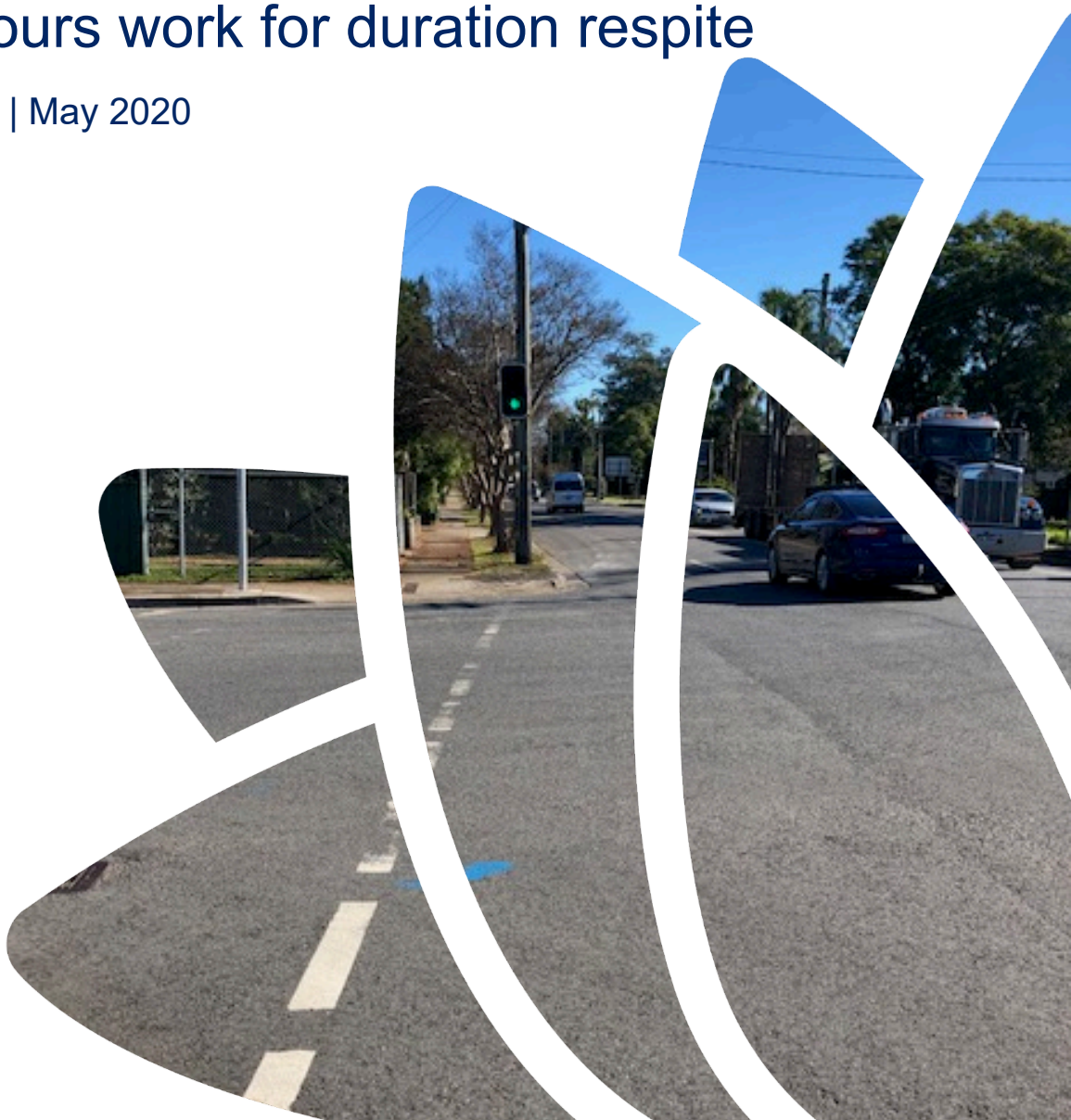
Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street, Richmond

Addendum review of environmental factors 4 - Out of hours work for duration respite

Transport for NSW | May 2020



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Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street, Richmond

Addendum review of environmental factors 4 - Out of hours work for duration respite

Transport for NSW | May 2020

Prepared by DM Roads and Transport for NSW

Document controls

Approval and authorisation

Title	Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street, Richmond Addendum review of environmental factors 4 - Out of hours work for duration respite.
Accepted on behalf of Transport for NSW by:	Georgia Barnes Contract Relationship Manager – West Zone, Sydney Maintenance
Signed:	
Dated:	26 May 2020

Executive summary

The proposed modification

It is proposed that the approved Richmond Bridge Approaches - Intersection upgrade at Bosworth Street and March Street, Richmond project be modified to permit out of hours work to be undertaken five nights a week in addition to work during standard construction hours to minimise the length of time the community is exposed to noise impacts throughout the project.

The proposed night work schedule would allow work up to five nights per week, generally in two to three week blocks at certain times of 2020 depending on the schedule and program of the utility relocation and upgrade works; and then up to five nights a week, every week, from November 2020 through to the end of the project in April 2021. Construction during standard hours would continue during these periods of night work to ensure the timely conclusion of the project.

Background

A Review of Environmental Factors (REF) was prepared by Jacobs and DM Roads and assessed by Transport for NSW (Roads and Maritime at the time of determination) in accordance with Division 5.1 of the Environmental Planning and Assessment Act 1979 (Part 5 at the time of the assessment). The Project and the activities described in the REF was approved by Transport for NSW in August 2016 (hereafter The Project).

In addition, the following addendum REFs for the Richmond Bridge Approaches- Intersection upgrade at Bosworth Street and March Street, Richmond have been prepared:

- Addendum REF 1 - Kentucky Fried Chicken (KFC) sign removal and replacement (Determined 20 August 2018)
- Addendum REF 2 - Ancillary facilities (Determined 3 December 2019)
- Addendum REF 3 - Vegetation and tree removal and property adjustments (Determined 21 May 2020).

The Project generally involves upgrading the intersection of Bosworth Street and March Street at Richmond. This work was identified as part of the broader Richmond Bridge and Approaches strategy designed to alleviate traffic congestion on Richmond Bridge and its approach roads.

Need for the proposed modification

Chapter 2 of the *Richmond Bridge Approaches - Intersection Upgrade at March Street and Bosworth Street, Richmond REF* addresses the strategic need for the project, the project objectives and the options that were considered. Generally, the proposal is required to improve travel conditions and road safety along the road corridor between Richmond and North Richmond (comprising Richmond Bridge and its approach roads).

The proposed modification is needed to minimise the overall impact of the night works on the community by decreasing the length of time the community would be affected by these works. The modification would provide duration respite (i.e. condensing the program rather than carrying out the work for two nights a week for a longer period of time) from noisy night work associated with certain aspects of the project such as utility realignment and intersection upgrades. These types of activities are required to take place during the evening and night time period to minimise traffic disruptions to the road corridor and to comply with Road Occupancy Licence conditions.

Proposal objectives

Section 2.3. of the approved REF identifies the objectives and development criteria that apply to the Project, being to:

- Reduce traffic congestion and improve traffic flow
- Improve accessibility and efficiency for freight and private vehicles
- Improve safety for motorists, cyclists and pedestrians
- Minimise socio-economic and environmental impacts.

The proposed modification is needed to facilitate the efficient construction of the project, and to minimise the duration of impacts related to noise associated with the works that are required during non-standard construction hours. While it is unlikely that this modification would result in environmental impacts not already considered in the Project REF, the process of reassessment seeks to ensure this is the case.

Options considered

The following options have been considered in the preparation of this addendum REF:

- **Option 1:** The 'do nothing' option- limit work in line with Respite Period 2 of the Roads and Maritime Construction Noise and Vibration Guideline.
    - This option would increase the project timeline by eight (8) months
    - Construction associated impacts of night-time work would be extended by eight months.
- **Option 2:** Allow night work to be completed up to five nights a week with no work carried out during standard construction hours when night work is occurring five nights a week.
    - This option would increase the project timeline by 4 months
    - Increased length of day-time and night time work would mean extended impacts of both types of work. Traffic and noise impacts would be the most notable.
- **Option 3:** Allow night work to be completed up to five nights a week in conjunction with work during standard construction hours.
    - Expedited night schedule would have increased noise impacts in comparison to option 1, however the shorter schedule would mean that work is expected to be complete by April 2021
    - Decreased risk of community and socio-economic impacts caused by extended work schedules.

Option 3 was chosen as the preferred option as it has the shortest program timeline. Option 1 and Option 2 would extend the project duration by approximately eight (8) and four (4) months, respectively. As such Options 1 and 2 would increase the impacts and disturbance to the community from construction.

Statutory and planning framework

The purpose of the addendum REF is to describe the modified activities, to document the likely impacts of the modified activities on the environment, to detail additional mitigation measures to be implemented and to determine whether the modified activity can proceed. For the purposes of these works Transport for NSW is the proponent and determining authority under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The assessment of the proposed works and associated environmental impacts has been carried out in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The addendum

REF helps to fulfil the requirements of Section 5.5 of the EP&A Act that Transport for NSW examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity. The findings of the addendum REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/of FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Assessment Report.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

Community and stakeholder consultation

Potential affected residents were consulted on the work schedule for non-standard construction hours via a Have Your Say (HYS). The HYS letter was distributed to seven hundred and seventy five (775) potentially affected receivers (sensitive receivers) asking their feedback for the proposed work schedule.

A total of 18 responses were received from the community. Four of the responses were from businesses that only operate during standard daytime construction hours and would not be impacted by out of hours work. Of the 14 responses being considered here, nine respondents were supportive of the proposed schedule, four respondents were neutral, and one was against the proposed work schedule.

The key theme expressed by those in favour of a more condensed work night schedule was that the overall project would be delivered faster as a result. The one person opposed was concerned about night work disturbing people's sleep and requested that more day work be undertaken. Several respondents expressed interest in reviewing the night work program and the effectiveness of mitigation measures once the night work program had got was underway.

On balance it was decided that due to there was general support of the proposal from the people that responded to the HYS. Therefore the proposed accelerated non-standard construction hour work schedule will go ahead with the application of mitigation measures outlined in this Addendum REF.

Environmental impacts

Through this addendum REF the proposed modification to the intersection upgrades at March Street and Bosworth Street has been considered. The likely and potential environmental impacts arising from the proposed modification are discussed in Section 6 of the addendum REF. In consideration of the scope of the modification, the assessment focused largely on noise and vibration impacts arising from the proposed modification.

Increased noise and vibration impacts would result as it is necessary to keep the road open during peak periods. As a result, it would be necessary to carry out some of the more intrusive works outside of normal construction hours, including some night-time works. Some of these works are predicted to exceed noise management levels.

During the utilities relocation, the high impact noise (such as saw cutting and jackhammering) will cease prior to midnight and it is assumed the noise level will drop substantially for the remainder of the night-time period. The noise generated during the paving work will likely continue throughout most of the night-time period, however, the paving work is only expected to take three to four shifts, and therefore the overall impact is expected to be minor. The results presented in Section 6.1 are therefore showing the worst-case scenario.

The proposed modification allows for duration respite to help reduce noise impacts on sensitive receivers. By allowing work to be completed five nights a week it is expected that the certain activities that need to be undertaken during the night-time period will be completed in a more timely manner. Ultimately this is expected to reduce the effects that construction has upon the community. In addition to duration respite, a range of other mitigation measures have been detailed in Section 6.1.5 to help reduce the impacts of the proposed modification, and night works as a whole, on the community.

Justification and conclusion

Through this addendum REF, the proposed modification to the project has been considered. The REF has examined and considered fully all matters affecting or likely to affect the environment from carrying out works five nights a week. The modified Project, as described in the addendum REF, best meets the Project objectives but would still result in some minor environmental impacts. Mitigation measures as detailed in this Addendum REF would seek to remove or minimise these potential impacts.

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1. Introduction

1.1 Proposed modification overview

Transport for NSW proposes to modify the *Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street*, Richmond by permitting out of hours work to be undertaken five evenings and nights a week, in addition to day works occurring during standard construction hours (proposed modification). Key features of the proposed modification would include:

- Work would be undertaken up to five nights a week, generally in two to three week blocks, from June 2020 to October 2020. This would be subject to change depending on the schedule and program of the utility relocation and upgrade works. This may be in addition to work in standard construction hours.
- Work to be undertaken up to five nights a week from November 2020 through to April 2021. This will occur in addition to work in standard construction hours.
- Work hours between 8pm and 5am from Sunday to Friday, excluding Saturdays and public holidays.
- Work would continue during standard construction hours in line with the requirements of the determined Project.
- High impact noise generating tasks such as saw-cutting concrete, jack-hammering and breaking up concrete would be completed by midnight.

The location of the proposed modification is shown in **Figure 1-1**. **Chapter 3** describes the proposed modification in more detail.

A review of environmental factors (REF) was prepared for Transport for NSW (formerly Roads and Maritime) in April 2016 and was determined on the 3 May 2016 (referred to in this addendum REF as the Project REF).

In addition, the following addendum REFs for the Richmond Bridge Approaches- Intersection upgrade at Bosworth Street and March Street, Richmond have been prepared:

- Addendum REF 1 - Kentucky Fried Chicken (KFC) sign removal and replacement (Determined 20 August 2018)
- Addendum REF 2 - Ancillary facilities (Determined 3 December 2019)
- Addendum REF 3 - Vegetation and tree removal and property adjustments (Determined 21 May 2020).

Figure 1-1: Location of the proposed modification

1.2 Purpose of the report

This addendum review of environmental factors (REF) has been prepared by DM Roads on behalf of Transport for NSW. For the purposes of these works, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This addendum REF is to be read in conjunction with the Project REF and previous addendum REF's for the project listed in Section 1.1. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail mitigation and management measures to be implemented.

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

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

- Section 5.5 of the EP&A Act including that Transport for NSW examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.
- The potential for the proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Australian Government Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

2.1 Strategic need for the proposed modification

Chapter 2 of the *Richmond Bridge Approaches - Intersection Upgrade at March Street and Bosworth Street, Richmond REF* addresses the strategic need for the project, the project objectives and the options that were considered. Generally, the proposal is required to improve travel conditions and road safety along the road corridor between Richmond and North Richmond (comprising Richmond Bridge and its approach roads). Bells Line of Road, Kurrajong Road and March Street run through the North Richmond and Richmond town centres. Chapter 2 of the Project REF also detailed that the Project was also designed to address a number of objectives outlined in the following strategic plans:

- NSW 2021: A plan to make NSW Number One
- NSW State Infrastructure Strategy
- NSW Long Term Transport Master Plan.

The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the project.

The proposed modification is needed to minimise the overall impact of the night works on the community by decreasing the length of time the community would be affected. The modification would provide duration respite (i.e. condensing the program rather than carrying out the work for two nights a week for a longer period of time) from noisy night work associated with certain aspects of the project such as utility realignment and intersection upgrades. These types of activities are required to take place during the evening and night-time period to minimise traffic disruptions to the road corridor and to comply with Road Occupancy Licence conditions. Further additional mitigation measures would also apply to the proposed modification in accordance with the Roads and Maritime *Construction Noise and Vibration Guideline.*

2.2 Proposal objectives and development criteria

Section 2.3 of the project REF identifies the proposal objectives and development criteria that apply to the proposed modification.

- Reduce congestion and improve traffic flow
- Improve accessibility and efficiency for freight and private vehicles
- Improve safety for motorists, cyclists and pedestrians
- Minimise socio-economic and environmental impacts.

The proposed modification is needed to facilitate the timely completion of the project and minimise the length of time the community would be subject to noise impacts associated with the work. Condensing the night work program is expected to minimise socio-economic impacts as it would allow work to be completed significantly faster than it otherwise would if work was only undertaken two nights a week. While it is unlikely that this modification would result in environmental impacts not already considered in the Project REF, the process of reassessment seeks to ensure this is the case.

2.3 Alternatives and options considered

2.3.1 Identified options

The following options have been considered in the preparation of this addendum REF:

- **Option 1:** The 'do nothing' option- limit work in line with Respite Period 2 of the Roads and Maritime Construction Noise and Vibration Guideline
- **Option 2:** Allow night work to be completed up to five nights a week with no work carried out during standard construction hours when night work is occurring five nights a week
- **Option 3:** Allow night work to be completed up to five nights a week in conjunction with work during standard construction hours.

2.3.2 Analysis of options

Option 1: 'Do Nothing'

The do-nothing option was not considered feasible as it would increase the overall impact that the project will have on the community. Limiting night-time construction to two consecutive nights per week and six nights per month (Respite period 2) would extend construction for eight (8) months, drawing out the noise and vibration impacts on the community.

Option 2: Allow up to five nights of work per week with no work carried out during standard construction hours when night work will be occurring

Advantages

- The proposal objectives outlined in the Project REF can be met
- Reduces some noise impacts of the project by allowing an expedited night work schedule- Duration respite.

Disadvantages

- Increased environmental, traffic and socioeconomic effects on the community from drawn out project length
- Increases program length by 3-4 months.

Option 3: Allow night work to be completed up to five nights a week in conjunction with work during standard construction hours

The implementation of duration respite for the length of the project was identified as the most effective way to reduce the overall impact on the community. The other respite options considered did not reduce the impacts on the community but extended the construction time frame therefore increasing the overall impact on the community.

Advantages

- The proposal objectives outlined in the Project REF can be met
- Allows for noisy work to be undertaken in a shorter time frame, ultimately minimising the length of community impacts that arise from such work
- Decreased risk of community and socioeconomic impacts caused by extended work schedules.

Disadvantages

- Increased noise impacts during the night time period.

2.4 Preferred option

The preferred option is **Option 3**, to allow for night works to take place up to five (5) nights per week, while also allowing for work to be undertaken during standard construction hours. This would be classified as duration respite and would reduce the overall impact of the project on the surrounding community.

3. Description of the proposed modification

3.1 The proposed modification

Transport for NSW proposes to modify the *Richmond Bridge and Approaches - Intersection upgrades at March Street and Bosworth Street* to allow for night construction to take place up to five (5) nights per week. The location of the proposed modification is shown in Figure 1-2.

It is anticipated the work in non-standard construction hours would be required when carrying out utility relocation that either cross March Street or Bosworth Street, or are located in the middle of the intersection of these streets. Night work will again be required when carrying out civil construction activities in the intersection or on either of these two streets.

As such the majority of the night work will be located directly at the intersection of Bosworth Street and March Street. Additionally, Ancillary Site 1 (164 March Street) and Ancillary Site 2 (148 Old Kurrajong Road) will be utilised during these works.

Key features of the proposed modification would include:

- Work would be undertaken up to five nights a week, generally in two to three weeks blocks, from June 2020 to October 2020. This would be subject to change depending on the schedule and program of the utility relocation and upgrade works. This may be in addition to work in standard construction hours.
- Work to be undertaken up to five nights a week from November 2020 through to April 2021. This will occur in addition to work in standard construction hours.
- Work hours between 8pm and 5am from Sunday to Friday, excluding Saturdays and public holidays.
- Work would continue during standard construction hours in line with the requirements of the determined Project.
- High impact noise generating tasks such as saw-cutting concrete, jack-hammering and breaking up concrete would be completed by midnight.

3.2 Construction activities

3.2.1 Work methodology

The main work methodology outlined in Section 3.3.1 of the Project REF is not expected to change as a result of the proposed additional night work. Additionally, the work methodologies outlined in Section 3.3.1 of Addendum REF 1, Section 3.2.1 of Addendum REF 2 and Section 3.2.1 of Addendum REF 3, will remain unaffected by the proposed modification.

3.2.2 Construction hours and duration

The Project is expected to take around 12-18 months to complete weather permitting. Section 3.3.2 of the Project REF noted that night and out of hours would be required to minimise traffic disruptions to the road corridor.

The approval of out of hours night work for up to five nights per week, and as such, use of duration respite (i.e. condensing the program to reduce the overall impact from the work) is the subject of this addendum REF.

Non-standard construction hours are as follows:

- 8 pm to 5 am Sunday to Friday.

Work during non-standard construction hours would only be carried out where necessary due to Road Occupancy Licence (ROL) restriction or where worker safety cannot be guaranteed during standard construction hours. It is anticipated the work in non-standard construction hours would be required when carrying out utility relocation that either cross March Street or Bosworth Street, or are located in the middle of the intersection of these streets. Night work will again be required when carrying out civil construction activities in the intersection or on either of these two streets.

All of the other utility relocation and the civil construction works related to the widening of March Street are anticipated to occur during standard construction hours behind temporary traffic barriers.

To ensure a timely completion of the project, work will be carried out during the day-time and night time periods. Details of mitigation measures that will be implemented to minimise noise and vibration impacts during this time are presented in Section 6.1 of this Addendum REF.

3.2.3 Plant and equipment

Plant and equipment used for the proposed work would be generally consistent with those listed in the Section 3.3.3 of the Project REF.

3.2.4 Earthworks

Earthworks for the proposed modification would be consistent with the earthworks described in the Section 3.3.4 of the Project REF.

3.2.5 Source and quantity of materials

Source and quantity of materials is consistent with those described in the Section 3.3.5 of the Project REF.

3.2.6 Traffic management and access

The proposed modification will not alter the approach to traffic management and access outlined in the Section 3.3.6 of the Project REF.

3.3 Ancillary facilities

The project site compounds are located at the corner of March and Bosworth Street (Ancillary Facility 1 shown on **Figure 1-1**) and Kurrajong Road and Old Kurrajong road (Ancillary Facility 2 shown on **Figure 1-1**). Both sites may be used during the proposed night works, and impacts have been incorporated into the additional noise assessment outlined in Section 6.1.

3.4 Public utility adjustment

The proposed modification would not likely require any additional impacts to public utility adjustment required for the project.

Public utility adjustments have been described in the Section 3.5 of the Project REF.

3.5 Property acquisition

The proposed modification does not require any additional acquisition of private property beyond what has already been acquired as stipulated in the Section 3.6 of the Project REF.

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

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

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modification is for a road and is to be carried out by DM Roads on behalf of Transport for NSW, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP), State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (State Significant Precincts) 2005.

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this addendum REF.

Other SEPPs

The proposed modification does not trigger any other state planning policies, nor does it alter the consideration given to the relevant planning policies outlined in the Section 4.1 of the Project REF.

4.1.2 Local Environmental Plans

Hawkesbury Local Environmental Plan (LEP 2012)

The proposed modification is located within the Hawkesbury LGA, as is the Project, and development within this area is controlled by Hawkesbury City Council under the Hawkesbury Local Environmental Plan (LEP) 2012. The zonings which apply to the land affected by the proposal are outlined with their objectives in the Figure 4-1 of the Project REF.

No additional requirements or changes to land use already discussed in the determined project are proposed as part of the modification. Additionally, the modification is not expected to affect any heritage listed under the LEP.

4.2 Other relevant NSW legislation

The proposed modification will not alter the relevance or applicability of other NSW legislation listed in the Section 4.4 of the Project REF.

Under the scope of the modification, no additional permit, licence or approval will be required under the legislative acts assessed in Appendix A of the Project REF.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6 of the addendum REF.

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

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

Findings – matters of national environmental significance (other than biodiversity matters)

The assessment of the proposed modification's impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Government Department of Agriculture, Water and the Environment is not required.

4.4 Confirmation of statutory position

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

5. Consultation

Section 5 of the Project REF outlines the approach to and outcomes of stakeholder and community consultation undertaken to date. This staged approach comprised:

- **Consultation carried out during the Richmond Bridge and Approaches congestion study**

  Broad consultation with respect to the Richmond Bridge and Approaches Congestion Study (which preceded the proposal) has been ongoing since July 2012, and included consultation with the community, comprising invitation for submissions, community workshops and direct interviews with member of various local organisations and associations.

- **Consultation carried out during the preparation of the Project REF (September- November 2015)**

  Table 5-1 of the Project REF summarises the consultation activities undertaken for the Project. In addition to general community consultation activity, feedback on the detailed Project proposal was sought from the community via the *Have your Say* (HYS) process. Table 5-2 of the Project REF summarises the key issues raised in the feedback received from the community.

- **Consultation carried out during the preparation of Addendum REF 1- Kentucky Fried Chicken (KFC) Sign removal and replacement (June - July 2018)**

  Section 5.1 of the Addendum REF 1 summarises the consultation activities undertaken for the modification. Consultation with KFC and Hawkesbury City Council was sought for the modification. Table 5-1 of the Addendum REF 1- Kentucky Fried Chicken (KFC) Sign removal and replacement summarises the key issues raised through consultation.

- **Consultation carried out during preparation of Addendum 3 - Vegetation and tree removal and property adjustments (October 2019 – January 2020)**

  Section 5.1 of the Addendum REF 3 summarises the consultation activities undertaken for the modification. Consultation with Hawkesbury City Council and the community was sought for the modification. Section 5.2 of Addendum REF 3 summarise the key issues raised and feedback collected from the community.

- **Consultation carried out during preparation of Addendum 4 - Out of Hours Work**

  Section 5.1 of this Addendum REF summarises the consultation activities undertaken for the modification. Consultation with the community was carried out through a Have your Say (HYS) process. Table 5-1 of the summarises the key issues raised in the feedback received from the community.

5.1 Consultation strategy

A Have Your Say consultation strategy was used to invite community feedback on the proposed modification. On 10 February 2020, Transport for NSW invited community feedback on a proposed night work schedule that would allow work up to five nights per week in three week blocks at certain times of 2020 depending on the schedule and program of the utility relocation and upgrade works, and then the ability to work up to five nights a week, every week, from November 2020 through to the end of the project in April 2021. The letter (shown at Appendix C) was distributed to 775 properties and emailed to the project's stakeholder database. The distribution area is attached in Appendix C.

The Have Your Say letter detailed the following information about the proposed modification:

- Work would be up to five nights a week in two to three week blocks intermittently, from March 2020 to October 2020 depending on the schedule and program of the utility relocation and upgrade works
- Work hours would be up to five nights a week from November 2020 through to April 2021
- Work hours would be between 8pm and 5am from Sunday to Friday, excluding Saturdays and public holidays
- Noisier tasks such as saw-cutting concrete, jack-hammering and breaking up concrete would be completed by midnight
- Properties within the project's notification distribution area (of 775 properties) would be notified before any new period of extended night work begins.

In addition to the Have Your Say notification, targeted phone calls, emails and a small number of meetings were used to encourage people to comment on the increased night work proposal, focusing mainly on the properties within the Project work zone as well as local motels.

5.2 Consultation outcomes

During consultation we received 18 responses overall. Four of these responses were from commercial premises that, although within or very close to the work zone, they would not operate during the proposed night work hours. All four supported the increased night work proposal however they have been excluded from the analysis below as they confirmed there would be no impact from the night work on their operations.

Of the 14 responses being considered, nine (9) responses supported the extended night work schedule, four responses were neutral and one response was opposed to working up to five nights a week. Table 5-1 summarises the feedback received.

The key theme expressed by those in favour of a more condensed work night schedule was that the overall project would be delivered faster as a result. One person was concerned about the impact of night work on people's sleep and called for noisier work to be done during the daytime. Several respondents expressed interest in reviewing the effectiveness of mitigation measures once the night work program had got underway.

Table 5-1: Summary of issues raised by the community

I.D	Method and date of feedback	Feedback received
1	11/2/20 – email in response to the Have Your Say notification	**Neutral**– showed initial concern about night work affecting sleep but then provided support when it was explained that the number of night shifts is the same overall, they will just be delivered in a more condensed period thus reducing the total duration of the project overall.
2	18/2/20 – a meeting and then a formal email response	**In support** – mentioned that although there would be more disturbance they would be in favour of more night shifts if it means reducing the duration of the project.

I.D	Method and date of feedback	Feedback received
3	25/2/20 – a meeting and a series of phone calls and emails followed by a formal email response to the Have Your Say notification	**In support** – supportive of the project and pleased to work with the project team to have the project completed as soon as possible. Comfortable with the night work approach as long as at least seven days' notice can be provided for the motel to plan ahead and, if necessary, move guests into rooms away from March Street.
4	20/2/20 – discussion during a doorknock about the start of work and vegetation clearing	**In support** – no concerns with increased night work.
5	20/2/20 – discussion during a doorknock about the start of work and vegetation clearing	**In support** – no concerns with increased night work.
6	20/2/20 – initial email feedback followed by a phone discussion	**Neutral** – the Property and Market Planning Manager for the South Richmond store had reservations about the night work due to concerns that it would impact the store's driveway access, drive-thru service and customer service. After a discussion about the night-time working hours, the location of the work, the fact there would be no impact to driveway or drive-thru access and a discussion about how traffic control would be implemented, the manager was comfortable with the night work approach proceeding subject to her being able to stay in close contact with the project team and a review traffic control arrangements near the KFC once the night work had started.
7	21/2/20 – email and then phone discussion	**Neutral** – comfortable with five nights a week proceeding but would like to review once it gets underway in case additional mitigation measures are needed for his tenants.

I.D	Method and date of feedback	Feedback received
8	21/2/20 – email in response to the Have Your Say notification	**Against** – opposed to the duration of the project overall and the request to work more night shifts due to concern that noise impacts will negatively affect the sleep and wellbeing of nearby residents. The resident asked for a reply and was sent two emails with detailed information about the planned night work approach, the benefits to the overall work program and a phone number to call if he had any further questions. The respondent has not replied to either email nor contacted the team's community relations advisor by phone as suggested. The team will ensure that details of expected noise impacts and the mitigation measures to be used are communicated before any extended night work periods (if approved) are implemented.
9	17/4/20 – follow up outbound phone call to the Have Your Say notification	**In support** – comfortable with more night work at the moment. Confident that noise impacts would be reduced at this location as the accommodation is at the back of the property and behind other buildings on March and Bosworth Streets. Will liaise with the project team to monitor the level of impact and request further mitigation measures if necessary.
10	17/4/20 – follow up outbound phone call to the Have Your Say notification	**In support** – not concerned by the proposal to increase the night work schedule within a shorter timeframe.
11	17/4/20 – follow up outbound phone call to the Have Your Say notification	**In support** – pleased with this approach as it will help complete the overall job faster.
12	17/4/20 – follow up outbound phone call to the Have Your Say notification	**Neutral** – respondent was okay with the proposed night work schedule but had some concerns about the amount and type of noise. Would like to revisit the approach and the mitigation measures once extended periods of night work begins.
13	17/4/20 – follow up outbound phone call to the Have Your Say notification	**In support** – comfortable with increased night work.
14	17/4/20 – follow up outbound phone call to the Have Your Say notification	**In support** – comfortable with increased night work. The respondent explained the property is currently vacant and it's likely that if a tenant moved in they would be a services business, operating during the day only.

5.3 Ongoing or future consultation

Subject to the approval of this Addendum REF, a notification to close out the outcomes of the Have Your Say process will be sent to the project stakeholder email list and the 775 properties shown in the map at Appendix C. They will be advised of the feedback received, the decision made and details of any extended periods of upcoming night work. Residents and businesses who operate at night within the area predicted to experience highly intrusive noise will be contacted to further explain the night work arrangements and planned mitigation measures.

Residents and businesses within the notification distribution area will be notified at least seven days prior to the contractor starting any extended periods of night work. Construction updates will be provided at least every three months and/or at key project milestones. The greatest impacted receivers will be contacted to discuss the proposed work, and the mitigation measures the Project will be applying to minimise the impact on each of the receivers.

As agreed with several respondents, community feedback about the impact of night shifts will be considered throughout the project and additional mitigation measures considered in accordance with the Roads and Maritime *Construction Noise and Vibration Guideline*. Adjustments to the noise mitigation measures may need to be made subject to the feedback received.

6. Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the *Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street*. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the guidelines *Roads and Related Facilities EIS Guideline* (DUAP, 1996) and *Is an EIS required?* (DUAP, 1999) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to ameliorate the identified potential impacts.

6.1 Noise and Vibration

6.1.1 Existing Environment

The March Street and Bosworth Street intersection is located in the suburban centre of Richmond. It is characterised by road infrastructure, a small amount of businesses and a variety of single and double storey residential buildings.

Noise sensitive receivers

The closest sensitive receivers to the proposal comprise the following:

- Residential properties, located at minimum five metres from the proposed work
- Several commercial premises, located around five metres from the proposed work
- The Uniting Care Hawkesbury Village, located about 55 metres from the proposed work.

The location of the closest sensitive receivers to the work are shown in Figure 6-1. The location and type of all sensitive receivers in the area are shown in 6-2

Vibration sensitive receivers

The nearest potentially vibration sensitive receivers located in the vicinity of the proposal area for proposal comprise residential and commercial receiver, the closest of which are located five (5) metres from the proposed work.

The locations of the nearest sensitive receivers are shown in Figure 6-1. The location and type of all sensitive receivers in the area are shown in Figure 6-2.

Background noise monitoring

Long-term continuous noise monitoring was carried out over 7 days in June 2014 at one location in March Street as part of the noise assessment prepared for the Project REF. Background noise levels recorded at noise monitoring location in March Street (as shown in Figure 6-1) are presented in Table 6-1. During deployment and collection of the noise logger, it was observed that background noise was dominated by traffic noise from local roads. The $L_{A90\ 15min\ 10th\ percentile}$ readings indicate the Rating Background level (RBL) for the area.

Table 6-1 Measured background noise levels

Monitoring location	Time of day	Background noise levels (dB)		
		$L_{A10\ 15min\ 50th\ percentile}$	$L_{A90\ 15min\ 10th\ percentile}$	$L_{Aeq\ 15min}$
162 March Street	Day	70	**56**	67
	Evening	67	**50**	64
	Night	61	**33**	62

Figure 6-1 Background noise monitoring location and nearest sensitive receivers.

Figure 6-2 Receiver type dispersion across area

6.1.2 Methodology

The noise assessment that was conducted as part of the Project REF assessed the noise impacts of the project at the fifteen (15) closest sensitive receivers. These are listed in table 6-2.

Table 2-2 Closest sensitive receivers

Receiver	Receiver Type	Distance to closest works
March Street and Bosworth Street intersection		
162 March Street	Residential	5 metres
164 March Street	Residential	7 metres
39 Bosworth Street	Residential	5 metres
165 Kurrajong Road	Residential	15 metres
184 Kurrajong Road	Residential	18 metres
155A March Street	Commercial	5 metres
34 Chapel Street	Residential	15 metres
190 Kurrajong Road	Residential	10 metres
Uniting Care Hawkesbury Village	Aged care facility	55 metres

An additional noise assessment has been carried out for the modification to better indicate potential impacts associated with the modification and work overall. This noise assessment broke down the area surrounding the Project into five different Noise Catchment Areas (NCAs). These are shown in Figure 6-3 and encapsulate a large area surrounding the proposed work site and ancillary sites.

NCA 1 and NCA 3 are representative of a higher traffic area within the general Richmond community. The NCAs both straddle March Street which is the major thoroughfare of Richmond connecting North Richmond to Windsor. As such these NCAs are expected to have a similar RBL which would be reflective of the background noise modelling done for the Project REF noise assessment.

NCA 2, NCA 4 and NCA 5 represent traffic areas that are largely dominated by local, light traffic. In these areas road noise is expected to have a lesser effect on the overall noise environment. In response to this up to five (5) dBA was subtracted from the RBLs used for NCA 1 and NCA 3 to give a more accurate background level. Additionally, although NCA 5 is located in a more rural setting with flat topography, this area is unlikely to receive any shielding from traffic noise along Kurrajong Road and Old Kurrajong Road. As such the RBLs for NCA 5 are expected to be similar to that of NCA 2 and NCA 4.

This is a conservative approach considering the high volumes of traffic Kurrajong Road and March Street were recorded as carrying during peak hour traffic (up to 1500 vehicles per hour). Table 6-3 summarises the nominal background noise levels.

Table 6-3 Background noise levels for each NCA

	Rating background level (RBL)		
NCA	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
1 & 3	56	50	33
2, 4 & 5	51	45	30

Construction activity and noise levels

Proposed activities and equipment for the works are summarised in Table 6-4, which includes associated overall unmitigated $L_{Aeq,\ 15\ minute}$ sound power levels.

Conducting consecutive nights of work is the subject of this Addendum REF, and as such each activity has been assessed as occurring during standard and non-standard hours.

Sound power levels and predicted noise levels depend on the number of plant items operating at any one time and their precise location relative to a sensitive receiver. Equipment was assumed to be working at the worst-case location relative to each receiver and represents a worst-case assessment. Where activity moves away from each receiver, or less equipment is operating, predicted levels will decrease.

Typical plant and equipment expected to be used for each activity during the completion of the stages of construction described in determined project has been estimated. Based on the guidance presented in the following standards and guidelines and typical noise levels for specific equipment, typical overall sound power levels (SWLs) were predicted for each activity.

- Australian Standard AS2436-2010: Guide to noise and vibration control on construction, demolition and maintenance sites (AS 2436-2010)
- Construction Noise Strategy 7TP-ST-157/2.0 (CNS), (TfNSW, April 2012)
- British Standard 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1:2009)
- United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) Noise database for prediction of noise on construction and open sites.

Modelling

SoundPlan noise modelling software was used to calculate noise impacts in accordance with the ISO9613 prediction method at all identified noise-sensitive receivers. The model included:

- Topography – 1 metre DEM based on LPI Lidar data captured in 2019
- Individual sensitive receivers – One receiver location representing each residential dwelling and located at 1.5 metres height up to 1,000 metres from the works
- Construction noise sources –Nominal activities and equipment as per Table 6-13. The maximum predicted LAeq noise level within each work area was identified for each receiver
- Meteorology –worst-case conditions (gentle breeze from source to receiver and stable conditions).

Table 6-4 Estimated plant and equipment, and overall SWL for each activity

Activity Number	Construction Activity	Typical plant/equipment used (sound power level)	Sound power level during activity dB(A)
1	**Preliminary work** Removal of existing concrete road furnishings, redundant signage, pavement and redundant line markings	Jackhammer*	110
		Excavator	
		Truck and dog	
		Hand tools	
		Line marking removal plant	
2	**Utilities** Utilities adjustment works along the alignment and at the intersection	Road Saw	117
		Saw Cutting	
		Sucker Truck	
		Excavator	
		Jack Hammer*	
		Compactor	
		Truck	
		Traffic Control	
		Light Vehicles	
		Hand Tools/power tools	
		Bobcat	
3	**Earthworks** Earthworks and pavement sub-grade preparation	Excavator	112
		Truck and dog	
		Water cart	
		Grader	
		Roller*	
		Wacker packer	
4	**Pavement work** Pavement, road furnishings, kerb and drainage	Paver	117
		Asphalt milling machine	
		Asphalt truck	
		Roller*	
		Spray sealing equipment	
		Road sweeper	
5	**Line marking** Line marking of intersection	Line marking plant	96
		Concrete truck	
6	**Signage** Installation of new signage along the footprint	Elevated working platform	100
		Mobile crane	
7	**Ancillary site operation** Operation of ancillary sites 1 and 2	People talking	102
		Light vehicles	
		Generator	
		Hand tools	

*5dB penalty applied in line with the Interim Construction Noise Guideline in consideration of potentially annoying characteristics of this equipment

Intersection March Street/Bosworth Street- NCAs

Figure 6-3 Project NCAs

6.1.3 Criteria

Construction noise criteria

Construction activities should meet the requirements of the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009).

The ICNG describes that noise in excess of the background level may result in adverse impact and increased likelihood of complaint. During standard hours, where construction noise is within 10 dB(A) of the RBL, the impacts are acceptable.

Where construction noise is more than 10 dB(A) above the RBL, a residential receiver is noise affected and the proponent should undertake all reasonable and feasible steps necessary to manage the impact and consult with the affected community. Above a $L_{Aeq,\ 15\ minute}$ noise level of 75 dB(A), a receiver is highly noise affected, requiring respite, provided in consultation with the regulatory authority and the community.

At night, or outside approved construction hours, construction noise at a residential receiver more than 5 dB(A) above the RBL is taken to be noise affected.

In addition, annoying noise such as rock hammers, impact piling, or other impulsive noise sources usually result in greater annoyance than continuous construction noise. A 5 dB(A) penalty is applicable to such activities prior to comparison with the NMLs.

The NML relevant to each NCA is summarised in Table 6-4, these numbers are based on the RBL measured for the site. For NCA3, NCA4 & NCA5, five (5) dBA was subtracted from the measured levels to more accurately represent the noise levels that would be experienced further away from the main road (March Street).

Table 6-4 Noise Management Levels for surrounding residential receivers

Residential receiver area	Noise management level $L_{Aeq\ 15\ minute}$ dB(A)			
	ICNG Standard hours of construction	Outside standard hours of construction (Sundays and public holidays excluded)		
		Day	Evening	Night
NCA1	66	55	55	38
NCA2	60	50	50	38
NCA3	66	55	55	35
NCA4	60	50	50	35
NCA5	60	50	50	35

Where a commercial property is affected by noise, a level above $L_{Aeq\ 15min}$ 70 dB(A) is considered to warrant noise mitigation. Similarly, an industrial facility would warrant noise mitigation at $L_{Aeq\ 15\ minute}$ noise levels above 75 dB(A).

Other sensitive land uses, such as schools will only find noise from construction to be disruptive when the properties are being used. Table 6-5 presents management levels for noise at other sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed.

Internal noise levels are assessed at the centre of the occupied room. Where internal noise levels cannot be measured, external noise levels may be used. A conservative estimate of the difference between internal and external noise levels is 15dB for buildings other than residences.

Table 6-5 NMLs for non-residential sensitive receivers

Receiver type	NML applicable when in use, $L_{Aeq,\ 15\ min}$
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	
Places of worship	
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

The immediate proposal area contains one non-residential receiver, being a building containing specialist medical and legal practitioner services, at 155a March Street, which is situated approximately 40 metres from the Bosworth Street intersection. There are commercial premises adjacent to this receiver on either side, being the Richmond KFC on the corner of Bosworth Street, and private office/professional rooms at 155 March Street.

Sleep disturbance

The ICNG recommends that, where works are likely to occur over more than two consecutive nights, maximum noise levels should be analysed in terms of the extent and number of times the maximum noise exceeds the RBL. Additionally, the DECCW (2011) Road Noise Policy discusses a guideline aimed at limiting the level of sleep disturbance due to environmental noise: a $L_{A1,\ 1\ minute}$ or L_{Amax} level of any noise should not exceed the ambient LA90 noise level by more than 15 dB(A).

In addition, the EPA (2011) *Road Noise Policy* suggests that maximum internal noise levels below 50-55 dB(A) are unlikely to awaken people from sleep and one or two noise events per night, with maximum internal noise levels of 65-70 dB(A) are not likely to affect health and wellbeing significantly.

Based on this guidance, a sleep awakening criterion of 55 dB(A) (internal) has been adopted for the works. Given that noise attenuation of 10 dB(A) is typically provided by an open window, a sleep awakening criterion of LAmax 65 dB(A) (external) has been applied to residential bedroom façades. This is consistent with the sleep disturbance threshold described in Appendix E of the CNVG.

While not mandatory, the awakening criterion should act as a maximum noise goal not to be exceeded on more than a couple of occasions in any night.

Vibration management levels

Construction vibration is associated with three main types of impact:

- disturbance to building occupants
- potential damage to buildings
- potential damage to sensitive equipment in a building.

Generally, if disturbance to building occupants is controlled, there is limited potential for structural damage to buildings. Construction vibration goals for disturbance to occupants and potential damage to buildings are summarised below.

Disturbance to building occupants

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with *Assessing Vibration: A Technical Guideline* (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 *Evaluation of human exposure to vibration in buildings* (1-80Hz). Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent':

- continuous vibration – from uninterrupted sources (see Table 6-6)
- impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (see Table 6-7)
- intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (see Table 6-8).

Table 6-3: Continuous vibration acceleration criteria (m/s^2) 1-80Hz

Location	Assessment Period[1]	Preferred Values, (m/s2)		Maximum Values, (m/s2)	
		z-axis	x- & y-axis	z-axis	x- & y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028

1. *Note: [1]. Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am*

Table 6-4: Impulsive vibration acceleration criteria (m/s^2) 1-80Hz

Location	Assessment Period	Preferred Values		Maximum Values	
		z-axis	x- & y-axis	z-axis	x- & y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92

Table 6-5: Intermittent vibration impacts criteria (m/s$^{1.75}$) 1-80Hz

Location	Daytime		Night-time	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
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

Building damage

The standards by which building damage from construction-induced vibration is assessed are British Standard 7385 Part 2 and the German standard DIN 4150: Part 3 – 1999 Effects of Vibration on Structure (DIN 1999).

British Standard 7385: Part 2 'Evaluation and measurement of vibration in buildings', is used as a guide to assess the likelihood of building damage from ground vibration. BS7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur, where the categories of structural damage are defined as:

- cosmetic - the formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/ concrete block construction
- minor - the formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks
- major - damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.

The cosmetic damage levels set by BS 7385 are considered 'safe limits' up to which no damage due to vibration effects has been observed for certain particular building types.

BS7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4 to 250 Hz, being the range usually encountered in buildings. At frequencies below 4 Hz, a maximum displacement value is recommended. The values relate to transient vibrations and to low-rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50%. Table 6-9 sets out the BS7385 criteria for cosmetic, minor and major damage.

Regarding heritage buildings, British Standard 7385 Part 2 (1993) notes that "a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive".

German Standard DIN 4150 -Part 3 Structural vibration in buildings -Effects on Structures (DIN 4150-3), also provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are conservative.

Criteria relating to heritage structures sensitive to vibration have been adopted from DIN 4150-3 and are summarised in Table 6-10. Based on DIN 4150-3, a measured value exceeding those listed in Table 6-10 will not necessarily lead to damage if it is significantly exceeded, however, further investigations may be necessary.

Table 6-6: BS 7385 structural damage criteria

Group	Type of Structure	Damage Level	Peak Component Particle Velocity[1] (mm/s)		
			4 – 15 Hz	15 – 40Hz	≥40Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50	50	50
		Minor[2]	100	100	100
		Major[2]	200	200	200
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 - 20	20 - 50	50
		Minor[2]	30 - 40	40 - 100	100
		Major[2]	60 - 80	80 - 200	200

Notes: [1] *Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.*

[2] *Minor and major damage criteria established based on BS 7385 Part 2 (1993) Section 7.4.2*

Table 6-7: DIN 4150-3 structural damage criteria

Type of structure	Guideline values for vibration velocity (mm/s)		
	1 - 10 Hz	10 - 50 Hz	50 - 100 Hz[1]
Structures that, because of their particular sensitivity to vibration, cannot be classified above and are of great intrinsic value (eg listed buildings under a preservation order).	3	3 - 8	8 - 10

[1] *At frequencies above 100 Hz the values given in this column may be used as minimum values.*

Safe working distances

The safe working distances presented in Table 6-11 are based on those recommended in the CNVG and will vary depending on the item of plant and local geotechnical conditions. The cosmetic damage thresholds apply to typical buildings under typical geotechnical conditions. Where structures are more sensitive, such as heritage items, more stringent conditions are applicable and should be considered individually. In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable.

Table 6-8 Safe working distances for vibration intensive plant

Plant item	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385-1)	Human response (DECCW)
Vibratory roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	15 m to 20 m 20 m 40 m 100 m 100 m 100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	73 m
Vibratory pile driver	Sheet piles	2 m to 20 m	20 m
Pile boring	≤800 mm	2 m	4 m
Jackhammer	Hand held	1 m	2 m

For heritage structures there is no table provided in the CNVG. However, requirements from DIN 4150 notes that vibration should not exceed 3mm/s at the structure. Table 6-12 has been provided by Transport for NSW and indicates the interim requirements of safe workings distances from Heritage Structures.

Table 6-9: Safe working distances Heritage structures (TfNSW, 2020)

Plant item	Rating / Description	Minimum working distance Heritage Structures
Vibratory Roller	< 100 kN (Typically 1-4 tonnes)	20 m
	< 200 kN (Typically 4-6 tonnes)	40 m
	> 200 kN (Typically 7 tonnes and above)	70 m

Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	10 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	25 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	50 m
Vibratory Pile Driver	Sheet piles	20 m
Pile Boring	≤ 800 mm	5 m
Jackhammer	Hand held	5 m

6.1.4Potential impacts

Predicted noise levels

This section summarises the predicted level of noise and associated impacts for the work.

Noise contours were modelled for activity one (1) to six (6) for two different scenarios. The first scenario assumed work was occurring along the whole project footprint. The second scenario assumed work was only being undertaken at the intersection. The operation of ancillary site one was considered cumulatively within these contours. Contours for ancillary site operations were also provided for ancillary site two.

Operation of Ancillary Site 2 in support of works outside standard hours is not likely to adversely impact many receivers. Up to 3 receivers are predicted to notice the compound in operation at night and just two are expected to find this clearly audible.

Contours for the noisiest work are shown in Figure 6-4 and Figure 6-5, all other contours are presented in Appendix D. In addition to these contours, façade modelling was carried out for both scenarios to ascertain the worst case impact to sensitive receivers.

A summary of exceedances of the NML over each time period for each activity for both scenarios is provided in tables 6-13 and 6-14.

The two scenarios have been assessed here separately for clarity and both represent the worst case impacts for activities. As the proposed modification is for the allowance of work up to five nights per week, this assessment focuses on potential impacts during the evening and night-time period.

Scenario 1- Assumes work along the whole Project Footprint

Predictions indicate that the proposed works represent a high risk of adverse impacts on amenity of the surrounding community for most of the proposed activities. The activities that are most likely to result in the highest noise levels are Utilities work, and Pavement work. Both activities have the same SWL, therefore should have a similar impacts on surrounding sensitive receivers. The noise contours that indicate the maximum expected effects of these activities are shown in Figure 6-4.

During the evening these activities are expected to have a significant noise impact. Up to 362 receivers are expected to experience noise levels between 0 to 5dB over the evening NML, 240 receivers are expected to experience exceedances of NML between 5 to 15dB; 35 receivers are expected to experience noise levels 15-25dB over NML and 40 receivers are expected to experience noise levels greater than 25dB over the evening NML.

These activities are likely to have the highest potential impact during the night time period with up to 19 receivers experiencing noise levels 0 to 5dB over NML; up to 505 receivers experiencing noise levels 5 to

15dB over NML; 672 receivers experiencing noise levels 15 to 25dB over NML; and up to 147 residential receivers expected to experience noise levels greater than 25dB over the night time NML.

Table 6-13 Predicted exceedances of NML for scenario 1

	Activity	Maximum level		Predicted no. receivers with exceedance of NML															
				Standard hours				Weekend Day				Evening				Night			
		Maximum	Rec. >75	0	< 10	10-20	> 20	0-5	5-15	15-25	>25	0-5	5-15	15-25	>25	0-5	5-15	15-25	>25
1	Preliminary Work	108	36	13	33	29	4	20	27	16	20	70	54	13	33	192	860	157	75
2	Utilities	115	49	30	14	7	30	102	61	13	34	362	240	35	40	19	505	672	147
3	Earthworks	111	40	21	33	28	7	33	35	10	30	175	83	21	36	74	861	291	98
4	Pavement Work	115	49	30	22	7	30	102	61	13	34	362	240	35	40	19	505	672	147
5	Line Marking	94	4	8	29	1	2	3	29	2	2	9	7	27	3	108	68	20	36
6	Signage	98	24	3	28	2	2	4	16	17	3	17	13	29	4	243	157	35	40

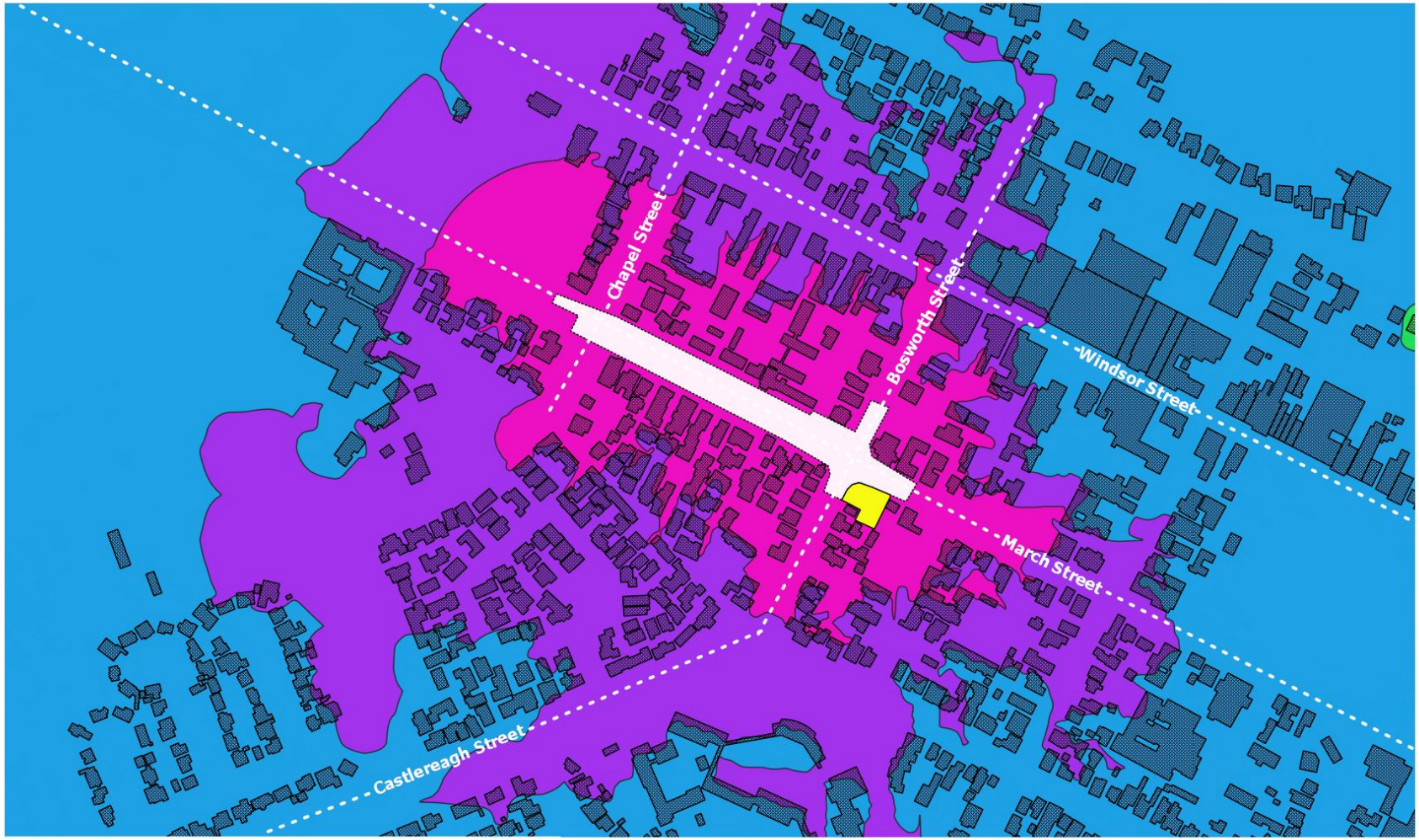

Figure 6-4 Worst case Noise contours for utilities and pavement work along Project Footprint

Scenario 2- Assumes work at the intersection

Similarly, to Scenario 1, this scenario indicated that the work represents a high risk of adverse noise impacts on amenity. Although this risk is lower than that of Scenario 1. Utilities work and Pavement work activities are still expected to have the highest noise impacts on sensitive receivers in the area. The noise contours that indicate the maximum expected effects of these activities are shown in Figure 6-5.

During the evening these activities are still expected to have a substantial noise impact. Up to 336 receivers are expected to experience noise levels between 0 to 5dB over evening NML, 159 receivers are expected to experience exceedances of NML between 5 to 15dB; 23 receivers are expected to experience noise levels 15-25dB over NML and 13 receivers are expected to experience noise levels greater than 25dB over the evening NML.

These activities are likely to have the highest potential impact during the night time period with up to 29 receivers experiencing noise levels 0 to 5dB over NML; up to 587 receivers experiencing noise levels 5 to 15dB over NML; 637 receivers experiencing noise levels 15 to 25dB over NML; and up to 88 residential receivers expected to experience noise levels greater than 25dB over the night time NML.

Table 6-14 Predicted exceedances of NML for scenario 2

	Activity	Maximum level		Predicted no. receivers with exceedance of NML															
				Standard hours				Weekend Day				Evening				Night			
		Maximum	Rec. >75	0	< 10	10-20	> 20	0-5	5-15	15-25	>25	0-5	5-15	15-25	>25	0-5	5-15	15-25	>25
1	Preliminary Work	106	11	9	18	6	2	12	15	6	5	48	32	10	8	220	890	103	36
2	Utilities	113	22	21	12	5	6	62	36	9	10	336	159	23	13	29	587	637	88
3	Earthworks	109	14	7	18	8	2	19	23	6	7	109	62	14	10	107	931	226	48
4	Pavement Work	113	22	21	3	5	6	62	36	9	10	336	159	23	13	29	587	637	88
5	Line Marking	92	2	3	6	1	1	3	6	0	2	7	5	4	2	65	50	14	10
6	Signage	96	5	2	8	0	2	3	6	3	2	8	10	6	2	216	103	23	13

Figure 6-5 Worst case Noise contours for utilities and pavement works at the intersection of Bosworth St and March St

Overall impacts

The predicted exceedances of the noise management levels at the nearest sensitive receivers do not indicate that the proposed work should not be carried out. Rather, the exceedances indicate that all feasible and reasonable work practices should be implemented to reduce noise impacts on these sensitive receivers.

Because of the need to keep the road open during peak periods, it would be necessary to carry out some of the more intrusive works outside of normal construction hours, including some night time works. As discussed above, some of these works are predicted to exceed noise management levels.
It should be noted that during the utilities relocation work the high impact noise (such as saw cutting and jackhammering) will cease prior to midnight and it is assumed the noise level will drop substantially for the remainder of the night-time period. The noise generated during the paving work will likely continue throughout most of the night-time period, however, the paving work is only expected to take three to four shifts, and therefore the overall impact is expected to be minor. These results are therefore showing the worst case scenario.

The proposed modification allows for duration respite to help reduce noise impacts on sensitive receivers. By allowing work to be completed five nights a week it is expected that the certain activities that need to be undertaken during the night-time period will be completed in a more timely manner. Ultimately this is expected to reduce the effects that construction has upon the community. In addition to duration respite, a range of other mitigation measures have been detailed in section 6.1.5 to help reduce the impacts of the proposed modification, and night works as a whole, on the community.

Ongoing community consultation will take place throughout the project to pursue the best outcome for receivers that may be noise affected by the project. The purpose of the proposed modification and the implementation of duration respite is to expedite the project so that the project area can be handed back to the community as soon as possible.

Sleep disturbance

Where works are proposed in the night period, the potential for sleep disturbance exists. Considering the maximum predicted L_{Aeq} noise level of 115 dBA across all proposed activities and scenarios, and assuming an adjustment of around 5 – 8 dB for L_{Amax}, the sleep disturbance threshold of 65dB(A), is likely to be exceeded.

All works at night should be undertaken with care to avoid metal-on-metal contact, dropping loads, shaking piling rig augurs, engine braking and other impulsive noises.

Construction vibration

A limited number of vibration intensive plant is expected to be operated during the works. Use of a vibratory roller and jackhammer, however, is necessary for compaction during earthworks, utility work and paving. Considering the typical vibration levels in Table 6-9, in conjunction with distances to receivers, the human comfort criteria are likely to be exceeded by vibration-intensive activity at some locations around the work area.

With regard to building damage criteria, it is unlikely that the lowest values (for 1 to 10 Hz) for commercial premises would be exceeded during the works. Where vibration-intensive equipment is used in closer proximity to residential properties (10 metres or closer to closest façade) it is possible that the lowest values (for 1 to 10 Hz) for building damage could be exceeded.

Table 6-12 indicates the interim safe working distances for equipment in proximity to heritage listed buildings. Figure 6-6 presents these distances and indicates that where a vibratory roller of 4-6 tonnes is required during works, up to eight (8) heritage listed buildings may be affected. Where a Vibratory roller of 7 tonnes or more is required for work, one more heritage listed building may be affected (9 in total). In addition to this the facades of up to five heritage listed properties lie within the safe working distance for a Jackhammer.

As the information in Table 6-12 was not available at the time of the noise and vibration assessment carried out for the Project REF a conservative approach was originally adopted for the Project. Vibration impacts may be greater than what was characterised in the REF. The safeguards outlined in the Project REF would still be appropriate, while some additional mitigation measures have also been identified.

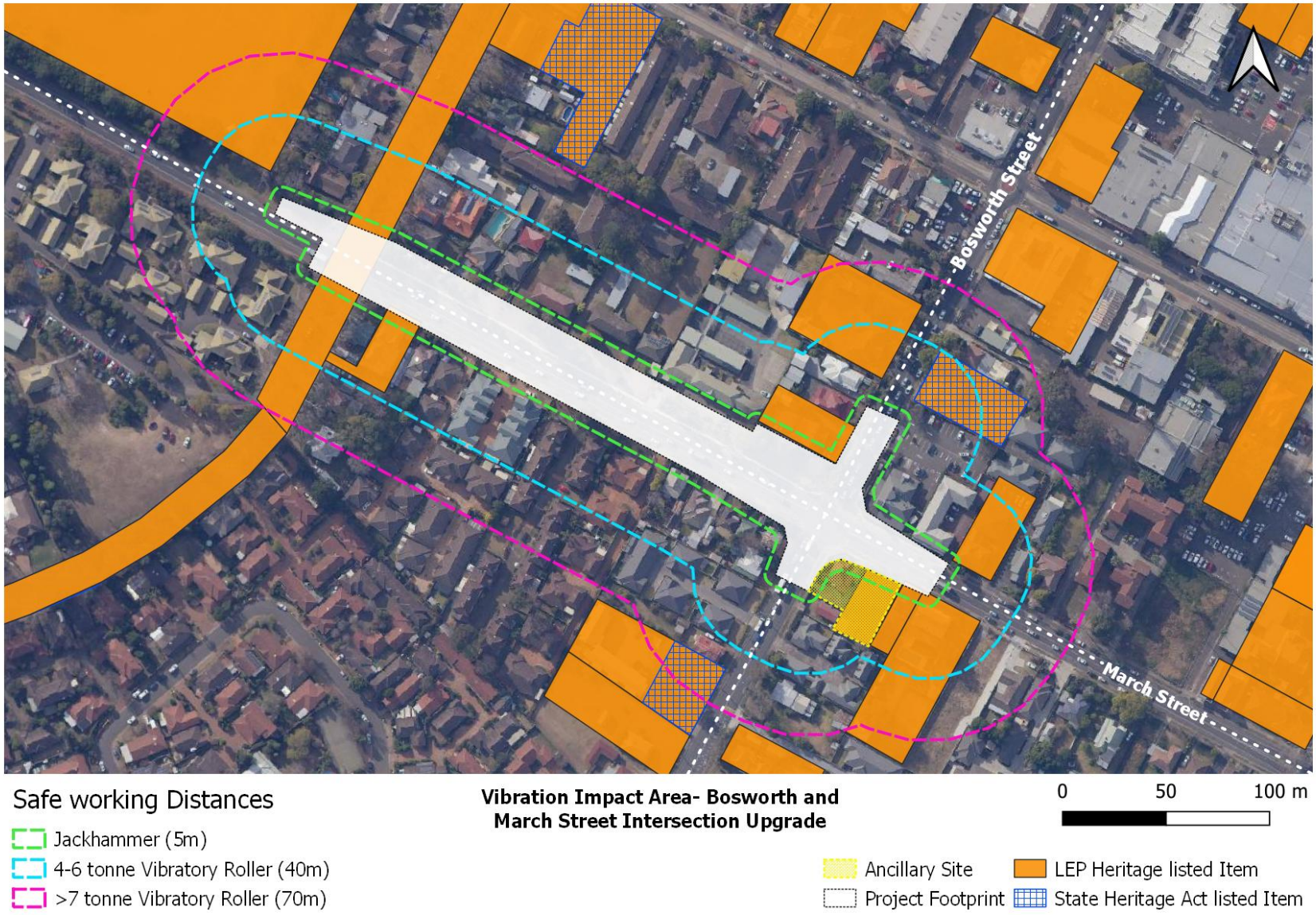

Figure 6-6 Vibration Impact Areas for Heritage Listed items

6.1.5 Safeguards and management measures

Construction Noise and Vibration Guideline standard mitigation

As part of planning for out of hours works, standard mitigation measures, as described in the ICNG and CNVG, are implemented where reasonable and feasible. However, after these measures have been applied, noise levels may continue to exceed the NMLs.

In this case, additional mitigation measures outlined in the CNVG, which largely focus on engagement with affected sensitive receivers, should be implemented where reasonable and feasible, unless other agreements are in place with the impacted receiver.

Triggers and additional mitigation measures for airborne noise are summarised in Table 6-5. Further details of specific additional mitigation measures are described in the CNVG.

Table 6-10 Triggers for additional mitigation measures – Airborne noise (Roads and Maritime 2016)

Predicted airborne LAeq(15min) noise level at receiver			
Perception	dB(A) above RBL	dB(A) above NML	Additional mitigation measures
All hours			
75 dB(A) or greater			N, V, PC, RO
Standard hours: Mon - Fri (7am – 6pm), Sat (8am – 1pm), Sun/Pub Hol (Nil)			
Noticeable	5 to 10	0	-
Clearly audible	10 to 20	< 10	-
Moderately intrusive	20 to 30	10 to 20	N, V
Highly intrusive	> 30	> 20	N, V
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Pub Hol (8am – 6pm)			
Noticeable	5 to 10	<5	-
Clearly audible	10 to 20	5 to 15	N, R1, DR
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR
Highly intrusive	> 30	>25	V, IB, N, R1, DR, PC, SN
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)			
Noticeable	5 to 10	<5	N
Clearly audible	10 to 20	5 to 15	V, N, R2, DR
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR
Highly intrusive	> 30	>25	AA, V, IB, N, PC, SN, R2, DR

Notes:
AA = Alternative accommodation
V = verification
IB = Individual briefings
N= Notification
R2 = Respite period 2
DR = Duration respite
R1 = Respite period 1
PC = Phone calls
SN = Specific notifications
RO = Respite offer
Perception = relates to levels above RBL
NML = Noise management level
HA = Highly affected

Safeguards and mitigation measures

The following safeguard table supersedes any predecessors and encapsulates all safeguards and management measures relating to noise and vibration that will be implemented during the Project.

Any safeguards that have not previously been detailed in the determined project are listed in *Blue Italics.*

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and Vibration	A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the CEMP. This plan would include, but would not be limited to, the following: • A map indicating the locations of sensitive receivers including residential properties, and clear protocols for communicating with affected residents with regard to likely exceedances of construction noise limits, and the frequency and duration of these events • Procedures for prior notification of nearby residents in advance of high noise construction activities and work outside of standard hours • Procedures for notifying residents about the program of work, duration of works including high noise activities, noise management and mitigation methods, and complaints procedure • Management measures to minimise potential noise impacts from mobile, high noise construction activities such as concrete cutting • Mitigation measures to avoid noise and vibration impacts associated with truck movements during construction • A process for assessing the performance of the implemented mitigation measures, including a noise and vibration monitoring program for sensitive receivers • A process for documenting and resolving issues and complaints • A process for updating the plan when activities affecting construction noise and vibration change • Identify in toolbox talks where noise and vibration management is required • Implement EPA Interim Construction Noise Guidelines (DECCW 2009).	Construction Contractor	Construction	Project REF
Noise and Vibration	Any out of hours work would comply with G36 community notification requirements specified	Construction Contractor	Construction	Project REF

Impact	Environmental safeguards	Responsibility	Timing	Reference
	within the *Roads and Maritime Construction Noise and Vibration Guidelines* Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.			
Noise and Vibration	If a complaint relating to vibration is received, attended monitoring would be carried out to assess whether criteria are being met. If monitoring identifies that criteria are being exceeded, then all work is to be scaled back until an acceptable vibration level can be reached in consultation with the affected resident.	Construction Contractor	Construction	G36 Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration	Pre-condition surveys are to be conducted at heritage listed properties situated in close proximity to work zones, specifically 190 March Street (Item I72), 35 Bosworth Street (Item I4), 162 March Street (Item I483), 160 March Street (Item I482), 158 March Street (Item I69), and 155 March Street (Item I71).	Construction Contractor	Pre-construction	G36 Project REF
Noise and Vibration	Where possible, carry out the tree removal during standard work hours (7am-6pm) or alternatively Out of Hours Work Period 1 (6pm-10pm).	Construction Contractor	Construction	Addendum REF 3
Noise and Vibration	*Prior to vibration intensive activities commencing within the vicinity of known heritage items, a vibration trial will be carried out to determine the safe working distances of the vibration intensive plant and equipment.*	*Construction Contractor*	*Pre- vibration intensive work*	*G36 Additional Safeguard*
Noise and Vibration	*Where safe working distances cannot be complied with, vibration monitoring will be carried out ensure vibration limits are not exceeded at heritage listed properties.*	*Construction Contractor*	*Construction*	*G36 Additional Safeguard*
Noise and Vibration	Locate compressors, generators, pumps and any other fixed plant as far from residences as possible and behind site structures.	Construction Contractor	Construction	Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration	Alternatives to reversing alarms will be considered for site equipment subject to Work Health Safety compliance requirements and risk assessments.	Construction Contractor	Construction	Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and Vibration	Vehicle delivery times will be scheduled where feasible to ~~*the recommended construction hours*~~ to minimise noise impacts from heavy vehicle movements and deliveries. *Plant should not be delivered during the night time period to Ancillary site 1.*	Construction Contractor	Construction	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*
Noise and Vibration	*No swearing or unnecessary shouting or loud stereos/radios on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Nosie and Vibration	*No dropping of materials from height, throwing of metal items, slamming of doors, shaking piling rig augurs, engine braking or other impulsive noises.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration	*Relating to use and siting of plant-* • *The offset distance between noisy plant and adjacent sensitive receivers is to be maximised* • *Plant used intermittently to be throttled down or shut down* • *Noise-emitting plant to be directed away from sensitive receivers* • *Only have necessary equipment on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration	*Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration- respite periods	*Duration Respite in the form of working up to five nights a week should be employed in order to complete the project more quickly.*	*Project Manager Construction Contractor*	*Construction*	*Interim Construction Noise Guideline (ICNG) (DECC 2006) Construction Noise and Vibration Guideline (RMS 2016).*

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and Vibration	*All additional safeguards as outlined in the Construction Noise and Vibration Guideline should be considered for affected receivers*	*Project Manager Environment Manager Community and Stakeholder Engagement Manager*	*Pre-construction and Construction*	*Construction Noise and Vibration Guideline (RMS 2016).*

A summary of all safeguards and management measures that would address noise and vibration impacts are identified in Section 7.2.

6.2 Other impacts

6.2.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Traffic and Transport access	Detailed traffic modelling and investigations for the Richmond Bridge and Approaches strategy are detailed in Section 6.2 of the project REF. The REF was based upon the review of the following three studies, as well as desktop searches: • *Richmond Bridge and Approaches Congestion Study – Stage 1* (Roads and Maritime 2012) • The *Richmond Bridge and Approaches Congestion Study – Long-term Options Report* (Roads and Maritime 2012) • The *Richmond Bridge and Approaches Congestion Study – Preferred Short-term and Long-term Options Report* (Roads and Maritime 2013). In summary, the potential and likely impacts arising from the construction of the Project were most notably: • A temporary minor increase in traffic along haulage routes • The works are not anticipated to have a significant impact to the performance of the road network • Delays for road users owing to traffic lane closures, the implementation of roadwork speed limits and/or when manual traffic control is on operation to facilitate the movement of construction vehicle as required • Temporary impacts on pedestrian traffic, due to footpath realignments. • Temporary impacts of cyclists potential to impact on cyclist movements in the proposal area, as cyclists travelling along the affected roads would need to move further into the adjacent traffic lane in order to travel around the construction worksite • Temporary and permanent loss of street parking	The proposed modification is not expected to result in traffic and access impacts exceeding those characterised in the determined project. The safeguards outlined in the Determined Project would be implemented to ensure minimal impacts to the road network.

Environmental factor	Existing environment	Potential impacts
	• Intermittent and temporary disruption to private property access • Bus services travelling along affected roads would be subject to minor delays and increased travel times as a result of increased congestion at intersections due to the implementation of roadwork speed limits and/or short-term traffic control.	
Aboriginal Heritage	A desktop assessment of known Aboriginal heritage records and previous archaeological investigations was carried out for the Project area on the 26/09/2019. This assessment included a search of OEH Aboriginal Heritage Information Management System (AHIMS). Six recorded sites were identified within a three-kilometre radius around the combined Richmond Bridge Approaches Proposals. These included an open campsite, axe grinding grooves, shelters and non-specified sites.	The proposed modification would not have direct impacts on any known Aboriginal heritage sites and in light of the historic land uses and associated levels of disturbance, no areas were identified as having archaeological potential within the study area. The safeguards and mitigation measures outlined in the Determined Project are considered sufficient to address the potential impacts arising from the proposed modification.

Environmental factor	Existing environment	Potential impacts
	 The key findings of the survey were that the Project site has been substantially disturbed from past clearing and road construction activities, and no areas within the proposal area were identified as having archaeological potential.	
Topography, geology and soils	The *Richmond Bridge Approaches-Intersection upgrade at March Street and Bosworth Street REF* included a desktop analysis of topography, geology and soils of the study area based on existing topographic and geological maps, database searches and other publicly available information. This assessment determined that:	The proposed modification would not have any additional impacts greater than those described in the Determined Project.

Environmental factor	Existing environment	Potential impacts
	• The proposal site has a low risk of AS/PASS impacts • The removal of vegetation and ground disturbance has the potential to expose ASS (if present) and increase the possibility of erosion and sedimentation. Ultimately the assessment found that construction and operation of the project to be unlikely to result in impacts to topography, geology and soils that could not be managed via the implementation of the recommended safeguards and management measures.	The safeguards and mitigation measures outlined in the Determined Project are considered sufficient to address the potential impacts arising from the proposed modification.
Landscape character and visual amenity	A detailed landscape character and visual impact assessment was carried out as part of the project REF. This assessment determined the following: • The majority of visual impacts during construction would be caused by the equipment associated with road widening, including temporary fencing, signage and construction machinery • Construction would result in a more cluttered street scape and there may be a visible increase in traffic • The use of portable lighting may impact on the visual amenity of the area owing to associated light spill • Permanent visual changes to the streetscape, mostly associated with the removal of trees and widening of the road. The March Street and Bosworth Street intersection is a significant junction in the town of Richmond, and in carrying out the proposed intersection upgrade, some impact on the local landscape is unavoidable. Landscape character and visual amenity are able to be maintained through the implementation of recommended safeguards and management measures. The proposed ancillary facility at 148 Old Kurrajong Road is located on a busy roadway at the last intersection before Richmond Bridge. During construction there would be minor impacts on visual amenity from the stockpiles, machinery, fenced compound area etc. These impacts would be temporary as the area would be returned to its current condition at the completion of works.	The increased night work schedule would lead to more light spill occurring over the course of a week. The increased schedule however is not expected to cause more light spill per night than what was characterised in the Project REF. The safeguards implemented in the determined project would still be considered sufficient in addressing potential impacts regarding visual impacts and landscape character.

<table>
<tr><th>Environmental factor</th><th>Existing environment</th><th>Potential impacts</th></tr>
<tr><td></td><td>Permanent changes to the landscape through increased tree removal were proposed as part of Addendum 3. These changes would generally increase the exposure of residents and pedestrians to the road way. Impacts from tree removal would be mitigated by placement of roadside plantings in line with the project landscape plan at the end of work.</td><td></td></tr>
<tr><td>Contaminated land</td><td>A desktop contamination assessment of the study area was conducted for the Richmond Bridge Approaches-Intersection upgrade at March Street and Bosworth Street). The assessment determined that:
The nearest registered contaminated site on the NSW EPA database is located over six kilometres north-west
A search of registered groundwater wells located within one kilometer (approximate) of the proposal identified four bores it is anticipated that the likely depth of groundwater within the study area would be encountered at about eight metres below the ground surface
Three Environmental Protection Licences (EPLs) were confirmed within a 5 kilometre radius of the proposal these include two sewage treatment plants and one water filtration plant
<table><tr><th>Number</th><th>Name</th><th>Location</th><th>Type</th><th>Status</th><th>Issued date</th></tr><tr><td>190</td><td>SYDNEY WATER CORPORATION</td><td>CNR BELLS LINE OF ROAD & CROOKED LANE, NORTH RICHMOND, NSW 2754</td><td>POEO licence</td><td>Issued</td><td>25-May-00</td></tr><tr><td>1726</td><td>SYDNEY WATER CORPORATION</td><td>BLACKTOWN ROAD, RICHMOND, NSW 2753</td><td>POEO licence</td><td>Issued</td><td>25-May-00</td></tr><tr><td>5425</td><td>SYDNEY WATER CORPORATION</td><td>GROSE VALE ROAD, NORTH RICHMOND, NSW 2754</td><td>POEO licence</td><td>Issued</td><td>19-Jun-00</td></tr></table>
A review of the Hawkesbury City Council flood level maps indicates that the proposal site is located within the probable maximum flood level.</td><td>The proposed modification is not expected to alter the assessment of contaminated land and risk conducted for the Determined Project.

The safeguards and mitigation measures outlined in the Determined Project are considered sufficient to address the potential impacts arising from the proposed modification.</td></tr>
</table>

Environmental factor	Existing environment	Potential impacts
	The assessment also considered potential contamination sources, the following which would remain relevant for the proposed modification: • Exhaust particulates and hydrocarbons released from motor vehicles on March Street and Bosworth Street • Unlawfully dumped waste at proposal site • The low risk of acid sulfate soils. The conclusions drawn from the assessment were that most potential sources, and therefore the relative contamination risk, would be low.	
Socio-economic	An assessment of the potential socio-economic impacts was previously conducted for the Project. In summary, and with reference to the proposed modification: • No land acquisition or property adjustment is required • No public transport facilities or services are in direct proximity to the work site. • Changes in conditions for cyclists near to construction works, particularly where road shoulders and/or kerbside traffic lanes on the approach to the March Street and Bosworth Street intersection are temporarily closed or narrowed • Changed access for pedestrians near to construction activities, particularly where footpath realignments are required at March Street and Bosworth Street. This may impact on perceptions of safety for some pedestrians, including children, the elderly and people with mobility difficulties • Temporary changes to property access for residents and local businesses that have direct access onto March Street and Bosworth Street roads near to the proposed works. • Temporary loss of or restrictions to on-street parking within or near to the construction footprint which may require some people to walk further to access residential, commercial or community uses • The majority of properties near to the proposal have access to off-street parking, which would assist in minimising potential impacts on surrounding residential, commercial and community properties.	The proposed modification is not expected to result in socio-economic appreciably different from those characterised in the Determined Project. The proposed modification may result in temporary reductions in amenity around the intersection of March Street and Bosworth Street, but for the most part would: • Not impact on existing public transport routes or access to bus stops on Kurrajong Road • Not impact pedestrian or cyclist access along Old Kurrajong Road • Not impact on parking within the area during its establishment or operation • Not affect existing property access • Not require any major disruption of utilities. Some minor disruption of utilities may be required during connections, however, these would be managed by the utility provider and minimised wherever possible.

Environmental factor	Existing environment	Potential impacts
		As most of the impacts are temporary, the safeguards largely focus on appropriate communications with residents and businesses on the Project and ancillary activity. This approach is considered appropriate and relevant to address the proposed modification and together is considered sufficient to address the potential impacts to socio-economic aspects arising from the proposed modification.
Land use and property	An assessment of the land use and property impacts aligned with this proposed modification, and derived from studies in support of the *Richmond Bridge Approaches- March Street and Bosworth Street Intersection REF,* determined that: • The proposed modification is located within the Hawkesbury LGA with land zoned SP2(Infrastructure), R2 (Low Density Residential), B2 (Local Centre) under Hawkesbury LEP • Land uses in the area surrounding the proposed modification comprise existing road infrastructure (e.g. road pavement, drainage and guard rails), utility easements (comprising overhead electricity supplies, water mains and telecommunications infrastructure), residential and other privately-owned property and vacant land located within the existing road reserve • Amenity related impacts associated with the proposal are not considered to be of an extent, magnitude or duration that would have the potential to impact on the current use of nearby properties.	The proposed modification would not change any land use or cause any property impacts relating to the approved project. Therefore, the land use and property impacts are considered to be similar to those described and approved in the Determined Project and would be managed in accordance with the safeguards in Section 7.
Non-Aboriginal Heritage	The project REF identified seven registered heritage items within or immediately adjacent to the project, all of which were of local heritage significance on the Hawkesbury Local Environmental Plan 2012 (Hawkesbury LEP). The REF concluded that overall, the level of impact on non-Aboriginal heritage items would be relatively minor. Additional mitigation measures for managing heritage items were added to the project in Addendum 2. Despite this, risk to heritage items remains low and would be	The proposed modification is not expected to directly impact any item of heritage significance. The potential impacts to non-aboriginal heritage items from the modification are considered to be negligible compared to the already approved

Environmental factor	Existing environment	Potential impacts
	reduced to an acceptable level through the implementation of mitigation measures detailed in REF.	project components, therefore no further mitigation measures are proposed.
Biodiversity	The biodiversity assessment conducted for the project summarised the biodiversity values of existing environment adjoining the Project site. • A review of existing broad scale vegetation mapping identified six native vegetation communities within two kilometres of the study area, five of which are listed as a threatened ecological community under the then TSC Act and/or the EPBC Act • The proposal area consists of road side plantings of exotic and native trees, including Crepe Myrtle (*Lagerstroemia indica*), Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Milkflower Cotoneaster (*Cotoneaster coriaceus*), as well maintained gardens situated along existing footpaths and within residential properties • No native fauna habitat was identified at the project site in the form of nests, hollows or suitable habitat trees • Existing vegetation that would be affected by the proposal was all identified as planted natives, or exotic species • There were no major wildlife corridors located within the proposal area • Threatened flora species identified within the area were considered to have either a low potential to occur or are unlikely to occur in the proposal area due to the absence of these non-cryptic species and/or the absence of suitable habitat for these species • The majority of the fauna species identified within the area were considered unlikely to, or have low potential to occur within the proposal area (54 species); however, one species- the Grey headed Flying Fox (listed as vulnerable under the then TSC Act and EPBC Act) - is considered to have a moderate potential to occur based on the habitats present and their condition.	The impacts of the proposed modification are considered to be similar to those described in the determined Project. Therefore, no additional safeguards are proposed in addition to those found in Section 7.

Environmental factor	Existing environment	Potential impacts
Water Quality and Hydrology	An assessment of the potential impacts to water quality and hydrology was conducted for the *Richmond Bridge Approaches- Intersection upgrade at March Street and Bosworth Street, Richmond* and is summarised as follows: • Two surface waterways are located in the vicinity of the proposal area. These comprise Pughs Lagoon and the Hawkesbury River, which are located about 500 metres and 2.3 kilometres to the north-west of the proposal, respectively • The existing road drainage for this intersection consists of a conventional urban pit and pipe network that drains east and west from Bosworth Street (i.e. the western side drains towards Chapel Street) • The west-draining flows eventually discharge into Pughs Lagoon, approximately 500 metres north-west of Bosworth Street. The eastern side of the intersection drains east towards East Market Street before draining to the north east along East Market Street towards Bensons Lane Sporting Complex • The kerb inlet pit located on the corner of Bosworth Street and March Street north appears to have an offset sump and limited pipe cover with twin 225 diameter pipes draining towards March Street east • The proposal is located in the flood plain of the Hawkesbury River. A review of Hawkesbury City Council's (2011) Approximate Flood Extents of the Hawkesbury River indicates that the proposal is located outside of the flood extent for a 100 year Average Recurrence Interval (ARI) event. However, the area would be inundated during the Probable Maximum Flood (PMF) • Given the distance to natural waterways, and the topography.	The proposed modification is not expected to result in impacts to water quality and hydrology not already characterised in the Determined Project. Therefore, these impacts would be managed in accordance with safeguards outlined in the determined Project.
Air quality	An assessment of the potential impacts to air quality was conducted for the Project REF and is summarised as follows: • Ambient air quality within the proposal area is likely to be primarily affected by local air emission sources. These include exhaust emissions from vehicles using the existing road network, particulate emissions (dust) from wind erosion from exposed areas and agricultural activities occurring on nearby rural land	The proposed modification is not expected to result in additional impacts to air quality exceeding those characterised in the Determined Project. The safeguards and management measures outlined in the Determined Project are considered sufficient to address the potential impacts arising from the proposed modification.

Environmental factor	Existing environment	Potential impacts

	• No manufacturing or other emitting industry is located near to the proposed work. Therefore, air quality in the study area is likely to reflect the typically rural residential nature of the area
	• The nearest sensitive receivers are:
	  ○ Seven residential properties five metres from the proposed work
	  ○ Commercial premises between five and sixty metres from the proposed work
	  ○ The Uniting Care Hawkesbury Village located about fifty-five metres from the proposed work.
	• Primary sources of emissions of airborne particulate matter from the construction of the proposal would include.
	  ○ Wind erosion from unsealed surfaces and stockpiles
	  ○ The loading/unloading of construction vehicles along paved and unsealed haulage routes and other work areas
	  ○ Vehicle (exhaust) emissions.
	• The volume of dust generated during a typical work day is anticipated to be small and is not expected to result in a significant reduction in local air quality at the nearest sensitive receivers
	• The focus of air quality management is to control dust emissions and mitigate impacts to ensure the proposal does not result in exceedances of air quality criteria at sensitive receptors.	

Resource use and waste	An assessment of the waste and resource management aspects of the Project was conducted and is summarised as follows: • Various waste streams are likely to be generated by the project and the waste management hierarchy defined in the Waste Avoidance and Resource Recovery Act 2001 is considered relevant • The existing road network currently generates minimal waste • The proposed wok would generate various waste streams from the demolition of medians and existing road pavements and kerbside areas (i.e. grasses and topsoils)	The proposed modification is not expected to result in material differences to the waste and resources management impacts assessed in the Determined Project. The safeguards and mitigation measures outlined in the Determined Project are considered sufficient to address the potential impacts arising from the proposed modification.

Environmental factor	Existing environment	Potential impacts
	• Construction would also generate waste streams typical of road construction and general wastes and sewage from site compounds and offices • Wastes would be classified, managed, transported and disposed of in accordance with the Waste Classification Guidelines (DECCW 2008).	
Greenhouse gas emissions and climate change	The Project REF'S conducted an assessment of greenhouse gas emissions and climate change and determined that various types of greenhouse gas emissions would be produced including: • Carbon dioxide, methane and nitrous oxide generated from liquid fuel use in plant and vehicles (diesel, petrol) • Embedded emissions associated with the manufacture and delivery of construction materials • Methane generated from land filling any carbon-based waste. Given the nature of the proposal, it would not be possible to completely avoid the generation of greenhouse gas emissions during construction (due to the need to consume energy and resources). Overall, construction related greenhouse gas emissions associated with the proposal would be relatively minor comparable with similar road upgrade projects. Climate change risks are generally considered to be minor and would be readily manageable through the application of standard mitigation measures that have been adequately designed to respond to the potential occurrence of the increased frequency and severity of rainfall events.	The modification is not expected to result in a material increase in greenhouse gas emissions and/or increase in climate change risk not already assessed in the Determined Project. It is expected that the safeguards and mitigation measures outlined in the Determined Project are sufficient to address the potential impacts arising from the proposed modification.

6.2.2Safeguards and management measures

Additional safeguards and management measures identified as part of this modification are included in the table below and all safeguards and management measures are outlined in Table 7-2.

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and Vibration	Vehicle delivery times will be scheduled where feasible to ~~*the recommended construction hours*~~ to minimise noise impacts from heavy vehicle movements and deliveries. *Plant should not be delivered during the night-time period to Ancillary site 1.*	Construction Contractor	Construction	*Roads and Maritime Construction Noise and Vibration Guidelines Additional Safeguard*
Noise and Vibration	*No swearing or unnecessary shouting or loud stereos/radios on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Nosie and Vibration	*No dropping of materials from height, throwing of metal items and slamming of doors.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration	*Relating to use and sitting of plant-* • *The offset distance between noisy plant and adjacent sensitive receivers is to be maximised* • *Plant used intermittently to be throttled down or shut down* • *Noise-emitting plant to be directed away from sensitive receivers* • *Only have necessary equipment on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and Vibration	*Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines*
Noise and Vibration- respite periods	*Duration Respite in the form of working up to five nights a week should be employed in order to complete the project more quickly.*	*Project Manager Construction Contractor*	*Construction*	*Interim Construction Noise Guideline (ICNG) (DECC 2006) Construction Noise and Vibration Guideline (RMS 2016).*
Noise and Vibration	*All additional safeguards as outlined in the Construction Noise and Vibration Guideline should be considered for affected receivers*	*Project Manager Environment Manager*	*Pre-construction and Construction*	*Construction Noise and Vibration Guideline (RMS 2016).*
Noise and Vibration	*Prior to vibration intensive activities commencing within the vicinity of known heritage items, a vibration trial will be carried out to determine the safe working distances of the vibration intensive plant and equipment.*	*Construction Contractor*	*Pre- vibration intensive work*	*G36 Additional Safeguard*
Noise and Vibration	*Where safe working distances cannot be complied with, vibration monitoring will be carried out ensure vibration limits are not exceeded at heritage listed properties.*	*Construction Contractor*	*Construction*	*G36 Additional Safeguard*

6.3 Cumulative impacts

The proposed modification is not considered to increase any cumulative impacts additional to those identified for the approved project.

6.3.1 Potential impacts

The proposed modification is not expected to result in material increase in potential cumulative environmental impacts assessed in the project REF. The proposed modification is unlikely to result in an increase in cumulative impacts such that additional mitigation measures are necessary.

No significant vegetation or habitat will be impacted by the proposed modification despite the cumulative increase in vegetation loss. The noise and vibration impacts arising from the Project, including the proposed modification, will not exacerbate similar impacts from other projects occurring along the broader Kurrajong and March Street corridor. The safeguards and mitigation measures outlined in the Project REF are considered sufficient to address the potential cumulative impacts arising from the proposed modification.

7. Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposed modification. Should the proposed modification proceed, these management measures would be addressed if required during detailed design and incorporated into the Contractors Environmental Management Plan (CEMP) and applied during the construction and operation of the proposed modification.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the *Richmond Bridge and Approaches- Intersection upgrade at March Street and Bosworth Street* are summarised in Table 7-1. Additional safeguards and management measures identified in this addendum REF are included in bold and italicised font. The safeguards and management measures will be incorporated into the CEMP and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
General					
GEN1	General	All environmental safeguards must be incorporated within the following: • Detailed design stage • Contract specifications for the proposal • Contractor's Environmental Management Plan.	Project Manager	Pre-construction	G36
GEN2	General	A risk assessment must be carried out on the proposal with the Transport for NSW Regional Environmental Staff, prior to construction The recommendations of the risk assessment are to be implemented. A review of the risk assessment must be carried out after the initial audit or inspection to evaluate is the level of risk chosen for the project is appropriate. Any work resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project Manager and Regional Environmental Staff	Pre-construction After first audit	G36
GEN3	General	All businesses and residences likely to be affected by the proposed work must be notified at least five working days before the start of the proposed activities.	Project Manager	Pre-construction	G36

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN4	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required	G36
Noise and vibration					
NV1	Construction noise	A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the CEMP. This plan would include, but would not be limited to, the following: • A map indicating the locations of sensitive receivers including residential properties, and clear protocols for communicating with affected residents with regard to likely exceedances of construction noise limits, and the frequency and duration of these events • Procedures for prior notification of nearby residents in advance of high noise construction activities and work outside of standard hours • Procedures for notifying residents about the program of work, duration of works including high noise activities, noise management and mitigation methods, and complaints procedure • Management measures to minimise potential noise impacts from mobile, high noise construction activities such as concrete cutting • Mitigation measures to avoid noise and vibration impacts associated with truck movements during construction • A process for assessing the performance of the implemented mitigation measures, including a noise and vibration monitoring program for sensitive receivers	Construction Contractor	Construction	Project REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• A process for documenting and resolving issues and complaints • A process for updating the plan when activities affecting construction noise and vibration change • Identify in toolbox talks where noise and vibration management is required • Implement EPA Interim Construction Noise Guidelines (DECCW 2009).			
NV2	Construction noise	Any out of hours work would comply with G36 community notification requirements specified within the Roads and Maritime Construction Noise and Vibration Guidelines. Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to.	Construction Contractor	Construction	Project REF
NV3	Construction noise	If a complaint relating to vibration is received, attended monitoring would be carried out to assess whether criteria are being met. If monitoring identifies that criteria are being exceeded, then all work is to be scaled back until an acceptable vibration level can be reached in consultation with the affected resident.	Construction Contractor	Construction	G36 Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*
NV4	Construction vibration	Pre-condition surveys are to be conducted at heritage listed properties situated in close proximity to work zones, specifically 190 March Street (Item I72), 35 Bosworth Street (Item I4), 162 March Street (Item I483), 160 March Street (Item I482), 158 March Street (Item I69), and 155 March Street (Item I71).	Construction Contractor	Pre- construction	G36 Project REF
NV5	Construction vibration	Where possible, carry out the tree removal during standard work hours (7am-6pm) or alternatively Out of Hours Work Period 1 (6pm-10pm).	Construction Contractor	Construction	Addendum REF 3

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV6	*Construction vibration*	*Prior to vibration intensive activities commencing within the vicinity of known heritage items, a vibration trial will be carried out to determine the safe working distances of the vibration intensive plant and equipment.*	*Construction Contractor*	*Pre- vibration intensive work*	*G36 Additional Safeguard*
NV7	*Construction vibration*	*Where safe working distances cannot be complied with, vibration monitoring will be carried out ensure vibration limits are not exceeded at heritage listed properties.*	*Construction Contractor*	*Construction*	*G36 Additional Safeguard*
NV8	Noise and Vibration	Locate compressors, generators, pumps and any other fixed plant as far from residences as possible and behind site structures.	Construction Contractor	Construction	Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*
NV9	Noise and Vibration	Alternatives to reversing alarms will be considered for site equipment subject to Work Health Safety compliance requirements and risk assessments.	Construction Contractor	Construction	Project REF *Roads and Maritime Construction Noise and Vibration Guidelines*
NV10	Noise and Vibration	Vehicle delivery times will be scheduled where feasible to ~~*the recommended construction hours*~~ to minimise noise impacts from heavy vehicle movements and deliveries. *Plant should not be delivered during the night time period to Ancillary site 1.*	Construction Contractor	Construction	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*
~~NV7~~	~~Noise and Vibration~~	~~Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month.~~	~~Construction Contractor~~	~~Construction~~	~~Additional safeguard~~
~~NV8~~	~~Noise and Vibration~~	~~Night time construction noise in out of hours period 2 (Mon-Fri 10pm-7am, Sat 10pm-8am, Sun/Pub Hol 6pm-7am) shall be limited to two consecutive nights except for where there~~	~~Construction Contractor~~	~~Construction~~	~~Additional safeguard~~

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		~~is a Duration Respite. For night work these periods of work should be separated by not less than one week and 6 nights per month. Where possible, high noise generating works shall be completed before 11pm.~~			
NV11	*Noise and Vibration*	*No swearing or unnecessary shouting or loud stereos/radios on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*
NV12	*Nosie and Vibration*	*No dropping of materials from height, throwing of metal items and slamming of doors.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*
NV13	*Noise and Vibration*	*Relating to use and sitting of plant-* • *The offset distance between noisy plant and adjacent sensitive receivers is to be maximised* • *Plant used intermittently to be throttled down or shut down* • *Noise-emitting plant to be directed away from sensitive receivers* • *Only have necessary equipment on site.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*
NV14	*Noise and Vibration*	*Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained.*	*Construction Contractor*	*Construction*	*Roads and Maritime Construction Noise and Vibration Guidelines* *Additional Safeguard*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV15	*Noise and Vibration- respite periods*	*Duration Respite in the form of working up to five nights a week should be employed in order to complete the project more quickly.*	*Project Manager Construction Contractor*	*Construction*	*Interim Construction Noise Guideline (ICNG) (DECC 2006) Construction Noise and Vibration Guideline (RMS 2016).* *Additional Safeguard*
NV16	*Noise and Vibration*	*All additional safeguards as outlined in the Construction Noise and Vibration Guideline should be considered for affected receivers.*	*Project Manager Environment Manager Community and Stakeholder Engagement Manager*	*Pre-construction and Construction*	*Construction Noise and Vibration Guideline (RMS 2016).* *Additional Safeguard*
Traffic, transport and access					
TTA1	Construction traffic management	A detailed traffic management plan would be prepared in accordance with Traffic Control at Work Sites (Roads and Traffic Authority 2010) and QA Specification G10 Control of Traffic (Roads and Traffic Authority 2005) to provide a comprehensive and objective approach to minimize any potential impacts on road network operations during construction. The traffic management plan would include measures to minimise heavy vehicle usage on local roads. Where practicable, deliveries of plant and materials would be carried out outside of peak traffic periods.	Construction Contractor	Pre-construction and construction	G10 Project REF
TTA2	Construction traffic management	The Construction Contractor would review the proposed timing of construction works at each of the intersection upgrade locations, with the objective of minimising the potential for cumulative traffic impacts.	Construction Contractor	Pre-construction and construction	Project REF

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TTA3	Construction traffic management	Consultation would be carried out with emergency services. Emergency vehicle access would be maintained at all times for the duration of construction.	Construction Contractor	Pre-construction and Construction	Project REF Best Practice
TTA4	Public transport	Access to bus stop locations would be maintained during construction wherever possible in consultation with bus operators (Busways).	Construction Contractor	Pre-construction and Construction	Project REF Best Practice
TTA5	Public transport	Consultation with Transport for NSW and Busways would be carried out prior to commencement of any works that would impact on existing bus stop locations. This consultation would include selection of temporary and permanent bus stop locations (where required). Updates on the location of temporary and permanent bus stops would be provided to the community during the construction period to ensure disruption is minimized.	Construction Contractor	Pre-construction and Construction	Project REF Best Practice
TTA6	Road user delay	The community would be kept informed about upcoming road construction activities. Notifications would include advertisements in the local media and prominently placing advisory notices and/or variable message signs.	Construction Contractor	Construction	Project REF Best Practice
TTA7	Pedestrian access	Safe pedestrian access around the worksite would be provided by the construction contractor (in consultation with Transport for NSW and Hawkesbury City Council) and capture within the traffic management plan.	Construction Contractor	Pre-construction and Construction	Project REF Best Practice
TTA8	Pedestrians and cyclists	Signage outlining pedestrian and cyclist diversion routes would be displayed during construction (where required).	Construction Contractor	Construction	Project REF Best Practice
TTA9	Property access	Access to affected residential properties and businesses would be maintained during construction and temporary property access would be provided to residences and businesses where required. The management of property access would be considered by the construction contractor and detailed as part of the final staging plan for the proposal.	Construction Contractor	Pre-construction and Construction	Project REF Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TTA10	On-street parking	The parking of light construction vehicles (eg staff vehicles) would be restricted to designated areas within the proposed construction compounds, wherever possible to minimise the proposal's impact on the existing parking supply within the study area.	Construction Contractor	Construction	Project REF Best Practice
Aboriginal Heritage					
AH1	Discovery/ disturbance of previously unrecorded Aboriginal sites	In the event of an unexpected find of Aboriginal cultural heritage, work will cease in the affected area and the Standard Management Procedure – Unexpected Archaeological Finds (Roads and Maritime 2012) will be implemented. This would include stopping all work in the vicinity of the find and contacting Transport for NSW Aboriginal Cultural Heritage Advisor or the relevant Transport for NSW Officer immediately to identify the appropriate course of action. Work would not recommence until receipt of written approval from Transport for NSW.	Construction Contractor	Construction	G36 *Standard Management Procedure – Unexpected Archaeological Finds*
Landscape character and visual impact					
LCVI1	Visual amenity impact – vegetation removal	Existing roadside trees should be retained where possible to minimise the potential landscape character and visual impact of the works. Where roadside trees cannot be retained, re-planting is to be carried out in accordance with the proposed Landscape Plan.	Construction Contractor	Construction	Project REF
LCVI2	Visual amenity impact –vegetation removal	Tree planting is to be carried out where feasible outside of the clear zone. Frangible screen planting within the clear zone will assist to reduce the impact of the works on the existing landscape character.	Construction Contractor	Construction	Project REF
LCVI3	Visual impacts of construction activities	The work site will be left in a tidy manner at the end of each work day.	Construction Contractor	Construction	Project REF Best Practice
LCVI4	Visual impacts of construction activities	Where appropriate, fencing with material attached (eg shade cloth) would be provided around the construction compound	Construction Contractor	Construction	Project REF Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		to screen views of the construction compounds from adjoining properties.			
LCVI5	Visual impacts of construction activities	Where required, lighting for night-time work would comply with relevant Australian Standards, including AS4282-1997 (*Control of the obtrusive effects of outdoor lighting*).	Construction Contractor	Construction	Project REF Best Practice
Topography, geology and soils					
S1	Soil and Water Quality	An Erosion and Sediment Control Plan would be prepared and incorporated into the CEMP. The plan would be prepared in accordance with Landcom's (2004) *Managing Urban Stormwater: Soils and Construction* and would include, but not be limited to: • Identify the site catchment, high risk areas and sensitive areas (eg ground disturbance areas) • Confirm the size of the above areas and catchments • Proposed staging plans for the proposal to ensure appropriate erosion and sediment controls measures are possible • The likely run-off from each worksite and direction of on and off site water flow • Diversion of clean water around the work site. • The locations and sizing of sediment sumps and associated drainage • A mapped plan identifying the above.	Construction Contractor	Pre-construction	G36 Project REF Best Practice *Managing Urban Stormwater: Soils and Construction (Landcom 2004)*
S2	Soil and Water Quality	The Erosion and Sediment Management Plan and the Acid Sulfate Soil Management Plan, will be sent to the Transport for NSW Environmental Manager for review and verification, prior to the commencement of any construction.	Construction Contractor	Pre-Construction	G38
Contaminated land					

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CL1	Potential exposure of contamination to site workers, public and environmental receptors	In the event of an unexpected find of contaminated materials, work would cease in the vicinity of the find and the unexpected contamination find procedure followed.	Construction Contractor	Construction	G36 Best Practice
Socio-economic					
SE1	Community consultation	A Communication Engagement Plan (CEP) will be prepared and will include (as a minimum): • Requirements to provide details and timing of proposed activities to affected residents • Contact name and number for complaints • Procedure to notify nearby land users for changed conditions during the construction period such as traffic, pedestrian and driveway access. The communications plan will be prepared in accordance with G36 requirements and Roads and Maritime Community Engagement and Communications Manual (Roads and Maritime 2012).	Construction Contractor	Pre-construction	G36 Project REF Best Practice
SE2	Socioeconomic	The times and duration of any disruptions to vehicular movements accessing the KFC drive thru lane would be negotiated between Transport for NSW and KFC prior to sign installation.	Transport for NSW	Construction	Safeguard 30A Addendum REF 1-KFC sign
SE3	Property access	During construction, access to properties within the proposal area will be maintained. Temporary property access will be provided to residences and businesses where required. Consultation will be undertaken with the Best Western Colonial Motel and KFC Richmond to ensure access is maintained for pedestrians and vehicles at these sites.	Construction Contractor	Construction	Project REF Best Practice
SE4	Emergency vehicle access	Access will be maintained for emergency vehicles near construction areas. Transport for NSW will consult with	Construction Contractor	Construction	Project REF Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		emergency services throughout construction to ensure that potential impacts are identified and appropriately managed.			
Land use and property					
LUP1	Direct land use and property impacts	Land directly affected during the establishment and operation of the construction compounds would be restored to its pre-construction condition.	Construction Contractor	Construction	Project REF Best Practice
LUP2	Property acquisition	All land acquisitions would be undertaken in accordance with the provisions of the *Land Acquisition (Just Terms) Compensation Act 1991*.	Transport for NSW	Pre-construction	Project REF Best Practice
LUP3	Leasing of private land	Landowner consent would be sought before the establishment of the construction compounds or any other ancillary facilities on private property. The construction compounds would not be established until a signed lease agreement has been received from the relevant Landowner. Transport for NSW would be consulted before contacting any landowners about the temporary leasing of their land.	Construction Contractor	Pre-construction	Project REF Best Practice
LUP4	Property Impacts	The contractor will provide the following to the land owner at 168 March Street: i. evidence of structural integrity to the property owner at 168 March Street, in the form of a certificate provided by a structural engineer stating that the new garage is structurally sound and compliant with the Building Code. ii. A deed of letter outlining that the garage was a lawful development assessed under Part 5 of the EP&A Act. This document should include a property adjustment plan.	Construction Contractor	Construction	Addendum REF 3 – additional safeguard.

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity					
FF1	Clearing limits / Habitat trees	Clearing limits would be marked out by a surveyor prior to the commencement of works and would be clearly demarcated.	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity Guidelines*
FF2	Clearing limits / Habitat trees	All works are to comply with Roads and Maritime *Biodiversity Guidelines – Protecting and managing biodiversity on RTA projects*.	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity Guidelines*
FF3	Noxious weeds	Develop and implement a weed management plan including specific measures in accordance with the regulations set out under the *Biosecurity Act 2015.*	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity Guidelines* *Biosecurity Act 2015*
FF4	Noxious weeds	A machinery hygiene procedure would be implemented to prevent spread of weeds.	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity Guidelines*
FF5	Noxious weeds	Weeds are to be kept separate from general green waste and appropriately disposed of.	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity Guidelines*\
FF6	General	Locate temporary infrastructure (plant sites and offices etc.) in cleared areas away from vegetation, outside of the dripline of trees. Erect bunting around the dripline of trees to prevent stockpiling in tree protection zones.	Construction Contractor	Construction	G36 Project REF Best Practice *Biodiversity*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
					Guidelines
Water quality and hydrology					
WQ1	Water quality management	Soil and water management measures would be incorporated in the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 before the start of construction. These measures will address the: • Roads and Maritime Code of Practice for Water Management (1999), the Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "The Blue Book" (Landcom, 2004) and Volume 2 (DECC, 2008) • Roads and Maritime Technical Guideline: Temporary Stormwater Drainage for Road Construction, 2011 • Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering, 2011 • Erosion and Sediment Management Procedures (P143P), Nov 2008.	Construction Contractor	Pre-construction	G36 Project REF Best Practice
WQ2	Water quality management	Before the start of work, an Erosion and Sediment Control Plan (ESCP) is to be prepared in accordance with the requirements of the Blue Book and reviewed by the Transport for NSW Environment Officer. The ESCP is also to address the following as a minimum: • A procedure to routinely monitor the BOM weather forecast and identification of additional controls to be implemented ahead of rain • A procedure for routine inspection and maintenance of erosion and sediment controls • Nominated concrete washout areas away from watercourses and drainage	Construction Contractor	Construction Contractor	G36 Project REF Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Nominated spill kit locations • Progressive stabilisation plan • Stockpiles are to be restricted to the identified construction compounds, and managed in accordance with Roads and Maritime Stockpile Site Management Guideline, RMS Environmental Protection (Management System) QA Specification G36 and RMS Vegetation QA Specification R178. • Any dewatering required would be in accordance with Roads and Maritime Environmental Management of Construction Site Dewatering 2011 • Controls are to be implemented at exit points to minimise tracking soil and particulates onto pavement surfaces • Any material transported onto pavements would be swept and removed at the end of each working shift and before rainfall.			
Air quality					
AQ1	Dust and air quality management	Dust emissions during construction of the proposal would be minimised through the implementation of standard mitigation measures, which would include (but would not be limited to) the following: • Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust • Work (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely • Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation • Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance	Construction Contractor	Construction	G36 Project REF Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		with the Roads and Maritime Stockpile Site Management Guideline (2011) • Communications material such as the project website and community notification would include a contact person and phone number to enable complaints to be received and responded to • The Erosion and Sediment Control Plan would be reviewed for adequacy in response to any dust complaints.			
Non-Aboriginal heritage					
NAH1	Potential impact on listed heritage items	The works footprint is to remain within detailed design footprint, and is to avoid any direct impact on known listed heritage items except where the house at 162 March Street is used for the purpose of an office.	Construction Contractor	Construction	G36 Project REF Best Practice Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds procedure
NAH2	Unexpected archaeological remains	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds procedure must be followed. Transport for NSW Senior Regional Environmental Officer must be contacted immediately.	Construction Contractor	Construction	Roads and Maritime Standard Management Procedure: Unexpected Archaeological Finds procedure
NAH3	Inductions	Environmental awareness is to include responsibilities under heritage legislation and the contractors CEMP. Training is to include details about the heightened risk of finding unexpected elements of rail infrastructure when excavating throughout the Project.	Construction Contractor	Pre-construction	G36 Project REF Addendum REF 2 Best Practice

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NAH4	Potential impact on 162 March Street	The house at 162 March Street must only be utilised for office use. No alterations are to be made to any part of the structure or fittings (internal or external) and all staff that will access the office must be trained in the appropriate use of the house.	Construction Contractor	Construction	Addendum REF 2 Best Practice
Resource use and waste					
W1	Resource use and waste	The following resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • Disposal is carried out as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001)*. All waste would be disposed of in accordance with the EPA Waste Classification Guidelines (2014) at an appropriately licensed waste facility. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day. Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.	Construction Contractor	Construction	G36 *Waste Classification Guidelines* (EPA, 2014)
W2	Resource use and waste	Prior to demolition, a hazardous materials survey must be carried out to determine the presence of hazardous materials in the house at 164 March Street *and within the garage at 168 March Street*.	Construction Contractor	Pre-construction, construction	Addendum REF 2 and 3 Best Practice
Greenhouse gas emissions and climate change					

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GCC1	Construction greenhouse gas emissions	• Plant and equipment would be switched off when not in use. • Vehicles, plant and construction equipment would be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency. • Materials would be delivered with full loads and would come from local suppliers, where possible. • The energy efficiency and related carbon emissions would be considered in the selection of vehicle and plant equipment.	Construction Contractor	Construction	G36 Best Practice
Cumulative environmental impacts					
CEI1	Cumulative impacts from concurrent developments	The CEMP would be updated as required to incorporate potential cumulative impacts from surrounding development activities as they become known. This would include a process to review and update mitigation measures as new work begins or if complaints are received.	Construction Contractor	Pre-construction	Best Practice

7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the *Richmond Bridge and Approaches- March Street and Bosworth Street Intersection Upgrade* and when they need to be obtained are listed in Table 7-2. Additional or changed licenses and approval requirements identified in this addendum REF are indicated by underlined and/or struck out font.

Table 7-2: Summary of licensing and approval required

Instrument	Requirement	Timing
Road Occupancy Licence	Prior to changing traffic conditions, a Road Occupancy Licence (ROL) must be obtained from the Traffic Management Centre (TMC) or local council.	Prior to changing traffic conditions.

8. Conclusion

8.1 Justification

Transport for NSW are undertaking construction to upgrade the intersection of March Street and Bosworth St in Richmond. The proposed modification is needed to minimise the overall impact of the night works on the community by decreasing the length of time the community would be affected. The modification would provide duration respite (i.e. condensing the program rather than carrying out the work for two nights a week for a longer period of time) from noisy night work associated with certain aspects of the project such as utility realignment and intersection upgrades. These types of activities are required to take place during the evening and night-time period to minimise traffic disruptions to the road corridor and to comply with Road Occupancy Licence conditions.

8.2 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The determined Project, including the proposed modification, together with the impact mitigation and management measures detailed in the Project REF and the three Addendum REF's allow for the proper management, development and conservation of natural and artificial resources. The main object of the Project is to improve the safety and transport efficiency of the intersection. Where possible throughout the design of the Project, management and conservation of natural resources has been incorporated. This has included optimising the road design to reduce the clearing footprint as far as possible. The works are wholly within the existing road reserve with impacts on existing rural residential land uses restricted to construction phase only. The incorporation of the proposed modification into the broader Project plan has not altered the approach to achieving this objective.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The approach to ecologically sustainable development is considered in Section 8.2.1 to 8.2.4 below.
1.3(c) To promote the orderly and economic use and development of land.	The Project would assist in the coordination of the orderly economic use and development of land for the region and along this important transition corridor, both for business and tourism. The incorporation of the proposed modification into the broader Project plan has not altered the approach to achieving this objective.

Object	Comment
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The Project has been designed to minimise impacts on the environment, including threatened species, populations and ecological communities and their habitats. Additional measures would be developed to manage and offset impacts during construction. The incorporation of the proposed modification into the broader Project plan will not alter the approach to meeting this objective.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Potential vibration impacts to heritage buildings will be managed via the implementation of safeguards addressed in Section 6.1.
1.3(g) To promote good design and amenity of the built environment.	Not relevant to the project.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Potential vibration impacts to buildings and residents will be managed via the implementation of safeguards addressed in Section 6.1.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	The development process for the intersection upgrade at March Street and Bosworth Street, Richmond and the Project has involved consultation with relevant government agencies, non-government agencies, community members and stakeholders. Consultation specific to the proposed modification has been conducted and will continue during the construction phase.

8.2.1 The precautionary principle

The precautionary principle deals 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 detailed assessment of potential environmental impacts has sought to minimise impacts of the proposal on the environment. Where information has been lacking, a conservative approach has been adopted for the assessment. Safeguards would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of a lack of scientific certainty.

8.2.2 Intergenerational equity

Intergenerational equity provides that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The modification would expedite the completion of the project which would provide improved road infrastructure for future generations. Should the modification not proceed, longer term impacts may result. The principle of intergenerational equity however should not be compromised.

The Project would benefit future generations by ensuring that road safety is improved, with this being a positive benefit for all road users.

8.2.3 Conservation of biological diversity and ecological integrity

The conservation of biological diversity and ecological integrity provides 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.

An assessment of the existing local environment has been carried out to identify and manage any potential impact of the Project on local biodiversity. The potential impacts of the Project on biodiversity would be limited to the construction phase and would involve the removal of planted native and exotic vegetation from the area surrounding the proposal.

The proposed modification does not involve the removal of any habitats or vegetation. The modification would not significantly fragment or isolate any existing large patches of vegetation and would not compromise biological diversity or ecological integrity.

8.2.4 Improved valuation, pricing and incentive mechanisms

Improved valuation, pricing and incentive mechanisms provide that cost to the environment should be factored into the economic costs of a proposal. This Addendum REF has examined the environmental consequences of the modification and identified additional mitigation measures for areas which have the potential to experience adverse impacts.

Requirements imposed and terms of implementation of these mitigation measures would result in an economic cost to Transport for NSW. The implementation of mitigation measures would increase both capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

8.3 Conclusion

This addendum REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration where relevant, of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the project objectives, but would still result in some construction noise

and vibration impacts. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would allow an expedited program that would include work up to five nights a week as well as work during standard construction hours. This would decrease the length of the Project and associated impact by up to eight (8) months. On balance the proposed modification is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposed modification would not result in a change to the findings of the project REF, Addendum 1- Kentucky Fried Chicken (KFC) sign removal and replacement , Addendum 2- Ancillary facilities or Addendum 3- Vegetation and tree removal and property adjustments, and would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposed modification is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposed modification would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Government Department of the Agriculture, Water and the Environment is not required.

9. Certification

This addendum review of environmental factors provides a true and fair review of the proposed modification in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed modification.

Prepared by:

Aidann Stathis

Graduate Environmental Scientist

Hutchison Weller Pty Ltd

Date: 18 May 2020

Reviewed By:

Cameron Weller

Senior Environmental Scientist

Hutchison Weller Pty Ltd

Date: 20 May 2020

I have examined this addendum review of environmental factors and accept it on behalf of Transport for NSW.

Georgia Barnes

Contract Relationship Manager

Sydney Maintenance West Zone Transport for NSW – Sydney Region

Date: 26 May 2020

Terms and acronyms used in this addendum REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	*Biodiversity Conservation Act 2016* (NSW).
CEMP	Construction / Contractor's environmental management plan
EIA	Environmental impact assessment
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
NES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
Roads and Maritime	NSW Roads and Maritime was dissolved by the Transport Administration Amendment Bill in August 2019, all function are now managed by Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP 14	State Environmental Planning Policy No.14 – Coastal Wetlands
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.

Appendix A

Consideration of clause 228(2) factors and matters of National Environmental Significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* (1995/1996) guideline and the *Roads and Related Facilities EIS Guideline* (DUAP, 1996) as detailed in the addendum REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposed modification on the natural and built environment.

Factor	Impact
a. Any environmental impact on a community? The proposed modification will cause medium term noise impacts on the local community. However, the potential impacts would be minimised via the implementation of the safeguards detailed in the Project REF and this addendum REF, CEMP and CNVMP.	Medium term negative
b. Any transformation of a locality? The proposed modification would not transform the locality. The site would be remediated upon completion of the works.	Nil
c. Any environmental impact on the ecosystems of the locality? The proposed modification is not anticipated to have impacts on the ecosystem of the locality. Any potential impacts would be minimised via the implementation of the safeguards detailed in the Project REF and this addendum REF.	Nil
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposed modification would not reduce the aesthetic, recreational, scientific or other environmental quality of the locality.	Nil
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposed modification would not effect a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.	Nil
f. Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)? The proposed modification would not impact on the habitat of any protected fauna.	Nil
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposed modification would not endanger and species of animal, plant or other life form, whether living on land, in water or in the air.	Nil
h. Any long-term effects on the environment? No long-term negative effects on the environment are expected as a result of the proposed modification.	Nil
i. Any degradation of the quality of the environment? The proposed modification will have no impact on the degradation of the quality of the environment	Nil
j. Any risk to the safety of the environment?	Nil

Factor	Impact
No risk to the safety of the environment is expected because of the proposed modification.	
k. Any reduction in the range of beneficial uses of the environment? There would be no reduction in the range of beneficial uses of the environment arising from the proposed modification.	Nil
l. Any pollution of the environment? The proposed modification would potentially cause noise pollution however, these impacts would be minimised with the implementation of the safeguards provided in the Project REF and this addendum REF, CEMP and CNVMP.	Medium term negative
m. Any environmental problems associated with the disposal of waste? The proposed modification would not generate additional waste. It is not anticipated that there would be any environmental problems associated with the disposal of waste.	Negligible
n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposed modification would not significantly increase demands on resources, which are in, or likely to become in short supply.	Nil
o. Any cumulative environmental effect with other existing or likely future activities? There are no known existing or likely future activities that would result in cumulative effects.	Nil
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposed modification would not impact on coastal processes and coastal hazards.	Nil

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of Water, Agriculture and the Environment.

Under the EPBC Act strategic assessment approval a referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this addendum REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a. Any impact on a World Heritage property?	Nil
b. Any impact on a National Heritage place?	Nil
c. Any impact on a wetland of international importance?	Nil
d. Any impact on a listed threatened species or communities?	Nil
e. Any impacts on listed migratory species?	Nil
f. Any impact on a Commonwealth marine area?	Nil
g. Does the proposed modification involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

Appendix B

Statutory consultation checklists

Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Hawkesbury City Council	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	Hawkesbury City Council	ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Hawkesbury City Council	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes / No / NA	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	N/A	N/A	ISEPP cl. 15A

Note: See interactive map here: ***https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management***. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	Hawkesbury City Council	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	Hawkesbury City Council	ISEPP cl.13(1)(b)

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	ISEPP clause
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	Hawkesbury City Council	ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	Hawkesbury City Council	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No	Hawkesbury City Council	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	Hawkesbury City Council	ISEPP cl.13(1)(f)

Local heritage items

Issue	**Potential impact**	**Yes / No**	**If 'yes' consult with the relevant local council(s)**	**ISEPP clause**
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than *minor* or *inconsequential*?	No	Hawkesbury City Council	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No	Hawkesbury City Council	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government.

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	DPIE	ISEPP cl.16(2)(a)
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	DPIE	ISEPP cl. 16(2)(b)
Aquatic reserves and marine parks	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Industry	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	Sydney Harbour Foreshore Authority	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	ISEPP cl. 16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Growth Centres SEPP

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP clause
Clearing native vegetation	Do the works involve clearing native vegetation (as defined in the *Local Land Services Act 2013)* on land that is not ***subject land*** (as defined in cl 17 of schedule 7 of the *Threatened Species Conservation Act 1995*)?	No	Department of Planning, Industry and Environment	SEPP 18A

Appendix C

Community Consultation

Australian Government
BUILDING OUR FUTURE

NSW GOVERNMENT

February 2020

Have your say - night work on the March and Bosworth Streets intersection upgrade, Richmond

The Australian and NSW governments are improving traffic flow and reducing congestion on the March Street and Bosworth Streets intersection.

Transport for NSW is inviting your feedback on a proposed night work schedule that would allow us to work up to **five nights** per week at certain times of the year. This work schedule would allow us to complete the work as quickly as possible, minimising the length of the disruption to road users and the local community.

Our work aims to:

- reduce congestion and improve traffic flow through the intersection and surrounding streets
- improve safety for motorists, cyclists and pedestrians
- improve access for freight and other heavy vehicles.

Location of work on March and Bosworth Streets, Richmond

Our proposed work schedule

Currently we are carrying out as much work during the day as possible. However, due to high traffic volumes in this area, we also need to carry out work at night. We propose working up to **five nights** a week in two to three week blocks intermittently. Our work hours would be between **8pm** and **5am** from **Sunday** to **Friday**, excluding Saturdays and public holidays. We would complete noisier tasks such as saw-cutting concrete, jack-hammering and breaking up concrete by **midnight**.

We would start this accelerated night work program from **March 2020** until **October 2020**. We would work **five nights** a week from **November 2020** until the project finishes in **April 2021**.

We would also notify the community before starting any extended periods of night work.

How can you give feedback?

We invite your feedback on our proposed work schedule by **Friday 21 February.** Please send your comments to our delivery partner DM Roads by:

Phone: 1800 332 660
Email: nsw_projects@dmroads.com.au
Post: DM Roads – March and Bosworth Street Intersection Upgrade
PO Box 6465
North Ryde NSW 2113

We will consider all feedback and continue to update you as the project progresses.

Contact

If you have any questions, please call DM Roads on 1800 332 660 or email nsw_projects@dmroads.com.au.

For more information on this project, visit rms.work/richmondimprovements.

Translating and Interpreting Service

If you need an interpreter, please call TIS National on **131 450** and ask them to call DM Roads on **1800 332 660**.

Arabic
إذا كنتم بحاجة إلى مترجم، الرجاء الاتصال بخدمة الترجمة الخطية والشفهية (TIS National) على الرقم **131 450** ، و الطلب منهم الاتصال بوكالتكم DM Roads على الرقم 1800 332 660

Cantonese
若你需要口譯員，請致電 **131 450** 聯絡翻譯和口譯服務署 (TIS National)，要求他們致電 1800 332 660 聯絡 DM Roads.

Mandarin
如果你需要口译员，请致电 **131 450** 联系翻译和口译服务署 (TIS National)，要求他们致电 1800 332 660 联系 DM Roads.

Greek
Αν χρειάζεστε διερμηνέα, παρακαλείστε να τηλεφωνήσετε στην Υπηρεσία Μετάφρασης και Διερμηνείας (Εθνική Υπηρεσία TIS) στο **131 450** και ζητήστε να τηλεφωνήσουν DM Roads στο 1800 332 660.

Russian
Если вам нужен переводчик, то позвоните в Службу письменного и устного перевода (TIS National) по номеру **131 450** и скажите переводчику, что вам нужно позвонить в DM Roads по номеру 1800 332 660.

Korean
통역사가 필요하시면 번역통역서비ᄉᆞ (TIS National) 에 **131 450** ᄃᆞ로 연락하여 이들에게 1800 332 660 번ᄒᆞ로 DM Roads 에 전화하도록 요청하십시오.

Vietnamese
Nếu cần thông ngôn viên, xin quý vị gọi cho Dịch Vụ Thông Phiên Dịch (TIS Toàn Quốc) qua số **131 450** và nhờ họ gọi cho DM Roads qua số 1800 332 660.

We'd like to talk to you

Monday 4 May

Transport for NSW is finalising its proposal to work up to five nights a week while we improve the intersection of March and Bosworth Streets, Richmond.

In February we advised that we want to work five nights a week for several three week blocks this year and then work five nights a week every week from November 2020 through to the end of the project, expected in April 2021.

We will reduce noise by informing residents before any extended periods of night work, using noise blankets wherever possible, use reversing quackers instead of beepers and only use machinery when necessary. Noisy activities like jack-hammering would be done by midnight.

It's important for us to engage with you safely about this project, and we want to take precautions to protect the health of you and your family at this time, so we'd like you to give us a call.

Please call Michael Robertson from our delivery partner DM Roads on 0457 544 464 **by Friday 8 May** so he can talk to you about what we're doing.

If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 332 660.

We'd like to talk to you

Monday 4 May

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It's important for us to engage with you safely about this project, and we want to take precautions to protect the health of you and your family at this time, so we'd like you to give us a call.

Please call Michael Robertson from our delivery partner DM Roads on 0457 544 464 **by Friday 8 May** so he can talk to you about what we're doing.

If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 332 660.

We'd like to talk to you

Monday 4 May

Transport for NSW is finalising its proposal to work up to five nights a week while we improve the intersection of March and Bosworth Streets, Richmond.

In February we advised that we want to work five nights a week for several three week blocks this year and then work five nights a week every week from November 2020 through to the end of the project, expected in April 2021.

We will reduce noise by informing residents before any extended periods of night work, using noise blankets wherever possible, use reversing quackers instead of beepers and only use machinery when necessary. Noisy activities like jack-hammering would be done by midnight.

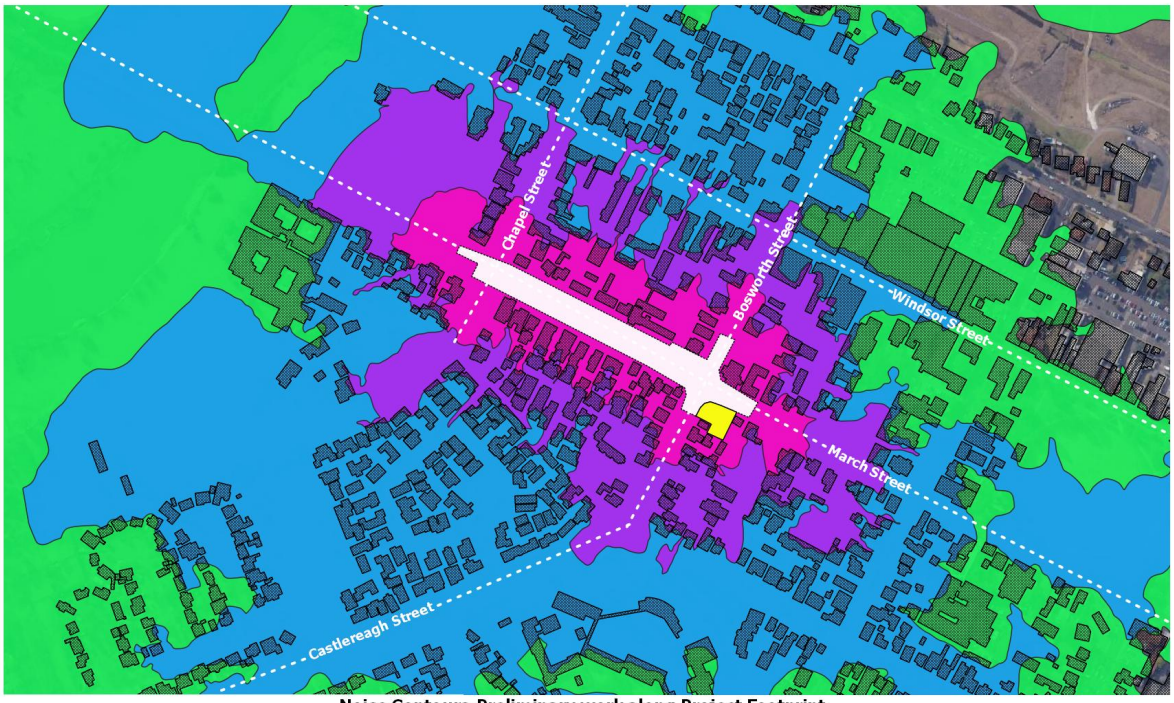
It's important for us to engage with you safely about this project, and we want to take precautions to protect the health of you and your family at this time, so we'd like you to give us a call.

Please call Michael Robertson from our delivery partner DM Roads on 0457 544 464 **by Friday 8 May** so he can talk to you about what we're doing.

If you need help understanding this information, please contact the Translating and Interpreting Service on 131 450 and ask them to call us on 1800 332 660.

Appendix D

Noise Assessment Results



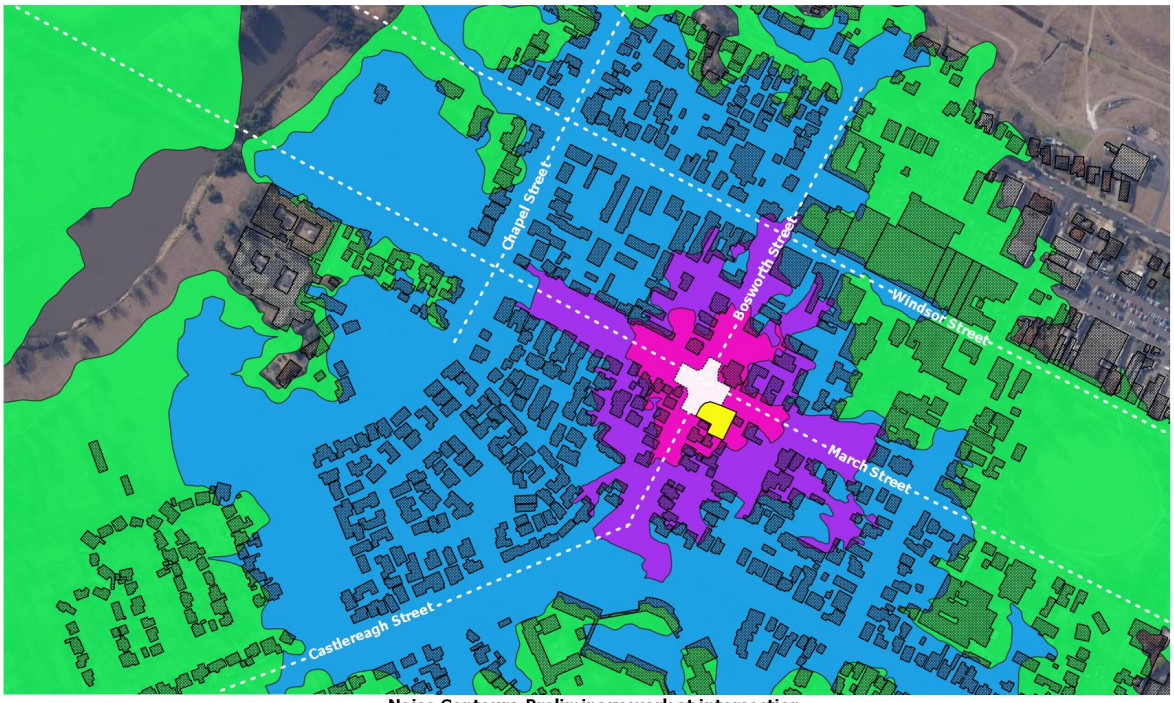
Noise Contours-Preliminary work along Project Footprint

Legend

Level Above NML
- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Project Footprint

0 100 200 m



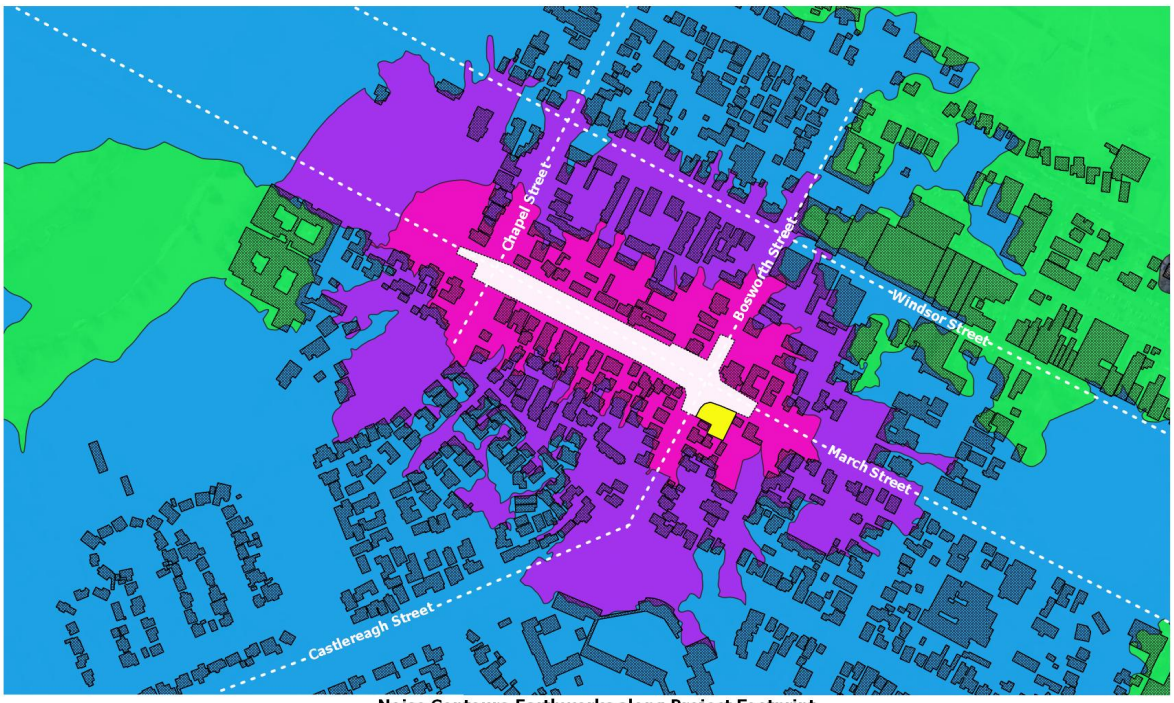
Noise Contours-Preliminary work at intersection

Legend

Level Above NML
- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Intersection

0 100 200 m



Noise Contours-Earthworks along Project Footprint

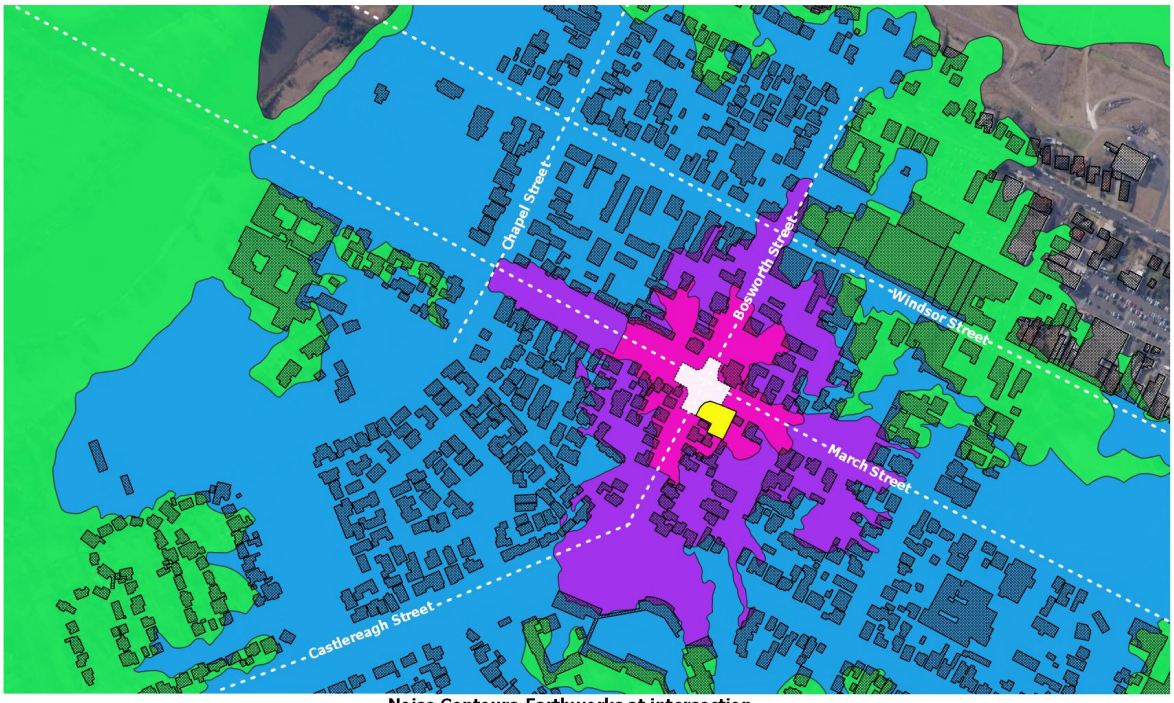
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Project Footprint

0 100 200 m



Noise Contours-Earthworks at intersection

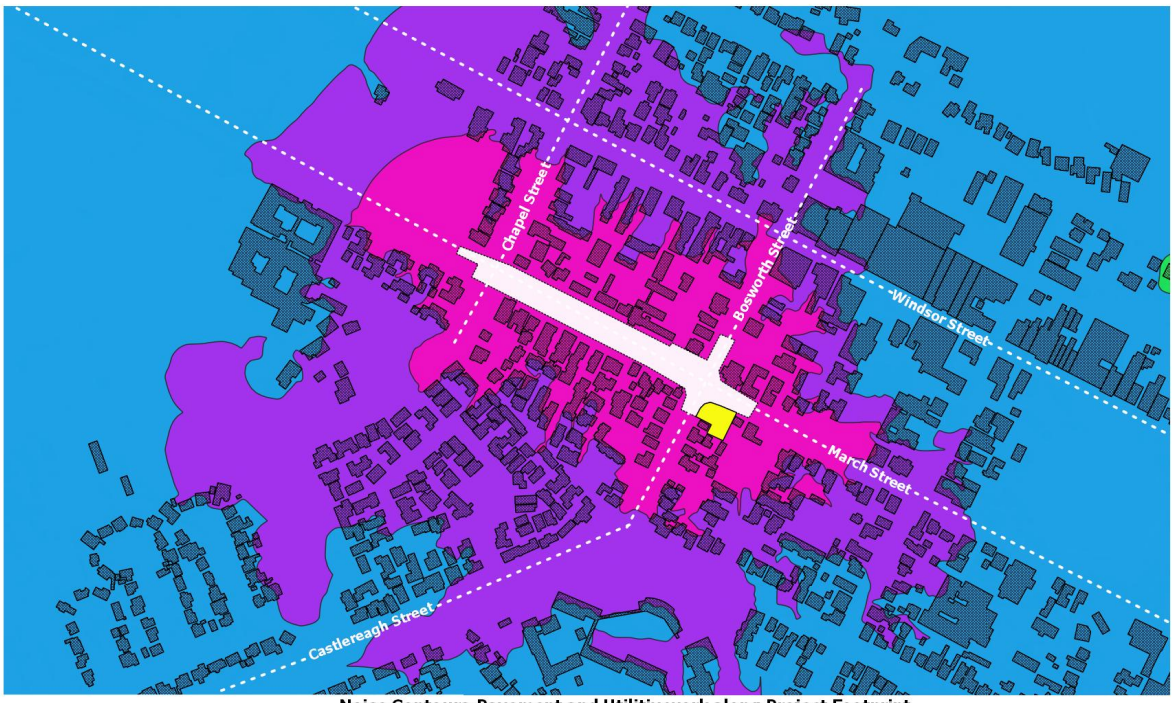
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Intersection

0 100 200 m



Noise Contours-Pavement and Utilitiy work along Project Footprint

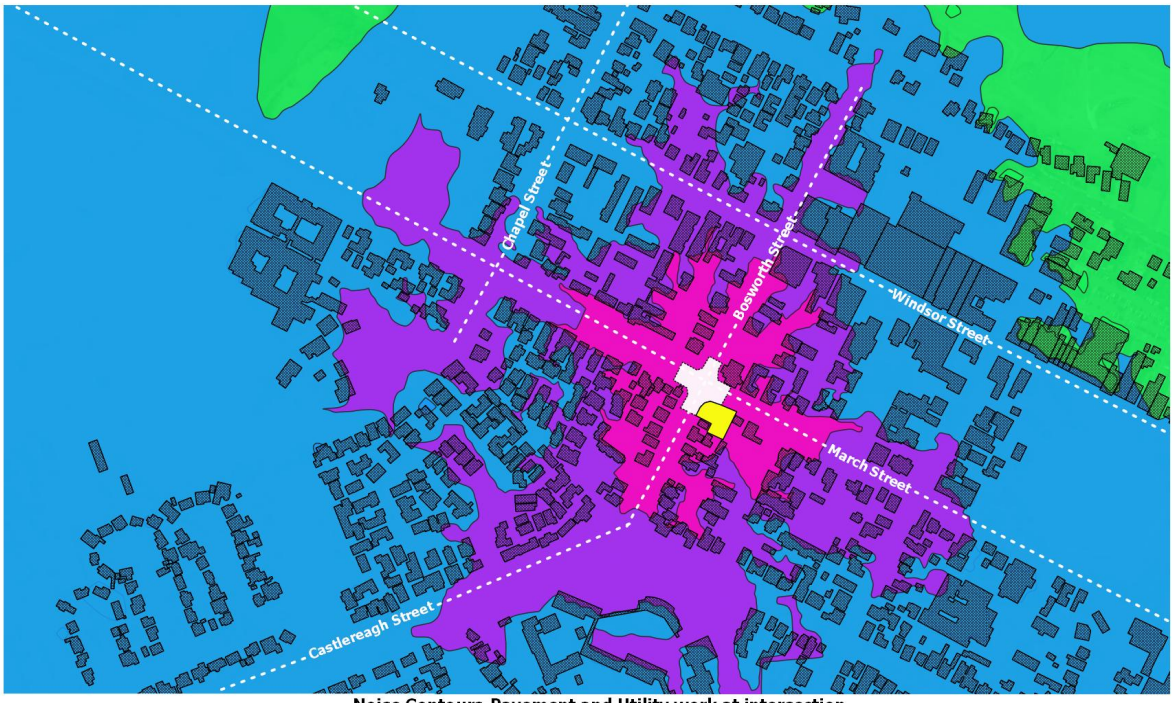
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Project Footprint

0 100 200 m



Noise Contours-Pavement and Utility work at intersection

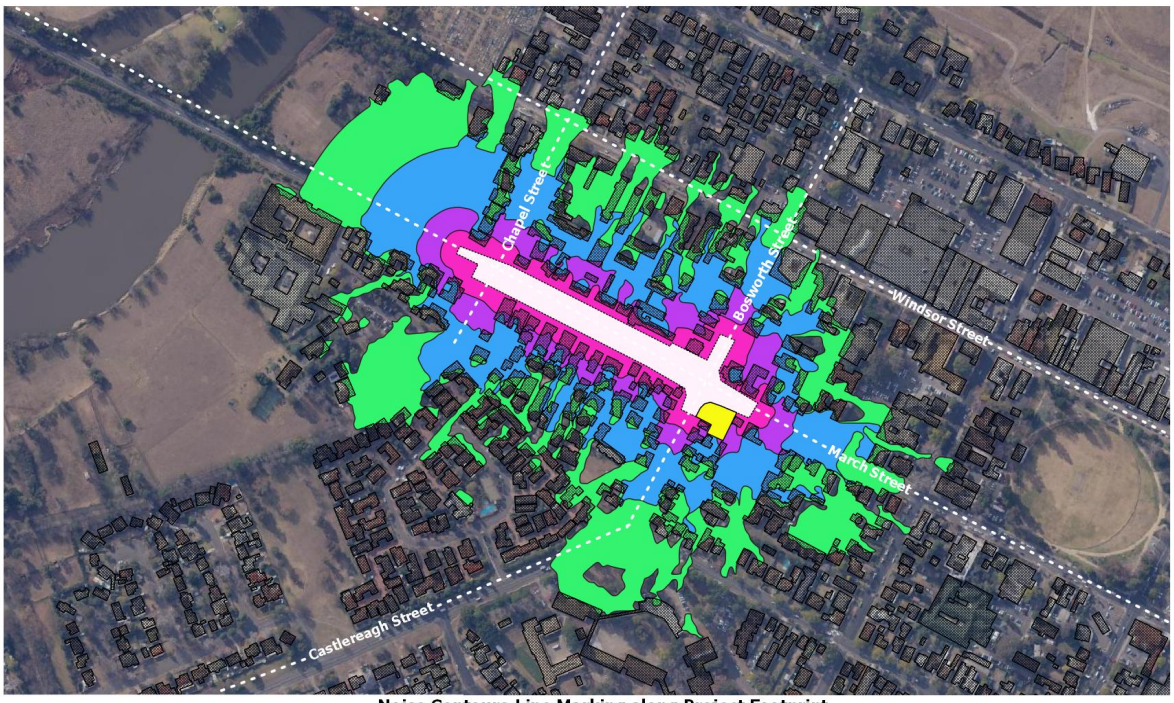
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Intersection

0 100 200 m



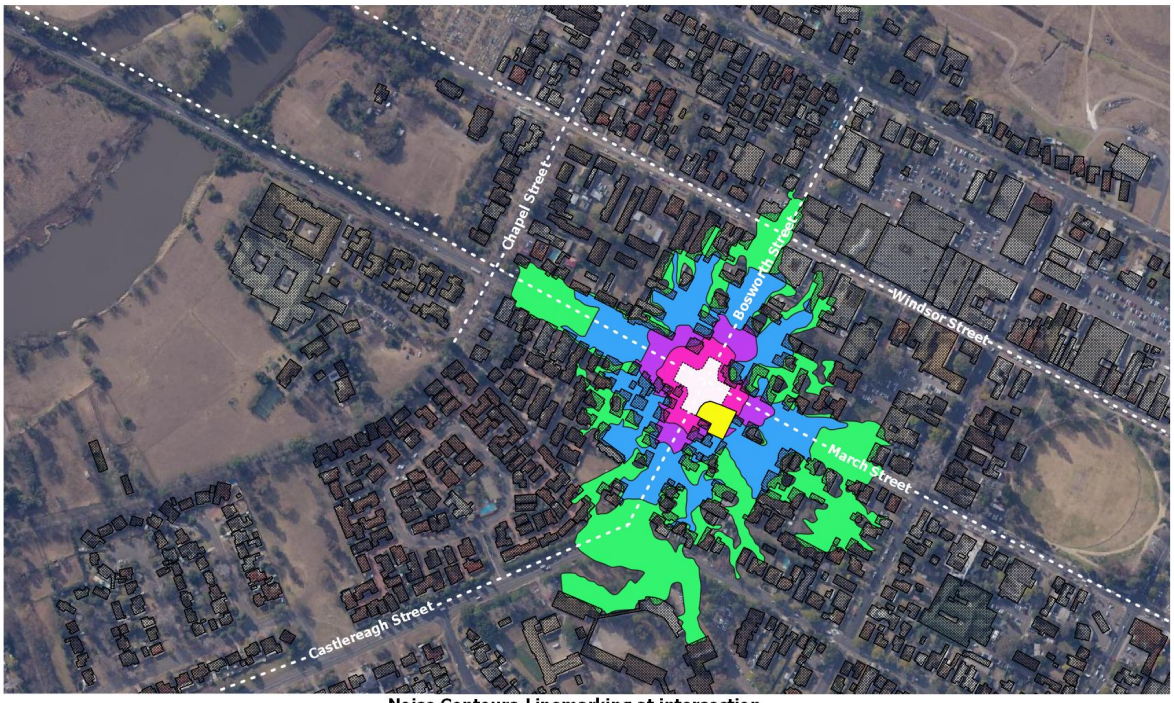
Noise Contours-Line Marking along Project Footprint

Legend

Level Above NML
- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Project Footprint

0 100 200 m



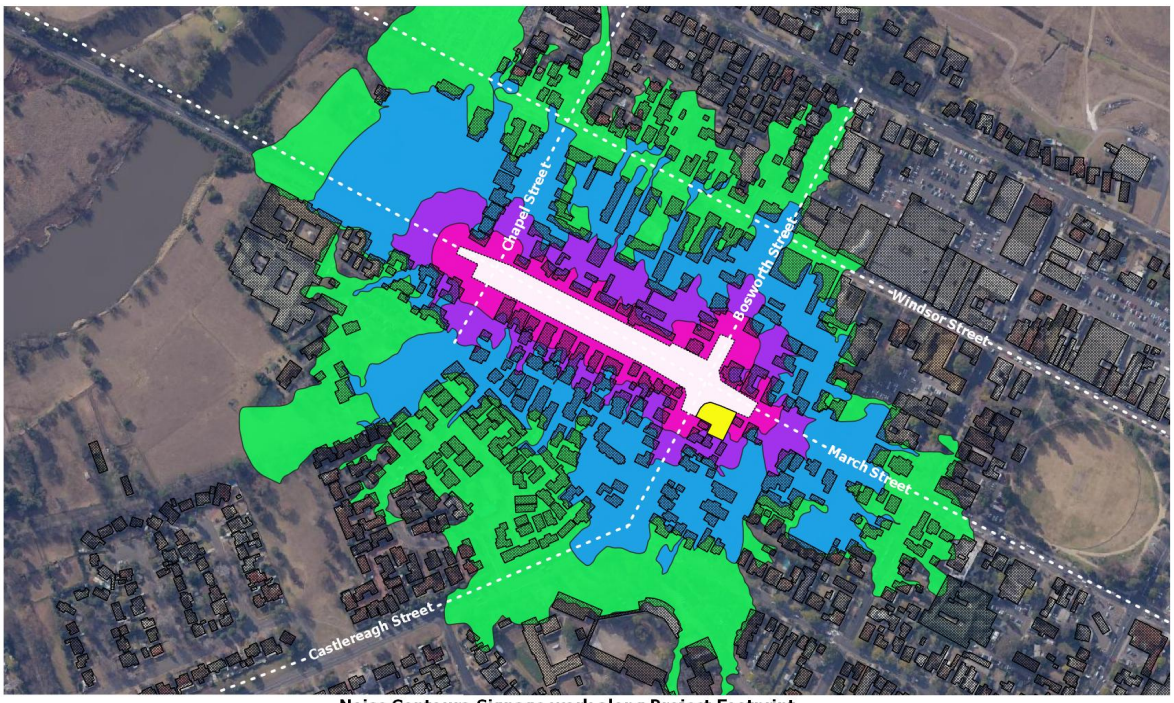
Noise Contours-Linemarking at intersection

Legend

Level Above NML
- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Intersection

0 100 200 m



Noise Contours-Signage work along Project Footprint

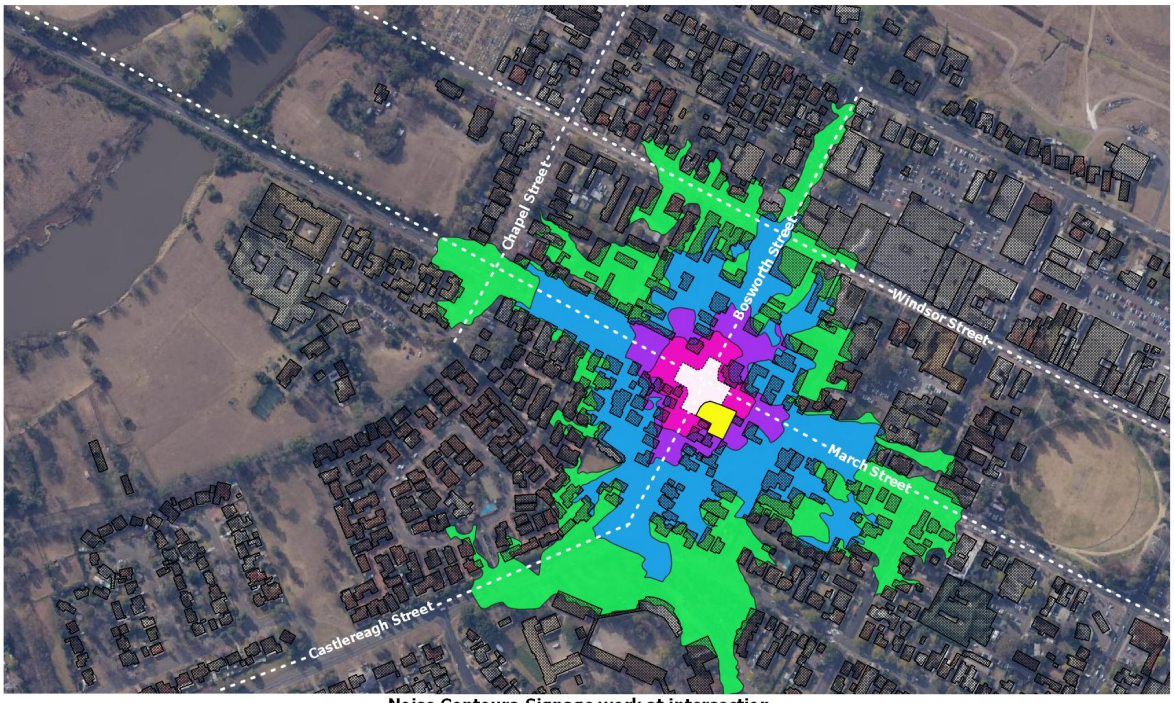
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Project Footprint

0 100 200 m



Noise Contours-Signage work at intersection

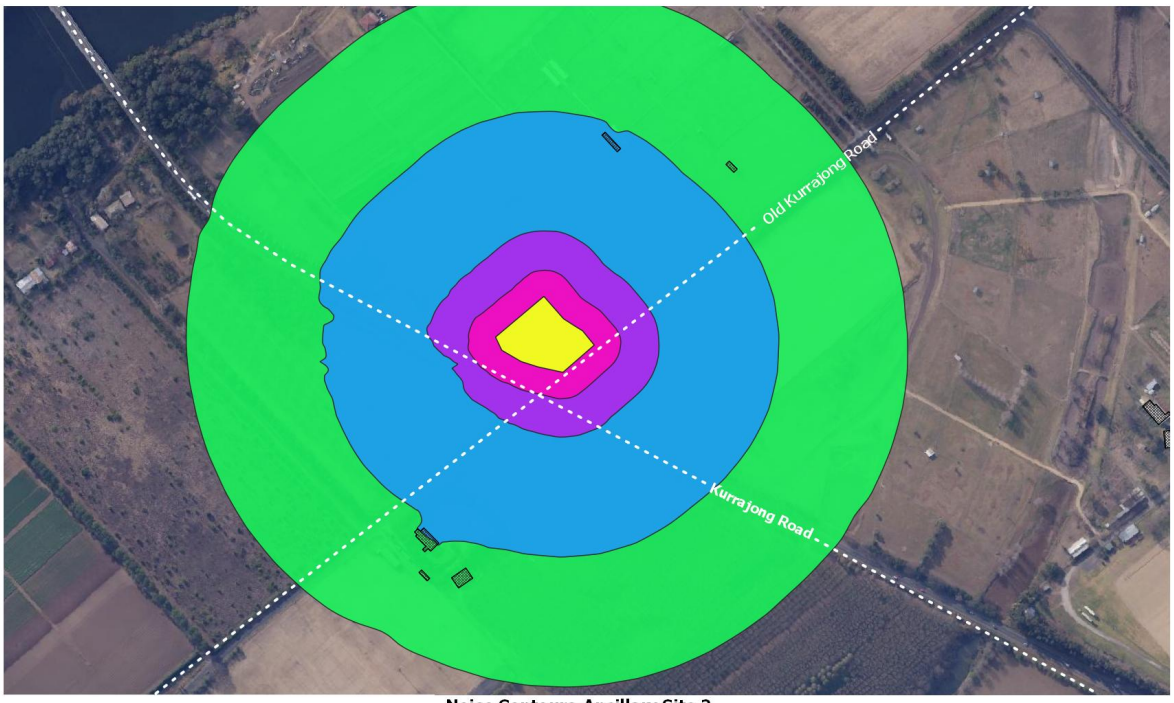
Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site
- Intersection

0 100 200 m



Noise Contours-Ancillary Site 2

Legend

Level Above NML

- 0-5dBA (Noticeable)
- 5-15dBA (Clearly Audible)
- 15-25dBA (Moderately Intrusive)
- >25dBA (Highly Intrusive)

- Buildings
- Ancillary Site

0 100 200 m

rms.nsw.gov.au/

13 22 13

Customer feedback
Transport for NSW
Locked Bag 928,
North Sydney NSW 2059

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