hunter regions. First collected in western Sydney. Only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. Grows in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum, Woollybutt and Melaleuca decora. Near Nowra, the species grows in an open forest of Spotted Gum, Forest Red Gum and Grey Ironbark. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark, Forest Red Gum and Black Cypress Pine.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Rhizanthella slateri	Eastern Australian Underground Orchid	V	E	-	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available (DECC 2005b; c). Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Flowers during October and November (Harden 1993).	Low
Muehlenbeckia costata	Scrambling Lignum	V	-	1	Scrambling Lignum is a scrambling climber. Grows in coarse sandy soils and peat in heath, mallee and open eucalypt woodland on granite or acid volcanic outcrops at higher altitudes. Scattered distribution from Queensland to the Blue Mountains in NSW.	Low
Persicaria elatior	Tall Knotweed	V	V	-	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Euphrasia arguta	-	CE	CE	-	Recently rediscovered near Nundle on the north-western slopes and tablelands, once known from scattered locations between Sydney, Bathurst and Walcha. Known populations occur in eucalypt forest with a mixed grass/shrub understorey, while previous records are described as occurring in open forest, grassy country and river meadows. Annual and dies back over winter. Dense stands observed in cleared firebreak areas, suggesting it may respond well to disturbance.	Low
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	5	Occurs between Moss Vale/Bargo and lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. Broad habitat range including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	Low
Grevillea shiressii	-	V	V	7	Known from only 2 populations near Gosford (at Mooney Mooney Creek and Mullet Creek). Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Low
Zieria smithii	Low growing form of Z. smithii, Diggers Head	E	-	14	Known only from Diggers Head at Coffs Harbour. Closely related forms occur on eight to ten headlands north to Byron Bay. Occurs in low heath with Kangaroo Grass (Themeda australis) on a coastal headland.	Low

Scientific Name	Common Name	Status		Number of records	Habitat	Likelihood of occurrence
		BC Act status	EPBC Act Status			
Thesium australe	Austral Toadflax	V	V	-	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass.	Low
Zannichellia palustris	-	E	-	1	Known from the Lower Hunter and Sydney Olympic Park. A submerged aquatic plant that grows in fresh or slightly saline water.	Low

Annexure C – Field data sheets

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

12578155 (KP2J) Penthie Road | Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	09 02 21			AB + FW			
Zone	Datum	Plot ID	001	Plot dimensions	20x50	Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m	154		
Vegetation Class						Confidence: H M L	
Plant Community Type	Exotic grassland			EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	60 45 60 40 30	5 15 20 10 5	5 0 0 0 35	0 0 0 0 0
Average of the 5 subplots				

20 30 20 5 5

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Scanned with CamScanner

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400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 09 02 21	PRATTLE Rd	001	A3 + FW

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
	1 COTONGASTER		0.8	2		
	2 PURPLETOP		3	15		
	3 COOLATAI GRASS		85	1000		
	4 BLACKBERRY		30	50		
*	5 ~~[illegible]~~ AMBROSIA ARTEMISIOIDES		1	30		
*	6 POLYGALA ? VIRGATA		0.2	10		
	7 PIGEON GRASS		0.1	10		
	8 PLANTAGO LANCEOLATA		0.5	30		
	9 COUCH GRASS		1	100		
	10 PASPALUM DILATATUM		0.9	~~30~~		
	11 CAPILLIPEDIUM SPICIGERUM		5	~~50~~		
*	12 BRIZA ~~MINOR~~ ? SUBARISTATA		0.2	20		
	13 SOLANUM MICRUM		0.1	1		
	14 MORARIA SISYRINCHIUM (GUINEA GRASS)		0.5	10		
	15 ACACIA PLENDULA		0.5	1		
	16 GIANT SETARIA		0.1	3		
*	17 ~~VOLUNTEER~~ TRITICUM AESTIVUM		0.1	2		
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	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

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BAM Site – Field Survey Form

12528155 Reattie Rd

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
		AB + FW

Date		Survey Name	Zone ID	Recorders			
				AB + FW			
Zone	Datum	Plot ID	002	Plot dimensions	20 x 50	Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m			
Vegetation Class						Confidence: H M L	
Plant Community Type				EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	IIII	1
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	IIII IIII IIII

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400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 04 02 21	PLATTE RD	002	ABm + FW

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
	1 L. GRANDIS? SALIGNA		15	2		
	2 LARGE-LEAVED PRIVET		80	50		
	3 ADIANTUM ~~RADDII~~ AETHIOPICUM		25	100		
	4 MILKY MOUSE WEED		8	50		
	5 TRAD		75	1000		
	6 PITTOSPORUM UNDULATUM		15	20		
~~FN~~	7 ~~JASMINUM~~ CRYPTOCARYA GLAUCESCENS		2	4		
L	8 ~~JASMINUM~~ ~~ASPARAGUS~~ SMILAX AUSTRALIS		85	10		
X	9 ~~ACACIA~~ ~~IMPENETRATA~~ ~~ACACIA~~ ~~SUBULATA~~ JACARANDA		3	2		
~~SX~~	10 ACACIA MALDENII?		8	1		
	11 ~~INCERT~~ ~~SHRUB~~ ~~WHITE~~ ~~FLOWERED~~ SARCOPETALUM HARVEYANUM		0.5	2		
	12 LANTANA CAMARA		~~5~~ 5	10		
	13 GUINEA GRASS		0.5	6		
	14 IPOMOEA INDICA		2	5		
~~V~~	15 ~~CIRSIUM VULGARE~~ RIPOGONUM ADSCENDENS		2	3		
	16 FISHBONE FERN		4	50		
	17 COOLTAI GRASS		0.2	10		
	18 ~~PTERIDIUM AQUILINUM~~ ADIANTUM HISPIDULUM?		0.1	1		
	19					
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

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BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Plottie Rd		A3M &

Date		Zone	Datum	Plot ID	Plot dimensions	Photo #
09 02 21		__		003	20x50	✓

Easting	Northing	IBRA region	Midline bearing from 0 m
_ _ _ _ _ _	_ _ _ _ _ _ _		180 Magnetic

		Confidence: H M L
Vegetation Class		
Plant Community Type	PCT 1071	EEC: Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	N/A	
50 – 79 cm	N/A	
30 – 49 cm	N/A	
20 – 29 cm	N/A	
10 – 19 cm	N/A	
5 – 9 cm	N/A	
< 5 cm	N/A	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0 daily space	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	75	60	70	85	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots																				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

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SPECIES	COVER	ABUNDANCE
PHYSALIS ANGULATA	85	500
WILD TOBACCO	2	3
CASTOR OIL WEED	3	5
LANTANA	2	3
GUINEA GRASS	0.3	10
IPOMOEA INDICA	0.5	3
RED NATAL	2	20
COASTAL MORNING GLORY	0.2	3
SENNA PENDULA	2	1
PAVONIA HASTATA	0.1	1

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BAM Site – Field Survey Form 12528155 Beattie Rd

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	9/2/21			TW & AB			
Zone	Datum	Plot ID	001	Plot dimensions	20×50	Photo #	
Easting	Northing	IBRA region		Midline bearing from 0 m			
Vegetation Class						Confidence: H M L	
Plant Community Type				EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm	11	0
30 – 49 cm	✓	
20 – 29 cm	✓	
10 – 19 cm	✓	
5 – 9 cm	✓	
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	111	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)					
Subplot score (% in each)	70	25	20	45	35	5	5	0	5	15	0	0	0	0	0	0	0	0	0	0	20
Average of the 5 subplots																					70
																					50

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

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Plot ID 4

Page ..... of .....

BAM Plant Species Richness Plot Survey data sheet

Project no.	PLATTIES Rd	**Field Staff**	A3m	**Signature**		**Date**	
Proposal Name		**Vegetation Zone ID**		**PCT / BVT**	1588 1	**Condition**	POOR

Sample	ID'd	Stratum	Species	Cover	Abundance	Sample	ID'd	Stratum	Species	Cover	Abundnace
			E UNDRA	8	3				G20FTOI GRASS	0.1	6
			E. SALIGNA	1	1						
			E. PILULARIS	10	4						
			Broad Leaved privet	15	4						
			E. PANICULATA	2	1						
			PITTOSPORUM UNDULATUM	5	3						
			LANTANA CAMARA	2	4						
			GUINEA GRASS	90	500						
			~~BRACHIARIA~~ DIPOGON LIGNOSUS	0.8	20						
			OXALIS	0.1	3						
			GLYCINE TABACINA	0.1	20						
			IPOMOEA INDICA	0.5	10						
			CASSIA PUBESCENS	2	4						
			FISHBONE FERN	0.5	10						
			BRACKEN FERN	0.3	4						
		3A	~~PASPALUM~~ GUIA SEMIGLABRA	2	2						
			~~XANTHIUM~~ AMBROSIA ARTEMISIIFOLIA	0.7	20						
			COOLATAI GRASS	5	30						
			BUFFALO GRASS	2	100						
			SPOTTED GUM	1	1						

Stratum in which each species occurs: E – emergent, o – overstorey; M – midstorey; G – groundcover.

Cover 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: species with cover less than or equal to 5%, count or estimate the number of individuals or shoots of each species within the plot, using the following intervals: 1,2,3,4,5,6,7,8,9,10,20, 50,100,500,1000,1500,2000, etc. Numbers above 20 are estimates only, and the recorded abundance is the upper end of each class (e.g. 50 represents an estimated abundance of between 20 and 50)

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Systematic frog and reptile survey data sheet

Site Peaties Rd Job Number 12528155 Field Staff LO AY Signature [signature] Date 24-2-21

Survey area — Waypoint — Easting —

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* Northing —

—

Altitude — Nearest weather station Williamtown

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / ~~CALL PLAYBACK~~/ DIP NET

Wind (1-4 see over) 0 Moon (1-6 see over) 2 Rain (1-5 see over) Species Played: 1 Green-thighed frog

Rain last 24 hours 9.2 mm Rain last 7 days 81.2 mm Cloud Cover 90 % 2 Green and Golden Bell frog

Start Time (24 Hr) 22:45 Temp. at Start 17 °C Humidity. at Start 95 % 3

Finish Time (24 Hr) 24:00 Temp. at Finish 17 °C Humidity. at Finish 95 % 4

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
	Lim peronii	Heard		5+	Drainage line	A

Systematic frog and reptile survey data sheet

Site Astra St **Job Number** 12528155 **Field Staff** LO, AY **Signature** [signature] **Date** 24-2-21

Survey area _____ **Waypoint** _____ **Easting** _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* **Northing** _____

_____

_____ **Altitude** _____ **Nearest weather station** William Dawn

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / CALL ~~PLAYBACK~~ / DIP NET

Wind (1-4 see over) 0 **Moon** (1-6 see over) 2 **Rain** (1-5 see over) 1 **Species Played: 1** Green thighed frog

Rain last 24 hours 9.2 mm **Rain last 7 days** 81.2 mm **Cloud Cover** 90 % **2** Green and golden Bell frog

Start Time (24 Hr) ~~19:30~~ 18:30 **Temp. at Start** 17 °C **Humidity. at Start** 95 % **3** _____

Finish Time (24 Hr) 22:30 **Temp. at Finish** 17 °C **Humidity. at Finish** 95 % **4** _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
Calling from left side of access track, near sandstone block stockpile.	Crinia Signifera	Heard	—	5+		A
	Lim. Peronii			2+		
Checked reference population @ Kooragang. Frogs active but not calling. 4 individuals seen within 10 minutes.						

Systematic frog and reptile survey data sheet

Site Astra St Job Number 12528155 Field Staff LO, AY Signature [signature] Date 25-2-21

Survey area – Waypoint – Easting –

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* Northing –

Altitude Nearest weather station Williamtown

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / ~~CALL PLAYBACK~~/ DIP NET

Wind (1-4 see over) 0 Moon (1-6 see over) 2 Rain (1-5 see over) 0 Species Played: 1 Green thighed frog

Rain last 24 hours 3.6 mm Rain last 7 days 96.8 mm Cloud Cover 80 % 2 Green and Golden Bell frog

Start Time (24 Hr) 19:00 Temp. at Start 19 °C Humidity. at Start 78 % 3

Finish Time (24 Hr) 22:00 Temp. at Finish 19 °C Humidity. at Finish 78 % 4

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
	Lim. Peronii	Heard/Seen	–	10+		
	Crinia Signifera	Heard	–	5+		

Systematic frog and reptile survey data sheet

Site Peaties Rd Job Number 12529155 Field Staff LO AY Signature LROM Date 25-2-21

Survey area _____ Waypoint _____ Easting _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* Northing _____

_____

_____ Altitude _____ Nearest weather station Williamtown

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / ~~CALL PLAYBACK~~/ DIP NET

Wind (1-4 see over) 0 Moon (1-6 see over) 2 Rain (1-5 see over) 0 Species Played: 1 Green thighed frog

Rain last 24 hours 3-6 mm Rain last 7 days 86-8 mm Cloud Cover 80 % 2 Green and Golden Bell frog

Start Time (24 Hr) 22:15 Temp. at Start 19 °C Humidity. at Start 78 % 3 _____

Finish Time (24 Hr) 23:00 Temp. at Finish 19 °C Humidity. at Finish 78 % 4 _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
	C. Signifera	Heard	—	5+	Drainage line	A

Systematic frog and reptile survey data sheet

Site Astra St Job Number 12528155 Field Staff LO AY Signature [signature] Date 16-3-21

Survey area _____ Waypoint _____ Easting _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* Northing _____

_____ Altitude — Nearest weather station Williamtown

Survey Method ACTIVE SEARCH / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / CALL PLAYBACK/ DIP NET

Wind (1-4 see over) 1 Moon (1-6 see over) 2 Rain (1-5 see over) 1 Species Played: 1 Green-thyed frog

Rain last 24 hours _____ mm Rain last 7 days _____ mm Cloud Cover _____ % 2 Green and golden Bell frog

Start Time (24 Hr) 19:00 Temp. at Start 20 °C Humidity. at Start 95 % 3 _____

Finish Time (24 Hr) 22:00 Temp. at Finish 19 °C Humidity. at Finish 100 % 4 _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
[illegible]	Crinia signifera	OW	-	5+	1, 2	A
	Lim. peronii	W	-	2+	2	A

Systematic Frog and Reptile Survey data sheet

Weather Codes

Wind	☐ 0. Calm	**Moon**	☐ 0. No moon	**Rain**	☐ 0. dry
	☐ 1. Light, leaves rustle		☐ 1. less than or equal to 1/4 moon		☐ 1. light drizzle
	☐ 2. Moderate, branches move		☐ 2. less than or equal to 1/2 moon		☐ 2. constant drizzle
	☐ 3. Strong, tops of trees move		☐ 3. less than or equal to 3/4 moon		☐ 3. heavy rain
			☐ 4. between 3/4 and full moon		☐ 4. mist, fog or heavy haze
			☐ 5.full moon		

Observation Codes

S – Seen **H** – Heard opportunistically **HC** – Heard after call playback **R** – Recorded **P** - Photographed

Microhabitat Codes

1 - in pools on roadside
2 - in grassland

Lifeform Codes

S – Spawn **T** – Tadpole **M** – Metamorph **J**– Juvenile **A** - Adult

Systematic frog and reptile survey data sheet

Site Peaties Rd Job Number 12528155 Field Staff LO AY Signature [signature] Date 16-3-21

Survey area _____ Waypoint _____ Easting _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* Northing _____

Altitude N/A Nearest weather station Williamtown

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / ~~CALL PLAYBACK~~ / DIP NET

Wind (1-4 see over) 1 Moon (1-6 see over) 2 Rain (1-5 see over) 1 Species Played: 1 Green-thighed frog

Rain last 24 hours 11 mm Rain last 7 days 28.6 mm Cloud Cover 100 % 2 Green and Golden Bell Frog

Start Time (24 Hr) 22:15 Temp. at Start 19 °C Humidity. at Start 100 % 3 _____

Finish Time (24 Hr) 23:00 Temp. at Finish 19 °C Humidity. at Finish 100 % 4 _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
Calling in South of site and South of rail line (off site)	Crinia Signifera	W	–	10+		A

Systematic frog and reptile survey data sheet

Site Peaties Rd **Job Number** 12528155 **Field Staff** LO, AY **Signature** [signature] **Date** 18-3-21

Survey area _____ **Waypoint** _____ **Easting** _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* **Northing** _____

Altitude – **Nearest weather station** Villamontown.

Survey Method ACTIVE SEARCH / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / CALL PLAYBACK/ DIP NET

Wind (1-4 see over) 0 **Moon** (1-6 see over) 2 **Rain** (1-5 see over) 2 **Species Played: 1** Green - thighed frog

Rain last 24 hours 94 mm **Rain last 7 days** 55.6 mm **Cloud Cover** 100 % **2** Green and Golden Bell frog

Start Time (24 Hr) 22:15 **Temp. at Start** 19 °C **Humidity. at Start** 100 % **3** _____

Finish Time (24 Hr) 23:00 **Temp. at Finish** 19 °C **Humidity. at Finish** 100 % **4** _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
Heard calling from drainage line in NW Section of the site.	Lim. peronii	Heard	–	5+	Drainge line	A

Systematic frog and reptile survey data sheet

Site Astra St. **Job Number** 12528155 **Field Staff** LO AY **Signature** [signature] **Date** 18-3-21

Survey area _____ **Waypoint** _____ **Easting** _____

Location and description *(brief description using landmarks, photograph number, etc. so site can be located again)* **Northing** _____

_____

_____ **Altitude** _____ **Nearest weather station** 068078 - Williamtown

Survey Method ~~ACTIVE SEARCH~~ / ROCK ROLLING/ SYSTEMATIC AREA SEARCH / NOCTURNAL STREAMSIDE SEARCH / ~~CALL PLAYBACK~~/ DIP NET

Wind (0-4 see over) 0 **Moon** (1-6 see over) 2 **Rain** (1-5 see over) 2 **Species Played: 1** Green-thighed frog

Rain last 24 hours 94 **mm** **Rain last 7 days** 55.6 **mm** **Cloud Cover** 100 **%** **2** Green and Bidden Bell frog

Start Time (24 Hr) 19:00 **Temp. at Start** 18 **°C Humidity. at Start** 100 **%** **3** _____

Finish Time (24 Hr) 22:00 **Temp. at Finish** 18 **°C Humidity. at Finish** 100 **%** **4** _____

Notes	Species	Observation Code	Photo / Recording ID	Number of individuals	Micro-habitat type	Lifeform
Striped marsh frogs observed	Limno. Peronii	OW, P	In Job folder	5+	P	A
on tar and gravel sections						
of the site. Also heard						
calling from typha at the						
most northern part of						
site						
	Crinia Signifera	W		3+		A

Systematic Frog and Reptile Survey data sheet

Weather Codes

Wind	☒ 0. Calm	**Moon**	☐ 0. No moon	**Rain**	☐ 0. dry
	☐ 1. Light, leaves rustle		☐ 1. less than or equal to 1/4 moon		☐ 1. light drizzle
	☐ 2. Moderate, branches move		☒ 2. less than or equal to 1/2 moon		☒ 2. constant drizzle
	☐ 3. Strong, tops of trees move		☐ 3. less than or equal to 3/4 moon		☐ 3. heavy rain
			☐ 4. between 3/4 and full moon		☐ 4. mist, fog or heavy haze
			☐ 5.full moon		

Observation Codes

S – Seen ☑ **H** – Heard opportunistically **HC** – Heard after call playback **R** – Recorded **P** - Photographed

Microhabitat Codes

P – puddles + wet areas

Lifeform Codes

S – Spawn **T** – Tadpole **M** – Metamorph **J**– Juvenile **A** - Adult

Annexure D – Secretary's environmental assessment requirements

Secretary's Environmental Assessment Requirements

Section 115Y of the *Environmental Planning and Assessment Act 1979*

Application Number	SSI 6888
Proposal	Construction of the fifth section of the Newcastle Inner City Bypass, between Rankin Park and Jesmond.
Location	Land generally located between Lookout Road and McCaffrey Drive, Rankin Park and Newcastle Road, Jesmond.
Proponent	Roads and Maritime Services
Date of Issue	3 March 2015
General Requirements	The Environmental Impact Statement (EIS) must be prepared in accordance with, and meet the minimum requirements of, Part 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation* 2000 (the Regulation), including: 1. the information required under clause 6 of Schedule 2 of the Regulation. 2. the content listed in clause 7 of Schedule 2 of the Regulation, including but not limited to: • a statement of the objectives of the proposal, including a description of the strategic need, justification, objectives and outcomes for the proposal, taking into account existing and proposed transport infrastructure and services within the adjoining subregions, and as relevant the outcomes and objectives of relevant strategic planning and transport policies, including, but not limited to, *NSW 2021*, *NSW Government State Infrastructure Strategy*, *NSW Long Term Transport Master Plan* (December 2012) and any other relevant plans (including the draft *Regional Growth Plan for the Lower Hunter* if it is placed on public exhibition prior to finalisation of the EIS); • an analysis of feasible alternatives to the carrying out of the proposal and proposal justification, including: o an analysis of alternatives/options considered (including interchange and intersection options for a western access to John Hunter Hospital) having regard to proposal objectives, including an assessment of the environmental costs and benefits of the proposal relative to alternatives and the consequences of not carrying out the proposal, and whether or not the proposal is in the public interest, and o justification for the preferred proposal taking into consideration the objects of the *Environmental Planning and Assessment Act 1979*; • a detailed description of the proposal, including: o design of road works, including interchange and intersection treatment, property access, pedestrian and cyclist facilities (including appropriate locations for overbridges and/or underpasses); o land use changes, including resumption of residential, commercial and/or industrial lands, and impacts to Council and Crown land; o location and operational requirements of construction ancillary facilities and access; and o relationship and/or interaction with existing public transport services (including bus traffic and bus stops); • an analysis of the proposal including an assessment, with a particular focus on the requirements of the listed key issues, in accordance with

	clause 7(1)(d) of Schedule 2 of the Regulation (where relevant), including an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing management/ mitigation measures; • detail how the principles of ecologically sustainable development will be incorporated in the design, construction and ongoing operation phases of the proposal; and • identification of whether the proposal is a scheduled activity under the *Protection of the Environment (Operations) Act 1997*. Where relevant, the assessment of key issues below, and any other significant issues identified in the risk assessment, must include: • adequate baseline data; and • measures to avoid, minimise and if necessary, offset the predicted impacts, including detailed contingency plans for managing any significant risks to the environment.
Key issues	The EIS must also address the following specific matters: **Biodiversity** — including but not limited to: • an assessment of the potential ecological impacts of the proposal, with specific reference to vegetation and habitat clearing, connectivity, edge effects, weed dispersal, riparian and aquatic habitat impacts, soil and water quality impacts and operational impacts. The assessment must: • make specific reference to impacts on landscape values, biodiversity values of native vegetation and threatened species or populations, including worst case estimates of vegetation clearing and operational impacts; • demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance, and be consistent with the 'avoid, minimise or offset' principle; • be undertaken in accordance with the *Framework for Biodiversity Assessment* (Office of Environment and Heritage (OEH) 2014) and the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014), and by a person accredited in accordance with section 142B(1)(c) of the *Threatened Species Conservation Act 1995.* Impacts on species, populations and ecological communities that will require further consideration and provision of information specified in section 9.2 of the *Framework for Biodiversity Assessment* include those identified by the OEH. Species specific surveys shall be undertaken for those species and in accordance with the survey requirements specified by the OEH (including during further consultation with the OEH); • in relation to aquatic biodiversity be consistent with the draft *Policy and Guidelines for Fish Habitat Conservation and Management – Update* 2013 (DPI 2013); • where there are potential impacts to the OEH estate reserved under the *National Parks and Wildlife Act 1974* or where the proposal is located upstream of OEH estate, an assessment of the matters to be considered outlined in the *Guidelines for developments adjoining land and water managed by DECCW* (DECCW 2010). **Traffic and Transport** — including but not limited to: • detailed assessment and modelling of operational traffic and transport impacts. This must consider: o key intersections and interchanges, and the level of service/performance of intersections upstream and downstream of

	the project area; o impacts on property access and on street parking provision, including permanent changes to access and parking; o impacts on access to and from John Hunter Hospital; o maintenance of existing cycle routes and consideration of opportunities to integrate recreational and commuter cycleway and pedestrian elements with existing and proposed networks, including those identified in the *Newcastle Cycling Strategy and Action Plan*, and maintenance of existing pedestrian paths between residential neighbourhoods; o operational implications for public transport and opportunities to improve public transport services and patronage; and o safety and access impacts on road users (including cyclists and pedestrians); • assessment of construction traffic and transport impacts of the proposal (including ancillary facilities) and associated management measures, in particular: o impacts to the road network (including safety and level of service, pedestrian and cyclist access, maintenance of access to John Hunter Hospital, and disruption to public transport services, access to properties, and parking); o route identification and scheduling of transport movements, including movements to transport spoil; o the number, frequency and size of construction related vehicles (both passenger, commercial and heavy vehicles); o the nature of existing traffic on construction access routes (including consideration of peak traffic times); and o the need to close, divert or otherwise reconfigure elements of the road network associated with construction of the proposal; and • details of stakeholder consultation regarding access disruption, including John Hunter Hospital and emergency services. **Noise and Vibration** — including but not limited to: • a detailed assessment of the noise impacts of the proposal during operation, consistent with the *NSW Road Noise Policy* (DECCW 2011), The assessment must include specific consideration of impacts (including impacts from compression brake noise) to sensitive receivers (residential, child care centres, educational establishments, hospitals, motels, nursing homes, or places of worship) and commercial and industrial land uses, as relevant and identify feasible and reasonable mitigation measures (including measures to quantify and minimise impacts of compression brake noise on sensitive receivers); • an assessment of construction noise and vibration impacts, consistent with the *Interim Construction Noise Guideline* (DECCW 2009), and *Assessing Vibration: a technical guideline* (DEC 2006); • the construction noise assessment must present, as relevant, an indication of the potential for work outside standard construction hours, including predicted levels and exceedences of the construction noise goals, justification for the activity and discussion of available mitigation and management measures; • details of stakeholder consultation, including John Hunter Hospital, regarding disruptions due to construction noise and vibration impacts (if any); and • details of any required construction and/or operational noise abatement measures.

	Visual Amenity, Built Form and Urban Design — including but not limited to: • rationale for the overall design of the integrated engineering and urban design proposal in terms of: o scale, length, height, width, materials, lighting and relationship of elements that affects the form and appearance of the proposal in its context for users and the community; o views to and from the proposal; and o design relationship to the existing State road network and adjoining recreational areas, built forms and streetscapes; • an assessment of the visual and amenity impacts of the proposal on the local and regional area, particularly on: o landscape, particularly trees and vegetation within the bushland within which the site is located o existing and future residential properties adjacent to the proposal alignment; o the John Hunter Hospital; o character precincts; o adjoining commercial, industrial, educational, cultural and recreational land uses; and o significant vantage points in the public domain; • how the proposal will be integrated into the adjacent environment and how visual and amenity impacts are to be mitigated, including how noise mitigation measures and significant civil engineering works are to be mitigated through design, the use of planting and other measures; and • incorporation of water sensitive urban design where possible.
Other Issues	**Land Use, Social and Economic —** including, but not limited to: • a description of the existing socio-economic environment; • social and economic impacts to businesses and to the community within the vicinity of the proposal including those associated with property acquisition, traffic, access, property, public domain and amenity related changes; • impacts on recreational use of surrounding land and measures to maintain availability for recreational uses during construction and operation. Assessment should consider (but not be limited to) actual and perceived impacts on Jesmond Park during construction and operation; • impacts on the management of residual publicly owned land in the vicinity of the project; • impacts on mineral resources, including operating mines, extractive industries, known mineral or petroleum resources, and exploration activities in the vicinity of the proposed development; • identification of properties required to be acquired for the works (full and partial acquisition) and an assessment of the scale of impact of this acquisition; • potential impacts on utilities (including communications, electricity, gas and water) and the relocation of these utilities; and • a draft Community Consultation Framework identifying relevant stakeholders, procedures for distributing information and receiving/responding to feedback and procedures for resolving stakeholder (including John Hunter Hospital) and community complaints during construction and operation. Key issues that should be addressed in the draft Strategy shall include: o traffic management (including property access, pedestrian access); o landscaping/urban design matters; o construction activities including out of hours work; o noise and vibration mitigation and management; and o disruption to the operation of the hospital.

	Soils, Water and Waste — including but not limited to: • erosion, sediment and water quality impacts, including an assessment of: o potential water quality impacts and mitigation measures to manage water pollution during construction and operation, with reference to relevant public health and environmental water quality criteria, including those specified in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000), and any applicable regional, local or site-specific guidelines; o proposed storm water management system and management measures for the containment of pollutants and minimisation of leachate and sediment mobilisation; o impacts on soil and slope stability resulting from vegetation clearing; o impacts on watercourses, including bed and bank stability; and o potential erosion and sediment controls consistent with *Managing Urban Stormwater – Soils and Construction* (Landcom 2004); • water quantity and stormwater impacts, including: o potential impacts of road construction and decreased permeability on downstream catchments and wetlands; o impacts on existing and planned stormwater infrastructure including condition, function and maintenance of such assets; o details of any works likely to intercept, connect with or infiltrate groundwater resources and of any proposed groundwater extraction; o impacts on groundwater recharge and flow path; and o measures to mitigate or prevent an increase in downstream stormwater flows; • impacts on water sources, sharing and licensing, including: o consistency with relevant water sharing plans; o details of water supply sources and the purpose, location, construction and expected annual extraction volumes; and o potential cumulative impacts on water sources and mitigation measures to manage the cumulative impacts; • hydrological impacts, including an assessment, taking into account the *Floodplain Development Manual* (Department of Natural Resources 2005), of the following: o changes to existing flood regimes, with particular reference to the northern end of the proposal at Jesmond; o impacts to existing receivers and infrastructure and the future development potential of affected land; o identifying the potential impacts on surface water flow velocities and directions, and impacts on the bed and bank stability, with particular reference to construction of the watercourse crossings, and o an assessment of the effects of sea level rise as a result of climate change on the project. • management of waste, including: o quantification of bulk earthworks and spoil balance, and reuse or disposal of excess spoil; o classification of waste taking into account the *Waste Classification Guidelines* (DECCW 2009); o waste handling, stockpiling and transportation, including identification of on-site waste facilities and off-site waste disposal; and o details of procedures for the assessment of all hazardous waste used, stored, processed or disposed of at the site; and • impacts from construction activities on contaminated land, including an assessment of potential contamination and a description of proposals for site remediation, if required, with reference to contaminated land planning legislation and guidelines.

Heritage – including but not limited to:

- impacts to *non-Aboriginal heritage* (including heritage items and archaeology) should be assessed, including through survey where appropriate. Where impacts are identified, the assessment shall:
  - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the guidelines in the *NSW Heritage Manual* (Heritage Office and DUAP 1996);
  - be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's *Excavation Director criteria*);
  - include a statement of heritage impact for all heritage items (including significance assessment);
  - consider impacts from vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment; and
  - where required, develop an appropriate archaeological assessment methodology, including research design, in consultation with the Department and the Heritage Council of New South Wales, to guide physical archaeological test excavations and include the results of these excavations; and
- impacts to *Aboriginal heritage* (including cultural and archaeological significance), in particular impacts to Aboriginal objects and potential archaeological deposits (PAD), should be assessed. Where impacts are identified, the assessment shall:
  - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the measures) generally consistent with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005) and other relevant guidelines and requirements;
  - be undertaken by a suitably qualified heritage consultant(s);
  - demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures);
  - assess and document the archaeological and cultural significance of cultural heritage values of affected sites; and
  - undertake appropriate archaeological investigations generally in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010), to establish the full spatial extent and significance of any archaeological evidence across each site/area of PAD, and include the results of these excavations. If an alternative excavation method is proposed, it shall be developed in consultation with OEH.

Air Quality — including but not limited to:

- potential construction and operational impacts on local and regional air quality, including:
  - potential for impacts on local and regional air quality, including on sensitive receivers; and
  - a construction air quality impact assessment; and
- details of the proposed mitigation measures to prevent the generation and emission of dust.

	Hazards and Risks — including but not limited to: • impacts on bushfire risk including changes to access for emergency services; and • impacts associated with the management of mine subsidence, including void management. **Environmental Risk Analysis** — notwithstanding the above assessment requirements, the EIS must include an environmental risk analysis to identify potential environmental impacts associated with the proposal (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the EIS.
Consultation	During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. • local, State and Commonwealth government authorities, including the: o Department of the Environment (Cth) o Environment Protection Authority; o Office of Environment and Heritage (including Heritage Division), o Department of Primary Industries (including the Mine Subsidence Board); o Hunter Local Land Services; o NSW Health (Hunter New England Local Health District); o Fire and Rescue NSW, Ambulance Service of NSW and other emergency services; o Newcastle Buses; o Newcastle City Council; and o Lake Macquarie City Council; • specialist interest groups, including Local Aboriginal Land Councils, Aboriginal stakeholders, environmental groups, and pedestrian and bicycle user groups; • utilities and service providers; and • the public, including community groups and adjoining and affected landowners, and licence holders (including PEL holders). The EIS must describe the consultation process and the issues raised, and identify where the design of the proposal has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.
Further consultation after 2 years	If you do not lodge an EIS for the proposal within 2 years of the issue date of these SEARs, you must consult further with the Secretary in relation to the preparation of the EIS.

NSW GOVERNMENT | Planning & Environment

Contact: Daniel Gorgioski
Phone: (02) 9228 6464
Email: daniel.gorgioski@planning.nsw.gov.au
Our ref: SSI 6888

Mr Peter Duncan
Chief Executive Officer
Roads and Maritime Services
Locked Bag 928
NORTH SYDNEY NSW 2059

Roads and Maritime Services
NSW
25 NOV 2015
RECEIVED
Chief Executive's Office

Attn: Matthew Mate

Dear Mr Duncan

Newcastle Inner City Bypass Rankin Park to Jesmond (SSI 6888) (EPBC 2015-7550)
Supplementary Assessment Requirements

I refer to the subject State Significant Infrastructure project currently being assessed under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

As you are aware, on 15 October 2015 the Commonwealth determined that the project will impact on matters of national environmental significance (MNES), protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Accordingly, the Project has been declared a controlled action and will require assessment and approval under the EPBC Act before it can proceed. The project will be assessed under the assessment bilateral agreement with New South Wales.

The Commonwealth has provided Guidelines for preparing Assessment Documentation relevant to the EPBC Act for the project, which are attached to this letter. These Guidelines should be considered as a supplement to, and be addressed in conjunction with, the Secretary's Environmental Assessment Requirements issued on 3 March 2015.

If you have any questions about this letter, please contact Daniel Gorgioski at the details listed above.

Yours sincerely

Karen Jones 19.11.15
Director
Infrastructure Assessments
as the Secretary's delegate

Guidelines for preparing Assessment Documentation relevant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Newcastle bypass Rankin to Jesmond, NSW EPBC 2015-7550

1. On 15 October 2015 it was determined the Newcastle bypass will impact upon the following matters of national environmental significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*:

   - **threatened species and communities**
   - **Ramsar wetlands**

2. These guidelines provide information on assessment requirements in relation to MNES, if the project is being assessed under the *NSW Assessment Bilateral Agreement (February 2015)*. It is a requirement of the Agreement that the project be assessed in the manner specified in Schedule 1 of that Agreement, including the matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). These guidelines do not stand alone but should be considered in conjunction with the Department of Planning and Environment's Secretary's Environmental Assessment Requirements. The Guidelines are intended to ensure there is sufficient information in the Assessment Report relevant to MNES such that the Commonwealth decision-maker may make a determination on whether or not to approve the action.

3. The proponent must undertake an assessment of all the protected matters that may be impacted by the development under the controlling provision identified in paragraph 1 (above). A list of specific protected matters that the Department of the Environment considered likely to be significantly impacted is provided at Attachment A to these Guidelines. Note that this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under each controlling provision (refer paragraph 1), likely to be significantly impacted, are assessed for the Commonwealth decision-maker's consideration.

General Requirements

The EIS must address the following issues:

4. the precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES).

5. an assessment of the likely impacts of the development on each EPBC Act-listed species and/or ecological community where there is likely to be a significant impact from the proposed development.

Key Issues – Biodiversity

6. The EIS must address the following issues in relation to Biodiversity including:

   - identification of all EPBC Act listed threatened species and communities likely to be located in the project area or in the vicinity; and
   - identification of all EPBC Act listed threatened species and communities likely to be significantly impacted by the development in accordance with the *Matters of National*

Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Significant Impact Guidelines).

7. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:

   - a description of the environment (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans;
   - details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.

Impacts

8. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a description of the impacts of the action having regard to the full national extent of the species or community's range including;

   - a detailed assessment of the extent, nature and consequence of the likely direct, indirect and consequential impacts – refer to the Significant Impact Guidelines for guidance on the various types of impact that need to be considered;
   - a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; and
   - a description of any likely cumulative impacts, where potential project impacts are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other proponents in the region and vicinity).

Avoidance and mitigation

9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including:

   - a description of proposed avoidance and mitigation measures to deal with relevant impacts of the action;
   - assessment of the expected or predicted effectiveness of the mitigation measures, and
   - a description of the outcomes that the avoidance and mitigation measures will achieve.

10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide reference to, and consideration of relevant Commonwealth guidelines and policy statements including conservation advice, recovery plans, threat abatement plans and wildlife conservation plans.

[Note: the relevant guidelines and policy statements for threatened species and communities are available from the Department of the Environment Species Profiles and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl]

Residual impacts and offsets

11. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide:

    - identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts is taken into account.
    - details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts.
    - details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.

    [Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.]

12. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy*. http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy

    [Note if the EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community you may wish to seek further advice from the Department of Planning and Environment.]

Environmental Record of person proposing to take the action

13. The information provided must include details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the person proposing to take the action; and for an action for which a person has applied for a permit, the person making the application.

14. If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must also be included.

REFERENCES

1. *Environment Protect and Biodiversity Conservation Act 1999* - section 51-55, section 96A(3)(a)(b), 101A(3)(a)(b), section 136, section 527E
2. NSW Assessment Bilateral Agreement (2015) - Item 18.1, Item 18.5, Schedule 1
3. *Matters of National Environmental Significance - Significant impact guidelines 1.1* (2013) EPBC Act
4. *Environment Protect and Biodiversity Conservation Act 1999* Environmental Offsets Policy October 2012

Attachment A

Listed threatened species and communities

The Department of the Environment considers impacts potentially arise in relation to the following matters:

- Black-eyed Susan (*Tetratheca juncea*) – vulnerable, and
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – vulnerable,

The Department considers there is some risk there may be significant impacts on the following matters:

- Leafless Tongue-orchid (*Cyrptostylis hunteriana*) - vulnerable, and
- Newcastle Doubletail (*Diuris praecox*) - vulnerable.

Ramsar wetlands

The Department of the Environment considers impacts potentially arise in relation to the following:

- The Hunter Estuary Wetlands Ramsar site.

Resulting in:

- a substantial and measurable change in the hydrological regime of the wetland
- a substantial and measurable change in the water quality of the wetland.

Planning, Industry & Environment

Mr Peter Wood
Senior Project Manager
Northern Project Office – Hunter
Transport for NSW
Locked Bag 2030
NEWCASTLE NSW 2300

Our ref: SSI-6888 Mod 1

Attention: Ms Melissa Mayfield-Smith

09/12/2020

Dear Mr Wood

Newcastle Inner City Bypass (NICB) - Rankin Park to Jesmond Bypass (SSI-6888)
Modification 1 - Additional Ancillary Facilities

I refer to your correspondence concerning a proposed modification to the NICB Rankin Park to Jesmond Bypass project. Reference is also made to the meeting held on 13 October 2020 which discussed the proposed ancillary facilities and the assessment approach which would be undertaken by Transport for NSW.

The Department has reviewed the proposed approach to preparing a modification application and requires the proposal to be assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the NICB Rankin Park to Jesmond project dated 3 March 2015. In relation to impacts on the biodiversity values of the proposal a biodiversity development assessment report must be prepared in accordance with the *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM).

Your next step will be to lodge your modification application through your dashboard on the major projects website (http://www.planningportal.nsw.gov.au/major-projects).

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of Agriculture, Water and the Environment to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 1111).

If you have any questions, please contact Michael Young on 9274 6437.

Yours sincerely,



Glenn Snow
Director
Transport Assessments

Annexure E – Biodiversity credit report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00024156/BAAS17098/21/00024157

Proposal Name
Newcastle Inner City Bypass - Rankin Park to Jesmond _ Peatties Road ancillary site

BAM data last updated *
29/03/2021

Assessor Name
Arien Quin

Assessor Number
BAAS17098

BAM Data version *
38

Proponent Names
Melissa Mayfield-Smith

Report Created
26/05/2021

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
26/05/2021

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Calidris tenuirostris / Great Knot
Irediparra gallinacea / Comb-crested Jacana
Ixobrychus flavicollis / Black Bittern
Limicola falcinellus / Broad-billed Sandpiper
Limosa limosa / Black-tailed Godwit
Calidris ferruginea / Curlew Sandpiper

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion	Not a TEC	0.2	0	0	0

BAM Biodiversity Credit Report (Like for like)

1071-Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Coastal Freshwater Lagoons This includes PCT's: 781, 783, 1071, 1735, 1736, 1737, 1740, 1741, 1742	Coastal Freshwater Lagoons >=70% and <90%	1071_Good	No	0	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

Appendix E

Construction noise and vibration assessment

Newcastle Inner City Bypass – Rankin Park to Jesmond

Construction noise and vibration assessment- modification for additional construction compounds

Transport for NSW

26 May 2021

The Power of Commitment

GHD Pty Ltd | ABN 39 008 488 373
GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300, Australia
T 61-2-4979 9999 | **F** 61-2-4979 9988 | **E** ntlmail@ghd.com | **ghd.com**

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Author	Simon Ritchie
Project manager	Simon Murphy
Client name	Transport for NSW
Project name	Newcastle Inner City Bypass - RP2J Enviro Advice
Document title	Newcastle Inner City Bypass – Rankin Park to Jesmond | Construction noise and vibration assessment- modification for additional construction compounds
Revision version	Rev 0
Project number	12528155

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	Simon Ritchie	E Potoczny		S Pearce		26/5/21

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Executive summary

Introduction and background

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project), approved 15 February 2019. Transport for NSW now propose to modify the project. The proposed modification to the project involves the establishment and use of four additional construction compounds for the purpose of construction of the project. The additional construction compounds are located at:

– Astra Street
– Lookout Road
– Cardiff Road
– Peatties Road.

The purpose of the construction noise and vibration assessment is to assess potential noise and vibration impacts from the establishment and use of four construction compounds, and where required, identify feasible and reasonable mitigation measures. The *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment* (GHD 2016) was prepared in support of the EIS for the project in accordance with the project SEARs. The *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment*, (GHD 2018) was prepared as part of the response to submissions and to incorporate design refinements. This report should be read in conjunction with these previous assessments.

For the proposed modification, DPIE issued a letter on 9 December 2020 advising that the assessment should be undertaken in accordance with the original SEARs dated 3 March 2015.

Noise impacts

Noise impacts predicted in relation to the Peatties Road compound are summarised as:

– During standard construction hours, 347 residential receivers were identified with potential exceedances of the construction noise management level with impacts of up to 26 dB(A) over the construction noise management level. The predicted worst case activity is vegetation clearing and grubbing (MOD04) and the predicted worst-case activity for the main construction period of up to 30 months is stockpile site (MOD08).
– During out of hours work (OOHW) up to 637 residential receivers were identified with potential exceedances of the construction noise management level with impacts of up to 31 dB(A) over the construction noise management level. The predicted worst case activity during this period is construction support activities (MOD12).

Noise impacts predicted in relation to the Cardiff Road compound are summarised as:

– During standard construction hours, 663 residential receivers were identified with potential exceedances of the construction noise management level with impacts of up to 58 dB(A) over the construction noise management level. The predicted worst case activity is vegetation clearing and grubbing (MOD04), which would occur over a period of up to 2 weeks. During the main construction period of up to 30 months, stockpile site (MOD08) would result in potential exceedances of the construction noise management level at up to 426 residential receivers by up to 50 dB(A) at the worst affected receivers.
– During standard construction hours, 17 residential receivers were identified with potential exceedances of the 75 dB(A) highly affected level with impacts of up to 29 dB(A) over this value. The predicted worst case activity is vegetation clearing and grubbing (MOD04), which would occur over a period of up to 2 weeks.
– Two non-residential receivers (One place of worship and one commercial) were identified with potential exceedances of the relevant construction noise management level. Impacts of up to 13 dB(A) were identified over the construction noise management level for places of worship and 8 dB(A) for the commercial receiver.

Noise impacts predicted in relation to the Astra Street compound are summarised as:

– During standard construction hours, 67 receivers were identified with potential exceedances of the construction noise management level with impacts of up to 9 dB(A) over the construction noise management level. The predicted worst case activity is crushing plant (MOD07), which would occur over a period of up to 30 months.
– During OOHW periods, up to 167 residential receivers were identified with potential exceedances of the construction noise management level with impacts of up to 23 dB(A) over the construction noise management level. The predicted worst case activity during this period is stockpile site (MOD08), which would occur over the construction period of 30 months.
– Three non-residential receivers including one passive recreation receiver, one active recreation receiver and one educational facility were identified with potential exceedances of the relevant construction noise management level. Impacts of up to 4 dB(A) were identified for the activity of crushing plant (MOD07).

Noise impacts predicted in relation to the Lookout Road compound are summarised as:

– One residential receiver adjacent to the compound was identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 14 dB(A) at this receiver. No other residential receiver exceedances of the construction noise management level are predicted during standard hours. The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05), which would occur over the construction period of 30 months.
– During OOHW, up to 160 receivers were identified with potential exceedances of the construction noise management level with impacts of up to 42 dB(A) over the construction noise management level at the adjacent receiver. The next highest exceedance of the OOHW criteria is 21 dB(A).
– One receiver adjacent to the compound is predicted to exceed the 75 dB(A) highly affected level by up to 5 dB(A) over this level.

Sleep disturbance and awakening

Sleep disturbance and awakening noise predictions for the compounds are as follows:

– Peatties Road - the three proposed night time activities of general compound activities (MOD05), deliveries (MOD11) and construction support activities (MOD12) have predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 391 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 89 residential receivers.
– Astra Street - the proposed night time activities of materials handling (MOD06), stockpile site (MOD08), batching plant (MOD09), bridge girder laydown (MOD10), deliveries (MOD11) and construction support activities (MOD12) have predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 167 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 51 residential receivers.
– Lookout Road - the proposed night time activity of general compound activities (MOD05) has predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 85 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 3 residential receivers.

Structural vibration

The following was found with consideration to structural vibration buffers:

– At the Cardiff Road compound six receiver structures were identified within the 18 metre buffer associated with vibratory roller activities and two receiver structures were identified within the four metre buffer associated with excavator activities.

Human comfort vibration

The following was found with consideration to human comfort vibration buffers:

– At the Peatties Road compound:
  - 210 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
– At the Cardiff Road compound:
  - 239 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
  - 19 residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period.
  - One commercial receiver was identified within the applicable 130 metre buffer distance for vibratory rolling. No other non-residential receivers were identified within this buffer distance or within the 24 metre buffer for excavator activities.
– At the Astra Street compound:
  - 14 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
  - One non-residential receiver (the golf range) was identified within the applicable 130 metre buffer distance.

Construction traffic noise

Access to the compounds is proposed via major roads including the existing Newcastle Inner City Bypass, Sandgate Road, Lookout Road, Cardiff Road and Charlestown Road. Due to relatively low numbers of construction traffic and high existing volumes the additional construction traffic movements would have negligible effect on traffic noise levels from these roads.

In relation to construction traffic on minor roads:

– While the proposed traffic movements would increase traffic volumes on Astra Street, the existing noise environment is dominated by the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and the adjacent Hunter Valley rail line. Therefore additional traffic on Astra Street is not expected to significantly increase overall traffic noise levels at these receivers.
– While Marshall Street is a local road servicing a residential area, given the low number of proposed construction vehicle movements (two light vehicles and two heavy vehicles per day), a negligible effect on traffic noise levels is predicted due to compound related traffic.
– Peatties Road is a no through road providing access to residential properties on Wimbledon Grove. Access to the Peatties Road site does not pass any residential properties. As such, a negligible effect on traffic noise levels is predicted due to compound related traffic.

Environmental management measures

Environmental management measures in section 7 of the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* and reproduced in Appendix G of the Newcastle Inner City Bypass – Rankin Park to Jesmond: Modification Report detail specific environmental management measures to minimise potential construction noise and vibration impacts associated with construction areas. These measures are applicable to the proposed modification and no new mitigation measures are recommended.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the report.

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1. Introduction

1.1 Project background

Transport for NSW (formerly Roads and Maritime Services) is planning for the construction of the fifth section of the Newcastle Inner City Bypass between Rankin Park and Jesmond (the project), approved 15 February 2019. The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. The project is located in the Newcastle local government area, about 11 kilometres west of the Newcastle central business district and about 160 kilometres north of Sydney.

The project was determined to be state significant infrastructure requiring approval under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with the Secretary's Environmental Assessment Requirements (SEARs) (dated 3 March 2015) and Supplementary SEARs (dated 19 November 2015), an environmental impact statement (EIS) was prepared by Transport for NSW in November 2016 (*Newcastle Inner City Bypass – Rankin Park to Jesmond Environmental Impact Statement*) to assess the potential impacts of the project. The EIS was exhibited by the former Department of Planning and Environment (DP&E) (now known as Department of Planning, Industry and Environment (DPIE)) for 30 days from 16 November 2016 to 16 December 2016.

Following public exhibition of the EIS, Transport for NSW prepared the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* in June 2018 to respond to submissions and describe project design refinements.

Approval for the project was granted on 15 February 2019 by the Minister for Planning (application number SSI 6888) and was subject to a number of conditions of approval.

The project was referred to the Australian Government Minister for the Environment and Energy under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 7 September 2015 due to the presence of listed threatened species and communities and wetlands of international significance that could be impacted by the project. The Australian Minister for the Environment confirmed the project would be a controlled action requiring approval in accordance with the bi-lateral assessment agreement between the Australian Government and the NSW State Government. The EIS was prepared to assess the potential impacts of the project in accordance with the requirements of the EP&A Act and EPBC Act.

Following project approval, Transport for NSW has made a number of project design refinements. These have arisen due to review of the concept design, development of the detailed design, stakeholder consultation and evaluation of construction methodologies. These design refinements resulted in minor changes to the construction footprint and as such were subject to two consistency assessments as follows:

– Consistency assessment 1 - Newcastle Inner City Bypass Rankin Park to Jesmond – Bridge 7 Early Work: Division 5.2 and EPBC Act Approval Consistency assessment report Detailed Design Changes (Aurecon, 2019)
– Consistency assessment 2 - Newcastle Inner City Bypass Rankin Park to Jesmond – Stage 3, Package 1 detailed design changes: Division 5.2 and EPBC Act approval (SSI 6888) consistency review (Bowditch Group, 2020).

The consistency assessments determined that the design refinements were consistent with the project approval and as such, further assessment or modification to the project approval was not required.



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Newcastle Inner City Bypass
Noise and Vibration Assessment

Project No. **12528155**
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Project locality

Figure 1-1

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Data source: Geoscience Australia: 250k Topographic Data Series 3, 2006; TfNSW / Aurecon: The Project, 2018; LPI: DTDB / DCDB, 2017; . Created by: fmackay

1.2 Proposed modification

An overview of the project and the proposed modification is shown on Figure 2.1 and includes establishment and use of four additional construction compounds during construction of the project and described further in section 2. The additional construction compounds are located at:

– Astra Street
– Lookout Road
– Cardiff Road
– Peatties Road.

1.3 Purpose of this report

GHD was engaged by Transport for NSW to prepare a construction noise and vibration assessment for the proposed modification. The purpose of the assessment is to assess potential noise and vibration impacts from the establishment and use of four construction compounds, and where required, identify feasible and reasonable mitigation measures.

The *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment* (GHD 2016) was prepared in support of the EIS for the project in accordance with the project SEARs. The *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment*, (GHD 2018) was prepared as part of the response to submissions and to incorporate design refinements.

This report should be read in conjunction with these previous assessments.

For the proposed modification, DPIE issued a letter on 9 December 2020 advising that the assessment should be undertaken in accordance with the original SEARs dated 3 March 2015. Table 1.1 summarises these requirements, as relevant to the proposed modification, and where they have been addressed in this report.

Table 1.1 SEARs for construction noise and vibration

Secretary's Environmental Assessment Requirements	Where addressed
The environmental impact statement must include the following:	
– An assessment of construction noise and vibration impacts, consistent with the Interim Construction Noise Guideline (DECC 2009) and Assessing Vibration: a technical guideline (DEC 2006).	Sections 6 and 8
– The construction noise assessment must present, as relevant, an indication of the potential for work outside standard construction hours, including predicted levels and exceedances of the construction noise goals, justification for the activity and discussion of available mitigation and management measures.	Sections 2.5, 5.2, 6, 7 and 10
– Details of stakeholder consultation, including John Hunter Hospital, regarding disruptions due to construction noise and vibration impacts (if any).	Details of consultation with relevant stakeholders for the proposed modification, including noise and vibration impacts, is provided in section 5 of the Modification Report.
– Details of any required construction and/or operational noise abatement measures.	Section 10

1.4 Standards and guidelines

The assessment has been carried out with consideration to the following:

- *Road Noise Policy* (DECCW 2011).
- *Construction Noise and Vibration Guideline* (Roads and Maritime Services 2016).
- *Construction Noise and Vibration Strategy ST-157/4.1* (Transport for NSW, 2019).
- *Noise Policy for Industry* (EPA 2017).
- *Industrial Noise Policy* (EPA 2000).
- *Interim Construction Noise Guideline* (DECC 2009).
- *Assessing Vibration: A Technical Guideline* (DEC 2006).
- *Environmental Noise Management Manual* (RTA 2001).
- *Environmental Criteria for Road Traffic Noise* (EPA 1999).
- *German Standard DIN 4150 (2016) Part 3: Structural Vibration in Buildings: Effects on Structures*.
- *British Standard BS 6472 (1992) Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)*.
- *British Standard BS 5228-1:2009 Code of practice for noise and vibration on construction and open sites – Part 1: Noise*.
- *British Standard BS 5228-2:2009 Code of practice for noise and vibration on construction and open sites – Part 2: Vibration*.
- *British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings.*
- *Australian Standard AS 2436 – 2010 Guide to noise and vibration control on construction, demolition and maintenance sites*.

1.5 Scope and limitations

This report has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Proposed modification

2.1 Overview

Transport for NSW is seeking to modify the approved project consisting of the establishment and use of four additional construction compounds for the purpose of construction of the project, identified as:

- **Astra Street:** located within Lot 16 of DP 1149782, this site is located within the former Astra Street landfill site within part of 2 and 28 Astra Street, Shortland, NSW. The site is owned by the City of Newcastle. The former Astra Street landfill site is subject to an approved Voluntary Management Proposal issued under Section 17 of the *Contaminated Land Management Act 1997*. The area of the proposed construction compound is 8.1 hectares.
- **Lookout Road:** located within Lot 222 of DP 840728, this site is a residential dwelling. The site is located at 136 Lookout Road, New Lambton Heights, NSW. The area of the proposed construction compound is about 0.1 hectares.
- **Cardiff Road:** located within Lots A-C of DP 347568, this site is located on disturbed vacant land at 10 and 12 Main Road, Cardiff Heights and 60 Marshall Street, New Lambton Heights. The site is owned by Transport for NSW. The area of the proposed construction compound is about 0.4 hectares.
- **Peatties Road:** located within Lot 1 of DP 330006, Lots 32 and 33 of DP 734569, and Lot 1 of DP 910200, this site is located at 1/6 Peatties Road, Kotara. The site has been subject to historical disturbance from a former quarry cut into the hillside, with roads built along terraces cut during quarrying activities. The site is owned by the City of Newcastle and Sydney Trains. The area of the proposed construction compound is about 1.7 hectares.

The additional construction compounds are located outside of the approved project boundary as shown on Figure 2.1. The proposed modification is needed to enable construction of the project safely.

2.2 Site establishment

Site establishment would involve the following activities:

- Erection of a temporary boundary fence and traffic management (as required).
- Installation of erosion and sediment controls.
- Minor earthworks to establish the compounds
- Vegetation clearing and grubbing (as required).
- Installation of site facilities.
- Connection to utilities.

2.3 Use of the construction compounds

A range of activities would be carried out at each construction compound identified for the proposed modification, as summarised in Table 2.1. A summary of daily light and heavy vehicle movements is also provided in Table 2.1.

The Peatties Road compound would replace construction compound A as the main construction compound for the project.

Table 2.1 Proposed activities

Activity	Peatties Road	Cardiff Road	Astra Street	Lookout Road
Main site compound area	Yes [1]			
Materials handling	Yes	Yes	Yes [1]	
Establishment of temporary fencing and traffic management	Yes	Yes	Yes	
Installation of erosion and sediment controls	Yes	Yes	Yes	
Establishment of compounds	Yes	Yes	Yes	
Vegetation clearing and grubbing	Yes	Yes	Yes	
Crushing plant			Yes	
Stockpile site	Yes	Yes	Yes [1]	
Batching plant			Yes [1]	
Bridge girder laydown			Yes [1]	
Site offices	Yes [1]			Yes [1]
Deliveries	Yes [1]		Yes [1]	
Parking	Yes [1]			Yes [1]
Construction support activities	Yes [1]		Yes [1]	
Demobilisation and rehabilitation	Yes	Yes	Yes	
Average worst case vehicle movements – daily (two way)				
Light vehicles	100	2	20	10
Heavy vehicles	20	2	30	2

Note 1: identifies proposed out of hours work (OOHW). Refer to section 2.4 for further information.

2.4 Access and acquisition

The additional construction compounds would have the following access points for both light and heavy vehicles:

– Astra Street: access from the project site would be via the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and Astra Street
– Cardiff Road: access from the project site would be via the Newcastle Inner City Bypass (Lookout Road), Cardiff Road and Marshall Street
– Lookout Road: access from the project site would be via Newcastle Inner City Bypass (Lookout Road)
– Peatties Road: access from the project site would be from the Newcastle Inner City Bypass (Lookout Road and Charlestown Road) and Peatties Road.

No acquisition is required for the proposed modification, where the land is not owned by Transport for NSW use of the sites would be carried out in accordance with the terms and conditions of the lease agreement with relevant landowners.

2.5 Construction hours

Construction hours for the proposed modification would generally be in accordance with Condition E26 of SSI-6888, which identifies construction hours as:

Work must only be carried out during the following construction hours:

(a) 7:00 am to 6:00 pm Mondays to Fridays.

(b) 8:00 am to 5:00 pm Saturdays.

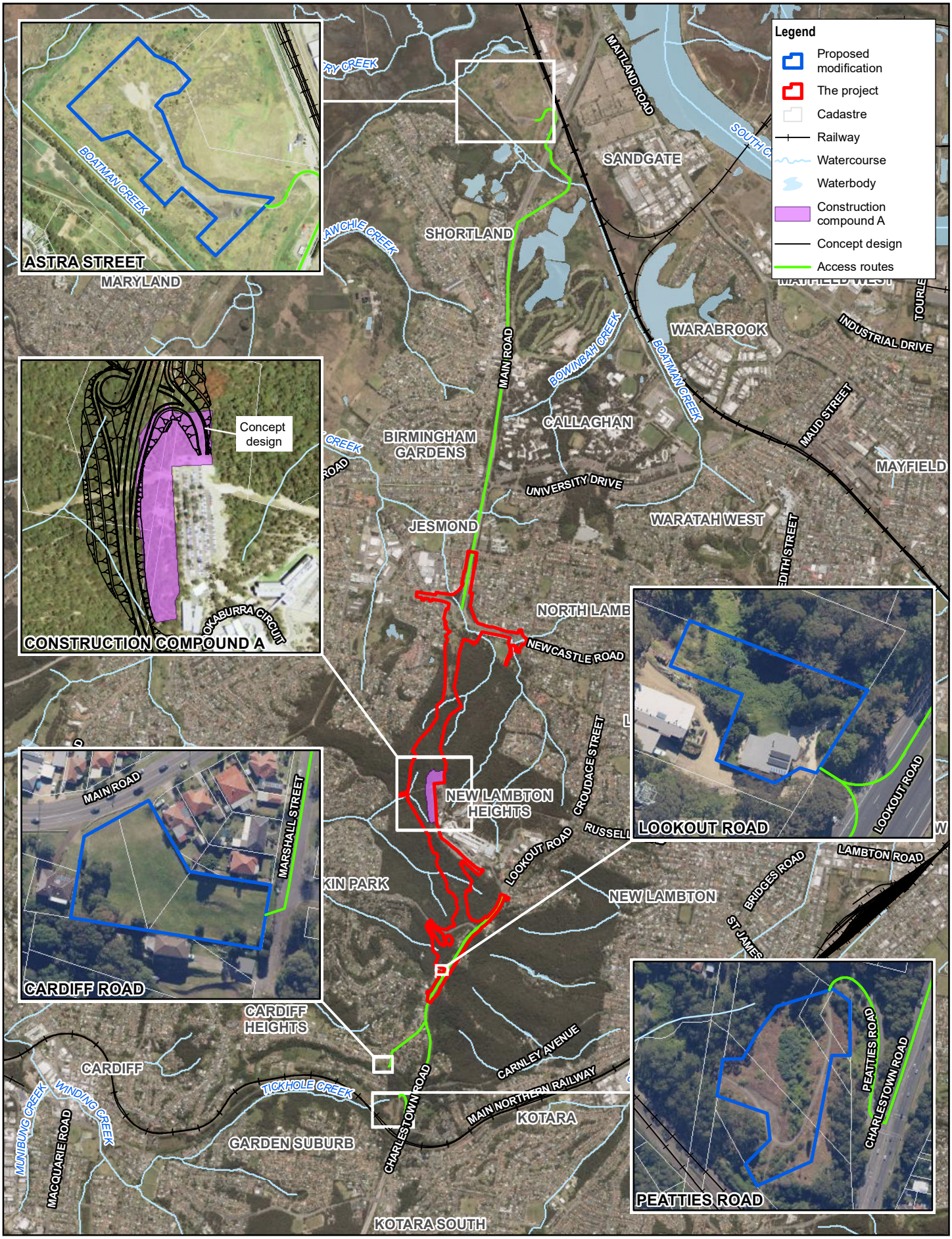
(c) at no time on Sundays or public holidays.

However, some out of hours work (OOHW) activities (refer to Table 2.1) are proposed at the Astra Street, Peatties Road and Lookout Road sites during the evening (6pm to 10pm Monday to Friday and Saturday 1pm to 10pm) and night (10pm to 7am Monday to Saturday) periods.

Any OOHW would be carried out in accordance with the conditions of approval (conditions E27, E28, E29 and E30). In particular, condition E27(c) permits OOHW to be carried out if it complies with the environment protection licence (EPL) (yet to be obtained) under the Protection of the Environment Operations Act 1997 for the project.

The reasons for carrying out OOHW include:

- Ensuring the safety of the public and construction workforce
- Minimising disruption to the existing road network and the network level of service
- Minimising disruption to road users and pedestrians
- In support of approved OOHW assessed in the EIS and SPIR.



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The project and proposed modification

Figure 2-1

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3. Existing environment

3.1 Noise monitoring

Background noise monitoring was carried out in *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment* (GHD 2016) to establish representative existing noise levels. Background noise monitoring was used to:

– Determine the existing background noise levels across each noise catchment area.

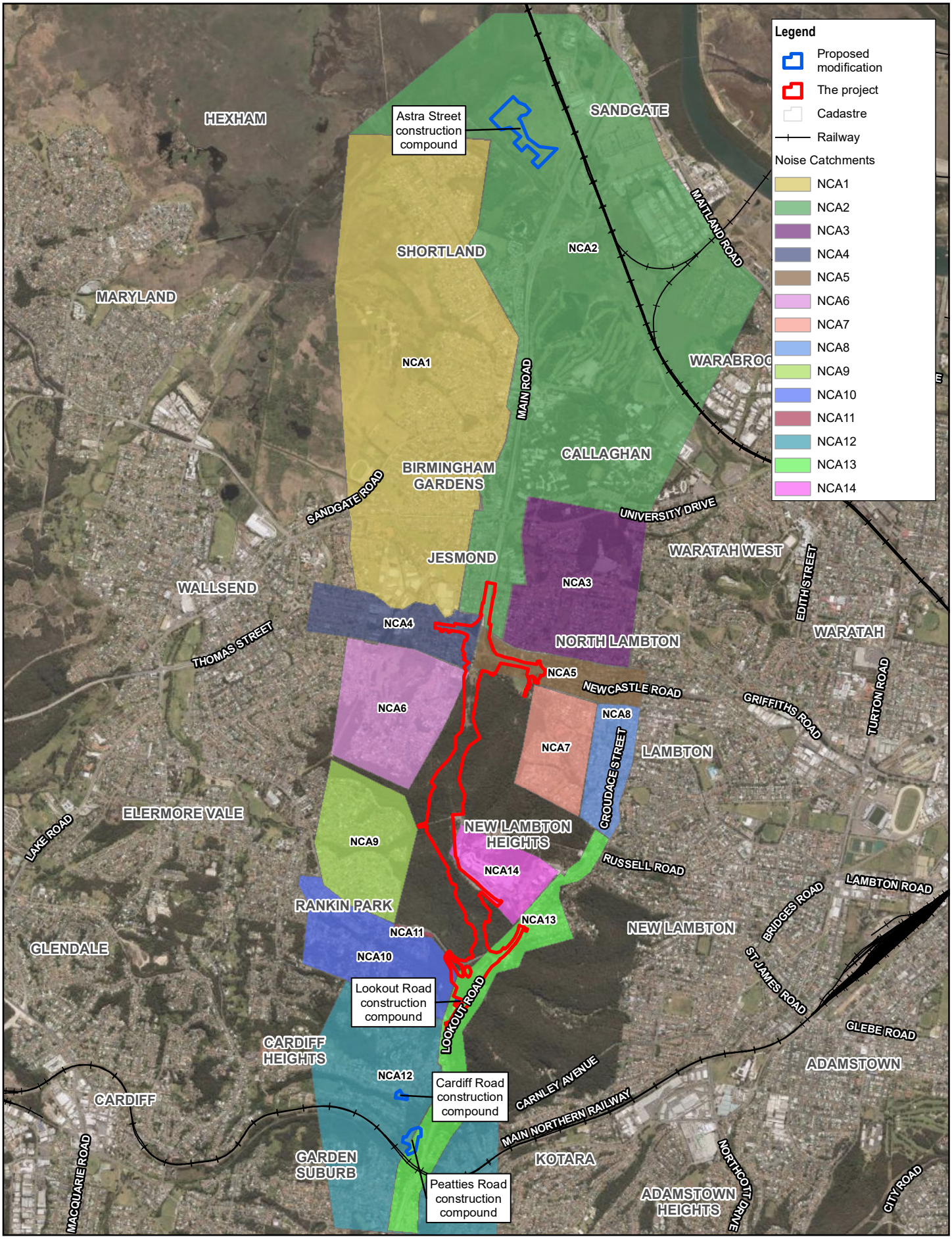
– Derive construction noise management levels.

Due to the similar distance from existing transportation noise sources noise monitoring conducted during the EIS is considered representative of the study area for this assessment, therefore no additional noise monitoring has been carried out for this updated assessment.

3.2 Noise sensitive receivers

As three of the construction compounds are geographically separated from the project, a 600 metre buffer from each construction compound was used to identify additional noise sensitive receivers for consideration in the assessment. Additional receivers identified within the buffer include 1037 residential receivers, two active recreation receivers, seven passive recreation receivers, one community facility, 10 commercial receivers, two educational receivers and two worship receivers.

All additional receivers have been grouped into the nearest representative existing noise catchment areas (NCA) based on the NCAs used in the *Newcastle Inner City Bypass – Rankin Park to Jesmond Technical Paper 3 - Noise and Vibration Assessment* (GHD 2018). Potentially impacted receivers from compound operations assessed in this report are located in NCAs 1, 2, 10, 11, 12 and 13 (Figure 3.1). Noise sensitive receivers considered in the assessment and their locations are presented in Appendix A to Appendix D for each of the compounds.



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Noise catchment areas

Figure 3-1

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Data source: TfNSW / Aurecon: The Project, 2018; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay

4. Criteria

4.1 Construction noise management levels

Specific construction noise management levels (CNMLs) for residential receivers were calculated for each NCA and are summarised in Table 4.1. CNMLs for non-residential receivers based on *Interim Construction Noise Guideline* (DECC 2009) are presented in Table 4.2.

Table 4.1 Construction noise management levels – residential receivers

NCA	Logging locations	NCA adopted background noise rating background level L_{A90}			Construction noise management level L_{Aeq}				
		Day	Evening	Night	During standard recommended hours		Outside of standard recommended hours (OOHW)		
					Highly noise affected	Noise affected level	Day 7am to 8am and 1pm to 6pm Saturday, 8am to 6pm Sunday & public holidays	Evening 6pm to 10pm Monday to Sunday & public holidays	Night 10pm to 7am, Monday to Saturday; 10pm to 8am Sunday & public holidays
NCA1	L01	45	39	33	75	55	50	44	38
NCA2	L02	49	43	35		59	54	48	40
NCA10	L15, L19	38	35	30(1)		48	43	40	35
NCA11	L14	50	42	33		60	55	47	38
NCA12	L21, L22	36	36	30(1)		46	41	41	35
NCA13	L16, L17, L18, L20, L24	56	49	33		66	61	54	38

Note 1: Background levels less than 30 dB(A) L_{90} have been set at 30 dB as per the *Industrial Noise Policy* (EPA 2000) Section 3.1.2. The *Industrial Noise Policy* also states that the evening rating background level should not be higher than the day time rating background level, and that the night time rating background level should not be higher than the evening rating background level.

The ‘noise affected’ management level represents the point at which there may be some community reaction to noise. Where the noise affected management level is exceeded, all feasible and reasonable work practices to minimise noise need to be applied. All potentially affected receivers will be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The noise affected management level is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The ‘highly noise affected’ management level represents the point at which there may be strong community reaction to noise. Where noise is above this management level, any feasible and reasonable ways to reduce noise below this level would be applied. If no quieter work method is feasible and reasonable, the affected residence would be advised of the duration and noise levels of the works and any respite periods that will be provided. The highly noise affected management level for standard hours is 75 dB(A).

Where construction noise is specified as an internal criteria a plus 7 dB conversion to external equivalent has been assumed in this assessment. This is conservatively representative of a typical dwelling of light construction with windows partially open.

Table 4.2 Construction noise management levels – non-residential receivers

Receiver type	Time period	ICNG management level, $L_{Aeq(15\ min)}$
Industrial premises	When in use	75 dB(A)
Offices, retail outlets	When in use	70 dB(A)
Educational institutes	When in use	45 dB(A) internal
Medical facilities	When in use	45 dB(A) internal
Places of worship	When in use	45 dB(A) internal
Active recreation areas	When in use	65 dB(A)
Passive recreation areas	When in use	60 dB(A)

Source: *Interim Construction Noise Guideline* (DECC 2009)

4.2 Sleep awakening and disturbance criteria

The *Interim Construction Noise Guideline* (DECC 2009) states that *‘*where construction works are planned to extend over more than two consecutive nights, the impact assessment should cover the maximum noise level from the proposed works*’*. In NSW, sleep disturbance and awakening are assessed using guidance in the *Road Noise Policy* (DECCW 2011) and the *Noise Policy for Industry* (EPA 2017).

Sleep awakening criteria are based on guidance in the *Road Noise Policy*. The *Environmental Criteria for Road Traffic Noise* (EPA 1999) acknowledges that, based on the current level of understanding, no absolute noise level criteria have been established that correlate to an acceptable level of sleep disturbance. However, the *Road Noise Policy* suggests that internal noise levels below 50 to 55 dB(A) L_{Amax} are unlikely to cause awakening reactions, and one or two events per night, with internal noise levels of 65 to 70 dB(A) L_{Amax} (inside dwellings) are not likely to significantly affect health and wellbeing.

The *Noise Policy for Industry* (EPA 2017) recommends a maximum noise level assessment to assess the potential for sleep disturbance events which includes awakenings and disturbance to sleep stages. An initial screening test for maximum noise level events should be assessed to the following levels:

- $L_{Aeq(15\ min)}$ 40 dB(A) or the prevailing rating background level plus 5 dB, whichever is greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing rating background level plus 15 dB, whichever is greater.

If the screening test indicates a potential for sleep disturbance, then a detailed maximum noise level assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background level and the number of times this happens during the night-time period.

Review of prevailing rating background levels across the relevant NCAs within the study area for this assessment indicates that the controlling *Noise Policy for Industry* sleep disturbance value is L_{AFmax} 52 dB(A) for all relevant NCAs.

A summary of the sleep disturbance criteria is provided in Table 4.3.

Table 4.3 Sleep awakening and disturbance criteria

Criteria	L_{Amax} criteria	Assessment location
Sleep awakening (*Road Noise Policy*)	55 dB(A)	Internal
Sleep disturbance screening level (*Noise Policy for Industry*)	52 dB(A)	External

4.3 Human vibration criteria

The Department of Environment and Conservation (DEC) publication, *Assessing vibration: A technical guideline* (DEC 2006) outlines methods of assessing potential impacts and ways to manage vibration from construction activities. The *Assessing Vibration: A Technical Guideline* is based on guidelines contained in British Standard *BS 6472-1:1992 Evaluation of human exposure to vibration in buildings (1–80 Hz).*

Typically, construction works generate ground vibration of an intermittent nature. In accordance with BS 6472- 1:1992, intermittent vibration is assessed using the Vibration Dose Value (VDV). Acceptable VDVs, as outlined in *Assessing Vibration: A Technical Guideline*, are listed in Table 4.4.

Table 4.4 Acceptable vibration dose values for intermittent vibration

Location	Daytime [1] ($m/s^{1.75}$)		Night-time [1] ($m/s^{1.75}$)	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas [2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Source: Table 2.4 Assessing vibration: A technical guideline (DEC 2006)

Notes:

1. Daytime is 7am to 10pm and night-time is 10pm to 7am.
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.

While the assessment of response to vibration in BS 6472-1:1992 is based on VDV and weighted acceleration, for construction-related vibration, it is considered more appropriate to provide guidance in terms of Peak Particle Velocity (PPV), since this parameter is more likely to be routinely measured based on the more usual concern over potential building damage.

Humans are capable of detecting vibration at levels well below those that risk causing damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in British Standard *BS 5228-2:2009 Code of practice for noise and vibration on construction and open sites – Part 2: Vibration* as listed in Table 4.5.

Table 4.5 Guidance on the effects of vibration levels

Approximate vibration level	Degree of perception
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30 mm/s	Vibration might be just perceptible in residential environments.
1.00 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.00 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Source: BS 5228-2:2009 *Code of practice for noise and vibration on construction and open sites – Part 2: Vibration*

4.4 Structural damage criteria

Currently, there is no Australian Standard that sets criteria for the assessment of building damage caused by vibration. Consistent with other major projects of a similar type, guidance on limiting vibration values has been obtained by reference to German Standard *DIN 4150-3: 2016-02 Structural Vibration – Part 3: Effects of vibration on structures.* Short-term vibration guideline values for vibration at the foundation of a structure are listed in Table 4.6.

Table 4.6 Guideline values for short-term vibration on structures

Line	Type of structure	Guideline values for velocity, vi(t) [1] [mm/s]		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz [2]
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and/or occupancy.	5	5 to 15	15 to 20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (such as heritage listed buildings under preservation order).	3	3 to 8	8 to 10

Source: *German Standard DIN 4150-3: 2016-02 Structural Vibration – Part 3: Effects of vibration on structures*

Notes:

1. The term v_i refers to vibration levels in any of the x, y or z axes
2. At frequencies above 100 Hz the values given in this column may be used as minimum values

4.5 Construction traffic noise

The *Road Noise Policy* (DECCW 2011) provides traffic noise target levels for receivers near existing roads (Table 4.7). These levels are applied to construction work to identify potential construction traffic impacts and the subsequent need for reasonable and feasible mitigation measures.

The Application Notes[1] for the *Road Noise Policy* states that 'for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development.' This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.

If road traffic noise during construction is within 2 dB(A) of current levels, then the objectives of the *Road Noise Policy* are met, and no specific mitigation measures are required.

[1]http://www.environment.nsw.gov.au/noise/roadnoiseappnotes.htm 12 December 2012

Table 4.7 Construction traffic noise criteria, $L_{Aeq(period)}$, dB(A)

Type of development	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residence affected by additional traffic on arterial roads generated by land use developments	60 $L_{Aeq(15hr)}$	55 $L_{Aeq(9hr)}$
Existing residence affected by additional traffic on local roads generated by land use developments	55 $L_{Aeq(1hr)}$	50 $L_{Aeq(1hr)}$
1. School classrooms	$L_{Aeq,1hour}$ 40 (internal) when in use	–
2. Hospital wards	$L_{Aeq,1hour}$ 35 (internal) when in use	$L_{Aeq,1hour}$ 35 (internal) when in use
3. Places of worship	$L_{Aeq,1hour}$ 40 (internal) when in use	$L_{Aeq,1hour}$ 40 (internal) when in use
4. Open space (active use)	$L_{Aeq,15hour}$ 60 (external) when in use	-
5. Open space (passive use)	$L_{Aeq,15hour}$ 55 (external) when in use	-
6. Child Care Facilities	Sleeping rooms $L_{Aeq,1hour}$ 35 (internal) Indoor play areas $L_{Aeq,1hour}$ 40 (internal) Outdoor play areas $L_{Aeq,1hour}$ 55 (external)	
7. Aged care facilities	assessed as residential receivers	Assessed as residential receivers

5. Methodology

The methodology for the construction noise and vibration assessment included:

– The construction noise management levels were adopted from the 2018 assessment.
– A list of likely construction activities and machinery was established for the proposed construction compounds. Representative sound power levels for the selected equipment were obtained from relevant standards and guidelines.
– Noise propagation calculations were carried out for the anticipated activities.
– Where noise levels were predicted to exceed the construction noise management levels, appropriate construction noise and vibration mitigation measures are provided to minimise impacts.

5.1 Noise prediction method

Construction noise impacts associated with the project were determined using CadnaA 2021MR1 noise modelling software using the ISO 9613 algorithm.

The noise model inputs and assumptions for this assessment are provided in Table 5.1.

Table 5.1 Construction noise modelling assumptions

Modelling component	Assumption
Noise model	CadnaA 2021MR1
Prediction algorithm	*ISO 9613 – 2 Acoustics – Attenuation of sound during propagation outdoors*
Modelling period	Typical worst case 15 minute period of operation where each item of equipment is running at full power
Meteorology	ISO 9613 considers the presence of a well-developed moderate ground based temperature inversion, such as commonly occurs on clear, calm nights or 'downwind' conditions which are favourable to sound propagation
Ground absorption coefficient	G = 0.75
Atmospheric absorption	Based on an average temperature of 10°C and an average humidity of 70 %
Receiver heights	1.5 m above building ground level (ground floor)

5.2 Construction compounds

Key construction scenarios for compound operations have been considered in this assessment. Assumed equipment and noise levels are provided in section 5.2.1. Relevant considerations for this assessment are summarised in the following sections.

The different scenarios represent different equipment noise levels and give an idea how noise levels may change with different activities being carried out. The construction noise is assessed assuming that the two loudest pieces of construction equipment are operational concurrently for each scenario. This is considered to represent the upper end of possible noise levels.

Construction equipment would likely move about the sites altering noise impacts with respect to the identified receivers. During any given period, the construction items to be used in the compound sites would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time and certain types of construction machinery would be present in the compound sites near to the receiver for only brief periods during construction activities.

5.2.1 Activity sound power levels

Relevant modelling scenarios, representative equipment, adopted sound power levels and estimated durations for this assessment are summarised in Table 5.2.

Table 5.2 Activity sound power levels

Modelling scenario	General tasks	Representative equipment [1]	Equipment individual sound power level, L_W dB(A)	Adopted activity sound power level, L_W dB(A)	Activity duration at each site
MOD01	Establishment of temporary fencing and traffic management	Truck (medium rigid)	103	110	2 months
		Road truck	108		
		Scissor Lift	98		
		Franna crane	98		
MOD02	Installation of erosion and sediment controls	Road truck	108	113	2 weeks
		Backhoe	111		
MOD03	Establishment of compounds	Hand tools (electric)	102	117	1 month
		Crane	110		
		Grader	110		
		Vibratory roller	113		
		Road truck	108		
MOD04	Vegetation clearing and grubbing	Dozer	116	123	2 weeks
		Chainsaw	119		
		Excavator 30T	110		
		Dump truck	117		
		Tub grinder and mulcher	116		
MOD05	General compound activities	Light vehicle	106	113	30 months
		Compressor	110		
		Road truck	108		
MOD06	Materials handling	Excavator 30T	110	114	30 months
		Franna crane	98		
		Front end loader	111		
MOD07	Crushing plant	Rock crusher	124	124	30 months
MOD08	Stockpile site	Excavator 30T	110	119	30 months
		Road Truck	108		
		Front end loader	111		
		Dump truck	117		
MOD09	Batching plant	Batching plant (asphalt)	108	111	30 months
		Batching plant (concrete)	108		
MOD10	Bridge girder laydown	Crane	110	110	30 months
		Franna crane	98		

Modelling scenario	General tasks	Representative equipment [1]	Equipment individual sound power level, L_W dB(A)	Adopted activity sound power level, L_W dB(A)	Activity duration at each site
MOD11	Deliveries	Light vehicle	106	110	30 months
		Franna crane	98		
		Road truck	108		
MOD12	Construction support activities	Hand tools (pneumatic)	116	117	30 months
		Hand tools (electric)	102		
		Water cart	107		
MOD13	Removal of compounds and rehabilitation	Hand tools (electric)	102	113	2 months
		Crane	110		
		Excavator 30T	110		

5.2.2 Assessment scenarios

Table 5.3 shows which activities are proposed for each of the construction compounds along with the time of day that these activities are proposed.

Table 5.3 Assessment scenarios

Compound	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Peatties Road	Standard hours	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	Y
	Day/Evening (OOHW1)	N	N	N	N	Y	N	N	N	N	N	Y	Y	N
	Night (OOHW2)	N	N	N	N	Y	N	N	N	N	N	Y	Y	N
Cardiff Road	Standard hours	Y	Y	Y	Y	N	Y	N	Y	N	N	N	N	Y
	Day/Evening (OOHW1)	N	N	N	N	N	N	N	N	N	N	N	N	N
	Night (OOHW2)	N	N	N	N	N	N	N	N	N	N	N	N	N

Compound	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Astra Street	Standard hours	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	Day/Evening (OOHW1)	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	N
	Night (OOHW2)	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	N
Lookout Road	Standard hours	N	N	N	N	Y	N	N	N	N	N	N	N	N
	Day/Evening (OOHW1)	N	N	N	N	Y	N	N	N	N	N	N	N	N
	Night (OOHW2)	N	N	N	N	Y	N	N	N	N	N	N	N	N

5.2.3 Construction vibration assessment

Energy from equipment is transmitted into the ground and transformed into vibration, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

– the efficiency of the energy transfer mechanism of the equipment (ie impulsive, reciprocating, rolling or rotating equipment).
– the frequency content.
– the impact medium stiffness.
– the type of wave (surface or body).
– the ground type and topography.

The construction vibration assessment is based on methods and information presented in:

– *Environmental Noise Management Manual* (Roads and Traffic Authority 2001).
– *British Standard BS 5228-2:2009 Code of practice for noise and vibration on construction and open sites – Part 2: Vibration.*
– *British Standard BS 6472:1992 Evaluation of human exposure to vibration in buildings (1–80 Hz)*
– *Construction Noise and Vibration Strategy ST-157/4.1* (Transport for NSW, 2019).
– *Assessing Vibration: A Technical Guideline* (DEC 2006).

The assessment of vibration levels from intermittent construction sources is described in *Assessing Vibration: A Technical Guideline* (DEC 2006), which is based on BS 6472:1992. The assessment evaluates vibration dose value, which incorporates the magnitude of vibration and the length of time the source of the vibration operates. For construction, the vibration impact on a receiver can be predicted and compared to the *Assessing Vibration: A Technical Guideline* vibration dose value criteria at various receiver types for day and night periods.

BS 6472:1992 provides a method to calculate the estimated vibration dose value using root-mean-square (r.m.s.) vibration velocity. The estimated vibration dose value (eVDV) is calculated as:

$eVDV = 0.07 \times V_{rms} \times t^{0.25}$ ($m/s^{1.75}$)

Where t= duration of the event.

The eVDV from construction equipment has been estimated, with assumptions discussed in this section.

With regards to frequency the *Assessing Vibration: A Technical Guideline* states the following:

> *'Over the frequency range of 8 to 80 Hz, z-axis velocity requires no frequency weighting in order to determine annoyance or disturbance response (no weighting over frequency range 2–80 Hz for x- and y-axis vibration). At frequencies below 8 Hz, the use of unweighted velocity is more strict than the requirements of BS 6472.'*

Furthermore, to estimate r.m.s. vibration velocity from available PPV values for given plant items, a sinusoidal waveform has been assumed. This PPV is also based on the conservative propagation relationship of $d^{-0.8}$ with typical ranges for this value being $d^{-0.8}$ to $d^{-1.6}$. Considering these assumptions, the assessment of human comfort vibration impacts using eVDV calculated from velocity is conservative in nature.

An additional assumption of operating time of vibration generating equipment is required to calculate the eVDV. The construction methodology is not known to this level of detail at this stage. The nature of the works would typically result in intermittent vibration levels at any given location as equipment moves within the site (eg a vibratory roller passing up and down the work area). Therefore, a cumulative duration of one hour for a given plant item during the 15-hour day period has been assumed. The 15-hour day period is as per that provided in the *Assessing Vibration: A Technical Guideline*, where daytime is defined as 7am to 10pm and night time is defined as 10pm to 7am. No significant vibration generating activities are proposed for the night time period.

The exact details of the construction methodology for the proposal, such as the operating duration of vibration generating equipment, are not yet known. This information would be determined during construction planning. As a result, estimating the vibration dose values from construction sources requires a broad range of assumptions described above. *Assessing Vibration: A Technical Guideline* notes that velocity values can be used as a screening method. In addition, velocity values are widely available for typical construction equipment, and are more likely to be routinely measured in relation to potential building damage. Therefore, PPV is presented alongside VDV as a screening method to assess human comfort impacts from construction vibration, with consideration given to the guidance in BS 5228-2.2009, which provides level categories that relate to human perception of vibration.

6. Construction noise impacts

The potential construction noise impacts have been assessed with reference to the construction noise management level and construction periods of:

- Standard hours:
  - Monday to Friday 7am to 6pm
  - Saturday 8am-1pm
- Out of hours works period 1 (OOHW1):
  - Day:
    - Saturday 7am to 8am and 1pm to 6pm
    - Sunday and public holidays 8am to 6pm
  - Evening:
    - Monday to Saturday 6pm to 10pm
- Out of hours works period 2 (OOHW2)
  - Monday to Saturday 10pm to 7am
  - Sunday and public holidays 6pm to 8am

6.1 Peatties Road

The predicted construction noise management level exceedances at residential receivers for each assessment scenario are shown in Table 6.1. No impacts are predicted for non-residential receivers. A full list of impacted noise sensitive receivers is provided in Appendix A.

Locations of works are shown in Appendix A (Figure A.1). These figures include noise contours for the worst-case assessment scenario (MOD12 – Construction support activities) and show noise sensitive receivers with their respective unique identifiers (IDs).

Where noise is above the construction noise management level, appropriate mitigation measures will be implemented (refer to section 10).

Table 6.1 Peatties Road – number of residential receivers impacted and level of impact

Assessment	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Highly affected level	0	0	0	0	0	0	-	0	-	-	0	0	0
	Standard hours	13	16	20	26	16	17	-	22	-	-	13	20	16
	Day (OOHW1)	-	-	-	-	21	-	-	-	-	-	18	25	-
	Evening (OOHW1)	-	-	-	-	21	-	-	-	-	-	18	25	-
	Night (OOHW2)	-	-	-	-	27	-	-	-	-	-	24	31	-
Number of receivers exceeding the construction noise management level	Highly affected level	0	0	0	0	0	0	-	0	-	-	0	0	0
	Standard hours	58	82	169	347	82	108	-	226	-	-	58	169	82
	Day (OOHW1)	-	-	-	-	199	-	-	-	-	-	126	322	-
	Evening (OOHW1)	-	-	-	-	202	-	-	-	-	-	127	333	-
	Night (OOHW2)	-	-	-	-	472	-	-	-	-	-	342	637	-

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

6.2 Cardiff Road

The predicted construction noise management level exceedances at residential receivers for each assessment scenario are shown in Table 6.2. The number of exceedances for non-residential receivers are shown in Table 6.3. A full list of impacted noise sensitive receivers is provided in Appendix B.

Locations of works are shown in Appendix B (Figure B.1). These figures include noise contours for the worst-case assessment scenario anticipated for the 30 month construction period (MOD08 – stockpile site) and show noise sensitive receivers with their respective unique identifiers (IDs).

Where noise is above the construction noise management level, appropriate mitigation measures will be implemented (refer to section 10).

Table 6.2 Cardiff Road– number of residential receivers impacted and level of impact

Assessment	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Highly affected level	3	9	17	29	-	11	-	21	-	-	-	-	9
	Standard hours	32	38	46	58	-	40	-	50	-	-	-	-	38
	Day (OOHW1)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Evening (OOHW1)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Night (OOHW2)	-	-	-	-	-	-	-	-	-	-	-	-	-
Number of receivers exceeding the construction noise management level	Highly affected level	4	5	9	17	-	6	-	15	-	-	-	-	5
	Standard hours	141	183	330	663	-	210	-	426	-	-	-	-	183
	Day (OOHW1)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Evening (OOHW1)	-	-	-	-	-	-	-	-	-	-	-	-	-
	Night (OOHW2)	-	-	-	-	-	-	-	-	-	-	-	-	-

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

Table 6.3 Cardiff Road – number of non-residential receivers impacted and level of impact

Assessment	Receiver type	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Commercial	0	3	7	13	-	4	-	9	-	-	-	-	3
	Place of worship	0	0	4	10	-	1	-	6	-	-	-	-	0
Number of receivers exceeding the construction noise management level	Commercial	0	1	1	1	-	1	-	1	-	-	-	-	1
	Place of worship	0	0	1	1	-	1	-	1	-	-	-	-	0

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

6.3 Astra Street

The predicted construction noise management level exceedances at residential receivers for each assessment scenario are shown in Table 6.4. The number of exceedances for non-residential receivers are shown in Table 6.5. A full list of impacted noise sensitive receivers is provided in Appendix C.

Locations of works are shown in Appendix C (Figure C.1). These figures include noise contours for the worst-case assessment scenario (MOD08 – stockpile site) and show noise sensitive receivers with their respective unique identifiers (IDs).

Where noise is above the construction noise management level, appropriate mitigation measures will be implemented (refer to section 10).

Table 6.4 Astra Street– number of residential receivers impacted and level of impact

Assessment	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Highly affected level	0	0	0	0	-	0	0	0	0	0	0	0	0
	Standard hours	0	0	2	8	-	0	9	4	0	0	0	2	0
	Day (OOHW1)	-	-	-	-	-	4	-	9	1	0	0	7	-
	Evening (OOHW1)	-	-	-	-	-	10	-	15	7	6	6	13	-
	Night (OOHW2)	-	-	-	-	-	18	-	23	15	14	14	21	-
Number of receivers exceeding the construction noise management level	Highly affected level	0	0	0	0	-	0	0	0	0	0	0	0	0
	Standard hours	0	0	1	53	-	0	67	12	0	0	0	1	0
	Day (OOHW1)	-	-	-	-	-	12	-	67	1	0	0	42	-
	Evening (OOHW1)	-	-	-	-	-	89	-	166	42	32	32	151	-
	Night (OOHW2)	-	-	-	-	-	167	-	167	163	148	148	167	-

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

Table 6.5 Astra Street– number of non-residential receivers impacted and level of impact

Assessment	Receiver type	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Passive recreation area	0	0	0	3	-	0	4	0	0	0	0	0	0
	Active recreation area	0	0	0	3	-	0	4	0	0	0	0	0	0
	Education facility	0	0	0	3	-	0	4	0	0	0	0	0	0
Number of receivers exceeding the construction noise management level	Passive recreation area	0	0	0	1	-	0	1	0	0	0	0	0	0
	Active recreation area	0	0	0	1	-	0	1	0	0	0	0	0	0
	Education facility	0	0	0	1	-	0	1	0	0	0	0	0	0

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

6.4 Lookout Road

The predicted construction noise management level exceedances at residential receivers for each assessment scenario are shown in Table 6.6. No exceedances are predicted at non-residential receivers. A full list of impacted noise sensitive receivers is provided in Appendix D.

Locations of works are shown in Appendix D (Figure D.1). These figures include noise contours for the worst-case assessment scenario (MOD05 – general compound activities) and show noise sensitive receivers with their respective unique identifiers (IDs).

Where noise is above the construction noise management level, appropriate mitigation measures will be implemented (refer to section 10).

Table 6.6 Lookout Road– number of residential receivers impacted and level of impact

Assessment	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
Highest exceedance of construction noise management level (1)	Highly affected level	-	-	-	-	5 (2) 0 (3)	-	-	-	-	-	-	-	-
	Standard hours	-	-	-	-	14 (2) 0 (3)	-	-	-	-	-	-	-	-
	Day (OOHW1)	-	-	-	-	19 (2) 4 (3)	-	-	-	-	-	-	-	-
	Evening (OOHW1)	-	-	-	-	26 (2) 7 (3)	-	-	-	-	-	-	-	-
	Night (OOHW2)	-	-	-	-	42 (2) 21 (3)	-	-	-	-	-	-	-	-
Number of receivers exceeding the construction noise management level	Highly affected level	-	-	-	-	1 (2) 0 (3)	-	-	-	-	-	-	-	-
	Standard hours	-	-	-	-	1 (2) 0 (3)	-	-	-	-	-	-	-	-
	Day (OOHW1)	-	-	-	-	48 (2) 47 (2)	-	-	-	-	-	-	-	-
	Evening (OOHW1)	-	-	-	-	93 (2) 92 (3)	-	-	-	-	-	-	-	-
	Night (OOHW2)	-	-	-	-	160 (2) 159 (3)	-	-	-	-	-	-	-	-

Note 1: Highest exceedance of the CNML shows the predicted noise level over the CNML at the single receiver with the highest predicted construction noise level for that scenario. This is an indication of the impact on the wider study area, but can be used to compare the relative level of noise between scenarios at the most potentially affected receiver and help to guide appropriate mitigation measures.

Note 2: The worst case result presented is for the residence located next to the Lookout Road site. As part of the proposed modification planning process, Transport for NSW has entered into an *Adjacent Property Access and Use Agreement* with this landowner for the use of Lookout Road compound.

Note 3: Provides results for the next worst affected receiver (ie excluding the residence discussed under note 2).

6.5 Summary of noise impacts

Noise impacts are predicted for sensitive residential and sensitive non-residential receivers due to the establishment, operation and decommissioning of construction compounds. Therefore the noise and vibration mitigation measures recommended for the project will be implemented where feasible and reasonable and all potentially impacted receivers should be informed of the nature of the work, expected noise levels, duration of work and a method of contact. The provided results and following summary are to be interpreted with consideration that the level of impact would vary over the activity duration as the demand and intensity of these activities varies during the project's construction.

Noise impacts predicted in relation to the Peatties Road compound are summarised as:

– During standard construction hours:
  - 347 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 26 dB(A) at the worst affected receivers.
  - The predicted worst case activity for level and extent of impact during standard construction hours is vegetation clearing and grubbing (MOD04), which would occur over a period of up to 2 weeks.
  - The predicted worst-case activity for the main construction period of up to 30 months is stockpile site (MOD08) with potential exceedances of the construction noise management level at up to 226 residential receivers. Predicted levels exceed the construction noise management level by up to 22 dB(A) at the worst affected receivers.
  - No impacts are predicted at non-residential receivers.
– During OOHW period 1 day, up to 322 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 25 dB(A) at the worst affected receivers. The predicted worst case activity during this period is construction support activities (MOD12), which would occur over the construction period of 30 months.
– During OOHW period 1 evening, up to 333 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 25 dB(A) at the worst affected receivers. The predicted worst case activity during this period is construction support activities (MOD12), which would occur over the construction period of 30 months.
– During OOHW period 2 night, up to 637 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 31 dB(A) at the worst affected receivers. The predicted worst case activity during this period is construction support activities (MOD12), which would occur over the construction period of 30 months.
– No receivers are predicted to exceed the 75 dB(A) highly affected level for any of the assessed scenarios.

Noise impacts predicted in relation to the Cardiff Road compound are summarised as:

– During standard construction hours:
  - 663 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 58 dB(A) at the worst affected receivers.
  - The predicted worst case activity for level and extent of impact during standard construction hours is vegetation clearing and grubbing (MOD04) which would occur over a period of up to 2 weeks.
  - The predicted worst-case activity for the main construction period of up to 30 months is stockpile site (MOD08) with potential exceedances of the construction noise management level at up to 426 residential receivers. Predicted levels exceed the construction noise management level by up to 50 dB(A) at the worst affected receivers.
  - Two non-residential receivers (one place of worship and one commercial) were identified with potential exceedances of the relevant construction noise management level. Impacts of up to 13 dB(A) were identified over the construction noise management level for places of worship and 8 dB(A) for the commercial receiver.

- Up to 17 residential receivers were identified with potential exceedances of the 75 dB(A) highly affected level with impacts of up to 29 dB(A) over this value. The predicted worst case activity is vegetation clearing and grubbing (MOD04), which would occur over a period of up to 2 weeks. For the main construction period of up to 30 months, the worst-case activity in relation to the highly affected level is stockpile site (MOD08) with potential exceedances of the highly affected level at up to 15 residential receivers by up to 21 dB(A).

– No activities are proposed for OOHW periods.

Noise impacts predicted in relation to the Astra Street compound are summarised as:

– During standard construction hours:
  - 67 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 9 dB(A) at the worst affected receivers.
  - The predicted worst case activity for level and extent of impact during standard construction hours is crushing plant (MOD07), which would occur over a period of up to 30 months.
  - Three non-residential receivers including one passive recreation receiver, one active recreation receiver and one educational facility were identified with potential exceedances of the relevant construction noise management level. Impacts of up to 4 dB(A) were identified for the activity of crushing plant (MOD07).
– During OOHW period 1 day, up to 67 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 9 dB(A) at the worst affected receivers. The predicted worst case activity during this period is stockpile site (MOD08), which would occur over the construction period of 30 months.
– During OOHW period 1 evening, up to 166 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 15 dB(A) at the worst affected receivers. The predicted worst case activity during this period is stockpile site (MOD08), which would occur over the construction period of 30 months.
– During OOHW period 2 night, up to 167 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 23 dB(A) at the worst affected receivers. The predicted worst case activity during this period is stockpile site (MOD08), which would occur over the construction period of 30 months.
– No receivers are predicted to exceed the 75 dB(A) highly affected level for any of the assessed scenarios.

Noise impacts predicted in relation to the Lookout Road compound are summarised as:

– During standard construction hours:
  - One residential receiver adjacent to the compound was identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 14 dB(A) at this receiver. No other exceedances of the daytime CNML are predicted.
  - The predicted worst case activity for level and extent of impact during standard construction hours is general compound activities (MOD05), which would occur over the construction period of 30 months.
  - No impacts are predicted at non-residential receivers.
  - One receiver adjacent to the compound was identified with potential exceedances of the 75 dB(A) highly affected level with impacts of up to 5 dB(A) over this value. The predicted worst case activity is general compound activities (MOD05), which would occur over the construction period of 30 months.
– During OOHW period 1 day, up to 48 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 19 dB(A) at the residential receiver adjacent to the compound. The next highest exceedance is predicted to be 4 dB(A) over the CNML for this period. The predicted worst case activity during this period is general compound activities (MOD05), which would occur over the construction period of 30 months.

– During OOHW period 1 evening, up to 93 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 26 dB(A) at the residential receiver adjacent to the compound. The next highest exceedance is predicted to be 7 dB(A) over the CNML for this period. The predicted worst case activity during this period is general compound activities (MOD05), which would occur over the construction period of 30 months.
– During OOHW period 2 night, up to 160 residential receivers were identified with potential exceedances of the construction noise management level. Predicted levels exceed the construction noise management level by up to 42 dB(A) at the residential receiver adjacent to the compound. The next highest exceedance is predicted to be 21 dB(A) over the CNML for this period. The predicted worst case activity during this period is general compound activities (MOD05), which would occur over the construction period of 30 months.

7. Sleep disturbance and awakening impacts

The sleep disturbance and awakening assessment criteria are provided in section 4.2. Potential noise impacts within the study area have been considered through a maximum noise level (L_{Amax}) assessment. Typically maximum (L_{Amax}) noise levels are around five dB to 10 dB greater than the $L_{Aeq(15\ min)}$ noise levels. A standard window will generally provide a 10 dB reduction when partially open and a 20 dB reduction when closed. As a potential worst-case it is assumed that a seven dB reduction is achieved where windows would be kept partially open at potentially impacted residential dwellings.

There is the potential for sleep disturbance and awakening impacts, with consideration to the *Road Noise Policy* (DECCW 2011) and *Noise Policy for Industry* (EPA 2017) criteria, if construction activities occur during the night-time period. Potential exceedances of these criteria are provided in Table 7.1. The provided results and following summary are to be interpreted with consideration that the level of impact would vary over the activity duration as the demand and intensity of these activities varies during the project's construction.

Sleep disturbance and awakening noise predictions for the compounds are as follows:

– Peatties Road - the three proposed night time activities of general compound activities (MOD05), deliveries (MOD11) and construction support activities (MOD12) have predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 391 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 89 residential receivers. Of the proposed night time activities, the scenario construction support activities (MOD12) has the greatest potential for sleep disturbance and awakening impacts and is anticipated to occur over the construction period of 30 months.
– Cardiff Road - compound operation and activities are proposed to occur during daytime standard hours only for this compound, therefore no sleep disturbance impacts are predicted.
– Astra Street - the proposed night time activities of materials handling (MOD06), stockpile site (MOD08), batching plant (MOD09), Bridge girder laydown (MOD10), deliveries (MOD11) and construction support activities (MOD12) have predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 167 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 51 residential receivers. Of the proposed night time activities, the scenario stockpile site (MOD08) has the greatest potential for sleep disturbance and awakening impacts and is anticipated to occur over the construction period of 30 months.
– Lookout Road - the proposed night time activity of general compound activities (MOD05) has predicted impacts at residential receivers impacted for sleep disturbance and awakening potential. These activities are predicted to exceed the external 52 dB(A) L_{Amax} *Noise Policy for Industry* sleep disturbance criteria at up to 85 residential receivers and the internal 55 dB(A) L_{Amax} *Road Noise Policy* awakening criteria at up to 3 residential receivers.

Table 7.1 Sleep disturbance – number of residential receivers impacted and level of impact

Assessment	Period	Construction activity												
		MOD01	MOD02	MOD03	MOD04	MOD05	MOD06	MOD07	MOD08	MOD09	MOD10	MOD11	MOD12	MOD13
		Establishment of temporary fencing and traffic management	Installation of erosion and sediment controls	Establishment of compounds	Vegetation clearing and grubbing	General compound activities	Materials handling	Crushing plant	Stockpile site	Batching plant	Bridge girder laydown	Deliveries	Construction support activities	Removal of compounds and rehabilitation
***Noise Policy for Industry* sleep disturbance criteria** *Level of exceedance (dBA, L_{Amax})*	Peatties Road	-	-	-	-	20	-	-	-	-	-	17	24	-
	Cardiff Road	-	-	-	-	-	-	-	-	-	-	-	-	-
	Astra Street	-	-	-	-	-	16	-	21	13	12	12	19	-
	Lookout Road	-	-	-	-	38 (1) 17 (2)	-	-	-	-	-	-	-	-
***Noise Policy for Industry* sleep disturbance criteria** *Number of residential receivers impacted*	Peatties Road	-	-	-	-	218	-	-	-	-	-	141	391	-
	Cardiff Road	-	-	-	-	-	-	-	-	-	-	-	-	-
	Astra Street	-	-	-	-	-	151	-	167	86	69	69	167	-
	Lookout Road	-	-	-	-	85 (1) 84 (2)	-	-	-	-	-	-	-	-
***Road Noise Policy* awakening criteria** *Level of exceedance (dBA, L_{Amax})*	Peatties Road	-	-	-	-	10	-	-	-	-	-	7	14	-
	Cardiff Road	-	-	-	-	-	-	-	-	-	-	-	-	-
	Astra Street	-	-	-	-	-	6	-	11	3	2	2	9	-
	Lookout Road	-	-	-	-	28 (1) 7 (2)	-	-	-	-	-	-	-	-
***Road Noise Policy* awakening criteria** *Number of residential receivers impacted*	Peatties Road	-	-	-	-	42	-	-	-	-	-	11	89	-
	Cardiff Road	-	-	-	-	-	-	-	-	-	-	-	-	-
	Astra Street	-	-	-	-	-	1	-	51	1	1	1	21	-
	Lookout Road	-	-	-	-	3 (1) 2 (2)	-	-	-	-	-	-	-	-

Note 1: The worst case result presented is for the residence located next to the Lookout Road site. As part of the proposed modification planning process, Transport for NSW has entered into an *Adjacent Property Access and Use Agreement* with this landowner for the use of Lookout Road compound.

Note 2: Provides results for the next worst affected receiver (ie excluding the residence discussed under note 1).

8. Construction vibration assessment

8.1 Potential impacts of individual equipment

Table 8.1 outlines typical vibration levels for different plant activities sourced from the *Environmental Noise Management Manual* (RTA 2001), *British Standard BS 5228-2: 2009 Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration* and the *Construction Noise and Vibration Strategy ST-157/4.1* (Transport for NSW, 2019).

As stated in the *Environmental Noise Management Manual*, it can be assumed that the vibration level of a source is inversely proportional to the distance source-receiver. Field variations show that the distance relationship generally varies between $d^{-0.8}$ and $d^{-1.6}$, rather than d^{-1}. The figures below are based on the conservative assumption of $d^{-0.8}$ unless otherwise stated.

The potential vibration levels due to the construction works at various distances are shown in Table 8.1.

Table 8.1 Predicted construction vibration levels

Vibration source	Distance to Source/Peak Particle Velocity (mm/s)			
	10 m	20 m	50 m	100 m
Vibratory roller (15 tonne)	8.0	4.6	2.2	1.3
Excavator	2.1	1.2	0.6	0.3

Note 1: Based on levels derived from BS 5228-2. *Bored piling through stones or other obstruction*. Vibratory piling based on relationship provided in Table E.1

8.1.1 Potential for structural damage

Predicted safe working buffer distances to comply with the cosmetic damage, standard dwelling and heritage building structural damage criteria were calculated for typical vibration values and listed in Table 8.2. This table is based on advice given in *BS 7385-2:1993 Evaluation and measurement for vibration in buildings.*

While vibration may be amplified in multi-level buildings through the structure to the upper floors, the buffer distances provided in Table 8.2 are based on *German Standard DIN 4150 (2016) Part 3: Structural Vibration in Buildings: Effects on Structures* and are applicable at a building's foundation where "if these values are complied with, damage that reduces the serviceability of the building will not occur". DIN 4150-3 (2016) specifies higher acceptable values for upper floors by a multiple of three to four compared to the base value for standard dwellings used in this assessment, therefore these buffers are considered appropriate for multi-level buildings of typical construction.

For the purposes of this assessment, non-residential receiver structures such as educational facilities, churches and medical facilities are assumed to have equivalent construction to standard dwellings. Passive and active recreational receivers have also been included as these may include facilities building, club houses or buildings for equipment storage.

Table 8.2 Vibration buffer distances – structural damage

Activity	Structural damage	
	Heritage building/structure DIN 4150-3 criteria (3.0 mm/s)	Standard dwellings DIN 4150-3 criteria (5.0 mm/s)
Vibratory roller (15 tonne)	35 m	18 m
Excavator	7 m	4 m

Numbers of identified receiver structures and relevant receiver IDs within structural damage vibration buffers for each compound are detailed in Table 8.3.

No heritage structures were identified within the relevant structural damage buffer distances. The closest listed heritage items to the proposed modification include Sandgate Cemetery listed in the *Newcastle Local Environmental Plan 2012* located about 200 metres east of the Astra Street site, and the Great Northern Railway listed in the *Lake Macquarie Local Environmental Plan 2014* located about 50 metres south-west of the Peatties Road site.

Table 8.3 Receivers within vibration buffer distances – structural damage

Activity	Structural damage, Standard dwellings DIN 4150-3 criteria (5.0 mm/s)			
	Peatties Road	Cardiff Road	Astra Street	Lookout Road
15 tonne vibratory roller (18 m buffer)	Nil	6 (R3019, R3013, R3010, R3006, R3035, R3024)	Nil	Nil
Excavator (4 m buffer)	Nil	3 (R3035, R3024, R3010)	Nil	Nil

The following was found with consideration to structural vibration buffers, at the Cardiff Road compound, six receiver structures were identified within the 18 metre buffer associated with vibratory roller activities and two receiver structures were identified within the four metre buffer associated with excavator activities. The buffer distances are based on the perimeter of the compound footprint, therefore operation of vibration generating sources further within the compound footprint and at the relevant buffer distances from the receiver buildings would result in predicted compliance with the structural damage criteria.

No sensitive receiver structures were identified within these buffers for Astra Street or Peatties Road compounds. No vibration generating activities are proposed for the Lookout Road compound site, therefore no structural impacts are expected.

Construction vibration buffers are provided in Appendix E.

8.1.2 Potential for human comfort and perception

Predicted safe working buffer distances to comply with the human comfort, and human perception were calculated for typical vibration values and listed in Table 8.4 and Table 8.5 for residential receivers and non-residential receivers respectively. These are based on advice given in *BS 5228-2:2009 Code of practice for noise and vibration on construction and open sites – Part 2: Vibration* and the *Assessing Vibration: A Technical Guideline* (DEC 2006). The various criteria buffers are interpreted as follows:

– The BS 5228-2.2009 criteria represents a level at which "*It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents*"

– The 'preferred' *Assessing Vibration: A Technical Guideline* vibration dose values represent a goal at which there is low probability of adverse comment or disturbance to building occupants.

– For 'maximum values' the *Assessing Vibration: A Technical Guideline* states: "*Where all feasible and reasonable measures have been applied, values up to the maximum value may be used if they can be justified. For values beyond the maximum value, the operator should negotiate directly with the affected community*."

Vibration is typically attenuated through multi-levels building to upper floors, however in some cases it may be amplified in the upper floors due to structural resonances and other factors. Locations of multi-level buildings are not known at this stage and therefore should be reviewed on a case-by case basis when identified. As a guide for multi-level receivers, adoption of the preferred value buffers in Table 8.4 and Table 8.5 is anticipated to typically protect against exceedances of the acceptable maximum human comfort values.

Table 8.4 Vibration buffer distances – human comfort and perception, residential receivers

Equipment	Human comfort criteria based on BS 5228-2.2009 (1.0 mm/s)	Human comfort based on AVTG vibration dose value ($m/s^{1.75}$)			
		Day preferred value 0.2 $m/s^{1.75}$	Day maximum value 0.4 $m/s^{1.75}$	Night preferred value 0.13 $m/s^{1.75}$	Night maximum value 0.26 $m/s^{1.75}$
15 tonne vibratory roller	140 m	310 m	130 m	230 m	94 m
Excavator	25 m	57 m	24 m	42 m	18 m

Table 8.5 Vibration buffer distances – human comfort and perception, non-residential receivers

Equipment	Human comfort criteria based on BS 5228-2.2009 (1.0 mm/s)	Human comfort based on AVTG vibration dose value ($m/s^{1.75}$)			
		Day preferred value 0.4 $m/s^{1.75}$	Day maximum value 0.8 $m/s^{1.75}$	Night preferred value 0.4 $m/s^{1.75}$	Night maximum value 0.8 $m/s^{1.75}$
15 tonne vibratory roller	140 m	130 m	54 m	55 m	23 m
Excavator	25 m	24 m	10 m	10 m	4 m

Numbers of identified receiver structures and relevant receiver IDs within human comfort vibration buffers for each compound are detailed in Table 8.6.

Table 8.6 Receivers within vibration buffer distances – human comfort and perception

Activity	Human comfort based on AVTG vibration dose value ($m/s^{1.75}$) Residential - Day preferred value 0.2 $m/s^{1.75}$ Non-residential - Day preferred value 0.4 $m/s^{1.75}$			
	Peatties Road	Cardiff Road	Astra Street	Lookout Road
15 tonne vibratory roller Residential: 310 m buffer Non-residential: 130 m buffer	210 residential	239 residential 1 commercial	14 residential 1 active recreation	Nil
Excavator Residential: 57 m buffer Non-residential: 24 m buffer	Nil	19 residential	Nil	Nil

The following was found with consideration to human comfort vibration buffers:

– At the Peatties Road compound:
  - 210 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
  - No residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period.
  - No non-residential receivers were identified within the applicable 130 metre buffer distance for vibratory rolling or 24 metre buffer for excavator activities.
– At the Cardiff Road compound:
  - 239 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
  - 19 residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period.
  - One commercial receiver was identified within the applicable 130 metre buffer distance for vibratory rolling. No other non-residential receivers were identified within this buffer distance or within the 24 metre buffer for excavator activities.

– At the Astra Street compound:
    - 14 residential receivers were identified within the human comfort and perception buffer of 310 metres for vibratory roller activities during the daytime period.
    - No residential receivers were identified within the human comfort and perception buffer of 57 metres for excavator activities during the daytime period.
    - One non-residential receiver (the golf range) was identified within the applicable 130 metre buffer distance.
    - No non-residential receivers were identified within the applicable 24 metre buffer for excavator activities.
– At the Lookout Road compound:
    - No vibration generating activities are proposed for this compound site, therefore no human comfort or vibration perception impacts are anticipated.

As discussed in section 5.2.3, the assessment of vibration is based on worst-case ground propagation conditions represented by $d^{-0.8}$. This results in VDV based human comfort buffer distances for residential receivers of up to 310 metres for vibratory roller activities. For ground that exhibits:

– average vibration propagation characteristics ($d^{-1.2}$), this buffer distance is reduced to 100 metres,
– poor vibration propagation characteristics ($d^{-1.6}$), this buffer distance is reduced to 55 metres.

Therefore, due to the potential for human comfort vibration impacts at nearby residential receivers, the existing environmental management measures recommended for the project will be implemented.

Construction vibration buffers are provided in Appendix E.

9. Construction traffic impacts

The potential traffic impacts of the project were assessed in the traffic and transport assessments (Aurecon, 2016 and Aurecon, 2018) for the EIS and SPIR. The proposed modification would not result in a change to overall construction traffic volumes beyond those assessed as part of the approved project however, access to the sites would involve construction traffic movements on additional roads as described below.

Astra Street:

– The average worst case construction vehicle movements would be 50 (20 light vehicles and 30 heavy vehicles) vehicles per day (two-way).
– The proposed construction access route via Newcastle Inner City Bypass (Jesmond to Sandgate) and Sandgate Road experience high volumes of existing daily traffic flows (about 36,100 and 14,400 average weekday daily traffic (two-way) respectively). As such, the additional construction traffic movements would have negligible effect on traffic noise levels from these roads.
– Astra Street is a local road providing access to the former landfill, Newcastle Golf Practice Centre, Sandgate Railway Station and a small residential area. While the proposed traffic movements would increase traffic volumes on Astra Street (about six two-way movements per hour), the existing noise environment is dominated by the Newcastle Inner City Bypass (Jesmond to Sandgate), Sandgate Road and the adjacent Hunter Valley rail line. Therefore additional traffic on Astra Street is not expected to significantly increase overall traffic noise levels at these receivers.

Cardiff Road:

– The average worst case construction vehicle movements would be four (two light vehicles and two heavy vehicles) vehicles per day (two-way).
– The proposed construction access route via Newcastle Inner City Bypass (Lookout Road), Cardiff Road experience high volumes of existing daily traffic flows (about 47,200 and 14,700 average weekday daily traffic (two-way) respectively). As such, the additional construction traffic movements would have negligible effect on traffic noise levels from these roads.
– While Marshall Street is a local road servicing a residential area, given the low number of proposed construction vehicle movements, a negligible effect on traffic noise levels is predicted due to compound related traffic.

Lookout Road:

– The average worst case construction vehicle movements would be 12 (ten light vehicles and two heavy vehicles) vehicles per day (two-way).
– The proposed construction access route via Newcastle Inner City Bypass (Lookout Road) experiences high volumes of existing daily traffic flows (eg Lookout Road north of McCaffrey Drive has an average weekday daily traffic (two-way) of 49,400 vehicles per day). As such, the additional construction traffic movements would have negligible effect on traffic noise levels from these roads.

Peatties Road:

– The average worst case construction vehicle movements would be 120 (100 light vehicles and 20 heavy vehicles) vehicles per day (two-way).
– The proposed construction access route via Newcastle Inner City Bypass (Lookout Road and Charlestown Road) experience high volumes of existing daily traffic flows (eg Lookout Road south of Carnley Avenue has an average weekday daily traffic (two-way) of 55,100 vehicles per day). As such, the additional construction traffic movements would have negligible effect on traffic noise levels from these roads.
– Peatties Road is a no through road providing access to residential properties on Wimbledon Grove. Access to the Peatties Road site does not pass any residential properties. As such, a negligible effect on traffic noise levels is predicted due to compound related traffic.

10. Mitigation measures

Environmental management measures in section 7 of the *Newcastle Inner City Bypass – Rankin Park to Jesmond Submissions and Preferred Infrastructure Report* and reproduced in Appendix G of the Newcastle Inner City Bypass – Rankin Park to Jesmond: Modification Report detail specific environmental management measures to minimise potential construction noise and vibration impacts associated with construction areas. These measures are applicable to the proposed modification and no new mitigation measures are recommended.

11. References

Aurecon Australasia Pty Ltd (Aurecon) 2016, *Newcastle Inner City Bypass, Rankin Park to Jesmond, Technical Paper 2 – Traffic and Transport Assessment*.

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Appendices

Appendix A

Peatties Road noise impacts

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2766_RES	377183.6	6355436.0	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2778_RES	377408.9	6355410.8	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	48	43	40	35	RES
R2780_RES	377179.0	6355405.7	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2786_RES	377410.4	6355387.4	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	48	43	40	35	RES
R2787_RES	377287.0	6355387.2	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2790_RES	377423.1	6355386.2	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	48	43	40	35	RES
R2794_RES	377299.5	6355377.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2809_RES	377396.0	6355334.1	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2810_RES	377410.3	6355333.4	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2841_RES	377377.7	6355113.1	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
R2843_RES	377363.2	6355109.1	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
R2855_RES	377405.3	6355066.9	34	37	41	47	37	38	48	43	35	34	34	41[n]	37	66	61	54	38	RES
R2861_RES	377397.9	6355052.0	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
R2866_RES	377382.4	6355037.5	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
R2869_RES	377254.5	6355031.4	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
R2871_RES	377372.4	6355021.1	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
R2872_RES	377442.0	6355020.2	35	38	42	48	38	39	49	44	36	35	35	42[n]	38	66	61	54	38	RES
R2875_RES	377354.9	6355010.5	34	37	41	47[s]	37[n]	38	48	43	35	34	34	41[n]	37	46	41	41	35	RES
R2877_RES	377340.8	6355002.8	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
R2879_RES	377177.0	6355001.3	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
R2880_RES	377445.0	6355000.3	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
R2883_RES	377327.0	6354991.0	32	35	39	45	35	36	46	41	33	32	32	39[n]	35	46	41	41	35	RES
R2884_RES	377413.2	6354987.0	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
R2885_RES	377452.7	6354984.9	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
R2886_RES	377180.0	6354984.1	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
R2890_RES	377116.5	6354980.7	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
R2891_RES	377317.1	6354979.4	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
R2894_RES	377130.3	6354977.5	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
R2895_RES	377403.2	6354975.4	36	39	43	49[s]	39[n]	40	50	45	37	36	36[n]	43[den]	39	46	41	41	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2896_RES	377144.9	6354974.5	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
R2897_RES	377159.1	6354974.4	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
R2899_RES	377388.3	6354969.1	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
R2900_RES	377302.4	6354968.3	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2901_RES	377178.9	6354967.2	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2903_RES	377284.9	6354963.2	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2904_RES	377379.1	6354960.5	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
R2905_RES	377449.8	6354960.1	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R2908_RES	377365.5	6354953.9	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2909_RES	377275.2	6354952.4	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
R2911_RES	377355.0	6354943.0	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2912_RES	377456.3	6354939.4	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R2913_RES	377267.2	6354937.3	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2917_RES	377342.1	6354934.0	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2919_RES	377127.5	6354931.3	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
R2920_RES	377147.3	6354930.2	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2921_RES	377325.5	6354929.8	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2924_RES	377247.2	6354927.1	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
R2926_RES	377173.2	6354925.8	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
R2927_RES	377459.7	6354924.9	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R2928_RES	377408.1	6354924.7	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2931_RES	377314.1	6354916.7	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
R2932_RES	377231.9	6354916.3	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2933_RES	377377.2	6354911.7	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R2934_RES	377455.3	6354908.7	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
R2935_RES	377170.6	6354907.1	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
R2936_RES	377303.1	6354906.0	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
R2938_RES	377214.4	6354899.4	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
R2940_RES	377420.1	6354895.7	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2941_RES	377463.6	6354895.5	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R2942_RES	377283.5	6354893.5	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2943_RES	377145.8	6354892.9	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
R2944_RES	377167.3	6354891.2	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2945_RES	377375.3	6354886.0	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2946_RES	377301.0	6354879.7	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2948_RES	377421.1	6354874.1	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2950_RES	376920.5	6354872.3	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2951_RES	376953.7	6354872.1	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2953_RES	377254.1	6354870.4	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2954_RES	377329.7	6354870.1	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2955_RES	376936.5	6354869.7	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2956_RES	377349.9	6354868.5	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2957_RES	377242.9	6354864.3	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2958_RES	377365.6	6354864.3	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2960_RES	377313.0	6354863.0	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2961_RES	377380.1	6354860.8	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2964_RES	377156.4	6354856.8	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
R2965_RES	377262.3	6354856.7	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2967_RES	377231.4	6354855.2	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2968_RES	377122.6	6354854.9	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2970_RES	377419.1	6354851.0	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2971_RES	377219.1	6354846.3	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2972_RES	377140.7	6354845.0	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2973_RES	377277.2	6354838.9	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2975_RES	377412.7	6354836.9	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R2976_RES	376946.0	6354834.8	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
R2977_RES	377207.6	6354832.9	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2980_RES	376957.8	6354826.2	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES

Notes:

^{s} = exceeds standard hours criteria, ^{d} = exceeds OOHW period 1 day criteria, ^{e} = exceeds OOHW period 1 evening criteria, ^{n} = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2981_RES	377098.1	6354825.4	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
R2982_RES	377289.2	6354822.1	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R2983_RES	376976.7	6354817.4	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2984_RES	377407.4	6354816.1	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R2985_RES	377084.5	6354814.1	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
R2986_RES	376993.0	6354813.5	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R2987_RES	377008.4	6354811.2	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2988_RES	377349.5	6354810.5	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
R2989_RES	377283.6	6354809.8	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
R2990_RES	377258.0	6354808.8	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R2991_RES	377071.2	6354806.9	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
R2992_RES	377035.4	6354806.7	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2993_RES	377151.9	6354805.0	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
R2995_RES	377058.2	6354801.9	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R2996_RES	377363.5	6354800.1	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
R2998_RES	377330.4	6354798.9	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
R2999_RES	377202.8	6354796.8	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
R3000_RES	377377.9	6354796.5	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R3001_RES	377399.3	6354795.6	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R3002_RES	377137.6	6354793.4	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
R3004_RES	377155.8	6354791.8	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
R3005_RES	377250.9	6354789.5	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
R3006_RES	377119.5	6354786.2	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R3007_RES	377196.0	6354782.8	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
R3009_RES	377317.4	6354777.3	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
R3010_RES	377110.2	6354776.4	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
R3012_RES	377250.9	6354772.8	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
R3013_RES	377147.5	6354770.6	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
R3014_RES	377197.0	6354766.2	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R3015_RES	377305.9	6354764.3	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
R3017_RES	377244.7	6354760.4	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
R3019_RES	377142.3	6354755.9	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
R3020_RES	377289.9	6354753.0	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
R3021_RES	377195.9	6354752.9	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
R3023_RES	377236.7	6354748.1	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
R3024_RES	377047.3	6354744.4	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
R3025_RES	377424.3	6354740.3	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
R3028_RES	377508.3	6354736.0	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
R3029_RES	377288.3	6354731.0	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
R3030_RES	377412.1	6354727.5	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R3031_RES	377278.0	6354722.1	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
R3033_RES	377398.9	6354716.9	42	45	49	55	45^{n}	46	56	51	43	42	42^{n}	49^{n}	45	66	61	54	38	RES
R3034_RES	377232.0	6354712.5	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
R3035_RES	377106.2	6354712.4	49^{s}	52^{s}	56^{s}	62^{s}	52^{sden}	53^{s}	63	58^{s}	50	49	49^{sden}	56^{sden}	52^{s}	46	41	41	35	RES
R3036_RES	377537.2	6354710.9	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
R3037_RES	377264.8	6354707.9	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
R3038_RES	377615.1	6354700.9	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	66	61	54	38	RES
R3039_RES	377390.8	6354699.8	43	46	50	56	46^{n}	47	57	52	44	43	43^{n}	50^{n}	46	66	61	54	38	RES
R3040_RES	377478.3	6354696.7	41	44	48	54	44^{n}	45	55	50	42	41	41^{n}	48^{n}	44	66	61	54	38	RES
R3041_RES	377491.8	6354689.5	41	44	48	54	44^{n}	45	55	50	42	41	41^{n}	48^{n}	44	66	61	54	38	RES
R3042_RES	377547.5	6354688.0	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
R3043_RES	377382.0	6354686.1	44	47	51	57	47^{n}	48	58	53	45	44	44^{n}	51^{n}	47	66	61	54	38	RES
R3044_RES	377371.7	6354675.7	46	49	53	59	49^{n}	50	60	55	47	46	46^{n}	53^{n}	49	66	61	54	38	RES
R3045_RES	377505.6	6354675.4	42	45	49	55	45^{n}	46	56	51	43	42	42^{n}	49^{n}	45	66	61	54	38	RES
R3046_RES	377479.6	6354666.0	42	45	49	55	45^{n}	46	56	51	43	42	42^{n}	49^{n}	45	66	61	54	38	RES
R3047_RES	377534.3	6354665.8	41	44	48	54	44^{n}	45	55	50	42	41	41^{n}	48^{n}	44	66	61	54	38	RES
RM10194_RES	377122.3	6355396.6	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10196_RES	377100.5	6355378.8	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES

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RM10199_RES	377062.7	6355366.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10200_RES	377077.9	6355362.5	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10202_RES	377042.9	6355349.5	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10203_RES	377025.6	6355348.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10204_RES	377006.8	6355342.2	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10205_RES	376877.2	6355341.1	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10206_RES	376989.2	6355335.0	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10207_RES	376890.8	6355334.2	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10209_RES	377039.2	6355326.7	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10211_RES	376907.8	6355324.6	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10213_RES	376971.7	6355322.8	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10214_RES	376959.1	6355322.1	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10215_RES	376920.9	6355320.0	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10216_RES	376938.3	6355318.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10222_RES	377036.9	6355301.9	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10223_RES	377076.6	6355298.8	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10225_RES	376885.6	6355295.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10226_RES	376867.1	6355295.0	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10228_RES	376901.9	6355288.4	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10229_RES	376989.0	6355282.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10232_RES	376917.0	6355277.8	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10233_RES	376961.4	6355277.6	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10234_RES	376936.5	6355276.7	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10247_RES	376819.0	6355254.2	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10249_RES	376833.5	6355244.4	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10251_RES	376977.5	6355238.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10268_RES	376934.4	6355192.5	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10290_RES	376549.5	6355079.4	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10292_RES	376515.5	6355000.1	32	35	39	45	35	36	46	41	33	32	32	39[n]	35	46	41	41	35	RES

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RM10293_RES	376538.4	6354999.0	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10295_RES	376567.8	6354989.7	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10297_RES	376581.0	6354983.0	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10298_RES	376599.1	6354982.2	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10299_RES	376627.0	6354978.1	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10301_RES	376640.5	6354972.2	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10302_RES	376665.6	6354969.0	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10303_RES	376692.2	6354968.4	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10309_RES	376502.0	6354946.9	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10312_RES	376527.0	6354944.6	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10316_RES	376550.1	6354936.9	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10317_RES	376582.4	6354924.6	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10318_RES	376608.6	6354916.7	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10319_RES	376751.4	6354915.9	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10320_RES	376628.5	6354911.6	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10322_RES	376781.9	6354900.5	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10323_RES	376648.0	6354901.2	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10325_RES	376677.9	6354895.3	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10327_RES	376799.0	6354890.2	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10328_RES	376811.8	6354886.3	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10330_RES	376714.1	6354880.3	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10332_RES	376827.8	6354874.9	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10333_RES	376846.2	6354868.3	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10334_RES	376742.2	6354868.2	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10335_RES	376622.9	6354867.0	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10336_RES	376866.3	6354861.8	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10337_RES	376636.0	6354859.1	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10339_RES	376771.3	6354848.0	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10340_RES	376914.3	6354845.2	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES

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RM10341_RES	376928.5	6354838.4	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10342_RES	376627.7	6354836.0	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10343_RES	376471.0	6354834.4	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10344_RES	376795.4	6354833.0	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10345_RES	376821.6	6354820.8	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10346_RES	376835.4	6354815.3	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10347_RES	376852.9	6354811.8	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10348_RES	376888.7	6354801.0	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10349_RES	376671.8	6354793.1	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10350_RES	376640.8	6354791.7	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10351_RES	376931.1	6354787.6	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10352_RES	376606.7	6354786.5	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10353_RES	376948.1	6354780.7	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10354_RES	376684.1	6354773.5	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10355_RES	376652.7	6354773.1	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10356_RES	376468.0	6354770.8	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10357_RES	376698.1	6354767.1	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10358_RES	376714.4	6354765.5	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10359_RES	376743.8	6354765.5	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10360_RES	376727.4	6354761.7	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10361_RES	376755.8	6354754.4	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10362_RES	376770.9	6354753.7	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10363_RES	376891.6	6354747.3	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10364_RES	376784.9	6354745.2	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10365_RES	376858.3	6354741.3	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10366_RES	376877.6	6354740.9	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10367_RES	376799.6	6354740.1	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10368_RES	376814.0	6354736.8	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10369_RES	376586.4	6354737.4	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10370_RES	376827.9	6354732.7	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10371_RES	376843.4	6354731.6	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10372_RES	376644.9	6354728.9	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10373_RES	376624.8	6354728.4	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10374_RES	376683.3	6354721.6	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10375_RES	376658.6	6354719.7	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10376_RES	376901.1	6354719.0	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10377_RES	376918.6	6354717.9	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10378_RES	376708.8	6354712.5	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10379_RES	376697.5	6354710.3	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10381_RES	376728.3	6354709.6	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10382_RES	376930.6	6354707.8	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10383_RES	376946.6	6354705.1	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10384_RES	376752.1	6354705.3	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10385_RES	376770.6	6354703.7	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10386_RES	376961.2	6354700.0	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10387_RES	376977.6	6354694.4	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10388_RES	377111.1	6354678.8	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10389_RES	376989.6	6354679.4	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10390_RES	376677.8	6354675.9	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10391_RES	377002.9	6354676.0	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10392_RES	376868.9	6354674.4	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10393_RES	377019.0	6354669.7	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10394_RES	376781.7	6354667.3	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10395_RES	376882.8	6354661.4	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10396_RES	377032.1	6354657.9	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10397_RES	376900.8	6354656.9	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10398_RES	376922.7	6354653.5	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10399_RES	377126.2	6354652.9	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10400_RES	376744.8	6354648.0	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10401_RES	377044.6	6354648.2	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10402_RES	376714.6	6354643.0	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10403_RES	377058.8	6354641.2	49^{s}	52^{s}	56^{s}	62^{s}	52^{sden}	53^{s}	63	58^{s}	50	49	49^{sden}	56^{sden}	52^{s}	46	41	41	35	RES
RM10404_RES	376809.1	6354636.4	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
RM10405_RES	377128.6	6354633.1	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10406_RES	377071.7	6354630.9	49^{s}	52^{s}	56^{s}	62^{s}	52^{sden}	53^{s}	63	58^{s}	50	49	49^{sden}	56^{sden}	52^{s}	46	41	41	35	RES
RM10407_RES	376961.0	6354630.2	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10408_RES	376945.5	6354626.6	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10409_RES	377086.1	6354624.8	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10410_RES	376978.0	6354622.7	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10411_RES	377099.6	6354619.2	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10412_RES	376990.2	6354617.4	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10413_RES	377007.8	6354611.6	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10414_RES	377112.5	6354612.3	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10415_RES	376987.6	6354606.7	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10416_RES	377018.1	6354605.1	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10417_RES	377124.3	6354605.2	53^{s}	56^{s}	60^{s}	66^{s}	56^{sden}	57^{s}	67	62^{s}	54	53	53^{sden}	60^{sden}	56^{s}	46	41	41	35	RES
RM10418_RES	376969.7	6354602.0	49^{s}	52^{s}	56^{s}	62^{s}	52^{sden}	53^{s}	63	58^{s}	50	49	49^{sden}	56^{sden}	52^{s}	46	41	41	35	RES
RM10419_RES	377034.4	6354598.6	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10420_RES	377045.5	6354593.7	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10421_RES	377059.9	6354581.6	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10422_RES	377072.2	6354577.8	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10423_RES	377072.6	6354565.7	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10424_RES	377087.3	6354564.9	54^{s}	57^{s}	61^{s}	67^{s}	57^{sden}	58^{s}	68	63^{s}	55	54	54^{sden}	61^{sden}	57^{s}	46	41	41	35	RES
RM10425_RES	377100.6	6354558.9	55^{s}	58^{s}	62^{s}	68^{s}	58^{sden}	59^{s}	69	64^{s}	56	55	55^{sden}	62^{sden}	58^{s}	46	41	41	35	RES
RM10426_RES	377113.7	6354555.3	56^{s}	59^{s}	63^{s}	69^{s}	59^{sden}	60^{s}	70	65^{s}	57	56	56^{sden}	63^{sden}	59^{s}	46	41	41	35	RES
RM10438_RES	377093.0	6354514.2	58^{s}	61^{s}	65^{s}	71^{s}	61^{sden}	62^{s}	72	67^{s}	59	58	58^{sden}	65^{sden}	61^{s}	46	41	41	35	RES
RM10439_RES	377107.7	6354512.9	59^{s}	62^{s}	66^{s}	72^{s}	62^{sden}	63^{s}	73	68^{s}	60	59	59^{sden}	66^{sden}	62^{s}	46	41	41	35	RES

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RM10447_RES	377439.8	6354464.1	33	36	40	46	36	37	47	42	34	33	33	40^{n}	36	66	61	54	38	RES
RM10448_RES	377458.6	6354454.8	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	66	61	54	38	RES
RM10454_RES	377429.0	6354431.2	34	37	41	47	37	38	48	43	35	34	34	41^{n}	37	66	61	54	38	RES
RM10460_RES	377447.2	6354408.3	33	36	40	46	36	37	47	42	34	33	33	40^{n}	36	66	61	54	38	RES
RM10463_RES	377427.8	6354396.8	34	37	41	47	37	38	48	43	35	34	34	41^{n}	37	66	61	54	38	RES
RM10470_RES	376564.8	6354388.1	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10480_RES	377392.7	6354359.1	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM10482_RES	376525.6	6354356.2	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10484_RES	376604.3	6354354.4	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10485_RES	376542.0	6354352.6	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10488_RES	377423.3	6354350.8	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	66	61	54	38	RES
RM10490_RES	376729.9	6354350.2	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10495_RES	377365.9	6354341.1	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10497_RES	376616.9	6354336.6	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10498_RES	376886.3	6354337.2	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10503_RES	376863.5	6354333.1	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10505_RES	376631.3	6354327.3	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10506_RES	376566.8	6354326.8	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10508_RES	377363.5	6354326.3	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10509_RES	376645.0	6354322.7	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10510_RES	376901.8	6354322.8	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10516_RES	376849.2	6354318.7	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10517_RES	377425.8	6354318.4	33	36	40	46	36	37	47	42	34	33	33	40^{n}	36	66	61	54	38	RES
RM10518_RES	377396.4	6354315.8	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
RM10521_RES	377357.9	6354309.1	44	47	51	57	47^{n}	48	58	53	45	44	44^{n}	51^{n}	47	66	61	54	38	RES
RM10524_RES	376907.7	6354304.1	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10527_RES	376528.6	6354298.9	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10528_RES	376852.5	6354298.6	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10531_RES	376543.0	6354295.1	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10532_RES	376558.7	6354293.9	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10535_RES	376572.5	6354292.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10537_RES	377352.2	6354291.8	44	47	51	57	47^{n}	48	58	53	45	44	44^{n}	51^{n}	47	66	61	54	38	RES
RM10539_RES	376902.6	6354289.8	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10541_RES	376947.2	6354288.1	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10542_RES	376589.3	6354288.5	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10543_RES	376673.9	6354286.2	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10545_RES	376611.0	6354282.7	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10546_RES	376850.7	6354282.2	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10547_RES	377403.7	6354280.5	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM10552_RES	376795.6	6354276.3	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10554_RES	376900.5	6354273.2	49^{s}	52^{s}	56^{s}	62^{s}	52^{sden}	53^{s}	63	58^{s}	50	49	49^{sden}	56^{sden}	52^{s}	46	41	41	35	RES
RM10555_RES	376939.3	6354271.0	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10556_RES	377337.7	6354271.0	43	46	50	56	46^{n}	47	57	52	44	43	43^{n}	50^{n}	46	66	61	54	38	RES
RM10557_RES	376853.5	6354265.0	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10558_RES	376694.9	6354263.3	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10564_RES	376902.0	6354256.6	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10566_RES	376937.8	6354255.0	51^{s}	54^{s}	58^{s}	64^{s}	54^{sden}	55^{s}	65	60^{s}	52	51	51^{sden}	58^{sden}	54^{s}	46	41	41	35	RES
RM10567_RES	376530.4	6354253.2	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10569_RES	376548.2	6354251.5	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10572_RES	376569.3	6354246.5	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10574_RES	377321.1	6354244.0	46	49	53	59	49^{n}	50	60	55	47	46	46^{n}	53^{n}	49	66	61	54	38	RES
RM10575_RES	377338.4	6354244.1	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
RM10577_RES	376588.5	6354242.3	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10578_RES	376809.8	6354241.8	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10580_RES	376609.3	6354241.4	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10581_RES	376709.8	6354240.7	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10582_RES	376975.3	6354238.4	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10583_RES	376896.5	6354238.5	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10585_RES	377392.7	6354236.5	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM10586_RES	377358.8	6354236.3	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM10587_RES	376629.1	6354236.4	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10588_RES	376935.7	6354236.4	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10590_RES	377373.1	6354234.4	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM10592_RES	376732.0	6354232.1	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10593_RES	376646.9	6354231.8	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10595_RES	377422.0	6354229.2	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10596_RES	376860.9	6354225.6	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10599_RES	377449.2	6354222.4	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10600_RES	376929.7	6354219.7	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
RM10603_RES	376972.8	6354216.8	52^{s}	55^{s}	59^{s}	65^{s}	55^{sden}	56^{s}	66	61^{s}	53	52	52^{sden}	59^{sden}	55^{s}	46	41	41	35	RES
RM10605_RES	376906.8	6354214.5	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10607_RES	376994.3	6354212.3	53^{s}	56^{s}	60^{s}	66^{s}	56^{sden}	57^{s}	67	62^{s}	54	53	53^{sden}	60^{sden}	56^{s}	46	41	41	35	RES
RM10610_RES	376633.7	6354208.2	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10611_RES	376860.1	6354207.8	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10613_RES	377061.4	6354204.8	57^{s}	60^{s}	64^{s}	70^{s}	60^{sden}	61^{s}	71	66^{s}	58	57	57^{sden}	64^{sden}	60^{s}	46	41	41	35	RES
RM10614_RES	377300.8	6354202.3	47	50	54	60	50^{n}	51	61	56	48	47	47^{n}	54^{n}	50	66	61	54	38	RES
RM10615_RES	376673.5	6354200.6	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10617_RES	377319.0	6354200.0	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
RM10619_RES	377336.7	6354196.7	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
RM10622_RES	376878.5	6354189.5	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10624_RES	376656.5	6354185.5	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10628_RES	377292.8	6354180.7	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
RM10630_RES	376723.3	6354180.6	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10631_RES	376679.3	6354180.5	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10632_RES	376952.4	6354176.3	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10633_RES	376861.4	6354175.4	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10634_RES	376932.9	6354172.9	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES

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RM10635_RES	376971.7	6354171.7	47[s]	50[s]	54[s]	60[s]	50[sden]	51[s]	61	56[s]	48	47	47[sden]	54[sden]	50[s]	46	41	41	35	RES
RM10636_RES	376599.7	6354171.2	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10637_RES	376987.1	6354170.9	47[s]	50[s]	54[s]	60[s]	50[sden]	51[s]	61	56[s]	48	47	47[sden]	54[sden]	50[s]	46	41	41	35	RES
RM10640_RES	377466.0	6354166.2	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10641_RES	377449.4	6354166.1	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10642_RES	377008.2	6354162.7	48[s]	51[s]	55[s]	61[s]	51[sden]	52[s]	62	57[s]	49	48	48[sden]	55[sden]	51[s]	46	41	41	35	RES
RM10643_RES	377479.9	6354161.6	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10644_RES	376676.2	6354162.3	32	35	39	45	35	36	46	41	33	32	32	39[n]	35	46	41	41	35	RES
RM10646_RES	376844.1	6354159.9	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
RM10647_RES	377021.3	6354159.7	51[s]	54[s]	58[s]	64[s]	54[sden]	55[s]	65	60[s]	52	51	51[sden]	58[sden]	54[s]	46	41	41	35	RES
RM10648_RES	376914.1	6354159.7	38	41	45	51[s]	41[n]	42	52	47[s]	39	38	38[n]	45[den]	41	46	41	41	35	RES
RM10650_RES	377036.3	6354157.9	52[s]	55[s]	59[s]	65[s]	55[sden]	56[s]	66	61[s]	53	52	52[sden]	59[sden]	55[s]	46	41	41	35	RES
RM10651_RES	377051.1	6354157.0	54[s]	57[s]	61[s]	67[s]	57[sden]	58[s]	68	63[s]	55	54	54[sden]	61[sden]	57[s]	46	41	41	35	RES
RM10657_RES	376717.1	6354152.0	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
RM10659_RES	376968.5	6354150.9	42	45	49[s]	55[s]	45[den]	46	56	51[s]	43	42	42[den]	49[sden]	45	46	41	41	35	RES
RM10661_RES	376985.4	6354149.3	41	44	48[s]	54[s]	44[den]	45	55	50[s]	42	41	41[n]	48[sden]	44	46	41	41	35	RES
RM10662_RES	377086.2	6354147.5	55	58	62	68[s]	58[en]	59	69	64	56	55	55[en]	62[den]	58	66	61	54	38	RES
RM10664_RES	377409.3	6354145.1	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10665_RES	376598.2	6354145.3	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10667_RES	376775.5	6354144.4	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
RM10669_RES	376898.9	6354142.4	38	41	45	51[s]	41[n]	42	52	47[s]	39	38	38[n]	45[den]	41	46	41	41	35	RES
RM10670_RES	376820.4	6354142.0	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
RM10671_RES	376670.0	6354140.4	34	37	41	47[s]	37[n]	38	48	43	35	34	34	41[n]	37	46	41	41	35	RES
RM10672_RES	376933.0	6354138.3	42	45	49[s]	55[s]	45[den]	46	56	51[s]	43	42	42[den]	49[sden]	45	46	41	41	35	RES
RM10674_RES	376568.6	6354134.7	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
RM10676_RES	376981.2	6354131.9	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
RM10677_RES	376611.9	6354130.8	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10679_RES	377004.5	6354129.6	35	38	42	48[s]	38[n]	39	49	44	36	35	35	42[den]	38	46	41	41	35	RES
RM10680_RES	376809.3	6354129.5	34	37	41	47[s]	37[n]	38	48	43	35	34	34	41[n]	37	46	41	41	35	RES

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RM10682_RES	376632.1	6354125.6	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10683_RES	376889.3	6354126.4	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10685_RES	376665.8	6354125.5	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10686_RES	377035.8	6354125.3	50^{s}	53^{s}	57^{s}	63^{s}	53^{sden}	54^{s}	64	59^{s}	51	50	50^{sden}	57^{sden}	53^{s}	46	41	41	35	RES
RM10688_RES	376922.6	6354119.4	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10689_RES	377082.2	6354117.7	53	56	60	66	56^{en}	57	67	62	54	53	53^{n}	60^{en}	56	66	61	54	38	RES
RM10690_RES	376730.3	6354115.9	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10691_RES	376753.6	6354116.1	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10692_RES	376660.7	6354113.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10693_RES	376813.3	6354113.0	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10694_RES	376712.2	6354113.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10695_RES	376868.0	6354112.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10696_RES	376981.4	6354111.8	38	41	45	51^{s}	41^{n}	42	52	47^{s}	39	38	38^{n}	45^{den}	41	46	41	41	35	RES
RM10697_RES	376792.8	6354112.2	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10700_RES	376770.2	6354105.7	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10701_RES	377040.1	6354102.7	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10702_RES	376922.7	6354100.0	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10703_RES	377251.5	6354098.4	50	53	57	63	53^{n}	54	64	59	51	50	50^{n}	57^{en}	53	66	61	54	38	RES
RM10706_RES	376813.5	6354095.4	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10707_RES	376969.0	6354093.5	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10708_RES	376869.1	6354093.5	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10709_RES	377176.5	6354088.6	52	55	59	65	55^{en}	56	66	61	53	52	52^{n}	59^{en}	55	66	61	54	38	RES
RM10710_RES	377032.0	6354088.1	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10712_RES	377085.4	6354081.5	51	54	58	64	54^{n}	55	65	60	52	51	51^{n}	58^{en}	54	66	61	54	38	RES
RM10713_RES	376787.3	6354082.0	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10714_RES	376921.6	6354079.6	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10716_RES	377274.9	6354078.5	45	48	52	58	48^{n}	49	59	54	46	45	45^{n}	52^{n}	48	66	61	54	38	RES
RM10717_RES	377029.7	6354075.5	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10718_RES	376808.8	6354076.3	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES

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RM10721_RES	376856.5	6354074.7	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10722_RES	376870.1	6354073.1	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10723_RES	376962.4	6354072.4	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10724_RES	377167.2	6354070.9	51	54	58	64	54^{n}	55	65	60	52	51	51^{n}	58^{en}	54	66	61	54	38	RES
RM10726_RES	376616.2	6354069.3	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10727_RES	377302.5	6354067.2	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM10730_RES	376892.7	6354066.1	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10731_RES	377076.6	6354066.0	46	49	53	59	49^{n}	50	60	55	47	46	46^{n}	53^{n}	49	66	61	54	38	RES
RM10733_RES	377233.4	6354064.9	46	49	53	59	49^{n}	50	60	55	47	46	46^{n}	53^{n}	49	66	61	54	38	RES
RM10736_RES	376921.0	6354063.1	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10738_RES	376679.4	6354062.0	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10739_RES	377018.1	6354061.4	47^{s}	50^{s}	54^{s}	60^{s}	50^{sden}	51^{s}	61	56^{s}	48	47	47^{sden}	54^{sden}	50^{s}	46	41	41	35	RES
RM10741_RES	377037.4	6354059.1	48^{s}	51^{s}	55^{s}	61^{s}	51^{sden}	52^{s}	62	57^{s}	49	48	48^{sden}	55^{sden}	51^{s}	46	41	41	35	RES
RM10742_RES	376864.5	6354059.4	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10745_RES	376738.7	6354057.1	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10748_RES	376890.5	6354055.1	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10749_RES	377324.5	6354054.9	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10750_RES	376960.7	6354054.0	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
RM10751_RES	377077.1	6354052.7	50	53	57	63	53^{n}	54	64	59	51	50	50^{n}	57^{en}	53	66	61	54	38	RES
RM10753_RES	377163.2	6354052.1	50	53	57	63	53^{n}	54	64	59	51	50	50^{n}	57^{en}	53	66	61	54	38	RES
RM10754_RES	377341.3	6354051.7	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10755_RES	376912.6	6354050.3	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10756_RES	377358.9	6354048.8	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10757_RES	377225.3	6354048.9	45	48	52	58	48^{n}	49	59	54	46	45	45^{n}	52^{n}	48	66	61	54	38	RES
RM10758_RES	376804.5	6354048.7	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10759_RES	376856.5	6354047.7	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10760_RES	377261.3	6354047.8	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10762_RES	377012.7	6354043.5	44	47^{s}	51^{s}	57^{s}	47^{sden}	48^{s}	58	53^{s}	45	44	44^{den}	51^{sden}	47^{s}	46	41	41	35	RES
RM10764_RES	377374.6	6354040.4	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES

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RM10765_RES	377151.5	6354039.5	50	53	57	63	53^{n}	54	64	59	51	50	50^{n}	57^{en}	53	66	61	54	38	RES
RM10766_RES	376912.3	6354038.0	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10768_RES	377075.3	6354036.7	49	52	56	62	52^{n}	53	63	58	50	49	49^{n}	56^{en}	52	66	61	54	38	RES
RM10770_RES	376960.7	6354036.0	45	48^{s}	52^{s}	58^{s}	48^{sden}	49^{s}	59	54^{s}	46	45	45^{den}	52^{sden}	48^{s}	46	41	41	35	RES
RM10771_RES	376759.7	6354034.8	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10772_RES	377216.3	6354033.6	45	48	52	58	48^{n}	49	59	54	46	45	45^{n}	52^{n}	48	66	61	54	38	RES
RM10773_RES	377388.3	6354032.3	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10775_RES	376857.1	6354030.0	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10777_RES	377257.9	6354029.0	34	37	41	47	37	38	48	43	35	34	34	41^{n}	37	66	61	54	38	RES
RM10778_RES	377403.3	6354028.0	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10779_RES	376909.1	6354025.6	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10781_RES	377024.3	6354023.6	46	49^{s}	53^{s}	59^{s}	49^{sden}	50^{s}	60	55^{s}	47	46	46^{den}	53^{sden}	49^{s}	46	41	41	35	RES
RM10782_RES	377145.5	6354023.2	49	52	56	62	52^{n}	53	63	58	50	49	49^{n}	56^{en}	52	66	61	54	38	RES
RM10785_RES	377073.0	6354022.1	49	52	56	62	52^{n}	53	63	58	50	49	49^{n}	56^{en}	52	66	61	54	38	RES
RM10791_RES	376764.7	6354019.3	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10793_RES	376958.7	6354017.9	43	46	50^{s}	56^{s}	46^{den}	47^{s}	57	52^{s}	44	43	43^{den}	50^{sden}	46	46	41	41	35	RES
RM10796_RES	377249.3	6354014.6	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
RM10799_RES	376849.7	6354012.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10801_RES	376911.6	6354010.7	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10804_RES	377322.3	6354006.6	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10805_RES	377143.3	6354006.6	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10807_RES	377002.1	6354003.5	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10808_RES	377345.3	6354002.7	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10809_RES	376959.5	6354002.7	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10810_RES	376782.3	6354002.8	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10811_RES	377237.5	6354001.2	34	37	41	47	37	38	48	43	35	34	34	41^{n}	37	66	61	54	38	RES
RM10813_RES	377296.2	6353999.3	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10814_RES	376902.0	6353998.1	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10817_RES	377205.9	6353993.9	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES

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RM10818_RES	376846.4	6353993.8	34	37	41	47[s]	37[n]	38	48	43	35	34	34	41[n]	37	46	41	41	35	RES
RM10820_RES	376748.5	6353991.9	30	33	37	43	33	34	44	39	31	30	30	37[n]	33	46	41	41	35	RES
RM10821_RES	377130.1	6353991.6	46	49	53	59	49[n]	50	60	55	47	46	46[n]	53[n]	49	66	61	54	38	RES
RM10822_RES	376953.7	6353989.3	37	40	44	50[s]	40[n]	41	51	46	38	37	37[n]	44[den]	40	46	41	41	35	RES
RM10824_RES	376861.9	6353987.1	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
RM10825_RES	376883.3	6353985.4	34	37	41	47[s]	37[n]	38	48	43	35	34	34	41[n]	37	46	41	41	35	RES
RM10826_RES	377014.1	6353984.2	44	47[s]	51[s]	57[s]	47[sden]	48[s]	58	53[s]	45	44	44[den]	51[sden]	47[s]	46	41	41	35	RES
RM10827_RES	377070.9	6353982.8	47	50	54	60	50[n]	51	61	56	48	47	47[n]	54[n]	50	66	61	54	38	RES
RM10828_RES	376908.6	6353982.1	38	41	45	51[s]	41[n]	42	52	47[s]	39	38	38[n]	45[den]	41	46	41	41	35	RES
RM10830_RES	376781.9	6353980.3	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10833_RES	377288.4	6353977.9	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10834_RES	377203.0	6353976.5	39	42	46	52	42[n]	43	53	48	40	39	39[n]	46[n]	42	66	61	54	38	RES
RM10837_RES	377124.0	6353973.5	41	44	48	54	44[n]	45	55	50	42	41	41[n]	48[n]	44	66	61	54	38	RES
RM10838_RES	376866.8	6353973.3	33	36	40	46	36[n]	37	47	42	34	33	33	40[n]	36	46	41	41	35	RES
RM10839_RES	376987.3	6353970.2	41	44	48[s]	54[s]	44[den]	45	55	50[s]	42	41	41[n]	48[sden]	44	46	41	41	35	RES
RM10841_RES	377010.0	6353968.1	43	46	50[s]	56[s]	46[den]	47[s]	57	52[s]	44	43	43[den]	50[sden]	46	46	41	41	35	RES
RM10843_RES	377315.0	6353967.0	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10844_RES	376908.0	6353966.2	38	41	45	51[s]	41[n]	42	52	47[s]	39	38	38[n]	45[den]	41	46	41	41	35	RES
RM10856_RES	376943.7	6353958.7	40	43	47[s]	53[s]	43[den]	44	54	49[s]	41	40	40[n]	47[sden]	43	46	41	41	35	RES
RM10860_RES	376866.4	6353957.1	32	35	39	45	35	36	46	41	33	32	32	39[n]	35	46	41	41	35	RES
RM10864_RES	377190.4	6353952.8	40	43	47	53	43[n]	44	54	49	41	40	40[n]	47[n]	43	66	61	54	38	RES
RM10865_RES	376816.0	6353952.7	29	32	36	42	32	33	43	38	30	29	29	36[n]	32	46	41	41	35	RES
RM10866_RES	377061.9	6353951.6	46	49	53	59	49[n]	50	60	55	47	46	46[n]	53[n]	49	66	61	54	38	RES
RM10868_RES	376955.4	6353950.6	40	43	47[s]	53[s]	43[den]	44	54	49[s]	41	40	40[n]	47[sden]	43	46	41	41	35	RES
RM10869_RES	376970.5	6353951.0	40	43	47[s]	53[s]	43[den]	44	54	49[s]	41	40	40[n]	47[sden]	43	46	41	41	35	RES
RM10870_RES	376900.3	6353950.8	38	41	45	51[s]	41[n]	42	52	47[s]	39	38	38[n]	45[den]	41	46	41	41	35	RES
RM10871_RES	376986.0	6353948.8	42	45	49[s]	55[s]	45[den]	46	56	51[s]	43	42	42[den]	49[sden]	45	46	41	41	35	RES
RM10875_RES	377014.9	6353946.5	43	46	50[s]	56[s]	46[den]	47[s]	57	52[s]	44	43	43[den]	50[sden]	46	46	41	41	35	RES
RM10879_RES	376871.3	6353941.7	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES

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RM10881_RES	377059.6	6353938.0	46	49	53	59	49^{n}	50	60	55	47	46	46^{n}	53^{n}	49	66	61	54	38	RES
RM10883_RES	376890.4	6353932.6	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10892_RES	377060.4	6353920.4	45	48	52	58	48^{n}	49	59	54	46	45	45^{n}	52^{n}	48	66	61	54	38	RES
RM10901_RES	376934.3	6353912.9	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10908_RES	376948.4	6353910.1	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10909_RES	376963.9	6353910.0	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10913_RES	376983.4	6353908.5	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10914_RES	377053.7	6353906.0	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
RM10917_RES	377319.8	6353903.4	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10918_RES	377006.2	6353901.5	41	44	48^{s}	54^{s}	44^{den}	45	55	50^{s}	42	41	41^{n}	48^{sden}	44	46	41	41	35	RES
RM10919_RES	376913.2	6353901.5	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10923_RES	377305.8	6353895.2	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10926_RES	377053.5	6353891.6	43	46	50	56	46^{n}	47	57	52	44	43	43^{n}	50^{n}	46	66	61	54	38	RES
RM10927_RES	377216.6	6353889.5	34	37	41	47	37	38	48	43	35	34	34	41^{n}	37	66	61	54	38	RES
RM10928_RES	377281.3	6353890.5	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10929_RES	376965.5	6353890.1	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10931_RES	376850.7	6353887.4	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10934_RES	376998.7	6353881.6	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10938_RES	376920.4	6353878.9	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10940_RES	377055.2	6353877.0	44	47	51	57	47^{n}	48	58	53	45	44	44^{n}	51^{n}	47	66	61	54	38	RES
RM10941_RES	377199.3	6353873.6	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM10945_RES	376950.8	6353873.1	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10950_RES	376996.4	6353867.6	42	45	49^{s}	55^{s}	45^{den}	46	56	51^{s}	43	42	42^{den}	49^{sden}	45	46	41	41	35	RES
RM10951_RES	377279.8	6353867.6	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10952_RES	376851.6	6353866.8	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10953_RES	377395.4	6353864.9	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM10954_RES	377338.2	6353863.3	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10955_RES	377056.3	6353861.6	44	47	51	57	47^{n}	48	58	53	45	44	44^{n}	51^{n}	47	66	61	54	38	RES
RM10956_RES	377615.8	6353860.6	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10958_RES	377379.7	6353860.0	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10960_RES	377357.5	6353856.7	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10962_RES	377423.1	6353855.3	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10963_RES	376929.9	6353854.0	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM10965_RES	377600.1	6353853.1	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10966_RES	377197.6	6353849.9	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10967_RES	377321.9	6353849.6	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10968_RES	377531.6	6353848.6	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10970_RES	377295.2	6353848.0	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10971_RES	377053.7	6353846.8	39	42	46	52	42^{n}	43	53	48	40	39	39^{n}	46^{n}	42	66	61	54	38	RES
RM10974_RES	377067.9	6353844.7	42	45	49	55	45^{n}	46	56	51	43	42	42^{n}	49^{n}	45	66	61	54	38	RES
RM10977_RES	376994.7	6353842.5	39	42	46	52^{s}	42^{den}	43	53	48^{s}	40	39	39^{n}	46^{den}	42	46	41	41	35	RES
RM10978_RES	376876.5	6353839.6	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10979_RES	377591.8	6353840.5	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10980_RES	377254.7	6353839.9	34	37	41	47^{s}	37^{n}	38	48	43	35	34	34	41^{n}	37	46	41	41	35	RES
RM10981_RES	377231.4	6353838.3	36	39	43	49	39^{n}	40	50	45	37	36	36	43^{n}	39	66	61	54	38	RES
RM10982_RES	377202.7	6353837.8	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM10983_RES	377430.8	6353836.9	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM10985_RES	376935.6	6353834.5	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10987_RES	377338.8	6353834.1	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10988_RES	377051.2	6353832.5	40	43	47	53	43^{n}	44	54	49	41	40	40^{n}	47^{n}	43	66	61	54	38	RES
RM10989_RES	376844.7	6353832.3	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10990_RES	377578.5	6353830.9	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10991_RES	377282.2	6353828.4	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM10993_RES	376866.9	6353826.4	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM10994_RES	377375.0	6353824.7	33	36	40	46	36^{n}	37	47	42	34	33	33	40^{n}	36	46	41	41	35	RES
RM10995_RES	376988.9	6353825.1	40	43	47^{s}	53^{s}	43^{den}	44	54	49^{s}	41	40	40^{n}	47^{sden}	43	46	41	41	35	RES
RM10996_RES	377299.6	6353822.6	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM10997_RES	376883.5	6353822.9	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10998_RES	377425.1	6353822.7	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM10999_RES	377566.6	6353821.5	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM11000_RES	377515.8	6353819.0	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM11001_RES	377044.9	6353816.8	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11002_RES	376943.2	6353814.2	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM11003_RES	377421.6	6353806.7	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM11004_RES	377560.6	6353807.1	32	35	39	45	35	36	46	41	33	32	32	39^{n}	35	46	41	41	35	RES
RM11006_RES	377200.4	6353806.1	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM11007_RES	377507.7	6353806.1	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM11008_RES	377034.4	6353804.1	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11009_RES	376979.3	6353804.3	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM11010_RES	377415.6	6353792.1	31	34	38	44	34	35	45	40	32	31	31	38^{n}	34	46	41	41	35	RES
RM11011_RES	377475.0	6353790.4	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM11012_RES	377328.9	6353789.3	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM11013_RES	377032.0	6353788.4	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11016_RES	377229.5	6353786.6	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM11017_RES	377201.8	6353786.0	38	41	45	51	41^{n}	42	52	47	39	38	38	45^{n}	41	66	61	54	38	RES
RM11018_RES	377502.2	6353786.2	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM11020_RES	377253.1	6353780.7	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM11021_RES	377296.5	6353779.1	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM11022_RES	377283.7	6353777.5	36	39	43	49^{s}	39^{n}	40	50	45	37	36	36^{n}	43^{den}	39	46	41	41	35	RES
RM11024_RES	377267.5	6353775.7	37	40	44	50^{s}	40^{n}	41	51	46	38	37	37^{n}	44^{den}	40	46	41	41	35	RES
RM11025_RES	377463.3	6353775.3	29	32	36	42	32	33	43	38	30	29	29	36^{n}	32	46	41	41	35	RES
RM11026_RES	377213.3	6353772.9	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11027_RES	377034.4	6353772.5	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11028_RES	377318.2	6353770.7	35	38	42	48^{s}	38^{n}	39	49	44	36	35	35	42^{den}	38	46	41	41	35	RES
RM11029_RES	377501.9	6353768.9	30	33	37	43	33	34	44	39	31	30	30	37^{n}	33	46	41	41	35	RES
RM11030_RES	377148.0	6353765.2	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES
RM11032_RES	377215.5	6353759.4	37	40	44	50	40^{n}	41	51	46	38	37	37	44^{n}	40	66	61	54	38	RES

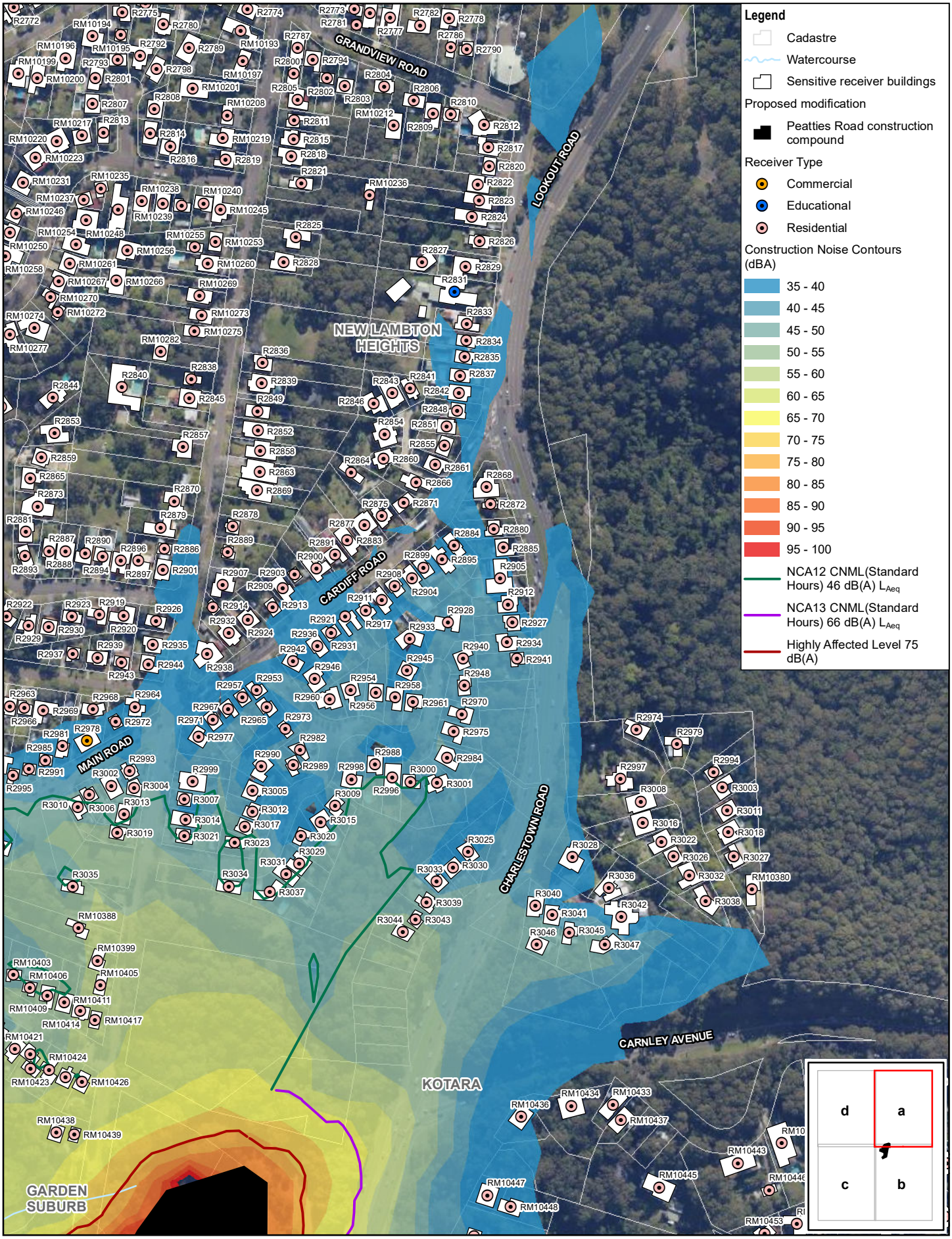
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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM11033_RES	377032.4	6353756.6	35	38	42	48	38	39	49	44	36	35	35	42[n]	38	66	61	54	38	RES
RM11034_RES	377459.1	6353756.3	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
RM11035_RES	377498.5	6353753.7	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
RM11036_RES	377126.0	6353753.2	37	40	44	50	40[n]	41	51	46	38	37	37	44[n]	40	66	61	54	38	RES
RM11037_RES	377149.7	6353751.0	37	40	44	50	40[n]	41	51	46	38	37	37	44[n]	40	66	61	54	38	RES
RM11038_RES	377251.9	6353749.8	36	39	43	49[s]	39[n]	40	50	45	37	36	36[n]	43[den]	39	46	41	41	35	RES
RM11039_RES	377204.1	6353742.7	35	38	42	48	38	39	49	44	36	35	35	42[n]	38	66	61	54	38	RES
RM11040_RES	377450.4	6353742.9	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
RM11042_RES	377025.1	6353740.5	33	36	40	46	36	37	47	42	34	33	33	40[n]	36	66	61	54	38	RES
RM11043_RES	377124.1	6353739.8	38	41	45	51	41[n]	42	52	47	39	38	38	45[n]	41	66	61	54	38	RES
RM11044_RES	377154.3	6353734.0	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11045_RES	377441.7	6353730.8	31	34	38	44	34	35	45	40	32	31	31	38[n]	34	46	41	41	35	RES
RM11046_RES	377023.6	6353722.8	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11047_RES	377248.7	6353720.9	36	39	43	49[s]	39[n]	40	50	45	37	36	36[n]	43[den]	39	46	41	41	35	RES
RM11048_RES	377205.5	6353720.0	34	37	41	47	37	38	48	43	35	34	34	41[n]	37	66	61	54	38	RES
RM11049_RES	377116.3	6353720.3	37	40	44	50	40[n]	41	51	46	38	37	37	44[n]	40	66	61	54	38	RES
RM11051_RES	377152.1	6353717.2	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11052_RES	377114.5	6353705.1	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11053_RES	377149.2	6353702.2	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11054_RES	377103.8	6353689.9	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11055_RES	377202.2	6353688.5	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11056_RES	377149.4	6353687.7	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11057_RES	377117.1	6353687.3	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11058_RES	377129.0	6353677.7	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES
RM11059_RES	377151.7	6353674.0	35	38	42	48	38	39	49	44	36	35	35	42[n]	38	66	61	54	38	RES
RM11060_RES	377097.4	6353671.1	37	40	44	50	40[n]	41	51	46	38	37	37	44[n]	40	66	61	54	38	RES
RM11061_RES	377198.8	6353667.8	35	38	42	48	38	39	49	44	36	35	35	42[n]	38	66	61	54	38	RES
RM11062_RES	377115.2	6353668.0	36	39	43	49	39[n]	40	50	45	37	36	36	43[n]	39	66	61	54	38	RES

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Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

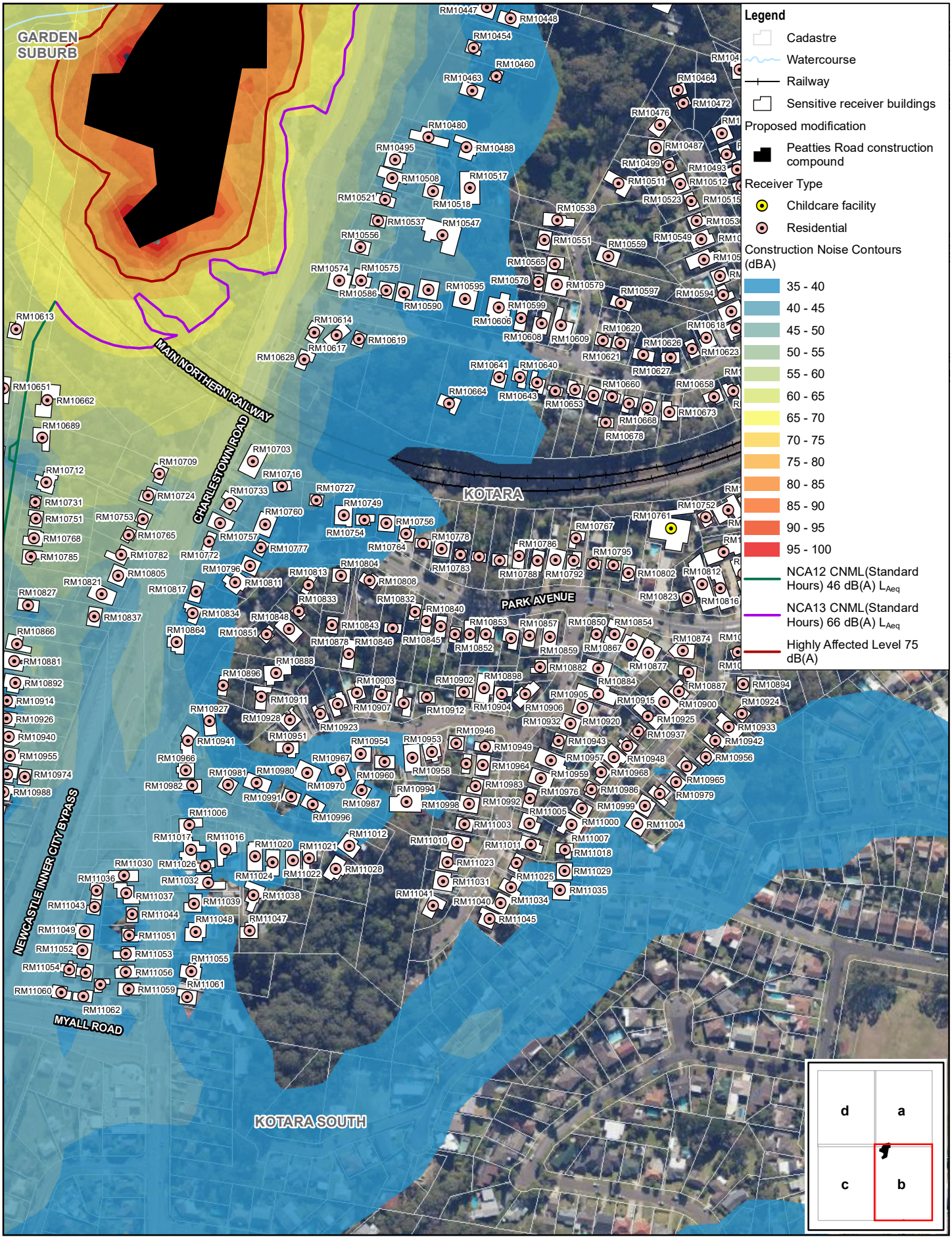
Peatties Road compound: construction noise contours, MOD12- construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure A.1a

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N003_AppendixA_PeattiesRd_shtA_B_DDP_0.mxd
Print date: 20 May 2021 - 10:35

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

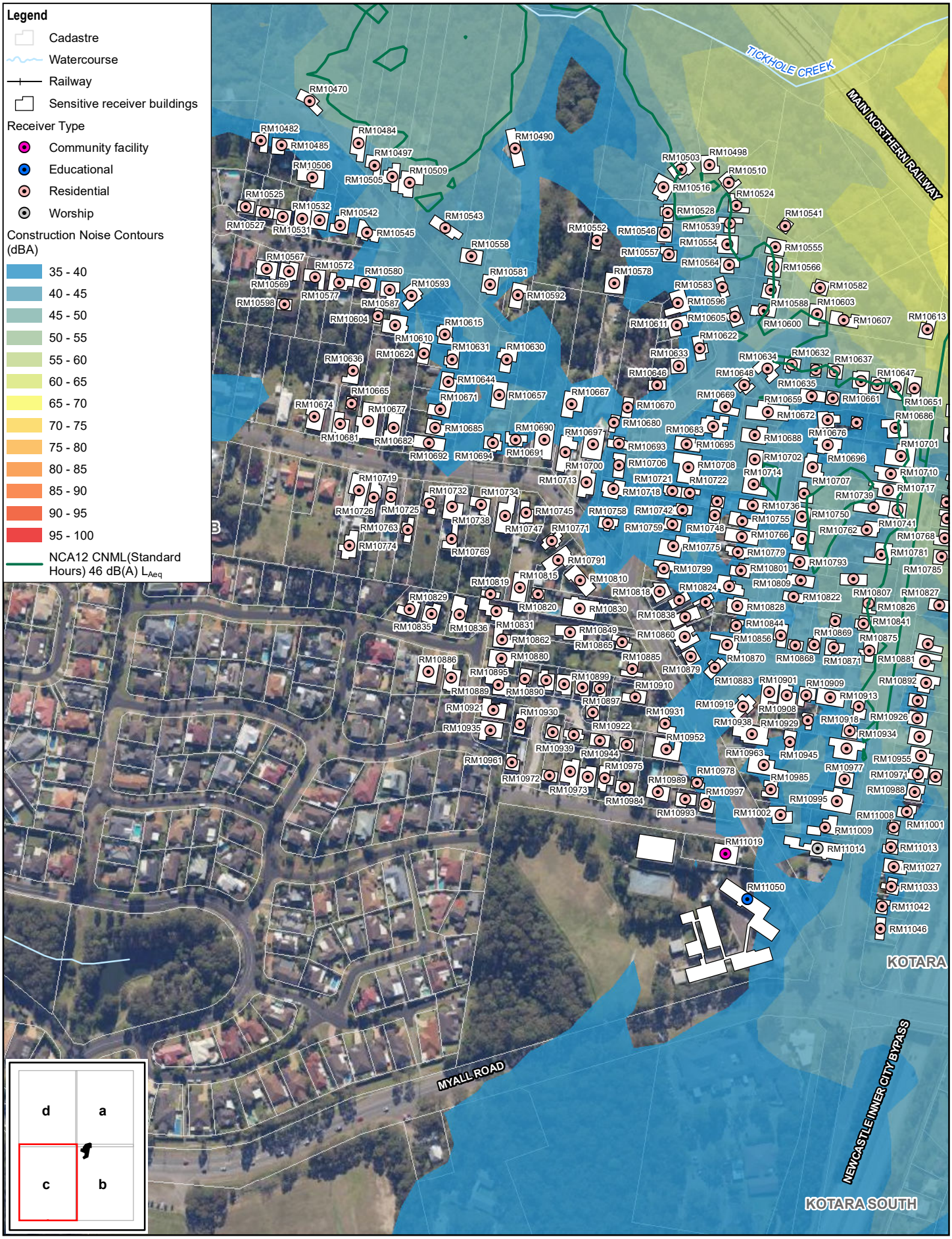
Peatties Road compound: construction noise contours, MOD12- construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure A.1b

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N003_AppendixA_PeattiesRd_shtA_B_DDP_0.mxd
Print date: 20 May 2021 - 10:35

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

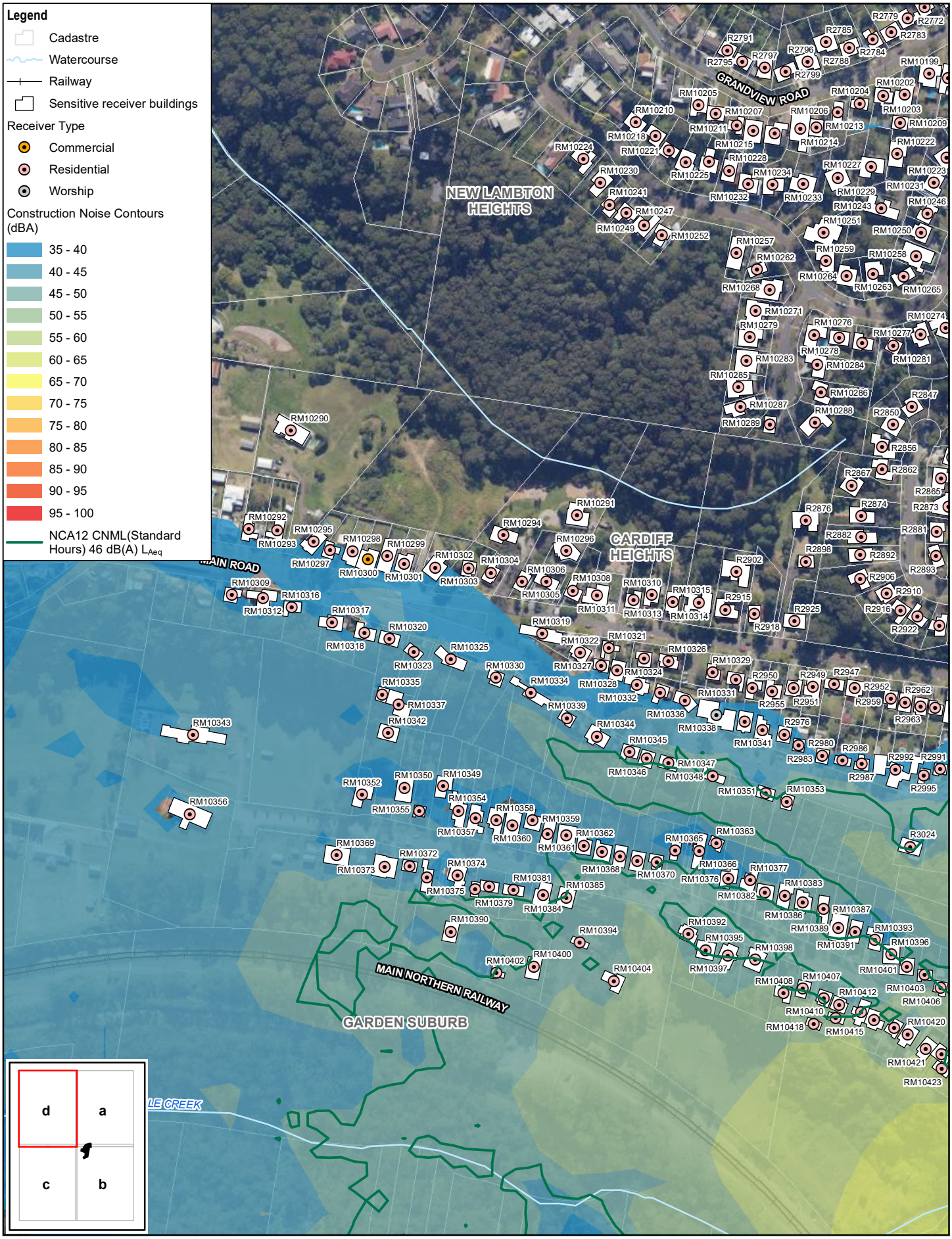
Peatties Road compound: construction noise contours, MOD12- construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure A.1c

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N003_AppendixA_PeattiesRd_shtC_D_DDP_0.mxd
Print date: 20 May 2021 - 10:35

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Peatties Road compound: construction noise contours, MOD12- construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure A.1d

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N003_AppendixA_PeattiesRd_shtC_D_DDP_0.mxd
Print date: 20 May 2021 - 10:36

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

Appendix B

Cardiff Road noise impacts

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2758_RES	377237.0	6355476.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	48	43	40	35	RES
R2760_RES	377135.3	6355462.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	48	43	40	35	RES
R2761_RES	377255.2	6355457.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	48	43	40	35	RES
R2762_RES	377121.6	6355453.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	48	43	40	35	RES
R2763_RES	377108.8	6355444.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	48	43	40	35	RES
R2766_RES	377183.6	6355436.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2767_RES	377204.6	6355433.9	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2770_RES	377223.9	6355428.5	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
R2771_RES	377165.0	6355423.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2774_RES	377246.9	6355418.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
R2775_RES	377146.4	6355415.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2780_RES	377179.0	6355405.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2784_RES	377017.3	6355393.9	38	41	45	51[s]	41	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2787_RES	377287.0	6355387.2	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2788_RES	376998.4	6355387.2	38	41	45	51[s]	41	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2789_RES	377199.6	6355386.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2792_RES	377160.5	6355380.5	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
R2793_RES	377142.7	6355377.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2794_RES	377299.5	6355377.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2796_RES	376964.6	6355375.9	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	48	43	40	35	RES
R2798_RES	377173.8	6355369.7	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2800_RES	377284.0	6355366.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2801_RES	377124.7	6355362.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2802_RES	377310.8	6355362.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2803_RES	377325.1	6355356.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2804_RES	377356.8	6355356.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2805_RES	377287.3	6355345.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2806_RES	377380.7	6355344.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2807_RES	377122.1	6355342.1	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2808_RES	377172.2	6355337.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2809_RES	377396.0	6355334.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2810_RES	377410.3	6355333.4	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2811_RES	377284.5	6355328.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2813_RES	377131.1	6355318.9	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2814_RES	377168.7	6355318.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2815_RES	377284.2	6355313.6	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2816_RES	377184.7	6355308.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
R2818_RES	377281.9	6355299.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2819_RES	377229.3	6355297.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2821_RES	377290.3	6355278.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2827_RES	377387.5	6355214.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2828_RES	377275.9	6355214.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2840_RES	377146.1	6355114.3	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2841_RES	377377.7	6355113.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R2843_RES	377363.2	6355109.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R2845_RES	377200.2	6355105.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2846_RES	377348.4	6355101.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R2847_RES	377048.8	6355098.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2850_RES	377033.5	6355084.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2852_RES	377255.3	6355079.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2853_RES	377091.8	6355076.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2854_RES	377357.2	6355076.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2856_RES	377024.6	6355065.9	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R2857_RES	377195.0	6355065.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2858_RES	377257.0	6355063.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2860_RES	377356.0	6355056.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2861_RES	377397.9	6355052.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2862_RES	377024.7	6355048.0	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2863_RES	377256.5	6355046.4	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2864_RES	377330.3	6355045.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2865_RES	377072.0	6355040.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2866_RES	377382.4	6355037.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2869_RES	377254.5	6355031.4	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2870_RES	377187.8	6355022.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2871_RES	377372.4	6355021.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R2873_RES	377078.1	6355018.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2874_RES	377007.9	6355010.6	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R2875_RES	377354.9	6355010.5	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2876_RES	376963.4	6355007.0	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2877_RES	377340.8	6355002.8	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R2878_RES	377234.9	6355002.0	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2879_RES	377177.0	6355001.3	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2881_RES	377068.7	6354997.8	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2882_RES	377008.0	6354993.6	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2883_RES	377327.0	6354991.0	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2884_RES	377413.2	6354987.0	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2886_RES	377180.0	6354984.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2887_RES	377087.5	6354982.4	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2888_RES	377100.5	6354982.3	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
R2889_RES	377231.1	6354981.3	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2890_RES	377116.5	6354980.7	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2891_RES	377317.1	6354979.4	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2892_RES	377007.2	6354979.1	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2893_RES	377068.0	6354978.1	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
R2894_RES	377130.3	6354977.5	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2895_RES	377403.2	6354975.4	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2896_RES	377144.9	6354974.5	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2897_RES	377159.1	6354974.4	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
R2898_RES	376963.5	6354973.8	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2899_RES	377388.3	6354969.1	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2900_RES	377302.4	6354968.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2901_RES	377178.9	6354967.2	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2902_RES	376907.6	6354965.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2903_RES	377284.9	6354963.2	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2904_RES	377379.1	6354960.5	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2906_RES	377006.9	6354960.0	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2907_RES	377226.8	6354955.2	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2908_RES	377365.5	6354953.9	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2909_RES	377275.2	6354952.4	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2910_RES	377028.3	6354948.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2911_RES	377355.0	6354943.0	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2913_RES	377267.2	6354937.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2914_RES	377219.2	6354936.9	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2915_RES	376898.7	6354935.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2916_RES	377039.4	6354934.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2917_RES	377342.1	6354934.0	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2918_RES	376922.2	6354931.9	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2919_RES	377127.5	6354931.3	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
R2920_RES	377147.3	6354930.2	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
R2921_RES	377325.5	6354929.8	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2922_RES	377053.1	6354929.8	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2923_RES	377105.8	6354929.4	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
R2924_RES	377247.2	6354927.1	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
R2925_RES	376954.3	6354926.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2926_RES	377173.2	6354925.8	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2928_RES	377408.1	6354924.7	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES

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R2929_RES	377070.7	6354922.4	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2930_RES	377087.2	6354921.1	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
R2931_RES	377314.1	6354916.7	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2932_RES	377231.9	6354916.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2933_RES	377377.2	6354911.7	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2935_RES	377170.6	6354907.1	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2936_RES	377303.1	6354906.0	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2937_RES	377106.4	6354899.8	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
R2938_RES	377214.4	6354899.4	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
R2939_RES	377126.1	6354896.5	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
R2940_RES	377420.1	6354895.7	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R2942_RES	377283.5	6354893.5	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2943_RES	377145.8	6354892.9	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2944_RES	377167.3	6354891.2	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2945_RES	377375.3	6354886.0	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2946_RES	377301.0	6354879.7	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2947_RES	376986.1	6354875.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2948_RES	377421.1	6354874.1	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2949_RES	376969.1	6354872.8	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2950_RES	376920.5	6354872.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
R2951_RES	376953.7	6354872.1	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
R2952_RES	377002.7	6354871.9	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2953_RES	377254.1	6354870.4	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
R2954_RES	377329.7	6354870.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
R2955_RES	376936.5	6354869.7	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
R2956_RES	377349.9	6354868.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
R2957_RES	377242.9	6354864.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R2958_RES	377365.6	6354864.3	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R2959_RES	377031.7	6354863.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES

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R2960_RES	377313.0	6354863.0	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2961_RES	377380.1	6354860.8	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R2962_RES	377043.3	6354860.5	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
R2963_RES	377055.8	6354857.4	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
R2964_RES	377156.4	6354856.8	58[s]	61[s]	65[s]	71[s]	61	62[s]	72	67[s]	59	58	58	65	61[s]	46	41	41	35	RES
R2965_RES	377262.3	6354856.7	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2966_RES	377067.5	6354855.8	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
R2967_RES	377231.4	6354855.2	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2968_RES	377122.6	6354854.9	61[s]	64[s]	68[s]	74[s]	64	65[s]	75	70[s]	62	61	61	68	64[s]	46	41	41	35	RES
R2969_RES	377082.8	6354853.9	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
R2970_RES	377419.1	6354851.0	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R2971_RES	377219.1	6354846.3	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
R2972_RES	377140.7	6354845.0	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
R2973_RES	377277.2	6354838.9	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2975_RES	377412.7	6354836.9	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
R2976_RES	376946.0	6354834.8	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
R2977_RES	377207.6	6354832.9	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
R2978_COM	377118.0	6354829.6	67	70	74[s]	80[s]	70	71[s]	81	76[s]	68	67	67	74	70	70	70	70	70	COM
R2980_RES	376957.8	6354826.2	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
R2981_RES	377098.1	6354825.4	68[s]	71[s]	75[s]	81[s]	71	72[s]	82	77[s]	69	68	68	75	71[s]	46	41	41	35	RES
R2982_RES	377289.2	6354822.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
R2983_RES	376976.7	6354817.4	57[s]	60[s]	64[s]	70[s]	60	61[s]	71	66[s]	58	57	57	64	60[s]	46	41	41	35	RES
R2984_RES	377407.4	6354816.1	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2985_RES	377084.5	6354814.1	70[s]	73[s]	77[s]	83[s]	73	74[s]	84	79[s]	71	70	70	77	73[s]	46	41	41	35	RES
R2986_RES	376993.0	6354813.5	59[s]	62[s]	66[s]	72[s]	62	63[s]	73	68[s]	60	59	59	66	62[s]	46	41	41	35	RES
R2987_RES	377008.4	6354811.2	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
R2988_RES	377349.5	6354810.5	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R2989_RES	377283.6	6354809.8	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
R2990_RES	377258.0	6354808.8	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES

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R2991_RES	377071.2	6354806.9	70[s]	73[s]	77[s]	83[s]	73	74[s]	84	79[s]	71	70	70	77	73[s]	46	41	41	35	RES
R2992_RES	377035.4	6354806.7	67[s]	70[s]	74[s]	80[s]	70	71[s]	81	76[s]	68	67	67	74	70[s]	46	41	41	35	RES
R2993_RES	377151.9	6354805.0	62[s]	65[s]	69[s]	75[s]	65	66[s]	76	71[s]	63	62	62	69	65[s]	46	41	41	35	RES
R2995_RES	377058.2	6354801.9	69[s]	72[s]	76[s]	82[s]	72	73[s]	83	78[s]	70	69	69	76	72[s]	46	41	41	35	RES
R2996_RES	377363.5	6354800.1	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R2998_RES	377330.4	6354798.9	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
R2999_RES	377202.8	6354796.8	59[s]	62[s]	66[s]	72[s]	62	63[s]	73	68[s]	60	59	59	66	62[s]	46	41	41	35	RES
R3000_RES	377377.9	6354796.5	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
R3001_RES	377399.3	6354795.6	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
R3002_RES	377137.6	6354793.4	67[s]	70[s]	74[s]	80[s]	70	71[s]	81	76[s]	68	67	67	74	70[s]	46	41	41	35	RES
R3004_RES	377155.8	6354791.8	63[s]	66[s]	70[s]	76[s]	66	67[s]	77	72[s]	64	63	63	70	66[s]	46	41	41	35	RES
R3005_RES	377250.9	6354789.5	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R3006_RES	377119.5	6354786.2	75[s]	78[s]	82[s]	88[s]	78	79[s]	89	84[s]	76	75	75	82	78[s]	46	41	41	35	RES
R3007_RES	377196.0	6354782.8	62[s]	65[s]	69[s]	75[s]	65	66[s]	76	71[s]	63	62	62	69	65[s]	46	41	41	35	RES
R3009_RES	377317.4	6354777.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
R3010_RES	377110.2	6354776.4	78[s]	84[s]	92[s]	104[s]	84	86[s]	106	96[s]	80	78	78	92	84[s]	46	41	41	35	RES
R3012_RES	377250.9	6354772.8	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
R3013_RES	377147.5	6354770.6	72[s]	75[s]	79[s]	85[s]	75	76[s]	86	81[s]	73	72	72	79	75[s]	46	41	41	35	RES
R3014_RES	377197.0	6354766.2	67[s]	70[s]	74[s]	80[s]	70	71[s]	81	76[s]	68	67	67	74	70[s]	46	41	41	35	RES
R3015_RES	377305.9	6354764.3	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
R3017_RES	377244.7	6354760.4	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
R3019_RES	377142.3	6354755.9	78[s]	84[s]	92[s]	99[s]	84	86[s]	100	95[s]	80	78	78	92	84[s]	46	41	41	35	RES
R3020_RES	377289.9	6354753.0	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
R3021_RES	377195.9	6354752.9	68[s]	71[s]	75[s]	81[s]	71	72[s]	82	77[s]	69	68	68	75	71[s]	46	41	41	35	RES
R3023_RES	377236.7	6354748.1	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
R3024_RES	377047.3	6354744.4	78[s]	84[s]	92[s]	104[s]	84	86[s]	106	96[s]	80	78	78	92	84[s]	46	41	41	35	RES
R3029_RES	377288.3	6354731.0	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
R3031_RES	377278.0	6354722.1	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
R3034_RES	377232.0	6354712.5	58[s]	61[s]	65[s]	71[s]	61	62[s]	72	67[s]	59	58	58	65	61[s]	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R3035_RES	377106.2	6354712.4	78[s]	84[s]	92[s]	104[s]	84	86[s]	106	96[s]	80	78	78	92	84[s]	46	41	41	35	RES
R3037_RES	377264.8	6354707.9	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10193_RES	377241.4	6355400.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10194_RES	377122.3	6355396.6	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10195_RES	377145.0	6355397.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10196_RES	377100.5	6355378.8	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10197_RES	377243.1	6355376.5	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10199_RES	377062.7	6355366.3	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10200_RES	377077.9	6355362.5	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10201_RES	377202.8	6355354.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10202_RES	377042.9	6355349.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10203_RES	377025.6	6355348.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10204_RES	377006.8	6355342.2	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10205_RES	376877.2	6355341.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10206_RES	376989.2	6355335.0	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10207_RES	376890.8	6355334.2	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10208_RES	377230.7	6355332.8	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10209_RES	377039.2	6355326.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10210_RES	376826.7	6355327.2	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10211_RES	376907.8	6355324.6	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10212_RES	377364.4	6355324.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10213_RES	376971.7	6355322.8	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10214_RES	376959.1	6355322.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10215_RES	376920.9	6355320.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10216_RES	376938.3	6355318.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10217_RES	377113.9	6355316.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10218_RES	376842.4	6355316.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10219_RES	377227.0	6355314.3	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10220_RES	377093.5	6355312.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES

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RM10221_RES	376853.2	6355304.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10222_RES	377036.9	6355301.9	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10223_RES	377076.6	6355298.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10224_RES	376784.6	6355297.6	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10225_RES	376885.6	6355295.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10226_RES	376867.1	6355295.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10227_RES	377016.0	6355291.5	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10228_RES	376901.9	6355288.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10229_RES	376989.0	6355282.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10230_RES	376798.2	6355278.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10231_RES	377066.3	6355278.4	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10232_RES	376917.0	6355277.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10233_RES	376961.4	6355277.6	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10234_RES	376936.5	6355276.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10235_RES	377129.1	6355274.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10236_RES	377345.2	6355268.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10237_RES	377115.1	6355264.6	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10238_RES	377161.8	6355263.5	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10239_RES	377178.9	6355261.9	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10240_RES	377211.6	6355262.0	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10241_RES	376805.5	6355260.9	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10242_RES	377193.9	6355259.9	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10243_RES	377024.1	6355258.1	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10244_RES	377143.0	6355257.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10246_RES	377061.1	6355253.7	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10247_RES	376819.0	6355254.2	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10248_RES	377117.2	6355248.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10249_RES	376833.5	6355244.4	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10250_RES	377056.1	6355238.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES

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RM10251_RES	376977.5	6355238.3	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10252_RES	376847.5	6355236.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10254_RES	377109.0	6355228.8	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10255_RES	377204.5	6355226.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10256_RES	377150.3	6355224.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10257_RES	376907.5	6355222.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10258_RES	377052.1	6355219.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10259_RES	376979.7	6355215.9	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10260_RES	377215.0	6355213.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10261_RES	377104.0	6355213.9	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10262_RES	376924.2	6355208.8	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10263_RES	377017.7	6355205.5	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10264_RES	376996.2	6355203.5	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10265_RES	377041.9	6355203.0	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10266_RES	377141.5	6355199.6	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10267_RES	377095.2	6355199.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10268_RES	376934.4	6355192.5	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10269_RES	377208.2	6355187.5	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10270_RES	377088.5	6355186.3	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10271_RES	376923.1	6355175.5	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10273_RES	377210.1	6355171.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10276_RES	376970.2	6355156.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10277_RES	377055.8	6355156.1	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10278_RES	376990.2	6355153.9	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10279_RES	376918.4	6355154.4	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10280_RES	377008.9	6355150.0	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10281_RES	377034.0	6355147.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10282_RES	377177.1	6355142.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10283_RES	376915.6	6355135.1	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES

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RM10284_RES	376972.5	6355132.3	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10285_RES	376909.3	6355113.9	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10286_RES	376975.5	6355110.0	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10287_RES	376910.8	6355098.3	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10288_RES	376970.9	6355085.7	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10289_RES	376934.5	6355083.9	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10290_RES	376549.5	6355079.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10291_RES	376779.6	6355011.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10292_RES	376515.5	6355000.1	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10293_RES	376538.4	6354999.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10294_RES	376720.3	6354995.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10295_RES	376567.8	6354989.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10296_RES	376770.9	6354982.6	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10297_RES	376581.0	6354983.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10298_RES	376599.1	6354982.2	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10299_RES	376627.0	6354978.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10301_RES	376640.5	6354972.2	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10302_RES	376665.6	6354969.0	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10303_RES	376692.2	6354968.4	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10304_RES	376710.2	6354964.8	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10305_RES	376735.3	6354957.8	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10306_RES	376755.0	6354957.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10308_RES	376776.3	6354950.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10309_RES	376502.0	6354946.9	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10310_RES	376839.4	6354947.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10311_RES	376795.3	6354946.6	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10312_RES	376527.0	6354944.6	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10313_RES	376824.9	6354942.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10314_RES	376877.5	6354940.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10315_RES	376856.2	6354941.2	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10316_RES	376550.1	6354936.9	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10317_RES	376582.4	6354924.6	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10318_RES	376608.6	6354916.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10319_RES	376751.4	6354915.9	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10320_RES	376628.5	6354911.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10321_RES	376804.9	6354904.4	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10322_RES	376781.9	6354900.5	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10323_RES	376648.0	6354901.2	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10324_RES	376833.2	6354895.5	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10325_RES	376677.9	6354895.3	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10326_RES	376853.1	6354893.6	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10327_RES	376799.0	6354890.2	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10328_RES	376811.8	6354886.3	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10329_RES	376888.7	6354884.6	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10330_RES	376714.1	6354880.3	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10331_RES	376907.3	6354878.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10332_RES	376827.8	6354874.9	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
RM10333_RES	376846.2	6354868.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
RM10334_RES	376742.2	6354868.2	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10336_RES	376866.3	6354861.8	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10338_WOR	376891.5	6354850.7	52	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	52	52	52	52	WOR
RM10339_RES	376771.3	6354848.0	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10340_RES	376914.3	6354845.2	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
RM10341_RES	376928.5	6354838.4	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10342_RES	376627.7	6354836.0	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10343_RES	376471.0	6354834.4	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10344_RES	376795.4	6354833.0	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
RM10345_RES	376821.6	6354820.8	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10346_RES	376835.4	6354815.3	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
RM10347_RES	376852.9	6354811.8	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
RM10348_RES	376888.7	6354801.0	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10349_RES	376671.8	6354793.1	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10350_RES	376640.8	6354791.7	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10351_RES	376931.1	6354787.6	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10352_RES	376606.7	6354786.5	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10353_RES	376948.1	6354780.7	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
RM10354_RES	376684.1	6354773.5	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10355_RES	376652.7	6354773.1	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10356_RES	376468.0	6354770.8	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10357_RES	376698.1	6354767.1	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10358_RES	376714.4	6354765.5	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10359_RES	376743.8	6354765.5	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
RM10360_RES	376727.4	6354761.7	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10361_RES	376755.8	6354754.4	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10362_RES	376770.9	6354753.7	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10363_RES	376891.6	6354747.3	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10364_RES	376784.9	6354745.2	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10365_RES	376858.3	6354741.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10366_RES	376877.6	6354740.9	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10367_RES	376799.6	6354740.1	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
RM10368_RES	376814.0	6354736.8	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
RM10369_RES	376586.4	6354737.4	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10370_RES	376827.9	6354732.7	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
RM10371_RES	376843.4	6354731.6	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
RM10372_RES	376644.9	6354728.9	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10373_RES	376624.8	6354728.4	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10374_RES	376683.3	6354721.6	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES

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RM10375_RES	376658.6	6354719.7	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10376_RES	376901.1	6354719.0	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10377_RES	376918.6	6354717.9	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10378_RES	376708.8	6354712.5	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10379_RES	376697.5	6354710.3	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10381_RES	376728.3	6354709.6	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10382_RES	376930.6	6354707.8	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10383_RES	376946.6	6354705.1	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
RM10384_RES	376752.1	6354705.3	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
RM10385_RES	376770.6	6354703.7	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10386_RES	376961.2	6354700.0	57[s]	60[s]	64[s]	70[s]	60	61[s]	71	66[s]	58	57	57	64	60[s]	46	41	41	35	RES
RM10387_RES	376977.6	6354694.4	59[s]	62[s]	66[s]	72[s]	62	63[s]	73	68[s]	60	59	59	66	62[s]	46	41	41	35	RES
RM10388_RES	377111.1	6354678.8	67[s]	70[s]	74[s]	80[s]	70	71[s]	81	76[s]	68	67	67	74	70[s]	46	41	41	35	RES
RM10389_RES	376989.6	6354679.4	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
RM10390_RES	376677.8	6354675.9	44	47[s]	51[s]	57[s]	47	48[s]	58	53[s]	45	44	44	51	47[s]	46	41	41	35	RES
RM10391_RES	377002.9	6354676.0	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
RM10392_RES	376868.9	6354674.4	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
RM10393_RES	377019.0	6354669.7	61[s]	64[s]	68[s]	74[s]	64	65[s]	75	70[s]	62	61	61	68	64[s]	46	41	41	35	RES
RM10394_RES	376781.7	6354667.3	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10395_RES	376882.8	6354661.4	51[s]	54[s]	58[s]	64[s]	54	55[s]	65	60[s]	52	51	51	58	54[s]	46	41	41	35	RES
RM10396_RES	377032.1	6354657.9	61[s]	64[s]	68[s]	74[s]	64	65[s]	75	70[s]	62	61	61	68	64[s]	46	41	41	35	RES
RM10397_RES	376900.8	6354656.9	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10398_RES	376922.7	6354653.5	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10399_RES	377126.2	6354652.9	64[s]	67[s]	71[s]	77[s]	67	68[s]	78	73[s]	65	64	64	71	67[s]	46	41	41	35	RES
RM10400_RES	376744.8	6354648.0	46	49[s]	53[s]	59[s]	49	50[s]	60	55[s]	47	46	46	53	49[s]	46	41	41	35	RES
RM10401_RES	377044.6	6354648.2	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
RM10402_RES	376714.6	6354643.0	45	48[s]	52[s]	58[s]	48	49[s]	59	54[s]	46	45	45	52	48[s]	46	41	41	35	RES
RM10403_RES	377058.8	6354641.2	59[s]	62[s]	66[s]	72[s]	62	63[s]	73	68[s]	60	59	59	66	62[s]	46	41	41	35	RES
RM10404_RES	376809.1	6354636.4	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES

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RM10405_RES	377128.6	6354633.1	60[s]	63[s]	67[s]	73[s]	63	64[s]	74	69[s]	61	60	60	67	63[s]	46	41	41	35	RES
RM10406_RES	377071.7	6354630.9	58[s]	61[s]	65[s]	71[s]	61	62[s]	72	67[s]	59	58	58	65	61[s]	46	41	41	35	RES
RM10407_RES	376961.0	6354630.2	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10408_RES	376945.5	6354626.6	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10409_RES	377086.1	6354624.8	57[s]	60[s]	64[s]	70[s]	60	61[s]	71	66[s]	58	57	57	64	60[s]	46	41	41	35	RES
RM10410_RES	376978.0	6354622.7	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10411_RES	377099.6	6354619.2	56[s]	59[s]	63[s]	69[s]	59	60[s]	70	65[s]	57	56	56	63	59[s]	46	41	41	35	RES
RM10412_RES	376990.2	6354617.4	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10413_RES	377007.8	6354611.6	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10414_RES	377112.5	6354612.3	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10415_RES	376987.6	6354606.7	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10416_RES	377018.1	6354605.1	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10417_RES	377124.3	6354605.2	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10418_RES	376969.7	6354602.0	49[s]	52[s]	56[s]	62[s]	52	53[s]	63	58[s]	50	49	49	56	52[s]	46	41	41	35	RES
RM10419_RES	377034.4	6354598.6	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10420_RES	377045.5	6354593.7	55[s]	58[s]	62[s]	68[s]	58	59[s]	69	64[s]	56	55	55	62	58[s]	46	41	41	35	RES
RM10421_RES	377059.9	6354581.6	54[s]	57[s]	61[s]	67[s]	57	58[s]	68	63[s]	55	54	54	61	57[s]	46	41	41	35	RES
RM10422_RES	377072.2	6354577.8	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10423_RES	377072.6	6354565.7	50[s]	53[s]	57[s]	63[s]	53	54[s]	64	59[s]	51	50	50	57	53[s]	46	41	41	35	RES
RM10424_RES	377087.3	6354564.9	53[s]	56[s]	60[s]	66[s]	56	57[s]	67	62[s]	54	53	53	60	56[s]	46	41	41	35	RES
RM10425_RES	377100.6	6354558.9	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10426_RES	377113.7	6354555.3	52[s]	55[s]	59[s]	65[s]	55	56[s]	66	61[s]	53	52	52	59	55[s]	46	41	41	35	RES
RM10438_RES	377093.0	6354514.2	48[s]	51[s]	55[s]	61[s]	51	52[s]	62	57[s]	49	48	48	55	51[s]	46	41	41	35	RES
RM10439_RES	377107.7	6354512.9	47[s]	50[s]	54[s]	60[s]	50	51[s]	61	56[s]	48	47	47	54	50[s]	46	41	41	35	RES
RM10440_RES	377676.5	6354505.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10443_RES	377641.2	6354490.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10451_RES	377688.5	6354441.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10453_RES	377662.6	6354433.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10457_RES	377706.3	6354420.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES

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RM10458_RES	377642.8	6354413.5	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10461_RES	377707.6	6354402.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10468_RES	377661.1	6354394.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10470_RES	376564.8	6354388.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10471_RES	377713.7	6354387.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10474_RES	377667.6	6354380.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10475_RES	377718.3	6354374.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10477_RES	377670.9	6354366.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10481_RES	377724.1	6354357.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10482_RES	376525.6	6354356.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10484_RES	376604.3	6354354.4	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10485_RES	376542.0	6354352.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10489_RES	377678.8	6354350.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10490_RES	376729.9	6354350.2	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10494_RES	377730.6	6354343.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10496_RES	377684.9	6354337.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10497_RES	376616.9	6354336.6	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10498_RES	376886.3	6354337.2	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10503_RES	376863.5	6354333.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10504_RES	377735.6	6354329.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10505_RES	376631.3	6354327.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10506_RES	376566.8	6354326.8	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10507_RES	377692.7	6354325.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10509_RES	376645.0	6354322.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10510_RES	376901.8	6354322.8	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10516_RES	376849.2	6354318.7	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10519_RES	377740.2	6354314.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10520_RES	377694.8	6354311.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10524_RES	376907.7	6354304.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES

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RM10525_RES	376513.4	6354303.4	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10527_RES	376528.6	6354298.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10528_RES	376852.5	6354298.6	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10529_RES	377700.0	6354299.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10530_RES	377749.2	6354295.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10531_RES	376543.0	6354295.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10532_RES	376558.7	6354293.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10535_RES	376572.5	6354292.3	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10539_RES	376902.6	6354289.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10541_RES	376947.2	6354288.1	43	46	50[s]	56[s]	46	47[s]	57	52[s]	44	43	43	50	46	46	41	41	35	RES
RM10542_RES	376589.3	6354288.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10543_RES	376673.9	6354286.2	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10544_RES	377709.0	6354285.8	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10545_RES	376611.0	6354282.7	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10546_RES	376850.7	6354282.2	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10552_RES	376795.6	6354276.3	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10553_RES	377713.2	6354272.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10554_RES	376900.5	6354273.2	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10555_RES	376939.3	6354271.0	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10557_RES	376853.5	6354265.0	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10558_RES	376694.9	6354263.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10563_RES	377720.1	6354257.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10564_RES	376902.0	6354256.6	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10565_RES	377494.2	6354257.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10566_RES	376937.8	6354255.0	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10569_RES	376548.2	6354251.5	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10572_RES	376569.3	6354246.5	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10576_RES	377481.2	6354242.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10577_RES	376588.5	6354242.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES

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RM10578_RES	376809.8	6354241.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10579_RES	377495.9	6354240.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10580_RES	376609.3	6354241.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10581_RES	376709.8	6354240.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10582_RES	376975.3	6354238.4	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10583_RES	376896.5	6354238.5	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10587_RES	376629.1	6354236.4	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10588_RES	376935.7	6354236.4	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10592_RES	376732.0	6354232.1	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10593_RES	376646.9	6354231.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10595_RES	377422.0	6354229.2	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10596_RES	376860.9	6354225.6	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10597_RES	377547.6	6354225.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10599_RES	377449.2	6354222.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10600_RES	376929.7	6354219.7	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10603_RES	376972.8	6354216.8	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10604_RES	376619.6	6354215.5	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10605_RES	376906.8	6354214.5	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10606_RES	377467.0	6354213.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10607_RES	376994.3	6354212.3	41	44	48[s]	54[s]	44	45	55	50[s]	42	41	41	48	44	46	41	41	35	RES
RM10608_RES	377483.8	6354209.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10609_RES	377499.2	6354207.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10610_RES	376633.7	6354208.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10611_RES	376860.1	6354207.8	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10613_RES	377061.4	6354204.8	42	45	49[s]	55[s]	45	46	56	51[s]	43	42	42	49	45	46	41	41	35	RES
RM10615_RES	376673.5	6354200.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10620_RES	377533.0	6354195.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10621_RES	377547.2	6354193.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10622_RES	376878.5	6354189.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES

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RM10624_RES	376656.5	6354185.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10626_RES	377565.5	6354183.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10627_RES	377587.5	6354182.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10630_RES	376723.3	6354180.6	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10631_RES	376679.3	6354180.5	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10632_RES	376952.4	6354176.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10633_RES	376861.4	6354175.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10634_RES	376932.9	6354172.9	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10635_RES	376971.7	6354171.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10636_RES	376599.7	6354171.2	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10637_RES	376987.1	6354170.9	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10642_RES	377008.2	6354162.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10644_RES	376676.2	6354162.3	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10646_RES	376844.1	6354159.9	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10647_RES	377021.3	6354159.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10648_RES	376914.1	6354159.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10650_RES	377036.3	6354157.9	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10651_RES	377051.1	6354157.0	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10657_RES	376717.1	6354152.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10659_RES	376968.5	6354150.9	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10660_RES	377540.2	6354150.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10661_RES	376985.4	6354149.3	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10665_RES	376598.2	6354145.3	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10666_RES	377553.9	6354145.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10667_RES	376775.5	6354144.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10668_RES	377568.6	6354142.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10669_RES	376898.9	6354142.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10670_RES	376820.4	6354142.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10671_RES	376670.0	6354140.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES

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RM10672_RES	376933.0	6354138.3	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10674_RES	376568.6	6354134.7	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10676_RES	376981.2	6354131.9	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10677_RES	376611.9	6354130.8	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10679_RES	377004.5	6354129.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10680_RES	376809.3	6354129.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10681_RES	376589.4	6354128.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10682_RES	376632.1	6354125.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10683_RES	376889.3	6354126.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10685_RES	376665.8	6354125.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10686_RES	377035.8	6354125.3	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10688_RES	376922.6	6354119.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10690_RES	376730.3	6354115.9	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10691_RES	376753.6	6354116.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10692_RES	376660.7	6354113.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10693_RES	376813.3	6354113.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10694_RES	376712.2	6354113.3	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10695_RES	376868.0	6354112.3	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10696_RES	376981.4	6354111.8	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10697_RES	376792.8	6354112.2	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10700_RES	376770.2	6354105.7	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10701_RES	377040.1	6354102.7	40	43	47[s]	53[s]	43	44	54	49[s]	41	40	40	47	43	46	41	41	35	RES
RM10702_RES	376922.7	6354100.0	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10706_RES	376813.5	6354095.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10707_RES	376969.0	6354093.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10708_RES	376869.1	6354093.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10710_RES	377032.0	6354088.1	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10713_RES	376787.3	6354082.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10714_RES	376921.6	6354079.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES

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RM10717_RES	377029.7	6354075.5	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10718_RES	376808.8	6354076.3	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10719_RES	376604.3	6354075.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10721_RES	376856.5	6354074.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10722_RES	376870.1	6354073.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10723_RES	376962.4	6354072.4	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10730_RES	376892.7	6354066.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10732_RES	376661.0	6354065.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10734_RES	376702.6	6354063.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10736_RES	376921.0	6354063.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10738_RES	376679.4	6354062.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10739_RES	377018.1	6354061.4	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10741_RES	377037.4	6354059.1	39	42	46	52[s]	42	43	53	48[s]	40	39	39	46	42	46	41	41	35	RES
RM10742_RES	376864.5	6354059.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10745_RES	376738.7	6354057.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10747_RES	376722.0	6354054.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10748_RES	376890.5	6354055.1	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10749_RES	377324.5	6354054.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10750_RES	376960.7	6354054.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10754_RES	377341.3	6354051.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10755_RES	376912.6	6354050.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10756_RES	377358.9	6354048.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10758_RES	376804.5	6354048.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10759_RES	376856.5	6354047.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10762_RES	377012.7	6354043.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10764_RES	377374.6	6354040.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10766_RES	376912.3	6354038.0	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10770_RES	376960.7	6354036.0	38	41	45	51[s]	41	42	52	47[s]	39	38	38	45	41	46	41	41	35	RES
RM10771_RES	376759.7	6354034.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES

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RM10773_RES	377388.3	6354032.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10775_RES	376857.1	6354030.0	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10778_RES	377403.3	6354028.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10779_RES	376909.1	6354025.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10781_RES	377024.3	6354023.6	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10791_RES	376764.7	6354019.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10793_RES	376958.7	6354017.9	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10801_RES	376911.6	6354010.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10804_RES	377322.3	6354006.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10807_RES	377002.1	6354003.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10809_RES	376959.5	6354002.7	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10810_RES	376782.3	6354002.8	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10814_RES	376902.0	6353998.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10818_RES	376846.4	6353993.8	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10822_RES	376953.7	6353989.3	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10824_RES	376861.9	6353987.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10825_RES	376883.3	6353985.4	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10826_RES	377014.1	6353984.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10828_RES	376908.6	6353982.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10838_RES	376866.8	6353973.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10839_RES	376987.3	6353970.2	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10841_RES	377010.0	6353968.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10844_RES	376908.0	6353966.2	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10856_RES	376943.7	6353958.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10868_RES	376955.4	6353950.6	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10869_RES	376970.5	6353951.0	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES
RM10870_RES	376900.3	6353950.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10871_RES	376986.0	6353948.8	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10875_RES	377014.9	6353946.5	37	40	44	50[s]	40	41	51	46	38	37	37	44	40	46	41	41	35	RES

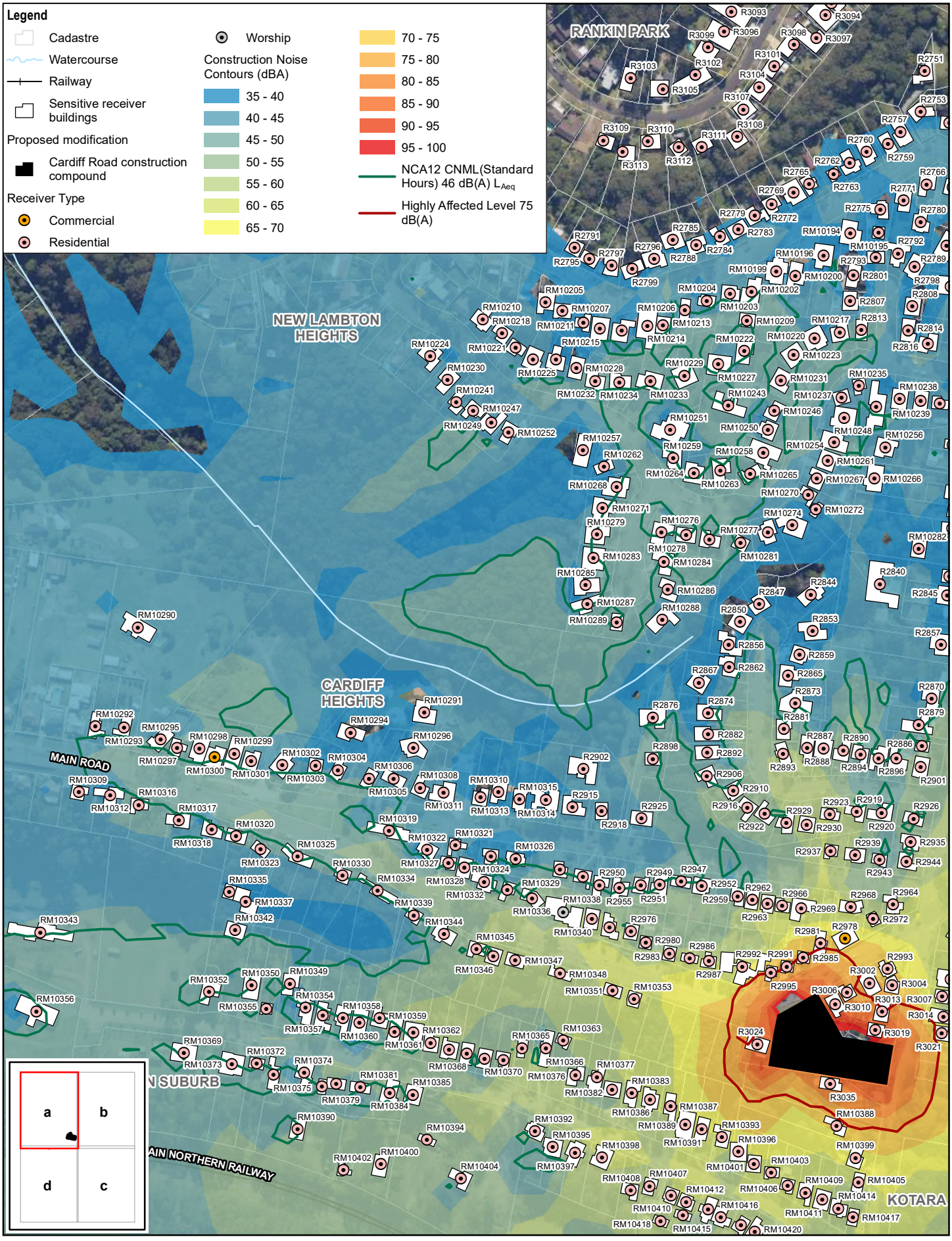
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RM10901_RES	376934.3	6353912.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10908_RES	376948.4	6353910.1	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10909_RES	376963.9	6353910.0	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10913_RES	376983.4	6353908.5	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10918_RES	377006.2	6353901.5	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10919_RES	376913.2	6353901.5	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10929_RES	376965.5	6353890.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10934_RES	376998.7	6353881.6	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10938_RES	376920.4	6353878.9	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10945_RES	376950.8	6353873.1	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10950_RES	376996.4	6353867.6	36	39	43	49[s]	39	40	50	45	37	36	36	43	39	46	41	41	35	RES
RM10954_RES	377338.2	6353863.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10960_RES	377357.5	6353856.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10963_RES	376929.9	6353854.0	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10967_RES	377321.9	6353849.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10978_RES	376876.5	6353839.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10987_RES	377338.8	6353834.1	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM10991_RES	377282.2	6353828.4	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10994_RES	377375.0	6353824.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10996_RES	377299.6	6353822.6	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM10997_RES	376883.5	6353822.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM11012_RES	377328.9	6353789.3	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM11020_RES	377253.1	6353780.7	35	38	42	48[s]	38	39	49	44	36	35	35	42	38	46	41	41	35	RES
RM11022_RES	377283.7	6353777.5	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM11024_RES	377267.5	6353775.7	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM11038_RES	377251.9	6353749.8	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES
RM11047_RES	377248.7	6353720.9	34	37	41	47[s]	37	38	48	43	35	34	34	41	37	46	41	41	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

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Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

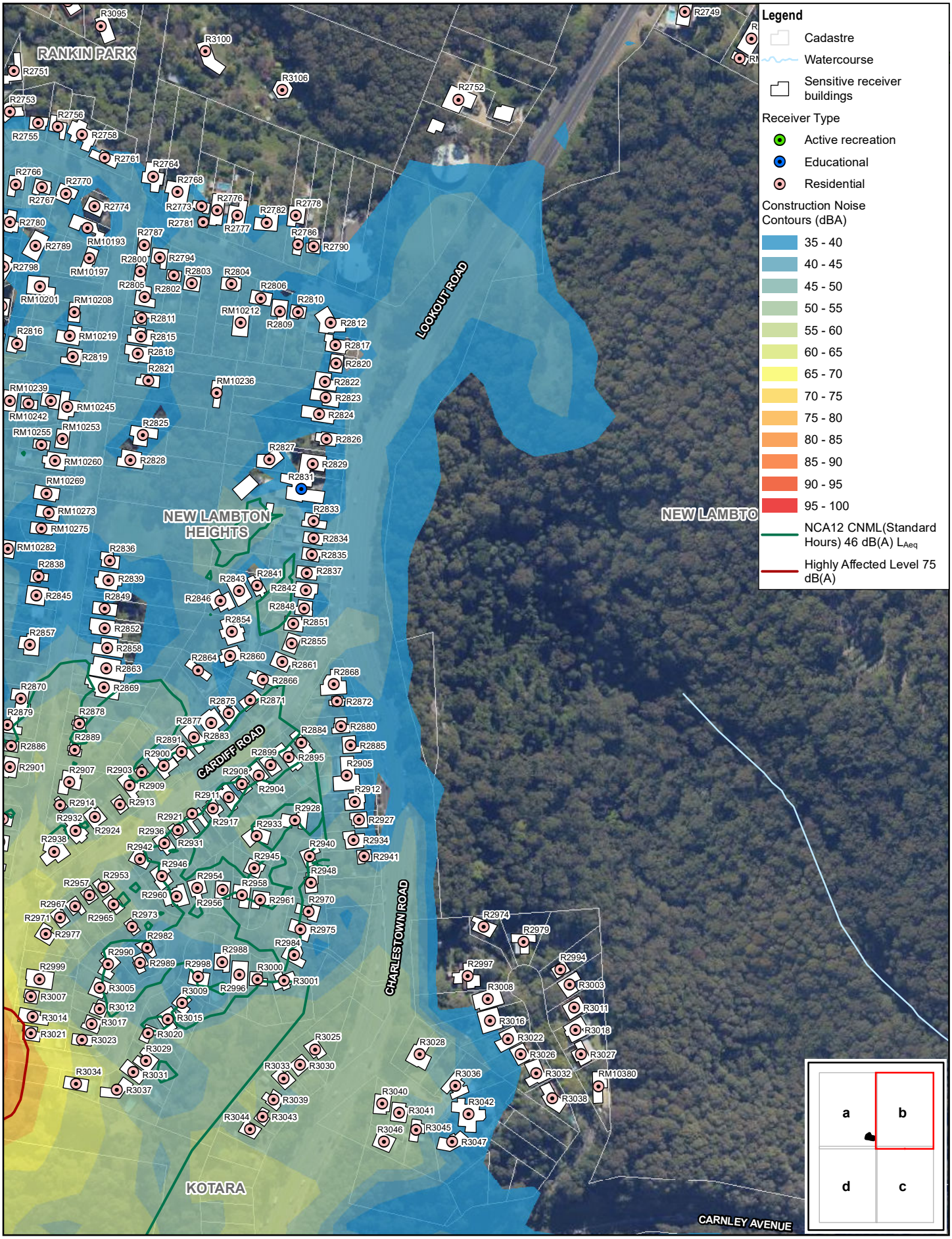
Cardiff Road compound: construction noise contours, MOD08- Stockpile site clearing dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure B.1a

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N004_AppendixB_CardiffRd_shtA_C_D_DDP_0.mxd
Print date: 20 May 2021 - 10:36

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Newcastle Inner City Bypass
Noise and Vibration Assessment

Cardiff Road compound: construction noise contours, MOD08- Stockpile site clearing dB(A), $L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure B.1b

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Print date: 20 May 2021 - 10:36

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Noise and Vibration Assessment

Cardiff Road compound: construction noise contours, MOD08- Stockpile site clearing dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure B.1c

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N004_AppendixB_CardiffRd_shtA_C_D_DDP_0.mxd
Print date: 20 May 2021 - 10:36

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

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Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Cardiff Road compound: construction noise contours, MOD08- Stockpile site clearing dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure B.1d

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N004_AppendixB_CardiffRd_shtA_C_D_DDP_0.mxd
Print date: 20 May 2021 - 10:36

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

Appendix C

Astra Street noise impacts

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
FM0013_PRA	378154.8	6362012.1	50	53	57	63^{s}	53	54	64^{s}	59	51	50	50	57	53	60	60	60	60	PRA
RM10008_ARA	378398.0	6362493.3	55	58	62	68^{s}	58	59	69^{s}	64	56	55	55	62	58	65	65	65	65	ARA
RM10009_RES	377232.1	6362465.9	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10010_RES	377258.2	6362400.5	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10011_RES	377465.1	6362389.4	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10012_RES	377326.9	6362385.5	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10013_RES	377483.1	6362383.6	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10014_RES	377501.6	6362382.5	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10015_RES	377520.7	6362380.1	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10016_RES	377356.8	6362376.3	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10017_RES	377542.0	6362375.5	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10018_RES	377376.2	6362369.8	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10019_RES	377284.4	6362366.4	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10020_RES	377394.4	6362366.0	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10021_RES	377556.7	6362362.0	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10022_RES	377343.2	6362360.5	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10023_RES	377421.3	6362360.6	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10024_RES	377405.6	6362359.9	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10025_RES	377574.4	6362357.6	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10026_RES	377292.4	6362354.0	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10027_RES	377437.0	6362348.8	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10028_RES	377450.2	6362346.7	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10029_RES	377584.6	6362344.7	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10030_RES	377302.6	6362342.5	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10031_RES	377465.3	6362342.9	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10032_RES	377351.6	6362342.5	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10033_RES	377480.9	6362341.0	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10034_RES	377598.9	6362337.3	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10035_RES	377494.6	6362335.4	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES

Notes:

^{s} = exceeds standard hours criteria, ^{d} = exceeds OOHW period 1 day criteria, ^{e} = exceeds OOHW period 1 evening criteria, ^{n} = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10036_RES	377510.0	6362331.8	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10037_RES	377366.3	6362330.9	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10038_RES	377307.5	6362329.5	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10039_RES	377611.4	6362328.9	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10040_RES	377521.7	6362324.6	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10041_RES	377628.4	6362324.1	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10042_RES	377535.5	6362318.4	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10043_RES	377372.2	6362317.0	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10044_RES	377318.2	6362317.1	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10045_RES	377639.7	6362315.2	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10046_RES	377550.7	6362311.6	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10047_RES	377653.2	6362306.9	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10048_RES	377322.0	6362304.4	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10049_RES	377566.4	6362302.8	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10050_RES	377412.3	6362301.3	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10051_RES	377432.8	6362299.9	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10052_RES	377580.2	6362295.7	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10053_RES	377663.5	6362296.1	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10054_RES	377396.0	6362295.2	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10055_RES	377445.0	6362293.4	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10056_RES	377333.2	6362290.9	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10057_RES	377460.3	6362291.2	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10058_RES	377380.2	6362289.4	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10059_RES	377473.4	6362286.1	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10060_RES	377592.8	6362285.4	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10061_RES	377678.0	6362285.2	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10062_RES	377694.8	6362284.2	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10063_RES	377488.8	6362282.6	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10064_RES	377605.5	6362277.5	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES

Notes:

^{s} = exceeds standard hours criteria, ^{d} = exceeds OOHW period 1 day criteria, ^{e} = exceeds OOHW period 1 evening criteria, ^{n} = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10065_RES	377705.8	6362276.6	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10066_RES	377503.4	6362275.8	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10067_RES	377337.9	6362276.3	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10068_RES	377519.6	6362275.0	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10069_RES	377621.1	6362274.4	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10070_RES	377530.5	6362267.7	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10071_RES	377720.3	6362266.7	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10072_RES	377634.3	6362265.9	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10073_RES	377346.3	6362264.2	37	40	44	50	40	41^{n}	51	46^{en}	38	37	37	44^{n}	40	55	50	44	38	RES
RM10074_RES	377733.5	6362261.4	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10075_RES	377549.1	6362261.1	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10076_RES	377647.0	6362255.0	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10077_RES	377422.7	6362253.9	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10078_RES	377355.6	6362251.8	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10079_RES	377436.6	6362250.4	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10080_RES	377660.7	6362249.4	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10081_RES	377561.1	6362247.2	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10082_RES	377407.5	6362245.6	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10083_RES	377450.3	6362246.4	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10084_RES	377465.7	6362240.3	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10085_RES	377573.0	6362240.1	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10086_RES	377746.1	6362238.9	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10087_RES	377679.4	6362237.9	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10088_RES	377362.5	6362237.6	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10089_RES	377480.0	6362233.3	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10090_RES	377602.4	6362233.3	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10091_RES	377586.8	6362232.8	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES
RM10092_RES	377497.1	6362232.0	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10093_RES	377618.0	6362228.4	43	46	50	56^{s}	46	47^{en}	57^{s}	52^{den}	44^{n}	43^{n}	43^{n}	50^{en}	46	55	50	44	38	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10094_RES	378426.8	6362225.0	54	57	61^{s}	67^{s}	57	58^{den}	68^{s}	63^{sden}	55^{den}	54^{en}	54^{en}	61^{sden}	57	59	54	48	40	RES
RM10095_RES	377516.8	6362224.4	41	44	48	54	44	45^{en}	55	50^{en}	42^{n}	41^{n}	41^{n}	48^{en}	44	55	50	44	38	RES
RM10096_RES	377754.0	6362224.3	47	50	54	60^{s}	50	51^{den}	61^{s}	56^{sden}	48^{en}	47^{en}	47^{en}	54^{den}	50	55	50	44	38	RES
RM10097_RES	377373.2	6362224.1	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10098_RES	377632.3	6362221.1	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10099_RES	377648.9	6362221.2	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10100_RES	377423.4	6362220.9	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10101_RES	377532.5	6362216.3	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10102_RES	377666.5	6362209.9	44	47	51	57^{s}	47	48^{en}	58^{s}	53^{den}	45^{en}	44^{n}	44^{n}	51^{den}	47	55	50	44	38	RES
RM10103_RES	377375.4	6362208.0	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10104_RES	377425.8	6362202.0	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10105_RES	377503.8	6362199.8	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10106_RES	377748.3	6362196.4	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10107_RES	377487.3	6362188.4	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10108_RES	377417.2	6362188.1	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10109_RES	377571.0	6362187.4	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10110_RES	377743.5	6362179.9	46	49	53	59^{s}	49	50^{en}	60^{s}	55^{den}	47^{en}	46^{en}	46^{en}	53^{den}	49	55	50	44	38	RES
RM10111_RES	377475.8	6362180.1	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10112_RES	377412.2	6362176.3	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10113_RES	377588.3	6362175.0	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES
RM10114_RES	377651.9	6362174.1	42	45	49	55	45	46^{en}	56^{s}	51^{den}	43^{n}	42^{n}	42^{n}	49^{en}	45	55	50	44	38	RES
RM10115_RES	377459.8	6362173.4	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10116_RES	377548.5	6362167.3	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10117_RES	377728.0	6362165.0	45	48	52	58^{s}	48	49^{en}	59^{s}	54^{den}	46^{en}	45^{en}	45^{en}	52^{den}	48	55	50	44	38	RES
RM10118_RES	377532.9	6362164.0	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10119_RES	377449.1	6362162.7	39	42	46	52	42	43^{n}	53	48^{en}	40^{n}	39^{n}	39^{n}	46^{en}	42	55	50	44	38	RES
RM10120_RES	378561.1	6362162.2	44	47	51	57	47	48^{n}	58	53^{en}	45^{n}	44^{n}	44^{n}	51^{en}	47	59	54	48	40	RES
RM10121_RES	377407.3	6362161.9	38	41	45	51	41	42^{n}	52	47^{en}	39^{n}	38	38	45^{en}	41	55	50	44	38	RES
RM10122_RES	377667.3	6362155.7	40	43	47	53	43	44^{n}	54	49^{en}	41^{n}	40^{n}	40^{n}	47^{en}	43	55	50	44	38	RES

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
RM10123_RES	377523.5	6362153.8	37	40	44	50	40	41[n]	51	46[en]	38	37	37	44[n]	40	55	50	44	38	RES
RM10124_RES	378525.6	6362150.0	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10125_RES	377689.9	6362148.7	40	43	47	53	43	44[n]	54	49[en]	41[n]	40[n]	40[n]	47[en]	43	55	50	44	38	RES
RM10126_RES	377441.5	6362148.6	38	41	45	51	41	42[n]	52	47[en]	39[n]	38	38	45[en]	41	55	50	44	38	RES
RM10127_RES	378569.6	6362146.6	44	47	51	57	47	48[n]	58	53[en]	45[n]	44[n]	44[n]	51[en]	47	59	54	48	40	RES
RM10128_RES	377709.8	6362146.2	45	48	52	58[s]	48	49[en]	59[s]	54[den]	46[en]	45[en]	45[en]	52[den]	48	55	50	44	38	RES
RM10129_RES	377494.2	6362140.3	38	41	45	51	41	42[n]	52	47[en]	39[n]	38	38	45[en]	41	55	50	44	38	RES
RM10130_RES	377513.7	6362140.3	40	43	47	53	43	44[n]	54	49[en]	41[n]	40[n]	40[n]	47[en]	43	55	50	44	38	RES
RM10131_RES	378530.3	6362135.9	44	47	51	57	47	48[n]	58	53[en]	45[n]	44[n]	44[n]	51[en]	47	59	54	48	40	RES
RM10132_RES	378579.2	6362136.0	45	48	52	58	48	49[en]	59	54[en]	46[n]	45[n]	45[n]	52[en]	48	59	54	48	40	RES
RM10133_RES	377482.0	6362130.9	38	41	45	51	41	42[n]	52	47[en]	39[n]	38	38	45[en]	41	55	50	44	38	RES
RM10134_RES	378587.8	6362122.1	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10135_RES	378536.5	6362120.0	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10136_RES	377470.8	6362119.5	39	42	46	52	42	43[n]	53	48[en]	40[n]	39[n]	39[n]	46[en]	42	55	50	44	38	RES
RM10137_RES	377457.4	6362113.1	36	39	43	49	39	40[n]	50	45[en]	37	36	36	43[n]	39	55	50	44	38	RES
RM10138_RES	378539.6	6362106.2	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10140_RES	378585.7	6362104.4	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10141_RES	378852.2	6362098.2	40	43	47	53	43	44[n]	54	49[en]	41[n]	40	40	47[n]	43	59	54	48	40	RES
RM10142_RES	378602.1	6362095.0	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10143_RES	378550.4	6362090.4	42	45	49	55	45	46[n]	56	51[en]	43[n]	42[n]	42[n]	49[en]	45	59	54	48	40	RES
RM10146_RES	378605.2	6362078.0	43	46	50	56	46	47[n]	57	52[en]	44[n]	43[n]	43[n]	50[en]	46	59	54	48	40	RES
RM10148_RES	378552.2	6362076.5	42	45	49	55	45	46[n]	56	51[en]	43[n]	42[n]	42[n]	49[en]	45	59	54	48	40	RES
RM10150_RES	378617.5	6362072.4	38	41	45	51	41	42[n]	52	47[n]	39	38	38	45[n]	41	59	54	48	40	RES
RM10152_RES	378557.4	6362061.8	42	45	49	55	45	46[n]	56	51[en]	43[n]	42[n]	42[n]	49[en]	45	59	54	48	40	RES
RM10153_RES	378597.6	6362061.5	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10154_RES	378606.5	6362049.1	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10155_RES	378559.6	6362045.7	45	48	52	58	48	49[en]	59	54[en]	46[n]	45[n]	45[n]	52[en]	48	59	54	48	40	RES
RM10156_RES	378575.5	6362028.9	44	47	51	57	47	48[n]	58	53[en]	45[n]	44[n]	44[n]	51[en]	47	59	54	48	40	RES
RM10157_RES	377561.6	6362020.8	40	43	47	53	43	44[n]	54	49[en]	41[n]	40[n]	40[n]	47[en]	43	55	50	44	38	RES

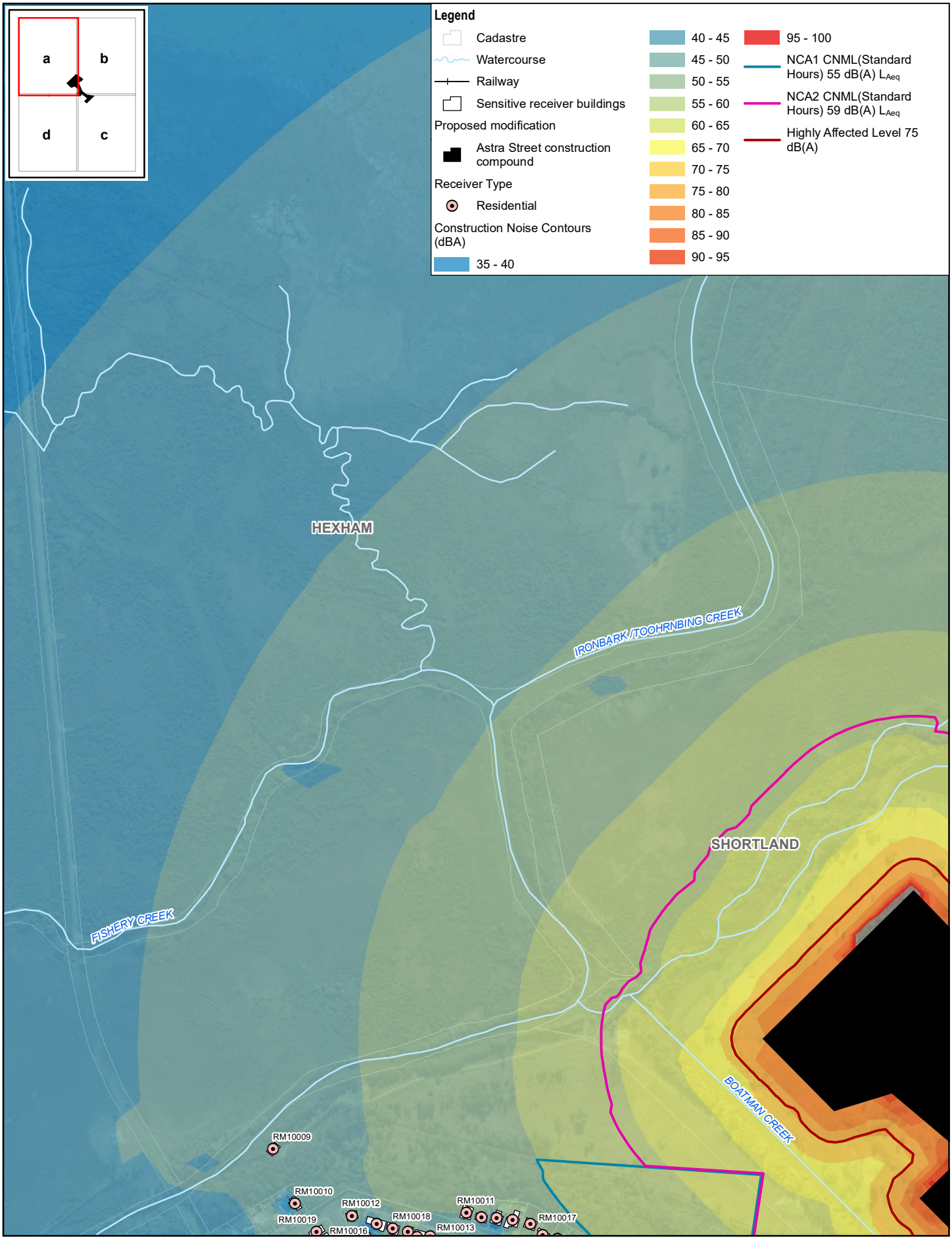
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RM10158_RES	378560.2	6362016.7	45	48	52	58	48	49[en]	59	54[en]	46[n]	45[n]	45[n]	52[en]	48	59	54	48	40	RES
RM10159_RES	378543.0	6362008.5	45	48	52	58	48	49[en]	59	54[en]	46[n]	45[n]	45[n]	52[en]	48	59	54	48	40	RES
RM10160_RES	378524.6	6362000.1	45	48	52	58	48	49[en]	59	54[en]	46[n]	45[n]	45[n]	52[en]	48	59	54	48	40	RES
RM10161_RES	377591.3	6361995.4	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10162_RES	377606.9	6361985.8	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10163_RES	377622.8	6361983.6	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10164_RES	377650.6	6361982.8	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10165_RES	377636.0	6361980.7	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10166_RES	377666.3	6361979.0	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10167_RES	377679.9	6361973.2	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10168_RES	377631.4	6361935.9	39	42	46	52	42	43[n]	53	48[en]	40[n]	39[n]	39[n]	46[en]	42	55	50	44	38	RES
RM10169_RES	377645.1	6361935.5	40	43	47	53	43	44[n]	54	49[en]	41[n]	40[n]	40[n]	47[en]	43	55	50	44	38	RES
RM10170_RES	377660.0	6361933.1	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10171_RES	377673.7	6361926.2	41	44	48	54	44	45[en]	55	50[en]	42[n]	41[n]	41[n]	48[en]	44	55	50	44	38	RES
RM10172_RES	377654.1	6361908.0	38	41	45	51	41	42[n]	52	47[en]	39[n]	38	38	45[en]	41	55	50	44	38	RES
RM10173_RES	378425.8	6361706.9	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10174_EDU	378097.8	6361705.4	42	45	49	55[s]	45	46	56[s]	51	43	42	42	49	45	52	52	52	52	EDU
RM10177_RES	378407.5	6361681.9	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10178_RES	378399.0	6361675.7	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10179_RES	378380.4	6361668.2	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10182_RES	378371.7	6361658.3	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10183_RES	378355.7	6361653.8	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10184_RES	378344.5	6361640.1	41	44	48	54	44	45[n]	55	50[en]	42[n]	41[n]	41[n]	48[n]	44	59	54	48	40	RES
RM10185_RES	378305.0	6361620.1	40	43	47	53	43	44[n]	54	49[en]	41[n]	40	40	47[n]	43	59	54	48	40	RES
RM10186_RES	378288.8	6361606.0	40	43	47	53	43	44[n]	54	49[en]	41[n]	40	40	47[n]	43	59	54	48	40	RES

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Paper Size ISO A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

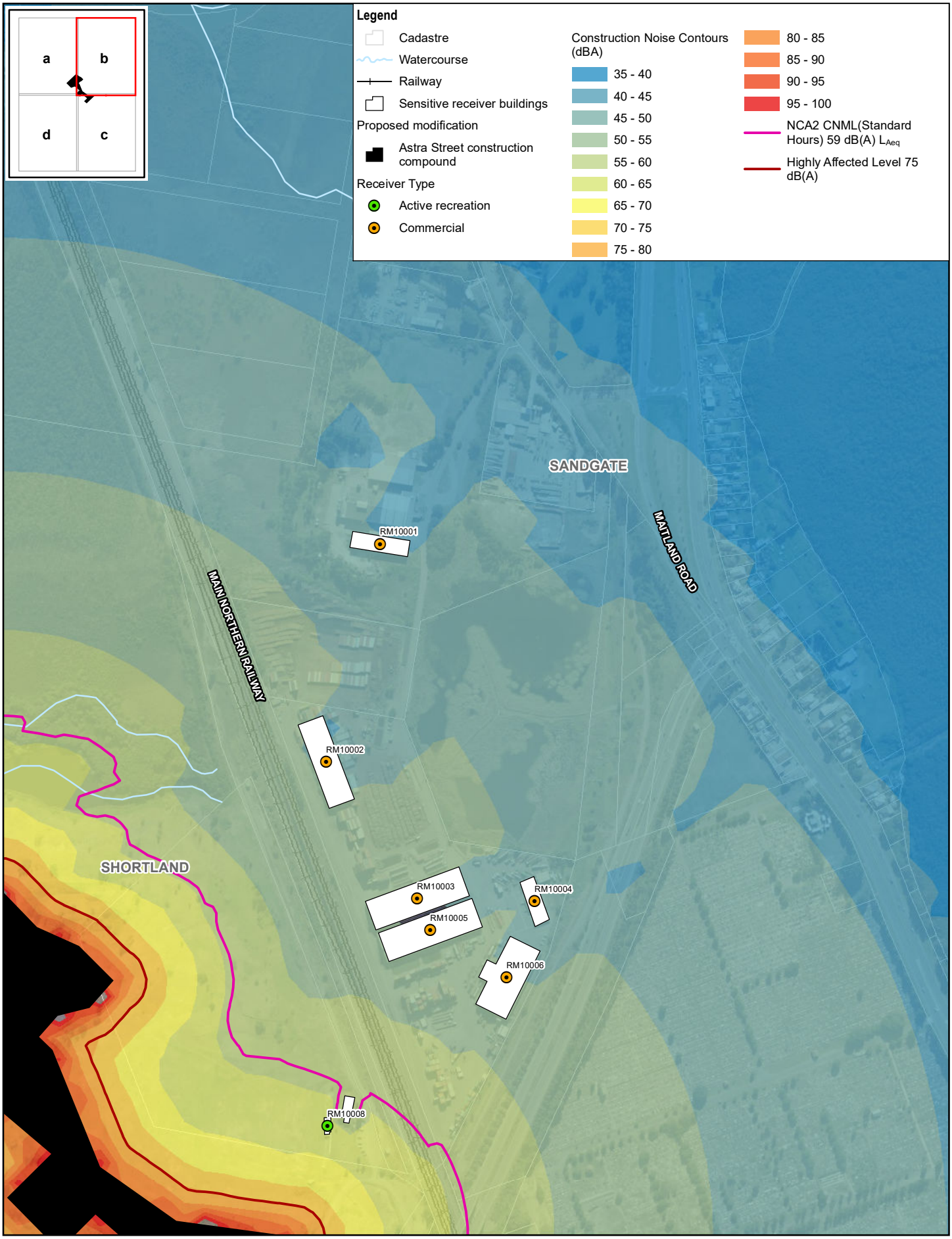
Astra Street compound: construction noise contours, MOD12- Construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure C.1a

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N005_AppendixC_AstraSt_ShtA_B_DDP_0.mxd
Print date: 20 May 2021 - 10:37

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

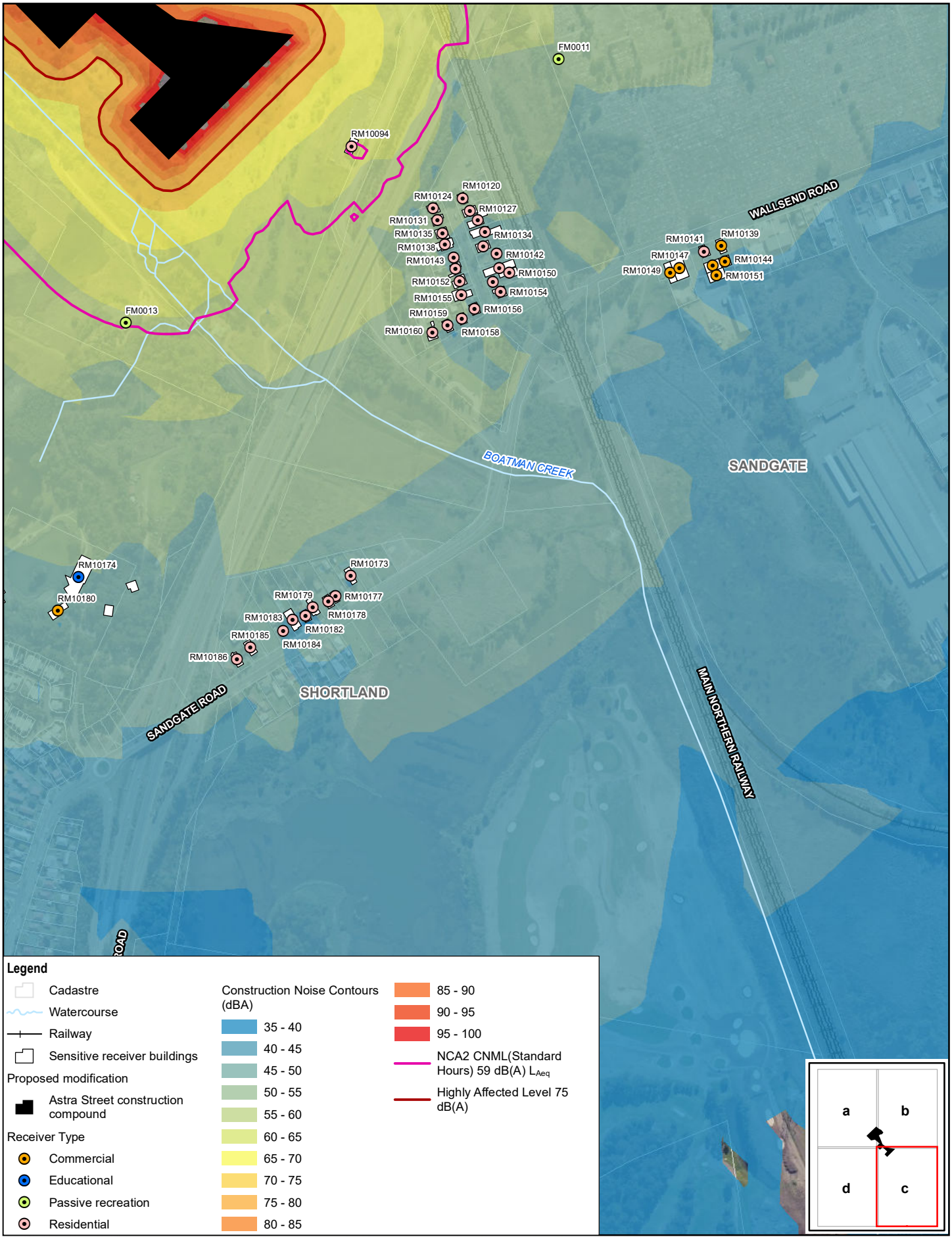
Astra Street compound: construction noise contours, MOD12- Construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure C.1b

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N005_AppendixC_AstraSt_ShtA_B_DDP_0.mxd
Print date: 20 May 2021 - 10:37

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Legend

- Cadastre
- Watercourse
- Railway
- Sensitive receiver buildings

Proposed modification

- Astra Street construction compound

Receiver Type

- Commercial
- Educational
- Passive recreation
- Residential

Construction Noise Contours (dBA)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85
- 85 - 90
- 90 - 95
- 95 - 100
- NCA2 CNML(Standard Hours) 59 dB(A) L_{Aeq}
- Highly Affected Level 75 dB(A)

Paper Size ISO A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

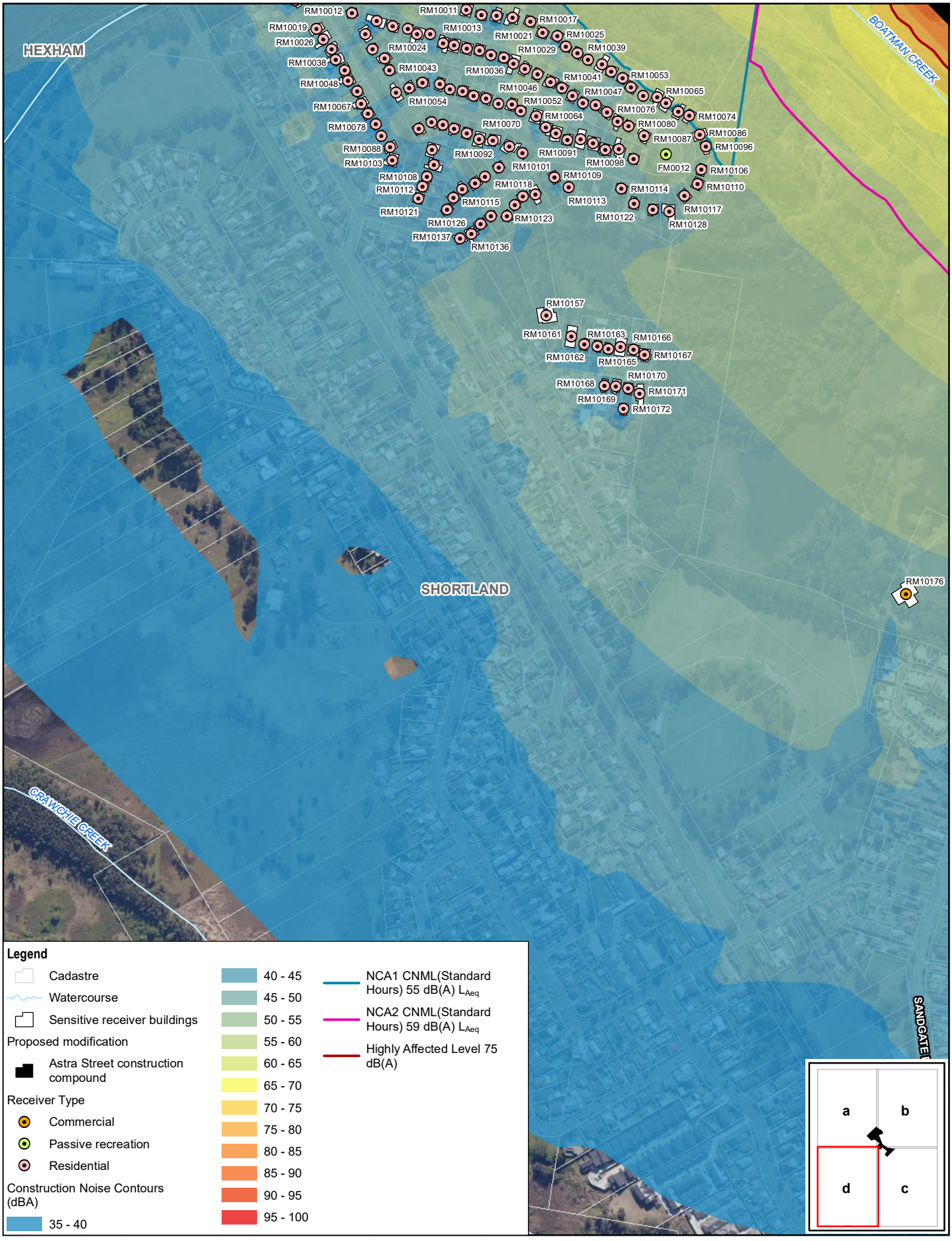
Astra Street compound: construction noise contours, MOD12- Construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure C.1c

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N005_AppendixC_AstraSt_ShtC_D_DDP_0.mxd
Print date: 20 May 2021 - 10:37

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Astra Street compound: construction noise contours, MOD12- Construction support activities dB(A),$L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure C.1d

G:\22\12528155\GIS\Maps\Deliverables\Noise\12528155_N005_AppendixC_AstraSt_ShtC_D_DDP_0.mxd
Print date: 20 May 2021 - 10:37

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

Appendix D

Lookout Road noise impacts

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2597_RES	377017.6	6356153.4	33	36	40	46	36[n]	37	47	42	34	33	33	40	36	44	39	37	35	RES
R2599_RES	377033.7	6356149.1	33	36	40	46	36[n]	37	47	42	34	33	33	40	36	44	39	37	35	RES
R2614_RES	378135.5	6356096.1	36	39	43	49	39[n]	40	50	45	37	36	36	43	39	66	61	54	38	RES
R2617_RES	377058.3	6356093.9	37	40	44	50	40[n]	41	51	46	38	37	37	44	40	60	55	47	38	RES
R2624_RES	377110.5	6356088.0	37	40	44	50	40[n]	41	51	46	38	37	37	44	40	60	55	47	38	RES
R2625_RES	377129.6	6356085.5	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	60	55	47	38	RES
R2626_RES	377147.6	6356083.5	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	60	55	47	38	RES
R2627_RES	377183.6	6356077.1	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	60	55	47	38	RES
R2629_RES	377165.8	6356075.0	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	60	55	47	38	RES
R2630_RES	377201.5	6356072.7	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2632_RES	377239.9	6356067.6	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2633_RES	377219.0	6356067.1	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2635_RES	377258.7	6356065.5	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2637_RES	377046.8	6356061.2	37	40	44	50	40[n]	41	51	46	38	37	37	44	40	48	43	40	35	RES
R2638_RES	377277.0	6356061.1	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2639_RES	377077.0	6356059.8	36	39	43	49	39[n]	40	50	45	37	36	36	43	39	48	43	40	35	RES
R2640_RES	377292.0	6356059.3	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	60	55	47	38	RES
R2644_RES	377309.2	6356052.8	41	44	48	54	44[n]	45	55	50	42	41	41	48	44	60	55	47	38	RES
R2647_RES	377091.1	6356046.9	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2649_RES	377326.9	6356046.4	40	43	47	53	43[n]	44	54	49	41	40	40	47	43	60	55	47	38	RES
R2651_RES	377124.3	6356040.2	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2652_RES	377140.4	6356040.1	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2653_RES	377159.6	6356040.0	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2654_RES	377056.7	6356039.9	37	40	44	50	40[n]	41	51	46	38	37	37	44	40	48	43	40	35	RES
R2656_RES	377074.9	6356037.9	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2657_RES	377106.3	6356037.4	38	41	45	51	41[en]	42	52	47	39	38	38	45	41	48	43	40	35	RES
R2658_RES	377177.9	6356036.8	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2660_RES	377344.5	6356035.5	41	44	48	54	44[n]	45	55	50	42	41	41	48	44	60	55	47	38	RES
R2661_RES	377197.3	6356034.2	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2662_RES	378160.7	6356033.5	36	39	43	49	39[n]	40	50	45	37	36	36	43	39	66	61	54	38	RES
R2664_RES	377214.9	6356031.5	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2666_RES	377232.8	6356029.3	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2667_RES	377251.1	6356028.3	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2668_RES	377270.6	6356024.9	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2670_RES	377288.0	6356021.1	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2671_RES	377303.2	6356015.7	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2674_RES	377312.8	6356005.6	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2675_RES	378072.3	6356004.2	39	42	46	52	42[n]	43	53	48	40	39	39	46	42	66	61	54	38	RES
R2681_RES	377175.6	6355989.8	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2682_RES	377194.7	6355989.2	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2683_RES	377152.9	6355987.4	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2684_RES	377212.2	6355985.9	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2685_RES	377132.6	6355985.2	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2686_RES	377319.6	6355985.2	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2688_RES	377230.1	6355982.6	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2689_RES	377031.1	6355979.6	35	38	42	48	38[n]	39	49	44	36	35	35	42	38	48	43	40	35	RES
R2690_RES	377056.8	6355977.9	35	38	42	48	38[n]	39	49	44	36	35	35	42	38	48	43	40	35	RES
R2692_RES	377014.2	6355976.2	34	37	41	47	37[n]	38	48	43	35	34	34	41	37	48	43	40	35	RES
R2694_RES	377276.1	6355971.9	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2695_RES	377247.8	6355970.7	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2696_RES	377154.6	6355969.9	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2697_RES	377323.7	6355968.8	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2701_RES	377173.0	6355963.8	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2702_RES	377272.6	6355959.8	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2703_RES	377191.7	6355955.8	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2704_RES	377323.1	6355953.9	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2705_RES	377085.3	6355952.4	35	38	42	48	38[n]	39	49	44	36	35	35	42	38	48	43	40	35	RES
R2706_RES	377224.8	6355941.9	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES

Notes:

[s] = exceeds standard hours criteria, [d] = exceeds OOHW period 1 day criteria, [e] = exceeds OOHW period 1 evening criteria, [n] = exceeds OOHW period 2 night criteria

Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2707_RES	377274.4	6355940.7	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2708_RES	377103.6	6355940.6	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2709_RES	377324.0	6355937.0	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2710_RES	377121.6	6355935.7	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2711_RES	377241.5	6355933.6	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2712_RES	377136.9	6355926.9	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2713_RES	377320.8	6355920.9	43	46	50	56	46[den]	47	57	52	44	43	43	50	46	48	43	40	35	RES
R2714_RES	377155.7	6355918.4	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2715_RES	377269.6	6355915.0	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2716_RES	377172.8	6355913.7	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2717_RES	377321.3	6355905.0	43	46	50	56	46[den]	47	57	52	44	43	43	50	46	48	43	40	35	RES
R2718_RES	377188.6	6355902.9	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2719_RES	377203.4	6355896.8	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2720_RES	377318.7	6355888.4	44	47	51	57	47[den]	48	58	53	45	44	44	51	47	48	43	40	35	RES
R2721_RES	377992.1	6355888.3	40	43	47	53	43[n]	44	54	49	41	40	40	47	43	66	61	54	38	RES
R2722_RES	377217.4	6355888.2	42	45	49	55	45[den]	46	56	51	43	42	42	49	45	48	43	40	35	RES
R2723_RES	377233.2	6355879.2	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2724_RES	377316.5	6355872.6	44	47	51	57	47[den]	48	58	53	45	44	44	51	47	48	43	40	35	RES
R2725_RES	377245.8	6355867.7	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2726_RES	377956.9	6355853.9	40	43	47	53	43[n]	44	54	49	41	40	40	47	43	66	61	54	38	RES
R2727_RES	377258.7	6355851.9	43	46	50	56	46[den]	47	57	52	44	43	43	50	46	48	43	40	35	RES
R2728_RES	377318.0	6355848.1	44	47	51	57	47[den]	48	58	53	45	44	44	51	47	48	43	40	35	RES
R2729_RES	377295.6	6355845.6	44	47	51	57	47[den]	48	58	53	45	44	44	51	47	48	43	40	35	RES
R2730_RES	377276.6	6355844.8	43	46	50	56	46[den]	47	57	52	44	43	43	50	46	48	43	40	35	RES
R2731_RES	377931.9	6355835.6	43	46	50	56	46[n]	47	57	52	44	43	43	50	46	66	61	54	38	RES
R2734_RES	377996.5	6355816.0	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	66	61	54	38	RES
R2737_RES	378037.1	6355794.1	38	41	45	51	41[n]	42	52	47	39	38	38	45	41	66	61	54	38	RES
R2739_RES	377935.9	6355784.0	40	43	47	53	43[n]	44	54	49	41	40	40	47	43	66	61	54	38	RES
R2746_RES	377753.7	6355639.8	47	50	54	60	50[n]	51	61	56	48	47	47	54	50	66	61	54	38	RES

Notes:

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
R2747_RES	377742.4	6355624.3	49	52	56	62	52[n]	53	63	58	50	49	49	56	52	66	61	54	38	RES
R2748_RES	377736.0	6355598.3	53	56	60	66	56[en]	57	67	62	54	53	53	60	56	66	61	54	38	RES
R2749_RES	377721.6	6355574.9	56	59	63	69	59[en]	60	70	65	57	56	56	63	59	66	61	54	38	RES
R2750_RES	377775.0	6355553.3	47	50	54	60	50[n]	51	61	56	48	47	47	54	50	66	61	54	38	RES
R2751_RES	377181.9	6355527.3	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2752_RES	377539.4	6355504.1	77	80	84	90	80[sden]	81	91	86	78	77	77	84	80	66	61	54	38	RES
R2753_RES	377178.8	6355494.4	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2755_RES	377201.7	6355485.4	35	38	42	48	38[n]	39	49	44	36	35	35	42	38	48	43	40	35	RES
R2756_RES	377217.5	6355482.3	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
R2758_RES	377237.0	6355476.1	40	43	47	53	43[en]	44	54	49	41	40	40	47	43	48	43	40	35	RES
R2761_RES	377255.2	6355457.2	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2764_RES	377294.0	6355442.4	41	44	48	54	44[den]	45	55	50	42	41	41	48	44	48	43	40	35	RES
R2766_RES	377183.6	6355436.0	35	38	42	48	38[n]	39	49	44	36	35	35	42	38	46	41	41	35	RES
R2768_RES	377313.7	6355429.6	39	42	46	52	42[en]	43	53	48	40	39	39	46	42	48	43	40	35	RES
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R2794_RES	377299.5	6355377.3	34	37	41	47	37[n]	38	48	43	35	34	34	41	37	46	41	41	35	RES
R2810_RES	377410.3	6355333.4	33	36	40	46	36[n]	37	47	42	34	33	33	40	36	46	41	41	35	RES
R2817_RES	377440.5	6355306.9	36	39	43	49	39[n]	40	50	45	37	36	36	43	39	66	61	54	38	RES
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Notes:

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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
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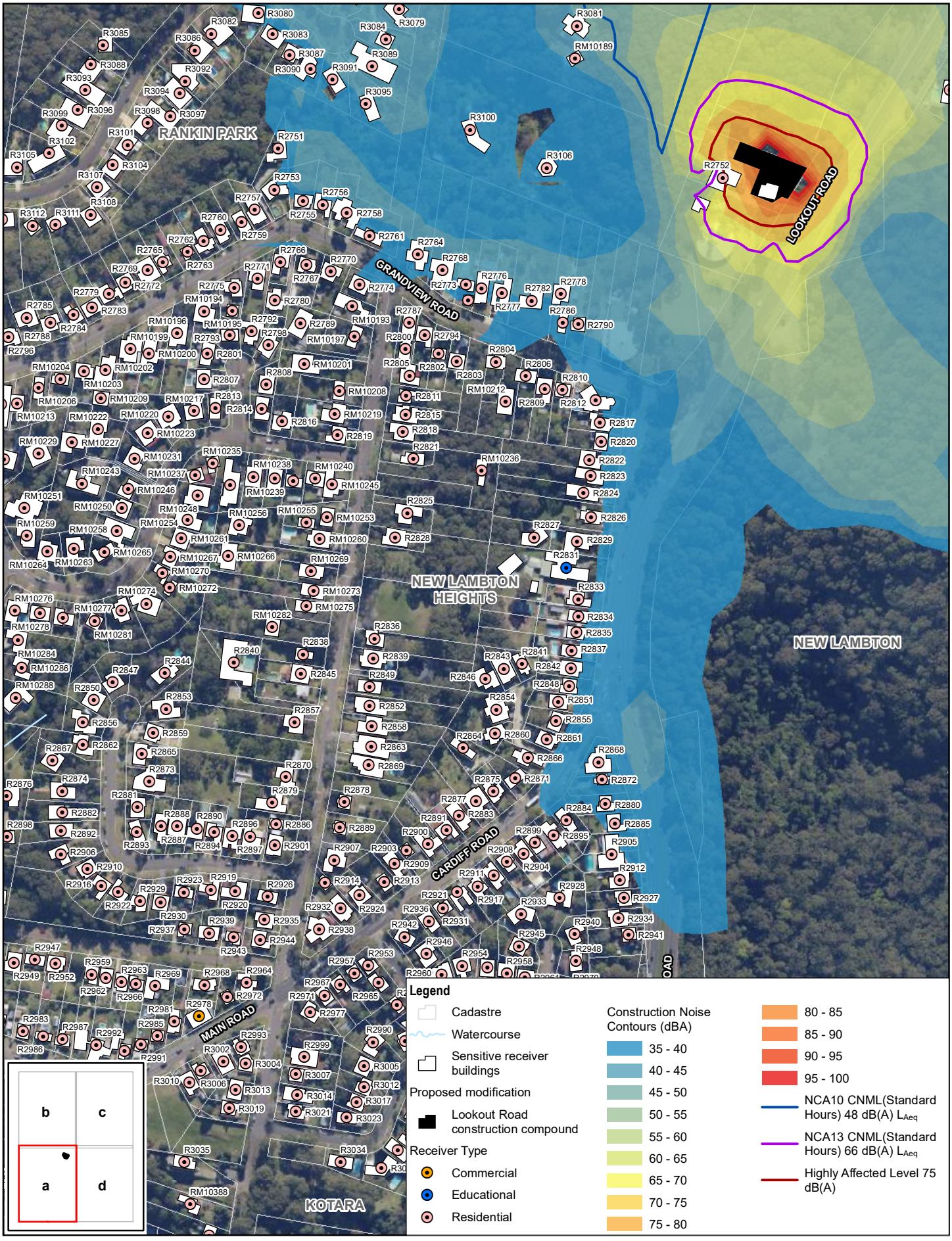
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Receiver ID	Coordinate X	Coortinate Y	MOD01-Establishment of temporary fencing and traffic management	MOD02-Installation of erosion and sediment controls	MOD03-Establishment of construction compound sites	MOD04-Vegetation clearing and grubbing	MOD05-Main compound operation	MOD06-Materials Handling	MOD07-Crushing plant	MOD08-Stockpile Site	MOD09-Batching plant	MOD10-Bridge girder laydown	MOD11-Deliveries	MOD12-Construction support activities	MOD13-Removal of construction compound and site tidy up	CNML Day	CNML Day (OOHW1)	CNML Evening (OOHW1)	CNML Night (OOHW2)	Receiver type
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RM10190_RES	377765.7	6355537.4	48	51	55	61	51[n]	52	62	57	49	48	48	55	51	66	61	54	38	RES
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Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

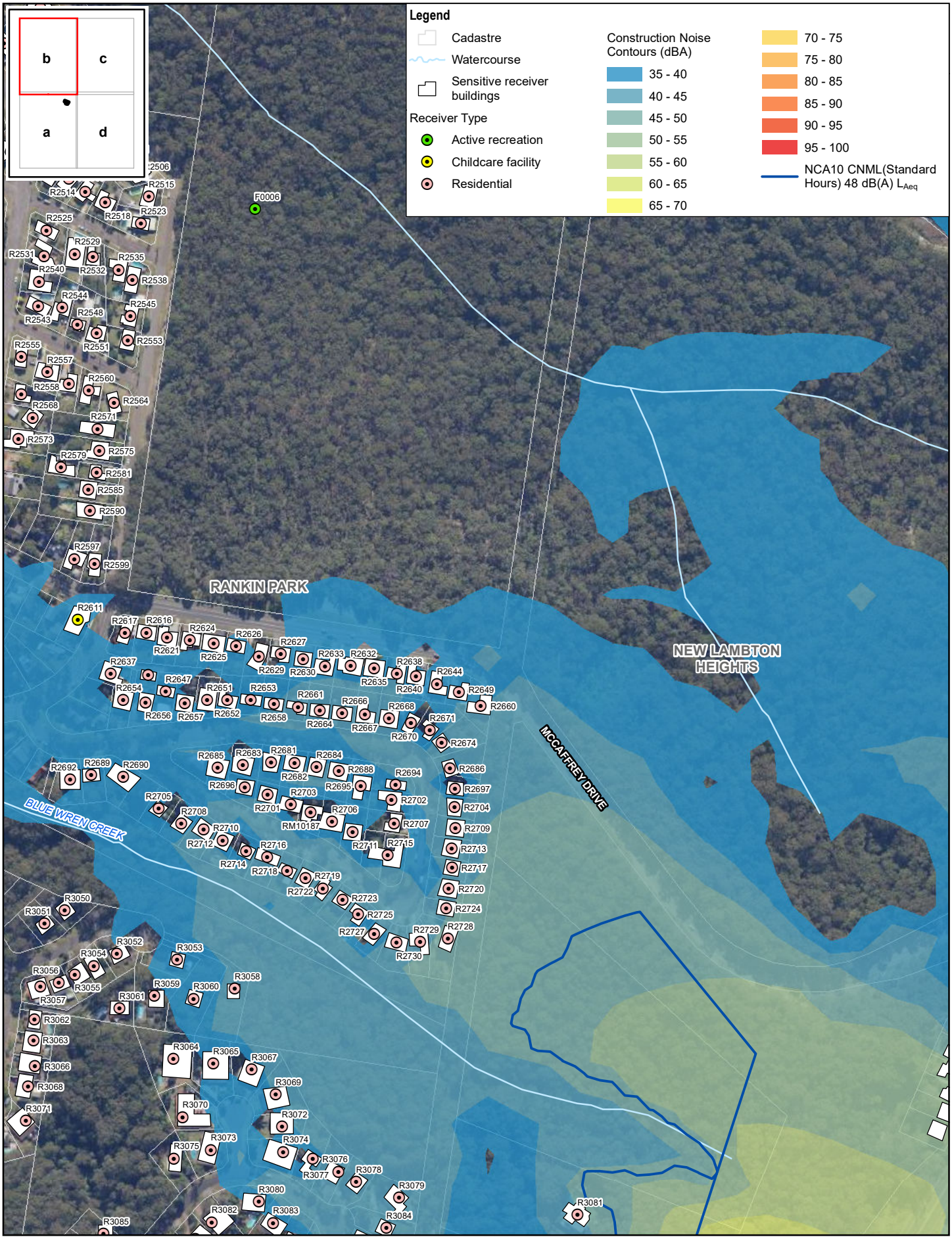
Lookout Road compound: construction noise contours, MOD05 - General compound activities dB(A), $L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure D.1a

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Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



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Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

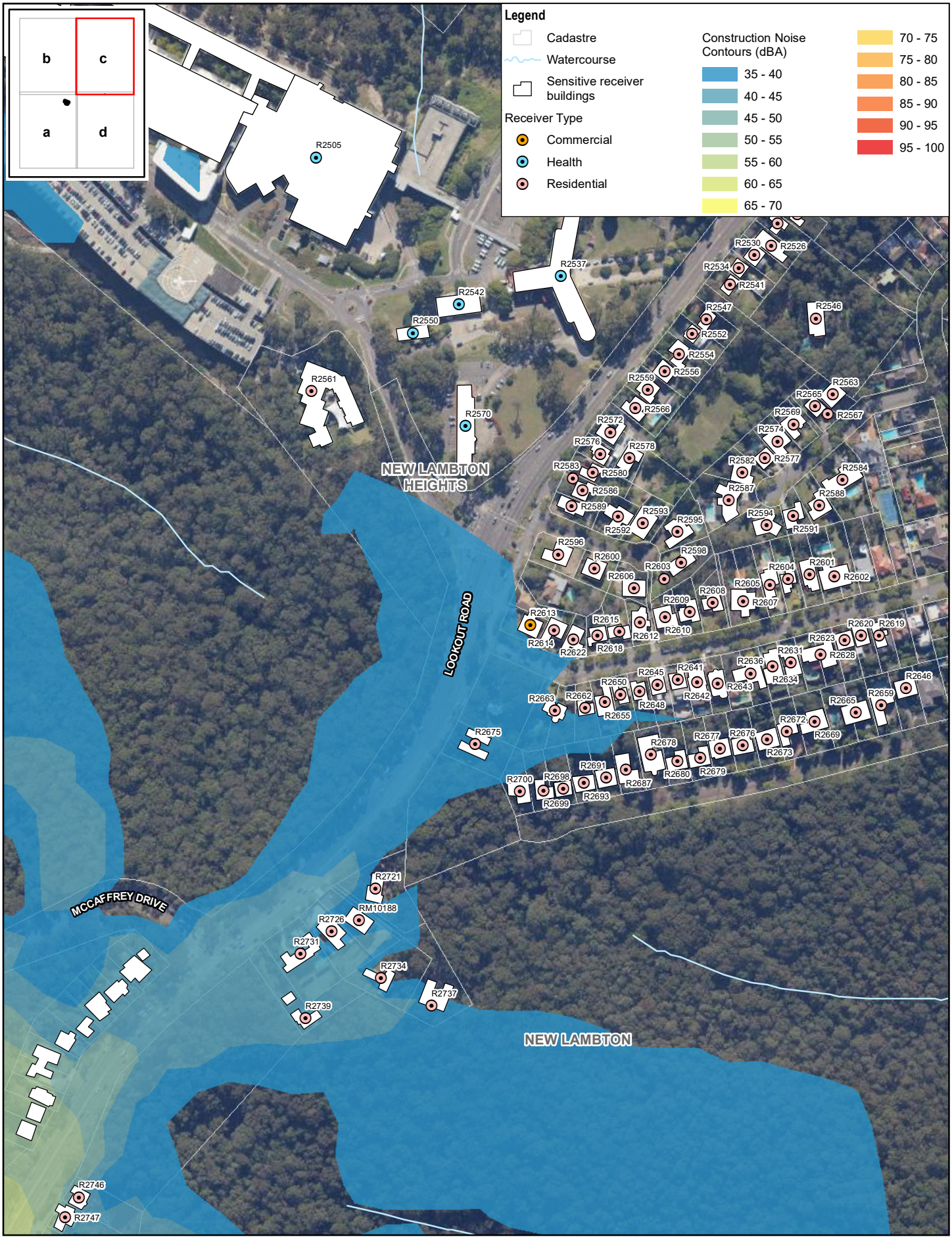
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Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure D.1b

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Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

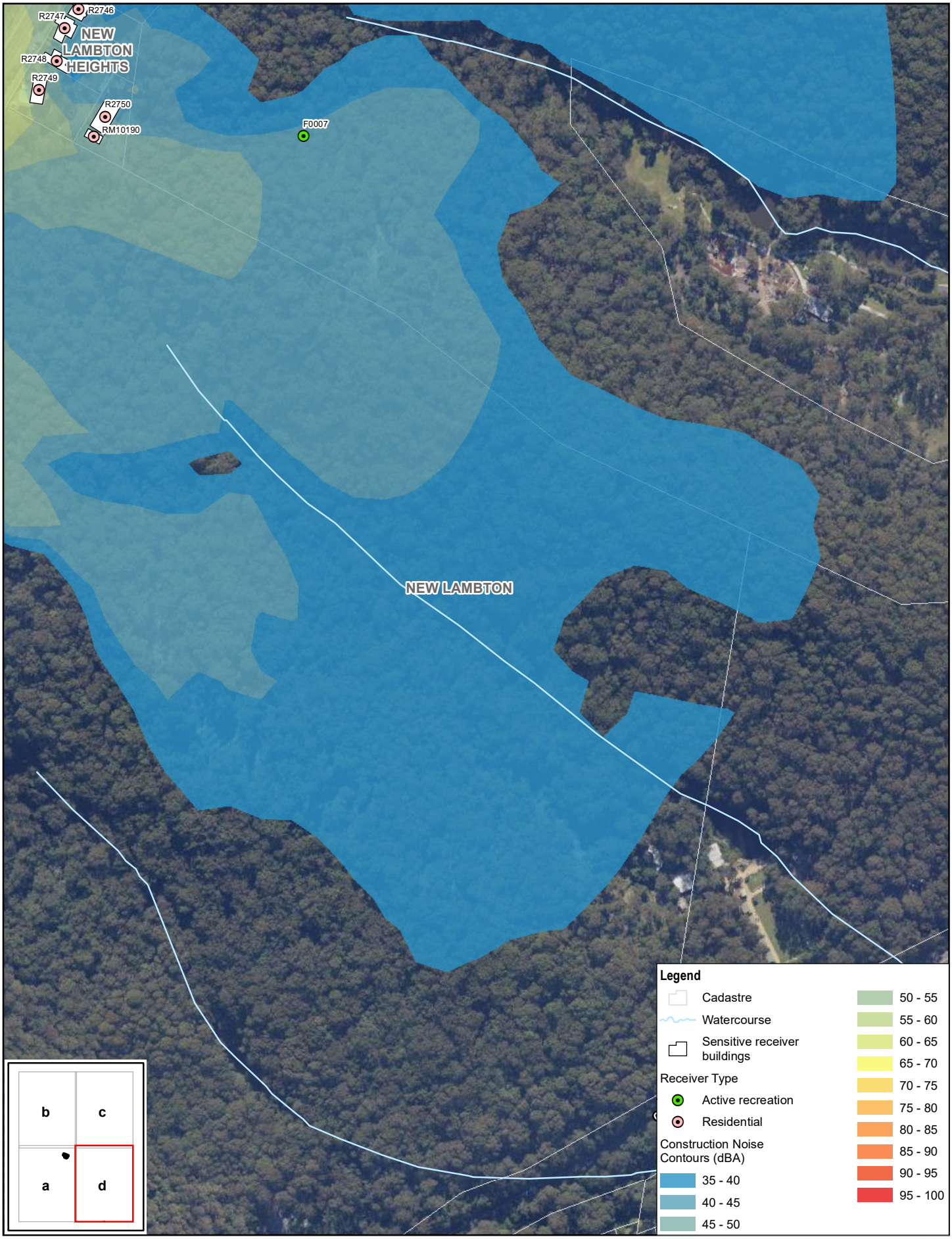
Lookout Road compound: construction noise contours, MOD05 - General compound activities dB(A), $L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure D.1c

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Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Lookout Road compound: construction noise contours, MOD05 - General compound activities dB(A), $L_{Aeq\ 15min}$

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

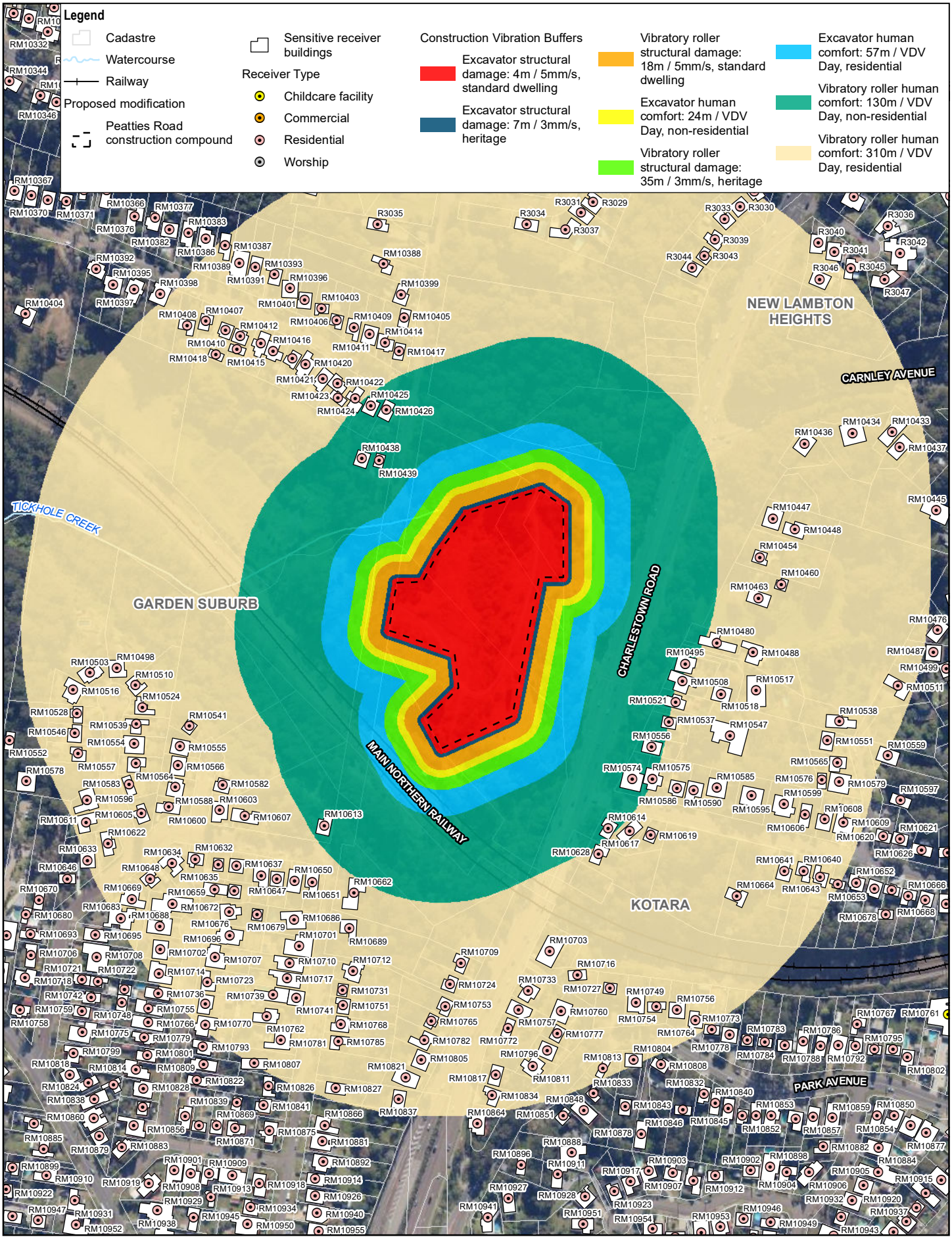
Figure D.1d

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Appendix E

Construction vibration buffers



Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

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Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

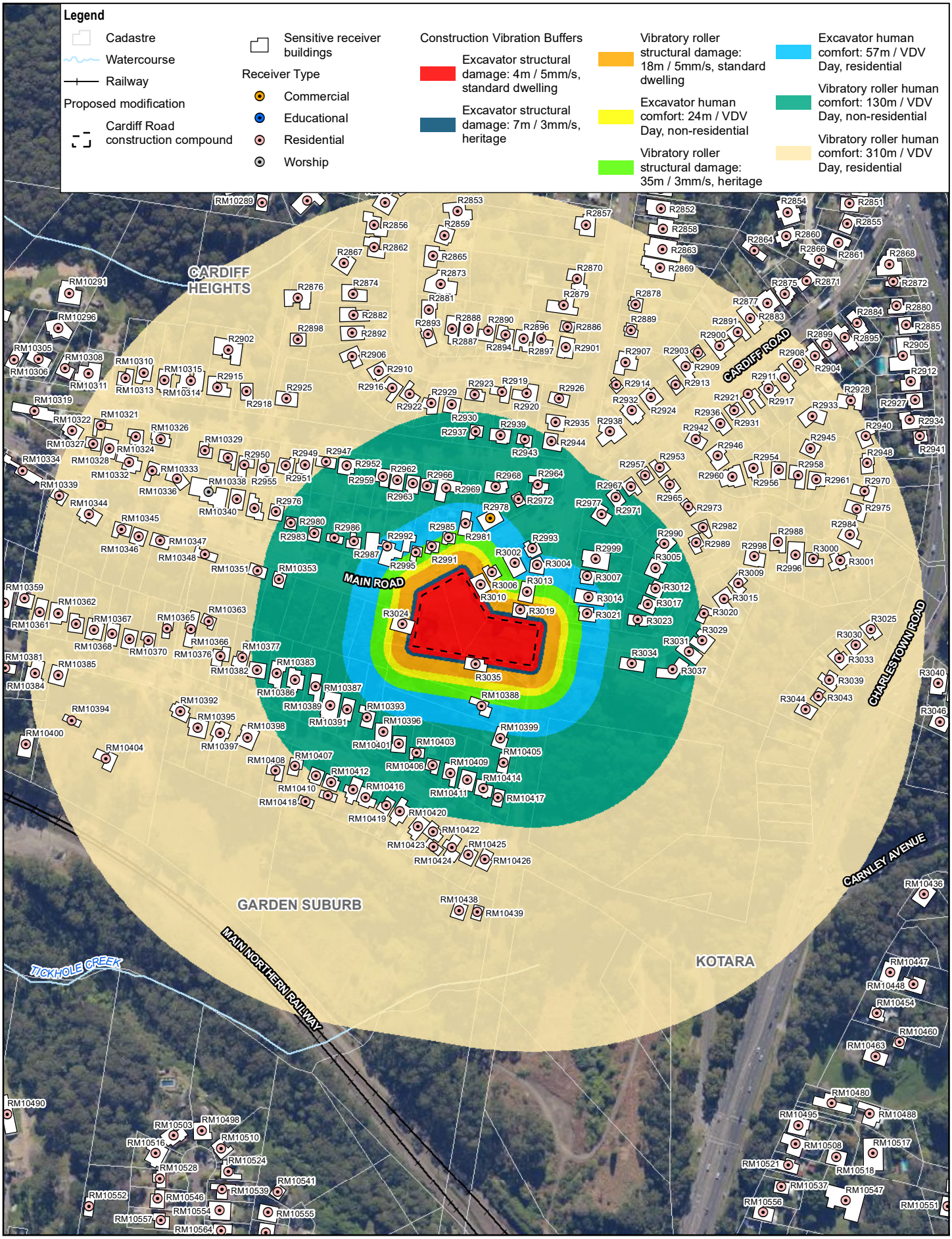
Peatties Road compound Construction vibration buffers

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure E.1

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Paper Size ISO A4

0 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Cardiff Road compound
Construction vibration buffers

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure E.2

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Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton



Paper Size ISO A4

0 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Transport for NSW
Newcastle Inner City Bypass
Noise and Vibration Assessment

Astra Street compound
Construction vibration buffers

Project No. **12528155**
Revision No. **0**
Date **20 May 2021**

Figure E.3

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Print date: 20 May 2021 - 10:38

Data source: BOM: Groundwater Dependent Ecosystems, 2020; LPI: DTDB / DCDB, 2017; © Department of Customer Service 2020. Created by: fmackay, tmorton

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→ The Power of Commitment

Appendix F

Aboriginal archaeological assessment

NEWCASTLE INNER CITY BYPASS – RANKIN PARK TO JESMOND
ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

Consistency Assessment

Prepared for Transport for NSW

Newcastle and Lake Macquarie Local Government Areas

February 2021

Ref. 1911

KELLEHER NIGHTINGALE CONSULTING PTY LTD
Archaeological and Heritage Management
ACN 120 187 671

Level 10, 25 Bligh St
SYDNEY NSW 2000
Phone 02 9232 5373

Document Information

Project Name	Newcastle Inner City Bypass – Rankin Park to Jesmond: Consistency Assessment
Project Number	1911
Status	V1
Client Name	Transport for NSW
Recipient	Melissa Mayfield-Smith
Issue Date	19 February 2021
Prepared by	Dr Matthew Kelleher; Madeline Harding; Zac Thomas
Approved by	Dr Matthew Kelleher

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1 Introduction

1.1 Project background

Transport for NSW are constructing the fifth section of the Newcastle Inner City Bypass from Rankin Park to Jesmond. The Rankin Park to Jesmond Project (RPJP) is approximately 3.4km in length and comprised a proposed four lane divided road between Lookout Road at New Lambton Heights to the south, and Newcastle Road at Jesmond to the north.

The project is State Significant Infrastructure (SSI 6888) and subject to approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). To support an application for project approval, TfNSW prepared an Environmental Impact Statement (EIS) for the project. This included detailed assessment of Aboriginal heritage in the form of a TfNSW *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) Stage 3 Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Cultural Heritage Assessment (Kelleher Nightingale Consulting 2017; Roads and Maritime 2011).

Impacts to Aboriginal heritage were assessed in accordance with the Secretary's Environmental Assessment Requirements (SEARs), the TfNSW PACHCI and the Heritage NSW *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010a), *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (OEH, 2010b). The project received approval from the Minister for Planning on 15 February 2019.

Following project approval, four areas (Area 1, Area 2, Area 3 and Area 4; refer Figures 1 & 2) were identified for additional ancillary facilities outside of the existing approved project boundary. KNC have been engaged by TfNSW, to undertake an Aboriginal archaeological consistency assessment for the additional ancillary facilities locations (collectively referred to as the 'study area') to inform the environmental assessment for the modification assessment report. The location of the study area and overall Rankin to Jesmond Project area are shown on Figure 1.

1.2 Aim of assessment

This report assesses the potential impact of the proposed works within the study area on Aboriginal archaeological heritage. This report is consistent with the Stage 3 PACHCI Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Cultural Heritage Assessment Report and should be read in association with that document (KNC 2017).

1.3 Summary

The consistency assessment and associated archaeological survey did not identify any Aboriginal archaeological sites, objects or areas of archaeological potential within the study area. The study area displays low to nil archaeological potential due to archaeologically unfavourable steep topography and disturbance resulting from residential properties, ground surface modification and quarrying activities. There is a very low likelihood of any intact archaeological deposit remaining within the study area.

It is reasonable to assume that no Aboriginal objects would be harmed by the proposed works. The proposed works can proceed with caution.

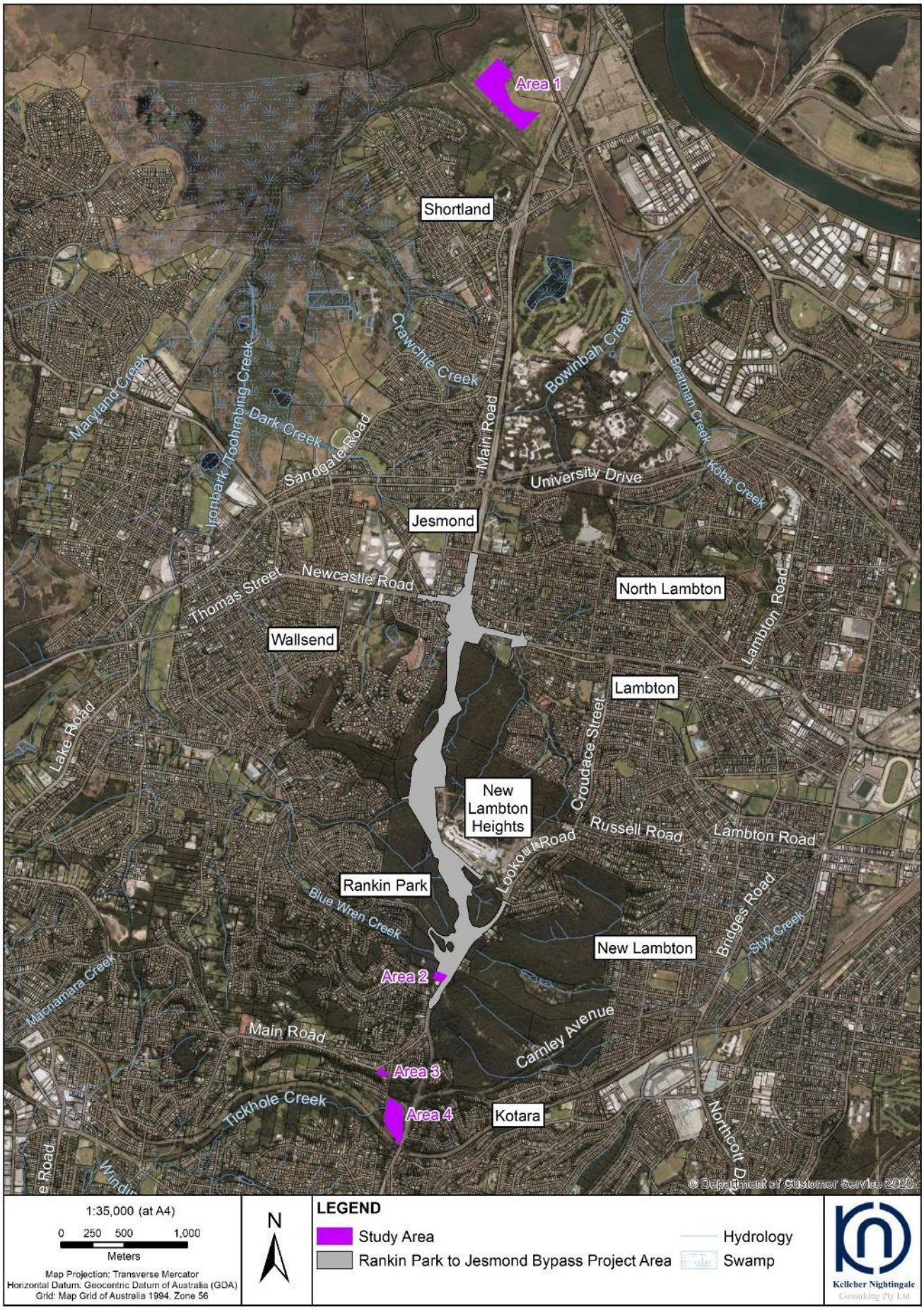


Figure 1. Location of the study area showing four Ancillary Facilities locations (Areas 1-4)

2 Assessment

2.1 Database search (AHIMS) and known information sources

2.1.1. AHIMS web services

The Aboriginal Heritage Information Management System (AHIMS) is a database operated by Heritage NSW, regulated under section 90Q of the *National Parks and Wildlife Act 1974*. AHIMS contains information and records related to registered Aboriginal archaeological sites (Aboriginal objects, as defined under the Act) and declared Aboriginal places (as defined under the Act) in NSW.

Two AHIMS searches of the study area were conducted on 18 February 2021 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area (AHIMS Client Service IDs: 568915 & 568963). The search results are attached as Appendix A. The AHIMS Web Service database search was conducted within the following coordinates (GDA, Zone 56):

Eastings: 377567 – 378630
Northings: 6361951 – 6363039
Buffer: 0 metres

Eastings: 376808 – 377902
Northings: 6353915 – 6355816
Buffer: 0 metres

The AHIMS search results showed:

1	**Aboriginal sites are recorded in or near the above location**
0	**Aboriginal places have been declared in or near the above location**

No previously registered Aboriginal archaeological sites have been recorded within the study area. One Aboriginal archaeological site Richmond Vale Rail Trail Isolated Find 11 (RVRT IF11) (AHIMS 38-4-1925) comprised an isolated artefact recorded approximately 245 metres southwest of Area 1. The AHIMS database search areas and the location of the AHIMS site registration are shown on Figure 2.

2.1.2. Other database searches

A search was undertaken of the following statutory and non-statutory heritage registers for Aboriginal heritage items:

- State Heritage Register and State Heritage Inventory
- Newcastle Local Environmental Plan 2012
- Lake Macquarie Local Environmental Plan 2014
- Section 170 Heritage and Conservation Registers
- National Heritage List
- Commonwealth Heritage List
- Australian Heritage Database (Register of the National Estate – Non-statutory archive) and
- Australian Heritage Places Inventory (Register of the National Estate – Non-statutory archive).

No Aboriginal heritage items were identified on these registers within the study area.

2.1.3. Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Heritage Assessment

Aboriginal archaeological investigations were undertaken for the Rankin Park to Jesmond section of the Newcastle Inner City Bypass Project in 2017. Investigations included archaeological survey, a program of test excavation and a process of Aboriginal community consultation. Survey identified two sites and two PAD areas within the assessed project area (KNC 2017a). Subsequent test excavation confirmed the presence of subsurface archaeological deposit at all four of the tested areas, resulting in the following sites: RP2J AFT 3 (AHIMS 38-4-1943), RP2J AFT 4 (AHIMS 38-4-1945), RP2J IF 1 (AHIMS 38-4-1944) and RP2J IF 2 (AHIMS 38-4-1940). The sites comprised two surface and subsurface artefact scatters, and two isolated subsurface artefacts (KNC 2017b). Site RP2J AFT 3 was determined to exhibit moderate archaeological significance, with the remainder of the sites exhibiting low archaeological significance. Impact assessment determined that all four sites would be wholly impacted by the proposed works. Archaeological mitigation through salvage excavation was recommended for site RP2J AFT 3, with surface collection recommended for all archaeological significance sites. Archaeological mitigation was required prior to commencement of works affecting the sites.

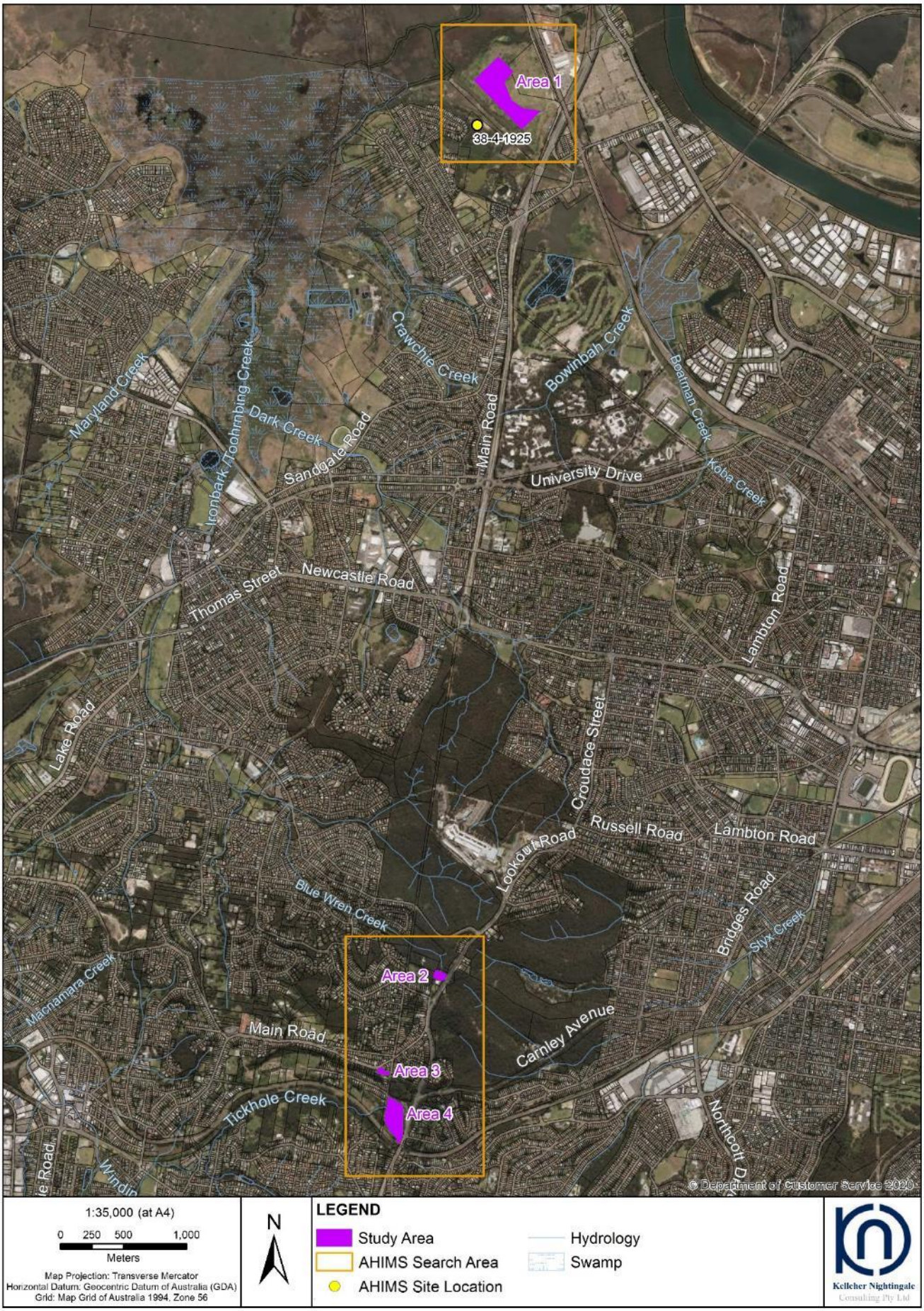


Figure 2. AHIMS search areas and results

2.2 Landscape context

The study area is located within the Lower Hunter Valley, a northern physiogeographic region of the Sydney Basin. The Sydney Basin is a large geological feature that stretches from Batemans Bay to Newcastle and west to Lithgow. The formation of the basin began between 300 to 250 million years ago when river deltas gradually replaced the ocean that had extended as far west as Lithgow. The oldest, Permian layers of the Sydney Basin consist of marine, alluvial and deltaic deposits that include shales and mudstone overlain by coal measures.

The topography of the northern part of the study area is characterised by a generally flat landform bordered by Boatman Creek to the southwest and the Main Northern Railway to the northeast. The southern portion of the study area is primarily characterised by moderate to steep slopes associated with prominent ridgelines which form the watershed for the catchments of Blue Wren Creek and Tickhole Creeks.

The underlying geology of the northern part of the study area comprises thick modern fill on Quaternary deposits. The northern part of the study area has been subject to extensive disturbance and modification of the landscape. Geology of the southern portion of the study area is formed from subgroups of the Newcastle Coal Measures. The high elevations of the ridgelines are formed from the Adamstown Subgroup (Pna) and comprise conglomerate, tuff, sandstone, siltstone, claystone and black coal (Hawley and Brunton 1995).

Soils within the northern part of the study area comprise Disturbed Terrain and Hexham Swamp soil landscapes. The Disturbed Terrain landscape is present across the majority of the northern part of the study area and represents heavy disturbance by human activity, including complete disturbance, removal or burial of soils. Landfill within this unit typically includes soil, rock, building and waste materials. Original vegetation has been entirely removed and replaced with turf or grasslands. A portion of the northern part of the study area is categorised as Hexham Swamp and comprises broad, swampy, estuarine backplains located on the Hunter Delta. Soils generally consist of waterlogged Humic Gleys which are subject to flood hazard, seasonal waterlogging, and localised tidal inundation.

Soils within the southern portion of the study area comprise the Stockrington, Gateshead and Killingworth soil landscapes. The Stockrington soil landscape is present across steep rises on conglomerates of the Newcastle Coal Measures Adamstone Subgroup. Soils include moderately deep to deep, Earthy loams and Friable loams on upper slopes, with deep, well drained Red Podzolic soils and red, brown and yellow Soloths on midslopes and benches (Matthei 1995). These soils are subject to mass movement and water erosion hazards across the steep slopes. Gateshead soils are present across the more gentle, undulating to rolling rises on the Permian conglomerate within the study area. Soils consist of moderately deep and well to imperfectly drained Yellow Podzolic Soils and yellow Soloths on the crest and sideslopes, with some Lithosols, moderately deep Red Podzolic Soils and red and yellow Soloths on shale parent material (Matthei 1995). Gateshead soils are primarily prone to water erosion hazard, and seasonal waterlogging. The Killingworth erosional soil landscape includes shallow to moderately deep Yellow Podzolic Soils, yellow Soloths, Gleyed Podzolic soils and gleyed Soloths on the crests and hillslopes of the southern part of the study area. Structured Loams, Bleached Loams and Lithosols are also present on some crests (Matthei 1995).

Contemporary land use practices have had a variable impact on the landscape within the study area. Native vegetation has been entirely cleared from the northern part of the study area and partially cleared across the southern part of the study area. The northern part of the study area has been subject to ground surface modification and the introduction of modern fill deposits. The southern portion has been subject to disturbance related primarily to residential housing building structures, vegetation clearance and quarrying activities. These activities greatly reduce the likelihood of intact archaeological deposits to occur within the study area.

2.3 Archaeological survey

The study area was inspected and assessed on 18 February 2021 by Tristram Miller (KNC). Survey commenced within Area 1, north of Astra Street, Shortland and west of the Main Northern Railway. The majority of Area 1 consisted of a giant mound of fill material (most likely comprising industrial rubble or mine site materials). Area 1 overlooked the altered drainage line of Boatmans Creek which runs along the southwestern boundary of Area 1. Neighbouring, more intact landforms suggested that the block may have originally comprised a part of the wetlands or floodplain. Archaeological survey confirmed that very little of the natural topography of the area had survived. No Aboriginal objects, site s or areas of potential were identified within Area 1.



Plate 1. Example of modified surface and imported surface gravels at Area 1.



Plate 2. Location of building and wall structures across more flat landform within Area 2.

Survey continued with assessment of Area 2 located at 136 Lookout Road, New Lambton Heights. The block was situated on the edge of a long ridgeline which was relatively flat across the southern half, before dropping away very sharply towards the north. The flatter portion of the inspected area had been disturbed by building structures, a driveway and landscaped gardens. The slopes were landscaped, steep and contained colluvial material. No Aboriginal objects, sites or areas of archaeological potential were identified within Area 2.



Plate 3. Disturbed and levelled ground across vacant lot within Area 3.



Plate 4. Example of roads built throughout Area 4 located off Peatties Road.

Area 3 comprised vacant lands located at 10-12 Cardiff Road, Cardiff Heights and 60 Marshall Street, New Lambton Heights. The large block mostly comprised moderate grassed upper hillslopes, apart from a level section at the north western end, alongside Cardiff Road. The hillslopes consisted of colluvial material, while the flat area was levelled with fill material. The levelled area had been disturbed by machinery and was determined likely to be the site of a demolished house, or an old stockpile area. An excavated vehicle track was also identified running along the north eastern perimeter of Area 3. Due to disturbance and unfavourable landforms, Area 3 was assessed as having no archaeological potential. No Aboriginal objects were identified within Area 3.

Survey concluded with assessment of Area 4 off Peatties Road, Kotara. Area 4 likely comprised a revegetated quarry site which had been cut into the hillside, with roads built along terraces cut during mining activities. The entirety of Area 4 had been significantly disturbed and subsequently revegetated. No archaeological potential or Aboriginal sites were identified within Area 4.

No Aboriginal archaeological sites, objects or areas of archaeological potential were identified within the study area.

3 Impact Assessment

No Aboriginal archaeological objects, sites are areas of archaeological potential were identified within the study area.

As a result, no Aboriginal heritage will be impacted by the proposed ancillary facilities within the study area.

3.1 Consistency determination

The findings of this Aboriginal archaeological assessment are consistent with the archaeological findings of the Stage 3 PACHCI Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Cultural Heritage Assessment Report (KNC 2017).

No Aboriginal archaeological objects/sites will be impacted by the proposed works within the study area and the proposal may proceed with caution.

4 Conclusions and Recommendations

No Aboriginal archaeological objects/sites will be impacted by the proposed works within the study area.

Significant disturbance of ground surfaces in the study area has impacted on the survival of archaeological deposit across the area and the presence of Aboriginal objects is unlikely.

This report should be read in conjunction with the Stage 3 PACHCI Newcastle Inner City Bypass – Rankin Park to Jesmond: Aboriginal Cultural Heritage Assessment Report (KNC 2017). All subsequent management of the study area should be consistent with the agreed Aboriginal heritage management strategy contained in the 2017 PACHCI Stage 3 Report.

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Appendix A

Office of Environment & Heritage

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : 1911.1
Client Service ID : 568915

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
38-4-1925	Richmond Vale Rail Trail Isolated Find 11 (RVRT IF11)	GDA	56	377838	6362231	Open site	Valid	Artefact : -		

Contact	Recorders	Permits
	Artefact - Cultural Heritage Management - Pyrmont,Mr ryan taddeucci	

Report generated by AHIMS Web Service on 17/02/2021 for Matthew Kelleher for the following area at Datum :GDA, Zone : 56, Eastings : 377567 - 378630, Northings : 6361951 - 6363039 with a Buffer of 0 meters. Additional Info : Arch Assessment. Number of Aboriginal sites and Aboriginal objects found is 1

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 1

Office of Environment & Heritage

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 1911.2
Client Service ID : 568963

Kelleher Nightingale Consulting Pty Ltd (Generic users)

Date: 17 February 2021

Kelleher Knightingale Consulting Pty Ltd Level 10, 25 Blight Street
Sydney New South Wales 2000
Attention: Matthew Kelleher

Email: knc.ahims@gmail.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 376808 - 377902, Northings : 6353915 - 6355816 with a Buffer of 0 meters, conducted by Matthew Kelleher on 17 February 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

Appendix G

Summary project description

Summary project description

Key features

The key features of the project include:

- New road with two lanes in each direction, separated by a median
- Three interchanges, consisting of:
  - Northern interchange providing access to Newcastle Road and the existing Jesmond to Shortland section of the Newcastle Inner City Bypass. The full interchange provides all movements to/from the bypass and Newcastle Road
  - Hospital interchange providing access between John Hunter Hospital precinct and the bypass. The full interchange provides all movements to/from the bypass
  - Southern interchange providing access to Lookout Road and the existing Kotara to Rankin Park section of the Newcastle Inner City Bypass. The bypass would travel under McCaffrey Drive. The half interchange provides connection in both directions on Lookout Road
- Structures along the road to allow for drainage, animal and bushwalker access
- Tie in and upgrades to connecting roads, including Lookout Road, McCaffrey Drive and Newcastle Road
- Large cut and fill embankments due to steep and undulating terrain
- Pedestrian and cycling facilities, including a shared path bridge over Newcastle Road and grade separation of the existing east-west Jesmond Park shared path at the northern interchange
- Noise barriers and/or architectural treatment, as required
- Permanent operational water quality measures.

Ancillary work to facilitate construction of the project, including:

- Adjustment, relocation and/or protection of public utilities and services
- Mine subsidence treatment, as required
- Temporary construction facilities, including sedimentation basins, compounds and stockpile sites
- Temporary and permanent access tracks
- Concrete/asphalt batching plant, as required.

Construction compounds

A total of ten construction compounds would be used during construction as follows:

- Construction compound A
- Construction compound B
- Construction compound C
- Construction compound D
- Construction compound E
- Construction compound F
- Astra Street
- Lookout Road
- Cardiff Road
- Peatties Road – main site compound

The Peatties Road compound would replace construction compound A as the main construction compound for the project.

Appendix H

Updated environmental management measures

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Biodiversity				
General	BD01	A flora and fauna management plan will be prepared as part of the Construction Environmental Management Plan (CEMP) for the project. The flora and fauna management plan will be prepared and implemented in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	Construction contractor	Pre-construction
	BD02	All workers will be provided with an environmental induction before starting work on-site. This would include information on the ecological values of the site and study area and measures to be implemented to protect biodiversity.	Construction contractor	Construction
Clearing of native vegetation	BD03	The Biodiversity Offsets Strategy will be finalised, in accordance with the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b) as part of detailed design and required offsets secured.	Roads and Maritime	Pre-construction/ construction
Impacts to threatened flora and fauna species	BD04	Vegetation clearing will be carried out in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 4: Clearing of vegetation and removal of bushrock)* (RTA 2011a).	Construction contractor	Construction
	BD05	Pre-clearance surveys will be carried out in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 1: Pre-clearing process)* (RTA 2011a).	Construction contractor	Construction
	BD06	Any unexpected threatened species finds will be dealt with in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	Construction contractor	Construction
	BD07	Exclusion zones will be identified and demarcated in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 2: Exclusion zones)* (RTA 2011a).	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impacts to native vegetation	BD08	Clearing of native vegetation and mature trees, particularly hollow-bearing trees, will be avoided and minimised where possible around watercourses, in Jesmond Park, near proposed fauna crossing structures and those identified as known or likely to be used for breeding and roosting by Powerful Owl (*Ninox strenua*).	Roads and Maritime and Construction contractor	Detailed design and construction
	BD09	Roads and Maritime will investigate opportunities to retain trees in construction compound A to provide an arboreal crossing for Squirrel Gliders and other arboreal fauna between vegetation to the east and west of the alignment.	Roads and Maritime	Detailed design
	BD10	The location of trees to be retained in the construction footprint would be confirmed during detailed design and incorporated in the flora and fauna management plan, landscape plan and re-vegetation management plan.	Roads and Maritime and Construction contractor	Detailed design and pre-construction
	BD11	Native vegetation will be re-established in accordance with a re-vegetation management plan prepared in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Guide 3: Re-establishment of native vegetation) (RTA 2011a). The re-vegetation management plan will use suitable species from the indigenous vegetation communities present at the site to replace habitat for threatened species including Grey-headed Flying-fox.	Construction contractor	Construction
Potential for spread of exotic species, or spread of pathogens	BD12	Protocols for preventing or minimising the spread of noxious and environmental weeds will be developed and implemented in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 6: Weed Management)* (RTA 2011a).	Construction contractor	Construction
	BD13	Protocols for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi will be developed and implemented in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 7: Pathogen Management)* (RTA 2011a).	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impacts to fauna and fauna habitat	BD14	Fauna handling will be conducted in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 9: Fauna handling)* (RTA 2011a).	Construction contractor	Construction
	BD15	Habitat will be replaced or re-instated in accordance with Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 5: Reuse of woody debris and bushrock* and *Guide 8: Nest boxes)* (RTA 2011a).	Construction Contractor	Construction
	BD16	Clearing of hollow-bearing trees will be carried out during periods which avoid breeding and hibernation seasons for threatened hollow-dependant fauna species (particularly the Powerful Owl (*Ninox strenua*) and Squirrel Glider (*Petaurus norfolcensis*)) where practicable.	Construction Contractor	Construction
	BD17	All permanent lighting will be designed to minimise light spill to surrounding habitat as far as practicable.	Roads and Maritime	Detailed design
	BD18	Down-lights and motion sensor lighting will be used where possible during construction in order to reduce light spill to surrounding habitat.	Construction contractor	Construction
Fragmentation of identified biodiversity links and habitat corridors	BD19	The fauna connectivity strategy will be finalised during detailed design to minimise impacts to fauna movement, in particular the Squirrel Glider.	Roads and Maritime	Detailed design
	BD20	Connectivity measures will be implemented in accordance with the Wildlife Connectivity Guidelines for Road Projects (Roads and Maritime, in preparation).	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Aquatic habitat impacts	BD21	Aquatic habitat will be protected in accordance with Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 10: Aquatic habitats and riparian zones)* (RTA 2011a), standard precautions and mitigation measures of the *Policy and guidelines for fish habitat conservation and management Update 2013* (Department of Primary Industries 2013) and with reference to DPI Water *Guidelines for Controlled Activities on Waterfront Land*.	Construction contractor	Construction
	BD22	The realignment of the northern branch of watercourse 2 will be designed to behave in a similar hydrologic and geomorphic manner as existing conditions and encourage native revegetation.	Roads and Maritime	Detailed design
	BD23	Native vegetation will be re-established around the realignment of the northern branch of watercourse 2 in accordance with a re-vegetation management plan prepared in accordance with the Roads and Maritime *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Guide 3: Re-establishment of native vegetation) (RTA 2011a).	Construction contractor	Construction
Impacts to native vegetation	BD24	Roads and Maritime will carry out further consultation with Newcastle City Council during detailed design regarding construction compounds D and E which are located in Jesmond Park to consider management measures required to minimise potential impacts to the area.	Roads and Maritime	Detailed design
Traffic and transport				
Construction traffic impacts	TT01	Roads and Maritime will carry out further consultation with NSW Health Infrastructure, Hunter New England Local Health District and Ronald McDonald House during detailed design to minimise potential impacts associated with use of the hospital road network for construction access.	Roads and Maritime	Detailed design
Property access impacts	TT02	During detailed design, Roads and Maritime will carry out consultation with affected landowners about changes to property access.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Fire trail impact	TT03	Consultation with relevant fire authorities will be carried out during the detailed design phase regarding the construction of additional fire trails.	Roads and Maritime	Detailed design
Public transport impacts	TT04	Roads and Maritime will carry out consultation with bus service providers during detailed design to manage potential impacts to bus operations and identify need for temporary and/or permanent relocation of bus stops.	Roads and Maritime	Detailed design
Parking impacts	TT05	Roads and Maritime will carry out consultation with Newcastle City Council to determine if replacement disabled parking spaces are required in the dedicated carpark in Jesmond Park.	Roads and Maritime	Detailed design
Impacts on access in the bushland area	TT06	During detailed design, Roads and Maritime will investigate the feasibility of an additional pedestrian access point across the proposed road corridor in the bushland area in consultation with nearby landowners, in order to provide improved connectivity between the John Hunter Hospital precinct and residential areas to the west.	Roads and Maritime	Detailed design
Construction traffic impacts	TT07	A construction traffic management plan (CTMP), including a vehicle movement plan, will be prepared in accordance with: • Roads and Maritime *QA Specification G10* (Roads and Maritime 2015c) • Roads and Maritime's *Traffic Control at Work Sites* (Roads and Traffic Authority 2010) • Relevant Australian Standards such as *Australian Standard (AS) 1742 – Manual of Uniform Traffic Control Devices* (Standards Australia 2014a).	Construction contractor	Pre-construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
	TT08	The CTMP will be developed in consultation with, as relevant, Newcastle City Council, NSW Health Infrastructure, Hunter New England Local Health District and emergency service providers. The plan will specify all requirements related to construction traffic and transport including: • Details of heavy haulage routes • Traffic control plans for work area including access to the site. This will include details of site specific traffic control measures (including signage) to manage traffic movements • Road safety audit requirements • Requirements for condition surveys of roads before the start of construction • Parking arrangements for construction staff • Access arrangements at construction sites detailing vehicle access movements • Notification requirements for changes to the existing road network • Notification requirements for changes to property access, bus stops and pedestrian/cyclist facilities.	Construction contractor	Pre-construction
	TT09	The contractor would obtain any licences and permits, such as a road occupancy licence, which would be required for any work or traffic controls in a public road.	Construction contractor	Pre-construction and construction
Property access impacts	TT10	In order to minimise access impacts, in consultation with residents the construction contractor will: • Provide vehicle access as far as practical/safe to enable residents, visitors and patrons to park inside the affected property • Where vehicle access is not available, pedestrian access would be provided where practical/safe • Where pedestrian access is unavailable for safety reasons, pedestrians can be escorted through the construction site by pre-arrangement with the construction contractor.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Jesmond Park shared path impacts	TT11	In order to minimise the impacts to users of the Jesmond Park shared path during construction Roads and Maritime will: • Construct the new shared path bridge (Bridge 7) over Newcastle Road and associated connections as early work • Provide pedestrian and cyclist access across the construction footprint on the southern side of Newcastle Road for limited periods of time where safe and practical to do so • Construct the new overpass bridge (Bridge 8) and underpass arrangement for the Jesmond Park shared path as soon as practicable.	Construction contractor	Construction
Noise and vibration				
Operational noise impacts	NV01	Roads and Maritime will review and update the operational noise model during detailed design to determine the final mitigation scenario. Where required this will include consultation with affected sensitive receivers.	Roads and Maritime	Detailed design
	NV02	Roads and Maritime will investigate opportunities for implementation of the final mitigation scenario prior to, or as soon as possible during construction, to assist with mitigation of construction noise levels.	Roads and Maritime	Detailed design
	NV03	Roads and Maritime will carry out further review of the sensitive non-residential receivers, including those in the John Hunter Hospital precinct, where it has been identified that the internal criteria may be exceeded. This review, including assessment of building materials and monitoring (if required), will determine the transmission loss through the relevant building facades and identify if mitigation is required.	Roads and Maritime	Detailed design
	NV04	Roads and Maritime will investigate opportunities to further refine grades where possible and assess the need for installation of signage to limit use of compression brakes by heavy vehicles.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Vibration impacts (sensitive equipment)	NV05	Consultation with NSW Health and Hunter New England Local Health District will be carried out to identify the specific construction vibration limits for all sensitive equipment and facilities in the hospital precinct. Appropriate buffer distances will then be established.	Roads and Maritime	Detailed design
Construction noise and vibration management	NV06	A construction noise and vibration management plan (CNVMP) will be prepared as part of the construction environmental management plan (CEMP). The plan will include, but not be limited to: • A map indicating the locations of receivers • A risk assessment to determine potential risk for activities likely to affect receivers (for activities carried out during standard construction hours, during the proposed extended construction hours and outside of the proposed extended construction hours) • Management measures to avoid noise and vibration impacts during construction activities including identification of appropriate work practices and equipment selection and use • A process for community notifications regarding construction activities • A process for scheduling of high noise and/or vibration generating activities during less sensitive noise periods as far as is possible • A process for implementation of respite periods, where required, in accordance with *Interim Construction Noise Guideline* (DECC 2009) for noise and vibration generating activities with impulsive, tonal or low frequency characteristics • A process for assessing the performance of the implemented management measures • A process for documenting and resolving issues and complaints • A program of noise and vibration monitoring for sensitive receivers • A process for updating the plan when activities affecting construction noise and vibration change. Identify in inductions and where required toolbox talks where noise and vibration management is required.	Construction contractor	Pre-construction and construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
	NV07	An out of hours work procedure (for work outside the proposed extended construction hours) will be developed and would include the following: • Contact the local community potentially affected by the proposed work and inform them by letter of the proposed work, location, type of work, days and dates of work and hours involved. The contact will be made before the start of work • A suitable advertisement will be placed in local papers including a reference to night-time noise impacts • A 24-hour community liaison phone number and permanent site contact will be provided so that complaints can be received and addressed in a timely manner • Measures to investigate and respond to any valid noise complaints.	Construction contractor	Pre-construction and construction
Construction vibration impacts	NV08	Building condition surveys will be conducted at receivers (as required) within 18 metres of proposed vibration generating activities (buildings and other structures).	Construction contractor	Pre-construction
	NV09	Notification of the proposed construction activities by letterbox drop will be carried out for all occupied buildings within 18 metres of vibration generating activities.	Construction contractor	Pre-construction and construction
	NV10	Where construction work will be located within 18 metres of any buildings vibration monitoring will be carried out at the beginning of the given construction activity. Where measurements indicate building damage criteria are exceeded, vibration generating activities are to immediately halt and alternative low-vibration work practices will be investigated and implemented.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
	NV11	A documented review will be carried out to determine if alternative methods can be implemented, where construction activity involving vibration intensive plant occurs: • Within 18 metres of buildings • Within the sensitive equipment buffer distances • Or if any monitoring indicates levels are excessive.	Construction contractor	Pre-construction and construction
Construction vibration impacts - John Hunter Hospital precinct	NV12	Construction buffer distances and potential additional mitigation measures identified during detailed design will be implemented in relation to sensitive equipment, standard buildings and heritage buildings in the John Hunter Hospital precinct.	Construction contractor	Construction
Construction noise impacts	NV13	Where practical, equipment will be selected to minimise noise emissions. Equipment will be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations will be removed from the site or stood down until repairs or modifications can be made.	Construction contractor	Construction
	NV14	Where reasonable and feasible, measures will be taken to shield sensitive receivers from noise such as: • The layout of the construction compound so that primary noise sources are at a maximum distance from residences, with solid structures (sheds, containers, etc.) placed between residences and noise sources (and as close to the noise sources as is practical). • Enclosures to shield fixed noise sources such as pumps, compressors, fans, screens (where practicable). • Taking advantage of site topography when situating plant.	Construction contractor	Construction
Construction noise and vibration complaints handling	NV15	In the event of a valid noise complaint, monitoring will be carried out and reported as soon as possible. If exceedances are detected, the situation will be reviewed to attempt to identify reduce the impact to acceptable levels, where practicable.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Blasting overpressure and ground vibration impacts	NV16	If blasting is to be carried out, a detailed blasting assessment will be carried out in consultation with NSW Health Infrastructure and Hunter New England Local Health District. The assessment will be prepared with reference to the human comfort, sensitive equipment and structural damage criteria for all receivers including residential receivers and receivers located in the John Hunter Hospital precinct. The assessment will be carried out by a suitably qualified and experienced blast consultant/contractor and determine the allowable blast sizes based on-site specific conditions and may include carrying out test blasts (or equivalent method). The assessment will identify all relevant requirements to be incorporated into a blasting management plan for the construction phase to ensure the relevant criteria can be met.	Roads and Maritime/ Construction contractor	Detailed design, pre-construction and construction
Operational noise impacts	NV17	To confirm the findings of the operational noise assessment a post-construction noise monitoring program (including simultaneous traffic counts) will be carried out within 12 months of project opening once traffic flows have stabilised. Monitoring locations will be selected along the project at/near the monitoring locations carried out in this assessment. A review of L_{Amax} events including heavy vehicle engine (compression) braking will be included in the post-construction noise assessment.	Roads and Maritime	Operation

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Landscape character and visual impact				
Landscape and visual impacts	LC01	The concept urban design and landscape plans will be finalised during detailed design and be consistent with the urban design objectives and principles. The plans will be developed in accordance with: • *Beyond the Pavement* (Roads and Maritime 2014a) • *Bridge Aesthetics* (Roads and Maritime 2012a) • *Landscape Guideline* (Roads and Traffic Authority 2008) • Noise Wall Design Guideline (Roads and Maritime 2016b). The landscape plan will be consistent with the re-vegetation management plan (management measure BD11) and will use suitable species from the indigenous vegetation communities present at the site to replace habitat for threatened species including Grey-headed Flying-fox. The landscape plan will include vegetation screening for highly impacted viewpoints where possible.	Roads and Maritime	Detailed design
Impacts on access in the bushland area	LC02	During detailed design, Roads and Maritime will investigate the feasibility of an additional pedestrian access point across the proposed road corridor in the bushland area in consultation with nearby landowners, in order to provide improved connectivity between the John Hunter Hospital precinct and residential areas to the west.	Roads and Maritime	Detailed design
Water sensitive urban design	LC03	Temporary and permanent drainage infrastructure would be designed to incorporate water sensitive urban design principles where possible such as replacing concrete lined longitudinal catch drains with vegetated swales and the operational water quality control measures.	Roads and Maritime	Detailed design
Visual impacts	LC04	Roads and Maritime will review feasible and reasonable measures to address privacy concerns for residents located immediately near the southbound off-ramp at the northern interchange in consultation with the affected property owners.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Construction visual impacts	LC05	Disturbed areas would be progressively revegetated during the construction period.	Construction contractor	Construction
	LC06	Construction lighting will be located to minimise potential impacts to surrounding residents.	Construction contractor	Construction
Monitoring of landscaping and rehabilitation	LC07	Landscape and rehabilitation work will be monitored and remedial measures implemented where required until vegetation has stabilised.	Roads and Maritime	Operation
Socio-economic, land use and property				
Community consultation	SL01	The draft Community Consultation Framework will be finalised during detailed design and will be implemented during construction to provide timely and transparent information about changes to access, traffic conditions, details of the construction program and general construction progress during the construction phase.	Roads and Maritime	Detailed design and construction
Property acquisition	SL02	Property acquisition will be carried out in accordance with the *Land Acquisition Information Guide* (Roads and Maritime 2014b) and the *Land Acquisition (Just Terms Compensation) Act 1991.*	Roads and Maritime	Detailed design
Residual public land	SL03	Areas of potentially residual public land would be confirmed during the detailed design phase and where there is residual Roads and Maritime land not required for the project or other future road requirements, consultation with Newcastle City Council and other government agencies will be carried out to identify possible land swaps or transfers.	Roads and Maritime	Detailed design
Fire trail impact	SL04	Consultation with relevant fire authorities will be carried out during the detailed design phase regarding the construction of additional fire trails.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impacts to Disc Golf course at Jesmond Park	SL05	Roads and Maritime will carry out consultation with the Newcastle Disc Golf club and the Newcastle City Council regarding potential relocation of the impacted Disc Golf course holes.	Roads and Maritime	Detailed design
Impacts on local businesses	SL06	Roads and Maritime will consult with local businesses that would be affected by the project.	Roads and Maritime	Detailed design
Impacts on access in the bushland area	SL07	During detailed design, Roads and Maritime will investigate the feasibility of an additional pedestrian access point across the proposed road corridor in the bushland area in consultation with nearby landowners, in order to provide improved connectivity between the John Hunter Hospital precinct and residential areas to the west.	Roads and Maritime	Detailed design
	SL08	During detailed design, Roads and Maritime will carry out consultation with Newcastle City Council about the feasibility of modifying the Bicentennial walking trail, if required.	Roads and Maritime	Detailed design
Impact to utilities	SL09	Roads and Maritime will co-ordinate work with respective utility providers before any changes to the utility services infrastructure.	Roads and Maritime	Detailed design
Impact to residences	SL10	During detailed design, Roads and Maritime will review the northern interchange layout including opportunities to move the intersection (including the southbound off-ramp) to the south-west further away from residential properties and to refine the layout of the northbound off-ramp further away from residential properties.	Roads and Maritime	Detailed design
Impact to utilities	SL11	Where services will be disrupted the affected residents will be consulted before work being carried out.	Construction contractor	Construction
Private property access	SL12	The construction contractor will consult with affected property owners/residents to minimise disruption to access. Where access to property would be disrupted for an extended period, alternative access will be provided. Pedestrian and emergency vehicle access to properties will be maintained at all times.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Pedestrian and cyclist access	SL13	Pedestrian and cyclist access on existing formal paths will be maintained where possible. Where closure of a formal path is required alternative access and appropriate signage will be provided.	Construction contractor	Construction
Emergency services access	SL14	During construction emergency vehicle access to the bushland areas surrounding the project will be provided at all times.	Construction contractor	Construction
Flooding and drainage				
Flooding and stormwater impacts	FD01	The proposed flood mitigation measures and changes to watercourses would be further refined during detailed design to minimise potential impacts.	Roads and Maritime	Detailed design
Flooding impacts	FD02	Roads and Maritime will consult with affected property owners likely to be affected by a change in flood levels including providing details of the predicted actual changes in flood levels in relation to each individual property.	Roads and Maritime	Detailed design
	FD03	Roads and Maritime will consult with the owners of the block of residential units to the north-east of the northern interchange where flood mitigation work will be carried out.	Roads and Maritime	Detailed design
	FD04	Construction staging plans will be refined during detailed design to ensure flood mitigation structures are constructed in a way that minimises flood risk.	Roads and Maritime	Detailed design
Realignment of watercourse 2 (WC2)	FD05	Further refinement of the design for the realignment of WC2 will be investigated during detailed design to ensure it is designed to behave in a similar hydrologic and geomorphic manner as existing conditions as far as is practicable.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Flooding impacts during construction	FD06	The construction environmental management plan will include a flood risk management plan that details the processes for flood preparedness, materials management, weather monitoring, site management and flood incident management. The plan will be developed in accordance with: • *Managing Urban Stormwater, Soils and Construction, Volume 1 4th Edition, March 2004* (Landcom 2004) and *Managing Urban Stormwater, Volume 2D – Main road construction* (DECC 2008) • Roads and Maritime *Erosion and Sedimentation Management Procedure* (Roads and Traffic Authority 2009) • Roads and Maritime *Technical Guideline, Temporary Stormwater Drainage for Road Construction* (Roads and Maritime Services 2011b) • Roads and Maritime *Stockpile Site Management Guideline* (Roads and Maritime Services 2011c).	Construction contractor	Pre-construction
Drainage impacts during construction	FD07	Activities that may affect existing drainage systems will be carried out so that existing hydraulic capacity of these systems is maintained where possible.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Soils, contamination and water quality				
Watercourse erosion	SW01	Roads and Maritime will investigate the following during detailed design: • Watercourse 2 (northern branch) – additional stabilisation measures near the bridge to minimise the risk of the existing gully head located about 200 metres downstream of the bridge from undermining the bridge or creek realignment work • Watercourse 2 (southern branch) – additional stabilisation measures near the culvert outlet to minimise the risk of undermining of the outlet structure by the existing gully head (currently located about 100 metres downstream) • Watercourse 3 and 4 - stabilised flow paths, including scour protection measures, to convey the cross drainage outlet flows to existing drainage lines on the western side of the project • Watercourse 4 – measures such as energy dissipaters to minimise erosion risk in the gully system below the multi-storey hospital carpark • Watercourse 4 – measures to minimise erosion and scour risk downstream of the project associated with concentrated flows from drainage outlets.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impacts to water quality and soil erosion	SW02	A soil and water management plan will be prepared in accordance with: • Roads and Maritime *Code of Practice for Water Management, Road Development and Management* (RTA 1999) • Roads and Maritime *Erosion and Sedimentation* Management *Procedure* (RTA 2009) • *Managing Urban Stormwater, Soils and Construction, Volume 1 4th Edition, March 2004* (Landcom 2004) and *Managing Urban Stormwater, Volume 2D – Main road construction* (DECC 2008) • Roads and Maritime *Technical Guideline, Temporary Stormwater Drainage for Road Construction* (Roads and Maritime 2011b) • Roads and Maritime *Stockpile Site Management Guideline* (Roads and Maritime 2011c) • Roads and Maritime *Technical Guideline, Environmental Management of Construction Site Dewatering* (RTA 2011b) • *Management of Tannins from Vegetation Mulch* (Roads and Maritime 2012b) • *Guideline for Batter Surface Stabilisation using vegetation* (Roads and Maritime 2015e).	Construction contractor	Pre-construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impacts to water quality and soil erosion	SW03	The soil and water management plan will address the following: • Identify areas of high risk based on soil erodibility • Management strategies to be used to minimise surface water impacts, including identification of water treatment measures, discharge points and erosion and sediment control measures • Minimising stormwater (volume and velocity) from running onto downstream work by appropriate staging of the work and, where necessary, utilising erosion control measures • Maximising diversion of clean water around or through disturbed portions of the site • Sedimentation basin construction and management • Measures to monitor and manage spoil, fill and materials • Protection of waterways • Management of tannins that may be generated from stockpiled vegetation • Monitoring of discharge waters • Measures for the management of tannins from stockpiled vegetative materials • Management of stockpiles.	Construction contractor	Pre-construction
Contaminated soil	SW04	Further soil testing would be carried out to delineate the extent of areas of contamination and classify the soils against the relevant criteria for reuse on-site or for disposal off-site.	Construction contractor	Pre-construction and construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Contaminated soil	SW05	A contaminated soil management plan will be prepared in accordance with the *Contaminated Land Management Act 1997,* Roads and Maritime *Guideline for the Management of Contaminated Land* (Roads and Maritime 2013a), Roads and Maritime *Environmental Incident Classification and Reporting Procedure*, (Roads and Maritime 2016c) and EPA Guidelines on contaminated land management. The contaminated soil management plan will include: • Contaminated land legislation and guidelines including any relevant licences and approvals to be obtained • Identification of locations of known or potential contamination • Identification of rehabilitation requirements, classification, transport and disposal requirements of any contaminated soil • Measures to manage excavation, segregation, stockpiling, validation and disposal requirements for potentially contaminated materials • Measures to ensure the contaminated soil is managed so that it does not pose a risk to water quality. Measures to be implemented include ensuring contaminated soils are deep buried and blended where further testing confirms on-site reuse is acceptable, or off-site disposal to a licensed facility where required • Contaminated management measures including unexpected finds procedures for unanticipated discovery of contaminated material or other source of contamination during construction.	Construction contractor	Pre-construction and construction
Soil erosion	SW06	The project will be constructed in accordance with the soil and water management plan.	Construction contractor	Construction
Accidental spills during construction	SW07	An emergency spill response procedure will be prepared to minimise the impact of spills including details on the requirements for managing, cleaning up and reporting.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
	SW08	Spill kits and adequate quantities of suitable material to counteract spillage would be kept readily available.	Construction contractor	Construction
	SW09	The refuelling of plant and maintenance of machinery will be carried out in designated refuelling areas. Refuelling would be attended at all times.	Construction contractor	Construction
	SW10	Vehicle wash-downs and/or concrete truck washouts will be located in a designated bunded area or located off-site.	Construction contractor	Construction
	SW11	Machinery will be checked daily to ensure that there are no oil, fuel, or other liquid leaks.	Construction contractor	Construction
Contamination	SW12	In the event that indicators of contamination are encountered during construction of the project (such as odours or visually contaminated materials), work in the area will cease until advice on the need for remediation or other action is obtained from the Roads and Maritime project manager.	Construction contractor	Construction
Water quality impacts	SW13	A soil conservation specialist will be engaged during construction to advise on the planning and implementation of erosion and sedimentation controls.	Construction contractor	Construction
	SW14	Sediment laden water will be directed through the construction phase water management system. All construction sedimentation basins and associated temporary drainage shall be designed and constructed as detailed in this report to manage flows generated by the 80th percentile five day rainfall event.	Construction contractor	Construction
	SW15	Water quality monitoring will be carried out at key discharge points from the construction phase water management system. The monitoring requirements will be defined in the soil and water management plan and will include collection of samples for analysis from sedimentation basin discharge points and visual monitoring of other points of release of construction waters.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Building demolition impacts	SW16	During demolition the following controls will be implemented: • Scheduling of work to avoid strong winds and rainfall • Mandatory coverage of trucks carrying waste and debris • Temporary barriers or dust screens, as appropriate, to suppress the effect of dust movement to uncontrolled sites • Dust suppression such as wetting measures • Appropriate control of temporary stockpiles on hardstands.	Construction contractor	Construction
Water quality impacts	SW17	Construct the operational water quality controls detailed in this report (subject to further refinement during detailed design).	Construction contractor	Construction
Revegetation	SW18	Proposed re-vegetation of cleared areas will be carried out with consideration of minimising erosion and in accordance with the *Guideline for Batter Surface Stabilisation using vegetation* (Roads and Maritime 2015e).	Construction contractor	Post construction
Water quality impacts	SW19	Where practical stormwater, including road runoff and intercepted groundwater, will be directed towards operational water quality treatment structures that will assist in the removal of pollutants from discharge water.	Roads and Maritime	Operations
Water quality impacts	SW20	As part of an operational environmental management plan visual inspection of stormwater management system, including the operational water quality treatment structures, will be carried out for a minimum period of 12 months to ensure the stormwater management system is operating as designed.	Roads and Maritime	Operation

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Potential interactions at the Astra Street landfill site	*SW21*	*The establishment and use of the Astra Street site as a construction compound would not occur until remediation work under the voluntary management proposal are complete on the land to be occupied by the construction compound. It will comply with:* • *City of Newcastle's Voluntary Management Proposal under the Contaminated Land Management Act 1997* • *Relevant outcomes of consultation with the City of Newcastle.* • *Relevant EPA guidelines.*	*Construction contractor*	*Construction*
Groundwater				
Groundwater inflow	GW01	During detailed design the cuttings will be designed to minimise the volume of groundwater inflow as far as is practicable.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Groundwater monitoring	GW02	A groundwater monitoring program will be prepared and implemented. The program will include: • Installation of monitoring bores (to replace those that would be removed during construction) • New monitoring bores will be installed both in and outside the predicted zones of perched groundwater drawdown to confirm the conceptual model. New bore(s) will be established in the proposed mine remediation area to confirm the depth to groundwater and groundwater quality • New monitoring bores will be installed near where mine remediation work is proposed to confirm the groundwater depth • Establishment of project specific water quality objectives • Bores will initially be monitored monthly for 12 months to collect baseline data. Monitoring will start as soon as possible and before the start of construction and will continue until completion, which may be after start of construction. The frequency of monitoring will then be reviewed to determine the appropriate regime • Bores will be monitored for standing water level and water quality (including pH, total dissolved solids, dissolved metals, nutrients and total recoverable hydrocarbons (silica gel clean-up) • A program of reporting of the monitoring results so that any unforeseen impacts are identified and responded to in a timely manner • The monitoring program will continue until 12 months after completion of construction with an annual review of groundwater data unless results permit an earlier end date.	Roads and Maritime	Detailed design, pre-construction, construction and operation-
Groundwater discharge	GW03	During detailed design Roads and Maritime will review the monthly groundwater monitoring data to confirm the proposed construction and operational water management controls are appropriate and the project specific water quality objectives can be achieved.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Groundwater dewatering	GW04	A construction groundwater and dewatering management plan will be prepared to manage groundwater inflows during construction.	Construction contractor	Pre-construction and construction
Groundwater quality	GW05	Coal seams exposed by cuttings will be sealed with shotcrete or over-excavated and backfilled with an inert material.	Construction contractor	Construction
Groundwater discharge	GW06	During construction, all groundwater seepage in the cuttings will be handled in the construction phase surface water management system.	Construction contractor	Construction
Groundwater management	GW07	An operational groundwater management plan will be prepared if groundwater monitoring results indicate there are likely to be post-construction groundwater quality discharge exceedances of the project specific water quality objectives.	Roads and Maritime	Operation
Aboriginal heritage				
Avoidance of impacts to known Aboriginal heritage sites	AH01	During detailed design, Roads and Maritime will avoid impacts to sites RP2J AFT 1 and RP2J AFT 2. In the event impacts are unavoidable further consultation with Awabakal Local Aboriginal Land Council will be carried out.	Roads and Maritime	Detailed design
Impacts to Aboriginal heritage sites	AH02	An Aboriginal heritage management plan will be prepared to manage potential direct project impacts to Aboriginal heritage. The plan will include management recommendations contained in the Newcastle Inner City Bypass – Rankin Park to Jesmond NSW, Aboriginal Cultural Heritage Assessment Report (Kelleher Nightingale Consulting 2018). The plan will include: • As part of the site induction, all workers will be advised of their obligations in relation to heritage under the National Parks and Wildlife Act 1974 • Procedures for management of unexpected finds.	Construction contractor	Pre-construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Impact to known Aboriginal heritage site (RP2J AFT 3)	AH03	Roads and Maritime will carry out sub-surface archaeological salvage of site RP2J AFT 3 before construction starts in the affected area. The salvage will be carried out in accordance with the methodology contained in the Aboriginal Cultural Heritage Assessment Report (Kelleher Nightingale Consulting 2018) and in consultation with the Aboriginal community.	Roads and Maritime	Pre-construction
Impact to known Aboriginal heritage sites (RP2J AFT 3, RP2J AFT 4, RP2J IF 1 and RP2J IF 2)	AH04	Roads and Maritime will carry out surface archaeological collection of the identified sites in the construction footprint before construction starts in the affected area. The collection will be carried out in accordance with the methodology contained in the Aboriginal Cultural Heritage Assessment Report (Kelleher Nightingale Consulting 2018) and in consultation with the Aboriginal community.	Roads and Maritime	Pre-construction
Non-Aboriginal heritage				
Construction impact on potential heritage item	HH01	Roads and Maritime will consult with DP&E, OEH Heritage Division and the Heritage Council of New South Wales to finalise the salvage program for the Hollywood shanty town site and associated impacted portion of the tramway. The salvage program will include sub-surface archaeological investigations as part of a salvage program, archival recording of any discovered items, further historical research and documentation of the history of the site. The final salvage program will be implemented in accordance with the approved salvage program.	Roads and Maritime	Pre-construction
Potential finds during construction	HH02	Contractors will be given awareness training on non-Aboriginal heritage before carrying out any construction work to ensure understanding of potential heritage items and the procedure in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of skeletal remains.	Construction Contractor	Pre-construction and construction
Potential finds during construction	HH03	In the event that either non-Aboriginal heritage items or skeletal remains are identified in the course of construction, the procedure detailed in Roads and Maritime *Standard Management Procedure, Unexpected Heritage Items* (Roads and Maritime 2015f) will be followed.	Construction Contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Air quality				
General air quality impacts	AQ01	The Construction Environmental Management Plan will include measures for the management of air emissions including: • Air quality management objectives • Potential sources and impacts of air emissions • Sensitive receivers • Hours of work • Mitigation measures to minimise air quality impacts to sensitive receivers and the environment • Consideration of high winds in dry weather • Suitable buffer zone separation distance from temporary fixed plant to off-site sensitive receivers (eg at least 100 metres for batching plants where possible) • A monitoring program to assess compliance with identified objectives • Contingency plans to be implemented in the event of non-compliances and/or complaints about air quality.	Construction contractor	Pre-construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
	AQ02	The following mitigation measures will be used on-site and included as part of the Construction Environmental Management Plan: • Areas of exposed surfaces are to be minimised through construction site planning and programming • Locating stockpiled material as far as possible from sensitive receivers • All stockpiles will be designed, established, operated and decommissioned in accordance with Roads and Maritime *Stockpile Site Management Guideline* (Roads and Maritime, 2011c) • Dust suppression measures, such as the use of water carts or soil binders, will be used on any unsealed surfaces and other exposed areas • Sealed roads at access points will be watered-down regularly to minimise the re-suspension of dust on sealed roads • Imposing work vehicle speed limits and designating specific routes for haulage and access • Construction activities which would generate dust would be avoided or modified during high wind periods where possible • All trucks will be covered when transporting materials to and from the site • All construction equipment will be maintained and operated in accordance with manufacturer specifications.	Construction contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Resource use and waste management				
Construction waste	RW01	A resource and waste management plan will be prepared to identify the hierarchy for sourcing and the use of resources and waste management. The plan will adopt the resource management hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001*, Roads and Maritime Services waste management procedures and Environmental Management System. The plan will include, but not be limited to: • Identification of the waste stream that will be generated during construction • A waste register detailing types of waste collected, amounts, date, time, transportation method and details of disposal • A resource management strategy detailing beneficial reuse options for surplus and/or unsuitable material • A strategy to minimise waste in packaging • Consideration of procurement strategies to minimise unnecessary consumption of materials.	Construction Contractor	Pre-construction and construction
Surplus excavation material	RW02	Surplus material that is not able to be used on-site as part of the project would be reused or disposed of in the following order of priority: • Transfer to other nearby Roads and Maritime projects for immediate use • Transfer to an approved Roads and Maritime temporary stockpile site for future use during projects or routine maintenance • Transfer to a Roads and Maritime approved site for reuse on concurrent private/local government project (with appropriate approvals as required) • Disposal at an approved materials recycling or licensed waste disposal facility • As otherwise provided for by the relevant legislation and regulation.	Construction Contractor	Construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Existing waste	RW03	Pre-existing waste will be dealt with in accordance with the POEO Act and *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014) and either recycled or disposed of at an appropriately licensed facility at the start of construction.	Construction Contractor	Construction
Operational waste	RW04	All operational waste will be managed in accordance with the Roads and Maritime waste management procedures and Environmental Management System.	Roads and Maritime	Operation
Hazards and risk				
Bushfire risk	HR01	The construction environmental management plan will include a bushfire management plan in accordance with the *Planning for Bush Fire Protection 2006 (Rural Fire Service 2006).* Measures to be implemented to manage bushfire risk include: • Consultation requirements for community notifications in the event of a bushfire • Maintaining equipment in good working order • Ensuring plant and equipment are fitted with appropriate spark arrestors, where practicable • Ensuring site workers are informed of the site rules including designated smoking areas and putting rubbish in designated bins • Obtaining hot work permits and implementing total fire bans as required • Implementing adequate storage and handling requirements for potentially flammable substances in accordance with the relevant guidelines.	Construction contractor	Pre-construction
Consultation with emergency services	HR02	Consultation with emergency services, including the Rural Fire Service and Fire and Rescue NSW to: • Ensure access is maintained during and after construction • To identify hazard reduction burns in the locality of the project.	Construction contractor	Pre-construction and construction

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Mine subsidence risk	HR03	Roads and Maritime will obtain approval from Subsidence Advisory NSW for the project.	Roads and Maritime	Detailed design
	HR04	The risk of mine subsidence will be further investigated during detailed design in consultation with Subsidence Advisory NSW, and the final design of bridges and other structures confirmed.	Roads and Maritime	Detailed design
Mine remediation – grouting	HR05	A mine remediation management plan will be prepared to manage potential risks associated with grouting operations. The plan will be prepared with reference to groundwater monitoring data to determine the risk of grouting impacting on groundwater. The plan will detail measures to manage the risk of escape of grout, including into surface watercourses or groundwater, through natural fractures including: • Consultation • Monitoring • Emergency spill response procedure.	Construction contractor	Construction
Coal seam gas generation	HR06	A coal seam gas management plan will be prepared and implemented to manage risks during construction. The plan will detail the requirements for monitoring before and during construction where excavation would intersect with areas of known coal seam gas or coal seams. It will also include response procedures, including notifying emergency services if required, to ensure the safety of workers and the public.	Construction contractor	Pre-construction and construction
Greenhouse gas and climate change				
Climate change	GH01	The detailed design of the project will take into consideration the potential effect of climate change, including designing drainage to accommodate increased rainfall and severe weather events.	Roads and Maritime	Detailed design

Environmental issue/impact	ID	Environmental management measures	Responsibility	Timing
Greenhouse gas emissions	GH02	Vegetation removal will be minimised where practicable.	Construction contractor	Pre-construction
	GH03	The use of alternative fuels and power sources for construction plant and equipment will be investigated and implemented, where appropriate.	Construction contractor	Pre-construction
	GH04	Recycled materials will be incorporated in the design of pavement and structures where possible.	Construction contractor	Pre-construction
	GH05	The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.	Construction contractor	Pre-construction
Cumulative impacts				
Cumulative impacts	CU01	The construction contractor will review environmental impacts before the start of construction and every six months during construction. Any new impacts identified will be addressed appropriately to reduce cumulative effects and reported as part of the construction environmental management plan.	Construction contractor	Construction