Document controls

Approval and authorisation

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<th>Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade</th>
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<tr>
<td>Accepted on behalf of</td>
<td>Yasaswi Kodali</td>
</tr>
<tr>
<td>Roads and Maritime NSW</td>
<td>Project Manager</td>
</tr>
<tr>
<td>Signed</td>
<td></td>
</tr>
<tr>
<td>Dated</td>
<td>4 December 2018</td>
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Document status

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<th>Reviewed by</th>
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<td>15/11/2017</td>
<td>Isabella See</td>
<td>Andrew Cook</td>
</tr>
<tr>
<td>2nd Draft</td>
<td>4/12/2017</td>
<td>Isabella See</td>
<td>Emma Taylor</td>
</tr>
<tr>
<td>3rd Draft</td>
<td>21/12/2017</td>
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<td>Emma Taylor</td>
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<tr>
<td>4th Draft</td>
<td>25/05/2018</td>
<td>Zoe McLaughlin, Ajit Padbidri</td>
<td>Emma Taylor</td>
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<tr>
<td>Final</td>
<td>04/12/2018</td>
<td>Zoe McLaughlin</td>
<td>Emma Taylor</td>
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</table>
Executive summary

The initial proposal

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the northern toll plaza precinct on the Cahill Expressway approaching the Sydney Harbour Bridge (the proposal). Work would be undertaken on Cahill Expressway between the High Street overpass and Fitzroy Street.

The proposal involves removal of the toll booths and toll office located in the northern toll plaza precinct and road surface improvement work. Removal of tolling infrastructure from the precinct allows for simplification and reconfiguration of traffic lanes, the provision of an emergency response and incident management area and the introduction of a uniform speed zone of 70 km/h between Warringah Freeway and the Sydney Harbour Bridge with the capacity to implement variable speed limits (as an extension of the variable speed limit zone across the Sydney Harbour Bridge). The road surface improvement work aims to minimise water damage, reduce the need for future maintenance and provide an improved road surface for drivers. Other work to be carried out as part of the proposed precinct upgrade includes utility adjustments, minor kerb, street lighting and drainage works and the updating of roadside signage.

Roads and Maritime prepared a Review of Environmental Factors (REF) for the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade to assess the potential environmental impacts. The REF was publicly displayed for 22 days between Monday 9 October 2017 and Monday 30 October 2017. In addition, a community feedback session was held on Wednesday 18 October 2017.

Summary of main issues

Roads and Maritime received 26 submissions during the REF display period, all of which were submitted by members of the public. Of these submissions, four expressed support for the proposal and one opposed the proposal, as they wanted the original toll structure to be maintained. All other submissions did not oppose the proposal but raised issues for consideration by Roads and Maritime.

This submissions report summarises the issues raised and provides responses to each issue (refer to Chapter 2). The key issues raised in submissions were related to road design, particularly traffic lane arrangement, bus lane arrangements and on ramp access arrangements. Key issues raised and Roads and Maritime’s responses are outlined below.

Traffic lane arrangements

Respondents expressed a view that the existing lane arrangement presents a road safety issue and that merges and lane changing should be minimised to improve traffic flow.

As part of the proposal, the removal of the toll booths would allow the general traffic lanes in the northern toll plaza precinct to be simplified into two straight lanes. This would reduce the number of required merges for southbound traffic and allow for a consistent speed limit on the Cahill Expressway. These changes would improve traffic flow, and traffic and bus travel times.

Road Safety Audits are carried out during the various design phases of the project and any identified safety issues will be addressed before construction.

Bus lane arrangements

Submissions relating to bus lanes were focused on providing priority to buses entering Cahill Expressway and physically separating the bus lane from general traffic to prevent general traffic from crossing into the bus lane.

Roads and Maritime is committed to promoting public transport as a viable alternative to private vehicles. The Sydney Harbour Bridge and Cahill Expressway are important links in the bus network as they provide connections to and from the Sydney CBD. The existing bus lane on the western side of the Cahill Expressway would be maintained as a permanent 24-hour bus lane as part of the
proposal. This would maintain the movement of buses across the Cahill Expressway as a priority, ensuring journey times and reliability. In addition, the existing Mount Street bus lane merge would be extended by 28 metres (refer to section 3.1 of the REF) to support the movement of buses from Mount Street onto the Cahill Expressway. The existing ‘Keep Clear’ zone at the Mount Street merge point would be repainted as part of the proposal. As such, it is expected that the proposal will support the use of public transport as a viable means of travel into the Sydney CBD.

Physically separating the bus lane from the general traffic would require installing additional medians on the road. Due to width constraints on the Sydney Harbour Bridge, installing medians in this area is not possible. The bus lane will be clearly marked. Vehicles using the bus lane illegally could be penalised.

**On ramp and access arrangements**

One respondent proposed minimising the number of on ramps entering the Cahill Expressway and suggested redirecting traffic from the High Street on ramp to the Mount Street on ramp. In response to this suggestion, other respondents commented via the online consultation tool that diverting traffic from the High Street on ramp to the Mount Street on ramp may cause congestion in an alternative area.

Changes to the High Street and Mount Street on ramps were investigated as part of the REF and are detailed in the Alternatives and Options Assessment (refer to section 2.4 of the REF). In the assessment, options which included changes to the High Street and Mount Street on ramps ranked poorly due to cost, safety, impacts to traffic, impacts on established vegetation, utilities and not achieving all project objectives.

Both the High Street and Mount Street on ramps also carry a high volume of daily traffic. The High Street on ramp carries approximately 3000-3500 vehicles during the peak weekday periods and the Mount Street on ramp carries approximately 1700-1800 vehicles during peak weekday periods. As such, Roads and Maritime does not propose to close either on ramp as the traffic would be displaced to other roads in the network.

**Changes to the proposal**

After consideration of the issues raised in the public submissions, the safeguard and management measures outlined in the REF are considered appropriate and no further changes are needed (refer to Chapter 4).

Following the display of the REF however, refinements were made to the proposal during detailed design. These include:

- Road design changes, including minor changes to the proposed lane alignment, emergency crossover, safety barriers and pavement marking
- Additional pavement levelling work
- Additional allowance for installation of hoarding and noise barriers during construction
- Additional utility relocation and kerb adjustments works
- Installation of temporary signage on the High Street on ramp
- Assessment of three alternative construction site compounds.

These changes resulted in amendments to the footprint and the scope of work that was originally assessed in the REF. An assessment was carried out to determine whether there would be any additional environmental impacts and whether the safeguards and mitigation measures in the REF were sufficient. The assessment identified additional safeguards to be added to the REF. The additional safeguards relate to the construction methodology for the additional utility relocation works and the use of the construction compounds to minimise heritage and noise and vibration impacts.

Should the proposal proceed, environmental management would be guided by the framework and measures outlined in the REF and in this Submissions Report.
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1 Introduction and background

1.1 The initial proposal

Roads and Maritime Services (Roads and Maritime) proposed to upgrade the northern toll plaza precinct on the Cahill Expressway approaching the Sydney Harbour Bridge (the proposal). Work would be carried out on the Cahill Expressway between the High Street overpass and Fitzroy Street.

The proposal involves removal of the toll booths and toll office located in the northern toll plaza precinct and road surface improvement work. Removal of tolling infrastructure from the precinct allows for simplification and reconfiguration of traffic lanes, the provision of an emergency response and incident management area and the introduction of a uniform speed zone of 70 km/h between Warringah Freeway and the Sydney Harbour Bridge with the capacity to implement variable speed limits (as an extension of the variable speed limit zone across the Sydney Harbour Bridge). The road surface improvement work aims to minimise water damage, reduce the need for future maintenance and provide improved road surface for drivers. Other work to be carried out as part of the proposed precinct upgrade includes utility adjustments, minor kerb, street lighting and drainage work and the updating of roadside signage. The location of the proposal is shown in Figure 1.1 and an overview of the proposal as shown in the REF is provided in Figure 1.2.

Removal of the existing toll booth structures and toll office would make the approaches to the Sydney Harbour Bridge safer, enable the existing road lanes to be simplified, provide an improved road surface and provide an improved visual experience for drivers and bridge users.

A more detailed description of the proposal is found in the Sydney Harbour Bridge northern toll plaza precinct upgrade Review of Environmental Factors (REF) prepared by Roads and Maritime in October 2017.
Figure 1.1: Location of Proposal
1.2 REF display

Roads and Maritime prepared an REF to assess the environmental impacts of the proposed work. The REF was publicly displayed for 22 days between Monday 9 October 2017 and Monday 30 October 2017 at two locations, as detailed in Table 1.1. The REF was also placed on the Roads and Maritime project website and made available for download. The display locations and website link were advertised in both the Mosman Daily and the North Shore Times.

Table 1.1: Display locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Sydney Council offices</td>
<td>200 Miller Street, North Sydney</td>
</tr>
<tr>
<td>Stanton Library</td>
<td>234 Miller Street, North Sydney</td>
</tr>
</tbody>
</table>

In addition to the above public display, a community feedback session was held on Wednesday 18 October, between 6pm and 8pm at the Bradfield Park Community Centre, 41 Alfred Street, Milsons Point. Details of previous consultation carried out for design development are described in section 5.5 of the REF.

The Office of Environment and Heritage were invited to comment on the proposal and raised no issues.

Community members and stakeholders were able to make submissions via email, phone or an online interactive consultation map. The community could contact Roads and Maritime and leave comments and submissions by:

- **Email:** sydneyharbourbridgeprojects@rms.nsw.gov.au
- **Phone:** 1800 581 595

1.3 Purpose of the report

This submissions report relates to the REF prepared for the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade, and should be read in conjunction with that document.

The REF was placed on public display and submissions relating to the proposal and the REF were received by Roads and Maritime. This submissions report summarises the issues raised and provides responses to each issue (Chapter 2) and describes any changes made to the proposal since the REF was finalised (Chapter 3).

After finalising the REF, changes were made to the proposal during detailed design. These include:

- Road design changes, including minor changes to the proposed lane alignment, emergency crossover, safety barriers and pavement marking
- Additional pavement levelling work
- Additional allowance for installation of hoarding and noise barriers during construction
- Additional utility relocation and kerb adjustments works
- Installation of temporary signage on the High Street on ramp
- Assessment of three alternative construction site compounds.

These changes resulted in amendments to the footprint and the scope of work that was originally assessed in the REF. An assessment was carried out to determine whether there would be any additional environmental impacts and whether the safeguards and mitigation measures in the REF were sufficient. The assessment identified an additional safeguard to be added to the REF. The additional safeguard relates to the use of vibratory rollers to minimise the impacts of construction on nearby residents.
2 Response to issues

Roads and Maritime received 26 submissions, accepted up until and including Monday 30 October 2017. Appendix A lists the respondents and each respondent’s allocated submission number. The table also indicates where the issues from each submission have been addressed in Chapter 2 of this report.

2.1 Overview of issues raised

A total of 26 submissions were received in response to the display of the REF. All submissions were received from community members.

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

The main issues raised in submissions related to road design, particularly traffic lane arrangement, bus lane arrangements and on ramp access arrangements. Respondents commented that the existing lane configuration presents a road safety issue and that merges and lane changing should be minimised to improve traffic flow. Comments about the bus lane focused on providing priority to buses entering Cahill Expressway and physically separating the bus lane from general traffic to prevent general traffic from crossing into the bus lane through the proposal area. Respondents also commented on the length of construction timing, arrangement of the emergency response and incident management area and provided support for the proposed speed limit change post-construction.

A number of comments were received relating to general traffic lane and bus lane configurations on Cahill Expressway (north of the proposal site) and on the Sydney Harbour Bridge. As the proposal only relates to the removal of the northern toll booths and immediate surrounds, these comments are considered out of scope.

The majority of submissions did not offer a position on the proposal but raised issues for consideration by Roads and Maritime. Four submissions offered support for the proposal and one submission was opposed to the proposal.
### 2.2 Need for the proposal

<table>
<thead>
<tr>
<th>Issue Category</th>
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<th>Issue Summary</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing</td>
<td>24</td>
<td>One respondent commented that the construction timeline for the proposal is too long.</td>
<td>The Cahill Expressway forms a critical part of Sydney’s road network. The construction of the proposal would need to be carried out outside of peak periods and during weekend closures to minimise traffic disruptions to road users. Any proposed improvement or upgrade requires careful planning and consideration of traffic impacts to the road network, other projects and stakeholder interfaces. The proposal is one of a number of projects within the Sydney Harbour Bridge precinct to improve and adapt it to the needs of a modern city. To ensure this program of work is successfully coordinated, it is critical that the work is staged. With the completion of the Sydney Harbour Bridge and Tunnel Tolling Upgrade, the Southern Toll Plaza Precinct Upgrade and the Sydney Harbour Bridge Access Lifts, Roads and Maritime are now planning for the next stage of work. The proposal would be staged appropriately in the Sydney Harbour Bridge precinct program of works to minimise impacts to all stakeholders of the precinct.</td>
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### 2.3 Design

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<th>Issue Summary</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus lane arrangement</td>
<td>3, 7, 8, 9, 10, 26</td>
<td>Respondents raised the following issues:</td>
<td>The existing bus lane on the western side of the Cahill Expressway would be maintained as a permanent 24-hour bus lane. The existing Mount Street bus lane merge would be extended by 28 metres as part of the proposal (refer to section 3.1 of the REF). The existing ‘Keep Clear’ zone at the Mount Street merge point would be repainted as part of the proposal. These works would support the function of this zone and the movement of buses from Mount Street on to the Cahill Expressway. Physically separating the bus lane from the general traffic would require installing additional medians on the road. Due to width constraints on the Sydney Harbour Bridge installing medians in this area is not possible. The bus lane will be clearly marked. Vehicles using the bus lane illegally could be penalised.</td>
</tr>
</tbody>
</table>

- Priority should be given to buses travelling over the Sydney Harbour Bridge
- Buses entering from the Mount Street on ramp and High Street on ramp should be given priority
- There is a need for concrete medians along either side of the bus lane to prevent cars crossing over the bus lane
- Enforce the ‘Keep Clear’ merge space on Cahill Expressway for buses exiting the Mount Street on ramp.
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<th>Submission Number(s)</th>
<th>Issue Summary</th>
<th>Response</th>
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| Traffic lane arrangement | 1, 3, 11, 23         | Respondents raised the following issues and comments: • Merge points and lane changing should be minimised to improve traffic flow • All incoming lanes should merge into existing lanes rather than forming a new lane • One respondent noted that this section of road is unsafe due to the number of merging cars, buses, taxis and motorcycles • There should be a minimum number of lane changes and the toll booth structures should be retained. | As discussed in section 6.4.2 of the REF, the existing configuration of the lanes through the existing northern toll plaza precinct results in several lane changes and merges for motorists which contributes to crashes, congestion and inconsistent traffic flow.  
As part of the proposal, the removal of the toll booths would allow for simplification of the general traffic lanes to two straight lanes. This would reduce the number of required merges for southbound traffic and allow for a consistent speed limit through the Cahill Expressway. These changes would improve traffic flow, minimise lane changing and improve traffic and bus travel times. Traffic entering Cahill Expressway from the High Street on ramp would merge into the realigned lanes. The additional space created by the removal of the toll booths would be converted to an emergency response and incident management area.  
Road Safety Audits are carried out during the various design phases of the project and any identified safety issues will be addressed before construction.  
The existing configuration requires the traffic lanes to be spilt to navigate the toll booth infrastructure. As such, the removal of the toll booth infrastructure is essential to allow the traffic lanes to be realigned as straight lanes. |
<table>
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<th>Submission Number(s)</th>
<th>Issue Summary</th>
<th>Response</th>
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</table>
| On ramps and access arrangement      | 3, 19, 23            | Respondents raised the following issues:  
  - Minimise on ramps onto the expressway  
  - Traffic entering from High Street should be diverted to Mount Street to reduce excess merging onto the Sydney Harbour Bridge  
  - In response to the above suggestion, it was commented through the online consultation tool that diverting traffic from the High Street entry ramp to the Mount Street entry ramp would cause congestion in an alternative area. | Changes to the High Street and Mount Street on ramps were investigated as part of the Alternatives and Options assessment (refer to section 2.4.2 of the REF). These changes included adjusting the entry angle of the High Street on ramp, and reducing the number of lanes from the Mount Street on ramp from two to one.  
  Section 2.4 of the REF describes the analysis of options that was conducted for the proposal. Options which included changes to the High Street and Mount Street on ramps ranked poorly due to cost, safety, impacts to traffic, impacts on established vegetation, utilities and not achieving all project objectives.  
  Both the High Street and Mount Street on ramps carry a high volume of daily traffic. The High Street on ramp carries approximately 3000-3500 vehicles during the peak weekday periods and the Mount Street on ramp carries approximately 1700-1800 vehicles during peak weekday periods. As such, Roads and Maritime does not propose to make any changes to or close either on ramp as the traffic would be displaced to other roads in the network. |
| Speed limit                          | 21                   | One respondent commented that the speed limit through the toll plaza should be maintained at 70 km/h once the proposal is complete.                                                                 | As described in section 3.1 of the REF, a uniform 70 km/h speed zone would be introduced through the northern toll plaza precinct with the capacity to implement variable speed limits (as an extension of the variable speed limit zone across the Sydney Harbour Bridge). The 70 km/h speed zone may have a safety benefit as it would provide a uniform speed limit along Warringah Freeway and Cahill Expressway. |
2.4 Project support

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<th>Issue Summary</th>
<th>Response</th>
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<td>Project support</td>
<td>13, 15, 19, 24</td>
<td>Four respondents expressed support for the proposal stating that the removal of the toll booths would allow for better alignment of traffic lanes, increased speed limit and improved traffic flow.</td>
<td>Roads and Maritime notes the respondent’s support of the project.</td>
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2.5 Issues out of scope

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<tr>
<th>Issue Category</th>
<th>Submission Number(s)</th>
<th>Issue Summary</th>
<th>Response</th>
</tr>
</thead>
</table>
| Network optimisation | 2, 5, 6, 9, 14, 16, 18, 20, 22 | Respondents raised the following issues:  
  • Request to remove the bus lane crossover that is permitted under the new southbound tolling gantry as it causes delays  
  • Request not to remove the crossover point as it would make access to the main deck of the Sydney Harbour Bridge more difficult. | As described in section 3.1 of the REF and shown in Figure 1.2, the footprint of the proposal extends from the High Street overpass at the most northern point to Fitzroy Street. As such the bus lane crossover under the new southbound tolling gantry falls outside the scope of this proposal and no changes are proposed as part of the Northern Toll Plaza Precinct Upgrade. Nonetheless, Roads and Maritime notes the concerns raised by the community with regard to the bus lane crossover and has forwarded these comments to the team looking after the Western Harbour Tunnel and Beaches Link program of works. The Western Harbour Tunnel and Warringah Freeway upgrade project is the most relevant program of work to further address these concerns. This project will include upgrade and realignment work to traffic lanes between Milsons Point and Naremburn, seeking to simplify and improve traffic flow, wayfinding and increase the resilience of the road network to make the network less vulnerable to incidents and disruptions. |
### Issue Summary

Respondents raised the following issues:

- Priority should be given to buses travelling over the Sydney Harbour Bridge
- The bus lane should be converted to a T2 lane
- A T3 lane should be introduced to encourage use of public transport
- Request for a single dedicated lane for general traffic and a single bus lane over the Cahill Expressway beginning from Chatswood.

### Response

Roads and Maritime are committed to promoting public transport as a viable alternative to private vehicles. The Sydney Harbour Bridge and Cahill Expressway are important links in the bus network as they provide connections to the Sydney CBD for commuters living on the North Shore and Northern Beaches area of Sydney. Roads and Maritime aims to support the use of public transport via maintenance of the permanent bus lane across the Cahill Expressway and conversion of the bus lane to a T2 lane would not support the above.

Converting Lane 8 of the Sydney Harbour Bridge to a T3 lane to further encourage use of public transport will not be carried out as part of this proposal. The provision of a 24 hour bus lane supports the use of public transport in the area.

Whilst bus services are reduced outside of commuter peaks there is still a need to maintain a permanent 24-hour bus lane on the Cahill Expressway. Maintaining the bus lane for journeys during the evening, at night and on the weekend is key to meeting increased customer demand for shopping, leisure and social travel outside commuter peaks which is consistent with *Sydney’s Bus Future* (Transport for NSW 2013).

As described in section 3.1 of the REF and shown in Figure 1.2, the footprint of the proposal extends from the High Street overpass at the most northern point to Fitzroy Street. As such, changes to traffic lanes prior to the High Street overpass will not be carried out as part of this proposal.
<table>
<thead>
<tr>
<th>Issue Category</th>
<th>Submission Number(s)</th>
<th>Issue Summary</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>General out of scope</td>
<td>4, 17, 24, 26</td>
<td>Respondents raised the following issues:</td>
<td>The operation of the proposal would improve bus travel times and bus reliability into the Sydney CBD. While provision of increased parking is outside the scope of this proposal, it is expected that this proposal will nonetheless have a beneficial impact on public transport travel times and therefore support the use of public transport as a viable means of travel into the Sydney CBD. The comment about road user behaviour is noted. As detailed in section 3.2.1 of the REF, the proposal has been designed in accordance with Roads and Maritime and Austroads design criteria. These criteria ensure road safety requirements are incorporated into the proposal. Section 6.13.2 discusses the broader program of work underway for the Sydney Harbour Bridge precinct. Figure 6-20 of the REF shows the location of the Sydney Harbour Bridge projects including the installation of new tolling points throughout the precinct. The installation of these tolling points was completed in December 2016 and these tolls are now operational. The request to show the toll charged is not supported by the technology installed which aims to provide multi-lane tolling capability that does not impact the flow of traffic. As described in section 3.1 of the REF and shown in Figure 1.2, the footprint of the proposal extends from the High Street overpass at the most northern point to Fitzroy Street. Street lighting within this footprint will be reinstalled as part of the proposal, however changes to lighting on the Sydney Harbour Bridge structure are not planned as part of this proposal. Similarly, traffic movement through York Street falls outside the scope of this REF.</td>
</tr>
</tbody>
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**Sydney Harbour Bridge Northern toll plaza precinct upgrade**

**Submissions Report**
3 Changes to the proposal

After finalising the REF, changes were made to the proposal during detailed design. These include:

- Road design changes, including minor changes to the proposed lane alignment, emergency crossover, safety barriers and pavement marking
- Additional pavement levelling work
- Additional allowance for installation of hoarding and noise barriers during construction
- Additional utility relocation and kerb adjustments works
- Installation of temporary signage on the High Street on ramp
- Assessment of three alternative construction site compounds.

These changes resulted in amendments to the footprint and the scope of work that was originally assessed in the REF. An assessment was carried out to determine whether there would be any additional environmental impacts and whether the safeguards and mitigation measures in the REF were sufficient. The assessment identified additional safeguards to be added to the REF. The additional safeguards relate to the construction methodology for the additional utility relocation works and the use of the construction compounds to minimise heritage and noise and vibration impacts.

No changes were made to the proposal as a result of the submissions received by the community.

3.1 Overview of changes

Table 3.1 summarises the additional work and design changes proposed. Figure 3.1 shows the original scope of works, the extended proposal boundary footprint and the additional work within the existing proposal boundary.

Table 3.1: Summary of the changes to the proposal following display of the REF

<table>
<thead>
<tr>
<th>Change</th>
<th>Outside the original proposal boundary footprint?</th>
<th>Additional environmental assessment required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road design changes including minor changes to the road alignment, pavement marking, signage, an extension of the existing emergency crossover and replacement of the existing safety barrier on the western side of the Cahill Expressway</td>
<td>No</td>
<td>No - The additional work to be carried out in the original proposal boundary is of the same nature and scale as the work assessed by the REF (refer Section 3.2 for detail)</td>
</tr>
<tr>
<td>Additional pavement levelling work</td>
<td>Yes – extended the proposal footprint by 20 metres to the south (see Figure 3.1b)</td>
<td>Yes – The work to be carried is of the same nature and scale as the work assessed by the REF however it is located in an extended boundary area and therefore requires assessment (refer Section 3.3 for detail)</td>
</tr>
<tr>
<td>Change</td>
<td>Outside the original proposal boundary footprint?</td>
<td>Additional environmental assessment required?</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Additional allowance for installation of hoarding and noise barriers during construction</td>
<td>Yes – extended the proposal footprint by five metres on the south-eastern side (see Figure 3.1b)</td>
<td>Yes – The work to be carried is of the same nature and scale as the work assessed by the REF however it is located in an extended boundary area and therefore requires assessment (refer Section 3.4 for detail)</td>
</tr>
<tr>
<td>Additional utility relocation and kerb adjustment works</td>
<td>Yes - refer to section 3.5 (see Figure 3.1b)</td>
<td>Yes – refer to section 3.5.2</td>
</tr>
<tr>
<td>Additional construction compounds</td>
<td>N/A</td>
<td>Yes – refer to section 3.6.3</td>
</tr>
<tr>
<td>Installation of a temporary sign on the High Street on ramp to provide advanced warning of construction on Cahill Expressway</td>
<td>Yes – refer to section 3.7 (see Figure 3.1b)</td>
<td>Yes – refer to section 3.7.2</td>
</tr>
</tbody>
</table>
Figure 3.1a: Original proposal boundary and additional work

Legend

Original REF scope of works

- Concept design
- Emergency crossover
- Impacted street light
- Kerb replacement works
- Pavement and waterproofing works
- Resurfacing works
- Original Project boundary

Note: Subject to detailed design

Figure 3.1a: Original proposal boundary and additional work
Figure 3.1b: Extended project boundary and locations of additional works

- Item 1: New utilities cable conduit under northern approach to the bridge
- Item 2: New utility cable behind the existing N-bounce barrier
- Item 3: Temporary attachment of utilities to western parapet and
- Item 4: Relocation of utilities within and above a new eastern kerb
- Item 5: Works at Chinamans Bight
- Item 6: Trenching along Cross Road and/or RMS Car Park
- Item 7: Connection to Lavender Street utility rods
3.2 Road design changes within the original Proposal footprint

Two components of additional work that lie within the original proposal boundary footprint have been proposed. These include:

- The extension of the existing emergency crossover on the western side of the Cahill Expressway
- The replacement of an existing safety barrier located on the western side of the Cahill Expressway
- Installation of a new changeable message sign between the Bradfield Highway and Cahill Expressway between chainage 200 to chainage 300
- Minor road design and lane alignment changes.

This work is not expected to cause significantly different noise levels or impacts from those already predicted (refer to section 6.3 of the REF). The work would not be significantly closer to receivers or result in any additional heritage impacts, and therefore the mitigation already identified in the REF is considered appropriate.

The work to be carried out within the original proposal boundary is of the same nature and scale as the work assessed by the REF. Therefore, no further environmental assessment is required.

3.3 Additional pavement levelling work

3.3.1 Overview

The proposal boundary has been extended by 20 metres to the south to allow for additional pavement levelling work. The works would be relatively minor additions to existing work assessed as part of the proposal.

3.3.2 Environmental assessment

Although the work is relatively minor, the extended proposal boundary due to the additional pavement levelling work was assessed for potential non-Aboriginal heritage, noise and vibration, visual amenity and traffic and transport impacts.

Non-Aboriginal heritage

The additional pavement levelling work falls within the 50-metre buffer that was assessed as part of the Non-Aboriginal heritage impact assessment (refer to section 6.1 of the REF). As such no new heritage items are captured within the extended boundary and no additional assessment is required.

Noise and vibration

The extension of the pavement work 20 metres to the south of the proposal boundary may cause a minor increase to noise levels at the receivers immediately adjacent when the work is at its closest point, however, the noise assessment has already identified these receivers as impacted by moderately intrusive noise levels and the mitigation measures recommended in the REF are considered sufficient to address the impacts.

Vibration impacts are not expected to significantly change as a result of the changes proposed to the proposal boundary. The additional 20 metres of pavement work at the south of the proposal boundary would potentially bring vibration sources closer to sensitive receivers. However, the mitigation measures identified in the REF are considered suitable to address this and no additional measures are required.
Visual amenity
The proposed additional pavement levelling work would not cause any additional visual impacts beyond what is already assessed in the REF. A moderate beneficial impact to the landscape character and visual amenity of the Cahill Expressway would still result from the proposal. There are no additional management or mitigation measures proposed.

Traffic and transport
The proposed additional pavement levelling work would not change the extent or timing of any road closures or traffic diversions as part of the proposal. Therefore, no additional traffic and transport impacts resulting from the changes are anticipated and no additional management or mitigation measures are proposed.

3.3.3 Revised management and mitigation strategies
The additional pavement levelling work is of the same nature and scale as the work assessed by the REF and does not require revisions to existing management and mitigation strategies outlined in the REF.

3.4 Additional allowance for construction hoarding and noise barriers

3.4.1 Overview
Additional allowance for the installation of hoarding and noise barriers during construction of the proposal is proposed. This has required the proposal boundary to be extended by five metres on the south-eastern side of the original proposal boundary. The work would be relatively minor additions to existing work assessed within the proposal.

3.4.2 Environmental assessment
Although the work is relatively minor, the extended proposal boundary due to the installation of hoarding and noise barriers during construction was assessed for potential non-Aboriginal heritage, noise and vibration, visual amenity and traffic and transport impacts.

Non-Aboriginal heritage
The installation of hoarding and noise barriers during construction falls within the 50-metre buffer that was assessed as part of the Non-Aboriginal heritage impact assessment (refer to section 6.1 of the REF). As such no new heritage items are captured within the extended footprint and no additional assessment is required.

Noise and vibration
The extension of the proposal footprint for the purposes of installing noise barriers and hoarding is not considered significant from a noise and vibration impact perspective in the context of the other construction works occurring. Once installed, the noise barriers and hoarding would have a positive impact, as they would help to minimise the noise impacts associated with other construction activities for the proposal. Therefore, the existing mitigation measures identified for the proposal would be sufficient to address installation of barriers and hoarding.

Visual amenity
The proposed installation of hoarding and noise barriers during construction would not cause any additional visual impacts beyond what is already assessed in the REF. A moderate beneficial impact to the landscape character and visual amenity of the Cahill Expressway would still result from the proposal. There would be no additional management or mitigation measures proposed.
**Traffic and transport**

The proposed installation of hoarding and noise barriers during construction would not change the extent or timing of any road closures or traffic diversions as part of the proposal. Therefore, no additional traffic and transport impacts resulting from the changes are anticipated and no additional management or mitigation measures are proposed.

### 3.4.3 Revised management and mitigation strategies

The installation work for hoarding and noise barriers during construction are of the same nature and scale as the work assessed by the REF and do not require revisions to existing management and mitigation strategies outlined in the REF.

### 3.5 Additional utility relocation and kerb adjustment work

#### 3.5.1 Overview

The extent of utility relocation work has been further defined following the display of the REF. These utilities are government owned and interface with the northern toll plaza precinct. The additional identified utility relocations would be programmed to occur prior to starting the main activities, which are outlined in section 3.3.1 of the REF. The need to relocate utilities has also led to the need to carry out additional kerb adjustments being identified. Table 3.2 outlines the utility relocation and specific additional kerb adjustment work proposed.

Table 3.2: Details of the utility relocation and additional kerb adjustment work proposed

<table>
<thead>
<tr>
<th>Item of work</th>
<th>Location (shown on Figure 3.1b)</th>
<th>Within existing boundary?</th>
<th>Description of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1 – New utility cable conduit under bridge connecting to the existing North Pylon utility node</td>
<td>Under the bridge deck, parallel to the eastern side of the Cahill Expressway from north of Fitzroy Street to the northern bridge pylon</td>
<td>No - Extended the proposal boundary about 300 metres south</td>
<td>Installation of a new permanent utility cable conduit alongside an existing conduit in areas of steel work under the road deck on the approach span of the Sydney Harbour Bridge. The area would be accessed via an existing maintenance catwalk. No disturbance of the road surface would be required. The installation of a new utility cable conduit would be carried out using an electric hand drill.</td>
</tr>
<tr>
<td>Item 2 – New utility conduit behind the existing W-beam barrier</td>
<td>Parallel to the eastern side of the Cahill Expressway from north of Fitzroy Street to Burton Street stairs</td>
<td>Yes</td>
<td>Installation of a new permanent cable conduit behind the existing W-beam barrier to route new temporary and/or permanent electrical cables through. The installation of a new utility cable conduit would be carried out at night using an electric hand drill.</td>
</tr>
<tr>
<td>Item of work</td>
<td>Location (shown on Figure 3.1b)</td>
<td>Within existing boundary?</td>
<td>Description of work</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------</td>
<td>--------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Item 3 - Temporary attachment of utilities to eastern parapet</td>
<td>Parallel to the eastern side of the Cahill Expressway from the top of the Burton Street stairs to chainage 390</td>
<td>Yes</td>
<td>Temporary attachment of utilities to the eastern parapet along the Cahill Expressway during construction. The utilities would be housed in steel galvanised pipes and connected to the parapet using bolts or clamps. These utilities would eventually be moved into new permanent conduits within the eastern kerb once they are constructed (as per Item 4).</td>
</tr>
<tr>
<td>Item 4 – Relocation of utilities within and above a new eastern kerb</td>
<td>Parallel to the eastern side of the Cahill Expressway from the top of the Burton Street stairs to chainage 390 (near the southern set of toll booths to be removed)</td>
<td>Yes</td>
<td>Permanent relocation of utilities to new conduits in the location of the existing eastern kerb along the Cahill Expressway. Following the installation of the new conduits, the eastern kerb will be reinstated including by encasing the new conduits in concrete. These works would be carried out at night using a nail gun and concrete vibrator. The kerb adjustment works between Burton Street stairs to Chainage 340 would be carried out during the day. In this section, the kerb would be reinstated to the same height as the existing kerb. The kerb adjustment works between Chainage 340 and Chainage 390 would increase the existing kerb from 150 mm to about 400 mm in height. This section of works would be undertaken at night. The existing water main on the eastern parapet would also need to be raised to a higher position on the parapet.</td>
</tr>
<tr>
<td>Item 5 – Coring work near chainage 390</td>
<td>Near chainage 390</td>
<td>Yes</td>
<td>Coring of a hole through the bridge deck to enable the conduit to drop through the bridge deck to Ennis Road below. These works would take place at night in one to two night shifts and use a concrete corer.</td>
</tr>
<tr>
<td>Item of work</td>
<td>Location (shown on Figure 3.1b)</td>
<td>Within existing boundary?</td>
<td>Description of work</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------</td>
<td>----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Item 6 - Trenching along Ennis Road/RMS Carpark</td>
<td>Along a section of Ennis Road near Greenway Apartments and the existing Roads and Maritime carpark</td>
<td>No - Extended the proposal boundary to the east to include additional sections of Ennis Road</td>
<td>The utility relocation would involve digging a trench on Ennis Road and within the RMS carpark that would be about 500 mm wide and 1500 mm deep. The works are expected to take about two weeks to complete. Most of the works would occur during the day, with access for pedestrians and the Roads and Maritime carpark maintained. However, one of the footpaths and/or traffic lanes as well as the existing parking along Ennis Road would be temporarily blocked off during construction. The trenching works are expected to use a concrete saw, small excavator, small crew truck, site ute, wacker packer and concrete agitator.</td>
</tr>
<tr>
<td>Item 7 – Connection to Lavender Street utility node</td>
<td>Across the Bradfield Highway (lanes 1 to 6 of the Sydney Harbour Bridge approach) to the existing Lavender Street utility node</td>
<td>No - Extended the proposal boundary to the west to the Lavender Street utility hub</td>
<td>The utility relocation would occur at night and is likely to require temporary road closures. The cables would be installed within existing conduits and no new road trenching would be required. The works are expected to be carried out using an electric hand drill.</td>
</tr>
</tbody>
</table>

### 3.5.2 Environmental assessment

Environmental assessment has been carried out for the additional kerb adjustment and utility relocation work. The assessment has focused on non-Aboriginal heritage, noise and vibration, visual amenity and traffic and transport.

**Non-Aboriginal heritage**

The utilities relocation and kerb adjustment works have the potential to physically affect aspects of the Sydney Harbour Bridge that have heritage significance (i.e. the heritage fabric of the Sydney Harbour Bridge). The *Sydney Harbour Bridge Conservation Management Plan* identifies that within the proposal footprint (GML, 2007):

- The areas of the roadway are of little heritage significance
- The areas of steelwork beneath the road deck on the approach spans are of high heritage significance
- The sections of parapet are of high heritage significance.
The potential non-Aboriginal heritage impacts associated with the additional utility relocation works are discussed in detail in Appendix B. In summary (refer to Section 8.2.1 in Appendix B):

- Installation of a new cable tray on the steelwork of the approach spans (Item 1) would introduce a new component within the bridge approaches and would involve direct impact to significant fabric, potentially requiring fixing to significant steelwork. It is noted that the presence of an existing cable tray has already introduced a new component in this locality.
- The existing W-beam barrier is considered to be a modern element, so installing a new permanent cable conduit behind it (Item 2) would not impact on heritage.
- The level of impact associated with the temporary attachment of utilities to the eastern parapet (Item 3) would be dependent on the methodology selected during design development, with the clamping method resulting in a minor localised physical impact, and bolting method resulting in a moderate localised physical impact.
- The kerb adjustment works between chainage 340 and chainage 390 (Item 4) are not considered to impact significant fabric as the wearing surfaces of the road are identified as elements of little significance.
- The coring work near chainage 390 (Item 5) would affect an area of the roadway that is of little heritage significance.
- The trenching along Ennis Road (Item 6) has a low potential to impact significant archaeological remains as it is expected that the proposed excavation areas have been previously disturbed and impacted by the construction of the Sydney Harbour Bridge and Cahill Expressway (refer to Section 8.7 in Appendix B).

Overall, the utility relocation works and kerb adjustment works would have a minor physical impact on the overall heritage significance of the Sydney Harbour Bridge.

**Noise and vibration**

The assessment of the predicted construction noise levels for the additional utility relocation and kerb adjustment work was carried out as two additional construction scenarios to those described in Table 6.9 of the REF:

- Scenario 1, which includes the utility relocation work from the north pylon utility node (Item 1) to Burton Street stairs (Item 2) and the connection to the Lavender Street utility node (Item 7).
- Scenario 2, which includes the kerb and utilities relocation work from Burton Street stairs to Chainage 390 (Items 3 and 4), Chainage 390 coring (Item 5) and trenching along Ellis Road (Item 6).

The noise catchment areas described in Table 6.16 in section of the REF were adopted for the noise assessment (refer to Table 3.3 and Figure 3.2).
Table 3.3: Noise catchment areas

<table>
<thead>
<tr>
<th>NCA</th>
<th>Typical distance (m)&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCA01.1E</td>
<td>127</td>
<td>Medium density residential receivers, isolated commercial receivers and an active recreation area north of the proposal boundary between Pacific Highway, High Street and Clark Road.</td>
</tr>
<tr>
<td>NCA01.1W</td>
<td>205</td>
<td>Multi-story commercial receivers north of the proposal boundary between Pacific Highway and Warringah Freeway.</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>20</td>
<td>Multi-story residential receivers immediately east of the proposal boundary and medium density residential receivers towards the eastern end of NCA between Pacific Highway, High Street and Clark Road, Willoughby Street and Neutral Bay. Commercial and industrial receivers and active recreation areas located along the bay. A place of worship is located north of Willoughby Street, Kirribilli.</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>98</td>
<td>Medium density and multi-storey residential receivers, and multi-storey commercial receivers west of the proposed proposal boundary between Pacific Highway, Lavender Street and Cahill Expressway. A place of worship and a child care centre are located north of Lavender Street, Lavender Bay.</td>
</tr>
<tr>
<td>NCA02.2E</td>
<td>549</td>
<td>Medium density residential receivers and commercial receivers northeast of the proposal boundary between Neutral Bay and Kurrraba Road.</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>298</td>
<td>Medium density residential receivers and commercial receivers southeast of the proposal boundary between Broughton Street, Willoughby Street, Neutral Bay and Parkes Street. Active recreation area Bradfield Park is located adjacent to the Sydney Harbour Bridge.</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>40</td>
<td>Multi-storey residential and commercial receivers to the west and southwest of the proposal boundary between Warringah Freeway, Lavender Street and Lavender Bay. Outdoor passive recreation (Bradfield Park) and a place of worship located on Alfred Street, and outdoor active recreation located on Lavender Street.</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>40</td>
<td>Medium density residential receivers, isolated commercial receivers and an outdoor passive recreation receiver southeast of the proposal boundary between Parkes Street and Neutral Bay.</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>329</td>
<td>Multi-storey and medium density residential receivers southwest of the proposal boundary between Lavender Bay, Lavender Street and Blues Point Road. Outdoor passive recreation areas located on Blues Point Road and Henry Lawson Avenue, and outdoor active recreation area located on Lavender Crescent.</td>
</tr>
</tbody>
</table>
Figure 3.2: Sensitive receivers, noise catchment areas and noise monitoring locations
For Scenario 1, it is understood that the utilities relocation work would be conducted with an electric hand drill. A conservative estimate has been adopted in relation to potential tools to be used and for this reason a hammer drill with a sound power level of 102 dBA (L_{Aeq}) was adopted for the noise modelling and 108 dBA (L_{Amax}) for the sleep disturbance assessment.

Table 3.4 presents the predicted noise level exceedances (refer to Section 4.1.1 in Appendix C for more detail).

Table 3.4: Predicted construction noise level exceedances for Scenario 1 (Items 1, 2 and 7)

<table>
<thead>
<tr>
<th>NCA</th>
<th>Predicted highest noise level range per scenario (L_{eq^{(15min)}}, dBA)</th>
<th>Noise management level criteria exceeded</th>
<th>Predicted maximum noise levels (L_{max}, dBA)</th>
<th>Sleep disturbance criteria exceeded?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential receivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>&lt; 30-68</td>
<td>• Daytime during standard hours by 1 dB</td>
<td>44-52</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Daytime during out-of-hours by 6 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evening by 7 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Night-time by 18 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>32-63</td>
<td>• Daytime during out-of-hours by 1 dB</td>
<td>44</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evening by 2 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Night-time by 13 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>&lt;30-57</td>
<td>• Night-time by 10 dB</td>
<td>31-40</td>
<td>No</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>&lt;30-58</td>
<td>• Night-time by 11 dB</td>
<td>56-72</td>
<td>Yes by 7 dB</td>
</tr>
<tr>
<td>Place of worship</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>54-56</td>
<td>• Daytime during standard hours by 1 dB</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Daytime during out-of-hours by 1 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evening by 1 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Where predicted noise level is 30 dBA or less, noise level of <30 dBA is shown as the predicted noise level.

The noise levels predicted for the other sensitive receivers assessed (that are not included in Table 3.4) did not exceed any of the adopted noise management levels. This includes all commercial, industrial, educational, child care and active/passive recreational receivers.

It should be noted that the noise predictions assume 10 minutes (out of 15 minutes) of continuous use of the electric drill. Shorter durations would reduce the L_{eq^{15min}} noise emissions, for example 5 minutes’ use would reduce the predicted noise levels by 3 dB.

The additional utility relocation work for Scenario 1 are considered within the same acoustic significance of the construction work proposed in the REF. Therefore, the existing mitigation measures identified for the proposal would be sufficient.
Scenario 2

For Scenario 2, the construction work would be carried out at various times of day and night, dependent upon the construction and traffic staging. The equipment modelled for each sub-scenario is outlined within Table 3.5.

Table 3.5: Equipment modelled in Scenario 2

<table>
<thead>
<tr>
<th>Work</th>
<th>Equipment Modelled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burton Street Stairs to Chainage 340 (Item 3) and Chainage 340 to</td>
<td>Nail gun: 101 dBA</td>
</tr>
<tr>
<td>Chainage 390 (Item 4) kerb and utility relocation works</td>
<td>Concrete Vibrator: 102 dBA</td>
</tr>
<tr>
<td></td>
<td>Combined: 104 dBA</td>
</tr>
<tr>
<td>Chainage 390 coring (Item 5)</td>
<td>Concrete Corer: 101 dBA</td>
</tr>
<tr>
<td>Ennis Road Trenching (Item 6)</td>
<td>Concrete Saw: 118 dBA</td>
</tr>
<tr>
<td></td>
<td>Small excavator: 105 dBA</td>
</tr>
<tr>
<td></td>
<td>Small crew truck: 108 dBA</td>
</tr>
<tr>
<td></td>
<td>Site ute: 88 dBA</td>
</tr>
<tr>
<td></td>
<td>Wacker packer: 106 dBA</td>
</tr>
<tr>
<td></td>
<td>Concrete agitator for reinstatement: 109 dBA</td>
</tr>
<tr>
<td></td>
<td>Combined: 118 dBA</td>
</tr>
</tbody>
</table>

Table 3.6 presents the predicted noise level exceedances (refer to Section 4.1.2 in Appendix C for more detail).

Table 3.6: Predicted construction noise level exceedances for Scenario 2

<table>
<thead>
<tr>
<th>NCA</th>
<th>Sub-scenario</th>
<th>Predicted highest noise level range ($L_{eq(15min)}, \text{dBA}$)</th>
<th>Noise management level criteria exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential receivers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>Item 6</td>
<td>32-60</td>
<td>• Night-time by 9 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>Item 3</td>
<td>&lt;30-64</td>
<td>• Daytime during out-of-hours by 2 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Evening by 3 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Night-time by 14 dB</td>
</tr>
<tr>
<td></td>
<td>Item 4</td>
<td>&lt;30-65</td>
<td>• Daytime during out-of-hours by 3 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Evening by 4 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Night-time by 15 dB</td>
</tr>
<tr>
<td></td>
<td>Item 5</td>
<td>&lt;30-61</td>
<td>• Night-time by 11 dB</td>
</tr>
<tr>
<td></td>
<td>Item 6</td>
<td>&lt;30-88</td>
<td>• Highly-noise-affected by 13 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Daytime during standard hours by 21 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Daytime during out-of-hours during 26 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Evening by 27 dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Night-time by 38 dB</td>
</tr>
</tbody>
</table>
The additional utility relocation and kerb adjustment work for Scenario 2 are considered within the same acoustic significance of the construction work proposed in the REF. Therefore, the existing mitigation measures identified for the proposal would be sufficient.

In addition, the predicted maximum vibrations levels for trenching along Ennis Road (Item 6) have been calculated and compared against the cosmetic damage criteria and underground utility criteria. This has been carried out assuming use of a 500 kilogram compactor.

Within the work areas, construction equipment may operate less than 10 metres to the nearest residential receiver within NCA 02.1E. The vibration levels are predicted to be 9.2 mm/s which is above the relevant criteria of 7.5 mm/s. The minimum working distance is expected to be approximately 12 metres. Therefore, the use of a lighter and/or lower vibration generating

<table>
<thead>
<tr>
<th>NCA</th>
<th>Sub-scenario</th>
<th>Predicted highest noise level range ($L_{eq(15min)}$, dBA)</th>
<th>Noise management level criteria exceeded</th>
</tr>
</thead>
</table>
| NCA02.1W  | Item 6       | <30-67                                                    | • Daytime during out-of-hours by 5 dB  
• Evening by 6 dB  
• Night-time by 17 dB                                                            |
| NCA03.1E  | Item 3       | <30-49                                                    | • Night-time by 2 dB                                                           |
|           | Item 6       | <30-62                                                    | • Night-time by 15 dB                                                          |
| NCA03.1W  | Item 3       | <30-57                                                    | • Night-time by 10 dB                                                          |
|           | Item 4       | <30-58                                                    | • Night-time by 11 dB                                                          |
|           | Item 5       | <30-55                                                    | • Night-time by 8 dB                                                           |
|           | Item 6       | <30-68                                                    | • Daytime during out-of-hours by 4 dB  
• Evening by 4 dB  
• Night-time by 21 dB                                                            |
| NCA03.2E  | Item 6       | <30-53                                                    | • Daytime during out-of-hours by 2 dB  
• Evening by 6 dB  
• Night-time by 7 dB                                                            |
| NCA03.2W  | Item 6       | <30-54                                                    | • Daytime during out-of-hours by 1 dB  
• Evening by 4 dB  
• Night-time by 9 dB                                                            |

**Place of worship**

<table>
<thead>
<tr>
<th>NCA</th>
<th>Sub-scenario</th>
<th>Predicted highest noise level range ($L_{eq(15min)}$, dBA)</th>
<th>Noise management level criteria exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCA03.1E</td>
<td>Item 6</td>
<td>37-56</td>
<td>• Daytime during standard hours, out-of-hours and evening by 1 dB</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>Item 6</td>
<td>&lt;30-58</td>
<td>• Daytime during standard hours, out-of-hours and evening by 3 dB</td>
</tr>
</tbody>
</table>

**Child care centre**

<table>
<thead>
<tr>
<th>NCA</th>
<th>Sub-scenario</th>
<th>Predicted highest noise level range ($L_{eq(15min)}$, dBA)</th>
<th>Noise management level criteria exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCA02.1W</td>
<td>Item 6</td>
<td>38-56</td>
<td>• Daytime during standard hours by 6 dB</td>
</tr>
</tbody>
</table>
compactor has been recommended as an additional management and mitigation measure to reduce the potential for vibration related impacts (refer to Table 4.1).

**Visual amenity**

**Construction**

The trenching along Ennis Road (Item 6) would result in an additional construction phase visual impact to surrounding residences and users of Ennis Road due to construction equipment, soil stockpiles, fencing and the trench being visible. However, it is anticipated this work would only take about two weeks to complete, the additional visual impact would be temporary and minor. They would be appropriately managed through the existing mitigation measures in the REF.

The construction work for Item 1 would be conducted using hand power tools from the existing maintenance catwalk under the bridge. There would be limited visual receivers of this work. Similarly, the construction work for Item 7 would be conducted at night and would not require any large equipment as the cables would be installed within existing conduits. Therefore, the work would result in a negligible additional visual impact compared to what is already assessed in the REF for the construction of the proposal.

Construction work for Items 2-5 would occur within the existing proposal boundary where the visual impacts during construction have already been assessed, such as from equipment use and noise hoarding. Therefore, the proposed additional kerb and utility work would not cause any additional visual impacts beyond what is already assessed in the REF.

**Operation**

The installation of the new cable conduit under the bridge deck (Item 1) would be outside of the existing proposal boundary. However, the new cable conduit would not cause visual impacts given the work would be alongside an existing conduit and so would not be a new visual component in the area, and there would be limited visual receivers as it would be located below the road surface.

Item 2 would have minimal additional visual impact as it would not be visible to users of the Cahill Expressway as it would be obscured by the W-beam barrier, and would only slightly change the appearance of the W-beam barrier for people walking along the adjacent pedestrian footpath.

An additional visual impact would result from Item 4 due to the increased kerb height between Chainage 340 and Chainage 390. However, as the kerb is only being raised about 250 mm and is otherwise in the same location as the existing kerb, this additional visual impact would be negligible.

Items 3, 5, 6 and 7 would not result in any notable visual impacts during operation.

**Traffic and transport**

**Construction**

Construction work for Item 1 would be accessed from the existing maintenance catwalk underneath the bridge, with no road closures or traffic diversions required. Construction work for Items 2 to 5 and Item 7 may require temporary road closures and are anticipated to impact local traffic networks, even at night. However, the work would require the closure of sections of the Cahill Expressway, Bradfield Highway and Warringah Freeway, which are already within the existing proposal boundary and would have impacts consistent with that assessed in the REF.

Therefore, there would be no additional traffic and transport impacts due to Items 1 to 5 compared to what has been assessed in the REF, and no additional management or mitigation measures are proposed.

The trenching along Ennis Road (Item 6) would result in an additional traffic and transport impact due to the closure of a footpath and traffic lane on Ennis Road being required during construction work. However, access for pedestrians and traffic would be maintained, including to the existing Roads and Maritime carpark. In addition, Ennis Road is a local road so these traffic management measures are unlikely to cause any significant delays. In addition, the parking along the section of Ennis Road where construction work would occur would be temporarily removed for a period of up
to two weeks in duration. However, the parking would only be reinstated following the construction work. Therefore, the additional traffic and transport impact would be temporary, minor and would be sufficiently managed through the management and mitigation measures outlined in the REF.

**Operation**

The additional kerb adjustment and utility relocation work would not result in any traffic and transport impacts during operation.

### 3.5.3 Revised management and mitigation strategies

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguard</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Wherever possible, utility relocation works would try to minimise physical and visual impacts to the Sydney Harbour Bridge.</td>
<td>Contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Where new conduits or cable trays are required, they would be neutral in appearance to minimise visual impact</td>
<td>Contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Where feasible, existing holes in the fabric would be utilised and new holes minimised. To minimise impacts, it is recommended that a clamping methodology for the temporary utility relocation works be adopted. In the event that a bolting methodology is adopted, bolts for fixing to significant fabric would be designed so that they are easily removable without causing damage to surrounding fabric.</td>
<td>Contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Care would be taken to avoid significant impacts to original fabric in all instances, and hand powered tools would be used for works located in proximity to significant fabric.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td>Prior to works commencing in Ennis Road and the Roads and Maritime Services office carpark, a vibration impact assessment must be undertaken of proposed work methodologies and mitigation measures implemented to prevent cosmetic or structural damage to adjacent buildings.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>
3.6 Construction compounds

Two additional construction compound sites and one alternative construction compound locations have been proposed. The additional construction compound sites are located in Rozelle on Sommerville Road and James Craig Road (on a portion of the out of service Glebe Island Bridge) (as shown in Figure 3.3). The alternative construction compound is located in The Rocks on Argyle Street (refer to Figure 3.4).

3.6.1 Construction compound sites in Rozelle

The Sommerville Road site is owned by Roads and Maritime and the James Craig Road site is owned by the Port Authority of NSW. The Argyle Street site is owned by Rail Corporation.

Roads and Maritime adopts the following principles for identifying compound sites:

- At least 40 metres away from the nearest waterway
- Of low ecological and heritage conservation significance
- At least 100 metres away from residential dwellings and other land uses that may be sensitive to noise
- Of relatively level ground
- Outside the 1 in 10 year ARI floodplain
- On direct access to the road network.

The Sommerville Road site is an existing construction compound site and has been used for similar purposes for other Roads and Maritime projects. The Sommerville Road site meets all the above criteria and would be used for:

- Storage and stockpiling of materials
- Storage of large construction vehicles
- Possible use as a site office and for construction staff parking.

The James Craig Road site is currently used for light vehicle parking and meets the majority of the criteria with the exception of it:

- Being within 40 metres of the Sydney Harbour waterway
- Having some heritage significance with the site being located within the curtilage of the Glebe Island Bridge which is listed on the State Heritage Register and the ‘Glebe Island Bridge approach’ which is listed on the Port Authority of NSW Section 170 Heritage Register.

In consideration of these site constraints the James Craig Road site is only proposed to be used for construction vehicle parking and storage of large construction equipment. No storage of fuels or chemicals would be permitted at this site.

3.6.2 Argyle Street construction compound

The Argyle Street construction compound has been identified as an alternative site office location to the Blue Street site which was identified as the site office location in section 3.4 of the REF. The existing facilities would be removed from the Argyle Street site and would be replaced by new site sheds, site offices and meal rooms installed on an existing hardstand. It would be powered by an onsite generator or via connection to the electrical mains. It would be operational 24 hours a day during the construction work. Five carpark spaces would be provided onsite for contractor vehicles.

The Argyle Street construction compound meets the majority of the criteria with the exception of it:

- Being of heritage conservation significance
- Within 100 metres of residential dwellings and other land uses that may be sensitive to noise.

In consideration of these site constraints, the Argyle Street construction compound is proposed to mainly be used as a site office, with some storage of machinery, equipment or materials and no stockpiling of loose materials.
Figure 3.3: Additional construction compounds
Figure 3.4: Alternative Site Office Location
3.6.3 Environmental assessment

The need to carry out additional environmental assessment was reviewed to consider the changes to the proposal. The review considered potential environmental impacts, with a focus on the key environmental impacts of the proposal. This includes non-Aboriginal heritage, noise and vibration, visual amenity and traffic and transport (refer to section 8.1 of the REF) for the additional construction compound sites and the alternative site office location.

Non-Aboriginal heritage

Construction compound sites in Rozelle

The Sommerville Road site and the James Craig Road site are unlikely to result in any additional non-Aboriginal heritage impacts.

Argyle Street construction compound

The proposed Argyle Street construction compound is within the State Heritage Register (SHR) curtilage for the Sydney Harbour Bridge and Argyle Street Railway Substation and in the vicinity of numerous heritage items and heritage conservation areas.

The installation, use and future demobilisation of demountable buildings within the construction compound would result in a reversible physical impact, but no permanent direct impacts to the Sydney Harbour Bridge, Argyle Street Railway Substation, or the surrounding heritage items and conservation areas.

The use of this area as a construction compound would result in temporary localised visual impacts to nearby heritage items, particularly the overlooking four-storey Argyle Street Railway Substation building and two-storey terrace housing. The proposed demountable buildings would introduce new temporary visual elements within the surrounding historic precinct. However, the site is relatively concealed from the surrounding streetscape and conservation areas, with views from the public domain limited to the entry drive off Cumberland Street.

Overall, the use of the Argyle Street construction compound would result in negligible physical and visual impact to the SHR listed Sydney Harbour Bridge and a minor physical and visual impact to the SHR listed Argyle Street Railway Substation. The proposed Argyle Street construction compound would result in negligible to minor temporary visual impacts to surrounding nearby heritage items (refer to Section 8.8 in Appendix B).

Noise and vibration

Construction compound sites in Rozelle

The two additional construction compound sites in Rozelle are located away from residential receivers and impacts from their temporary use are not anticipated.

Argyle Street construction compound

An assessment of the removal of the existing facilities and construction of new demountable site offices was undertaking using the Construction Noise Estimator in accordance with the CNVG (refer to Section 4.2.1 in Appendix C). This assessment assumed that the work would likely be carried out within one day primarily by a small excavator and trucks.

The assessment found that residential receivers within 30 metres of the Argyle Street site would be noise affected during the activities, and residential receivers within 15 metres would be highly noise affected. The Harbour View Hotel would also be within the noise affected distance calculated for commercial type receivers during the activities. To minimise the potential for noise impacts, the standard mitigation measures outlined in the REF should be implemented, including community consultation or notification, selection of quieter equipment and planning of the work site and activities to minimise noise.
Due to some residential receivers being located within the highly noise affected distance, additional mitigation measures should also be implemented, such as notification via letterbox drop detailing the work activities and the expected time periods.

A generator is potentially required to provide power for the Argyle Street construction compound once it is established. It would be operational for 24 hours a day. As such, the highest acceptable sound power level for the generator operation will be limited by the night-time NML. Figure 3.5 details the areas where the generator of a given sound power level may be positioned when operating at night.

Figure 3.5: Maximum generator sound power level at night
Based on the noise modelling carried out, the highest acceptable sound power level for the generator during the night time period would be 95 dBA, if it is situated in the south east corner of the compound. Should the generator be located on the boundary adjacent to residents, a sound power level in the order of 70 dBA or less would be required. These levels assume no significant contribution from other construction-related noise sources.

As these numbers are based upon the night time noise levels which are the most stringent, it is possible to use a louder generator outside of these hours. In the daytime, the noise management level is 12 dB higher than during the night, 7 dB higher for day outside of standard hours, and 2 dB higher during the evening. The difference in night time and other period noise criteria may be considered when selecting a generator. For example, a generator with a sound power level of up to 107 dBA may operate in the south east corner of the compound during daytime standard hours only.

The noise modelling does not include barrier effects due to site buildings, and as a result may be considered conservative. Some attenuation would be achieved with a building breaking line of sight between the generator and the nearest sensitive receivers.

Visual amenity
The visual impacts relating to all of the possible construction compounds would be minor and temporary in nature. The sites have been used for similar construction compound type uses so the proposed uses as part of this proposal would not create a significant change. Standard safeguards would be implemented to minimise the impacts.

Traffic and transport
Vehicle access to the two construction compounds in Rozelle would be via Sommerville Road and would be co-ordinated with the Port Authority of NSW as they are located within controlled access areas.

Vehicle access to the Argyle Street construction compound in Dawes Point would be via Cumberland Street, beneath the Cahill Expressway.

Additional construction vehicle volumes between the two construction compounds in Rozelle are not anticipated to significantly impact the local road network performance. The Argyle Street construction compound will be adjacent to the Harbour View Hotel and other shops and residences. However, given the use of the Argyle Street construction compound mainly as a site office, additional vehicle volumes are not anticipated to significantly impact local traffic along Cumberland Street, Lower Fort Street and the local road network.

3.6.4 Revised management and mitigation measures
Five additional management measures are required as a result of the changes to the proposal. These are identified below.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards and management measures</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>There is to be no ground disturbing activities or impacts to significant fabric would occur within the proposed Argyle Street site compound area. Any changes to the proposal that involve potential impacts to the adjacent Sydney Harbour Bridge retaining wall and surrounding heritage items, or excavations or ground disturbing works must be subject to an addendum impact assessment.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

Sydney Harbour Bridge Northern toll plaza precinct upgrade
Submissions Report
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards and management measures</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality</td>
<td>No storage of fuels or chemicals to be permitted at the James Craig Road construction compound site. Appropriate bunding and/or sediment and erosion control measures must be implemented to minimise runoff from stockpiled materials.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Due to some residential receivers being located within the highly noise affected distance, additional mitigation measures must be implemented for the proposed construction works at the Argyle Street site. This could consist of notification via letterbox drop detailing the work activities and the expected time periods.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Any on site generator installed at the Argyle Street site must be positioned in a location and/or have a sound power level so as not to adversely impact on adjacent residents.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

### 3.7 Temporary advanced warning sign at High Street

#### 3.7.1 Overview

Installation of a temporary signage pole on High Street is proposed during construction to provide warning to motorists about the traffic conditions ahead. This temporary signage pole is anticipated to take less than a day to install during standard working hours. No lane closures or other traffic management measures would be required as the construction contractor would park on the existing adjacent footpath.

#### 3.7.2 Environmental assessment

**Noise and vibration**

The assessment of the predicted construction noise levels for the additional temporary advanced warning sign on High Street was carried out as part of Scenario 2 in the noise addendum memo (refer to Appendix C). The noise catchment areas described in Table 6.16 in section of the REF were adopted for the noise assessment.

For Scenario 2, the construction work would be carried out at various times of day and night, dependent upon the construction and traffic staging. The equipment and associated sound power levels modelled for the additional High Street Works (for the installation of the temporary advanced warning sign) were:

- Small excavator (95 dBA)
- Site ute (88 dBA)
- Combined use (95 dBA).

Table 3.7 presents the predicted noise level exceedances (refer to Section 4.1.2 in Appendix C for more detail).
Table 3.7: Predicted construction noise level exceedances for Scenario 2

<table>
<thead>
<tr>
<th>NCA</th>
<th>Predicted highest noise level range (L_{eq(15min)}, \text{dBA})^1</th>
<th>Noise management level criteria exceeded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential receivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>&lt;30-55</td>
<td>Night-time by 4 dB</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>&lt;30-57</td>
<td>Night-time by 7 dB</td>
</tr>
</tbody>
</table>

1. Where predicted noise level is 30 dBA or less, noise level of <30 dBA is shown as the predicted noise level.

The noise levels predicted for the other sensitive receivers assessed (that are not included in Table 3.7) did not exceed any of the adopted noise management levels. This includes all commercial, industrial, educational, child care and active/passive recreational receivers.

The noise predictions assume 10 minutes (out of 15 minutes) of continuous use of the electric drill. Shorter durations would reduce the \(L_{eq 15\text{min}}\) noise emissions, for example 5 minutes’ use would reduce the predicted noise levels by 3 dB.

Overall, the additional work for the temporary warning sign at High Street are considered within the same acoustic significance of the construction work proposed in the REF. Therefore, the existing mitigation measures identified for the proposal would be sufficient.

**Visual amenity**

The signage pole would result in an additional impact on visual amenity as it would introduce an additional visual element into the landscape. However, this additional visual amenity impact would be temporary and negligible, as it would be removed following completion of the construction work and signage poles are a common and expected visual element along roads.

**3.7.3 Revised management and mitigation measures**

The installation work for the temporary signage pole during construction would be minor in nature and does not require revisions to existing management and mitigation strategies outlined in the REF.
4 Environmental management

The REF for the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade identified the framework for environmental management, including safeguards and management measures that would be adopted to avoid or reduce environmental impacts (Chapter 7 of the REF).

Consideration of the issues raised in the public submissions has not resulted in the need to revise the safeguard and management measures from the REF.

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

4.1 Environmental management plans

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by environment staff, Greater Sydney Project Office, prior to starting any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP will be developed in accordance with the specifications set out in the QA Specifications:

- G10 – Traffic Management
- G36 – Environmental Protection (Management System)
- G38 – Soil and Water Management (Soil and Water Plan).

4.2 Summary of safeguards and management measures

The REF for the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the proposed changes to the proposal, the environmental management measures for the proposal (refer to Chapter 7 of the REF) have been revised to include additional management measures. Should the project proceed, the environmental management measures in Table 4.1 will guide the subsequent phases of the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade. Additional and/or modified environmental safeguards and management measures to those presented in the REF have been written in **bold** and **underlined**. Deleted measures or parts of measures are denoted by **strikethrough text**.

Revisions to the non-Aboriginal heritage protection and noise and vibration mitigation measures for the construction phase of the proposal have also been made. These revisions are standalone and not a result of the proposed changes to the proposal. The non-Aboriginal heritage revisions have involved identifying more detailed measures at this stage of the proposal development as opposed to detailing them in the pre-construction phase as part of a temporary protection plan.
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards and management measures</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| General – minimise environmental impacts during construction | A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following:  
  • Any requirements associated with statutory approvals  
  • Details of how the project will implement the identified safeguards outlined in the REF  
  • Issue-specific environmental management plans  
  • Roles and responsibilities  
  • Communication requirements  
  • Induction and training requirements  
  • Procedures for monitoring and evaluating environmental performance, and for corrective action  
  • Reporting requirements and record-keeping  
  • Procedures for emergency and incident management  
  • Procedures for audit and review.  The endorsed CEMP will be implemented during the undertaking of the activity. | Contractor / Roads and Maritime project manager | Pre-construction |
<p>| General – notification                                       | All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.                                                                 | Contractor / Roads and Maritime project manager | Pre-construction |</p>
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards and management measures</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>General – environmental awareness</td>
<td>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular &quot;toolbox&quot; style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • Areas of heritage sensitivity • Adjoining residential areas requiring particular noise management measures</td>
<td>Contractor / Roads and Maritime project manager</td>
<td>Pre-construction / Construction detailed design</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>The proposal involves works in close proximity to significant fabric of the Sydney Harbour Bridge northern approaches. In particular, this includes the concrete rendered retaining walls on the eastern side of the Sydney Harbour Bridge northern approaches, the Sydney Harbour Bridge north east stairs and the underlying Milsons Point Tram Station. <strong>A Heritage Management subplan shall be prepared as part of the project CEMP to these significant heritage components</strong> for the duration of the project to minimise potential physical impact.</td>
<td>Contractor</td>
<td>Pre-construction/construction</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>A specialist heritage consultant must be engaged to should provide ongoing heritage advice during the detailed design and construction phases of the proposal.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design/Pre-construction/Construction</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td><strong>Prior to any works commencing that impact on items listed under the State Heritage Register, a Section 60 Heritage Act approval application must be prepared and approval obtained from the NSW Heritage Council.</strong></td>
<td>Roads and Maritime</td>
<td>Detailed Design/Pre-construction</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards and management measures</td>
<td>Responsibility</td>
<td>Timing</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>The <em>Standard Management Procedure - Unexpected Heritage Items</em> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.</td>
<td>Contractor</td>
<td>Detailed design/pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>Prior to construction commencing removal of the 1950s toll booths and 1970s toll office within the Sydney Harbour Bridge northern toll plaza precinct, a Photographic Archival Recording (PAR) of the 1950s toll booths and 1970s toll office is to be prepared for these items. The PAR would be prepared as per the SoHI (refer to Section 8.2 in Appendix C) and in accordance with the NSW Office of Environment &amp; Heritage guidelines for <em>Photographic Recording of Heritage Items Using Film or Digital Capture</em>. The report must consist of an archival standard photographic record of the site, noting the location and details of the toll booths and toll office as well as demonstrating the overall setting within the Sydney Harbour Bridge northern approaches.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed Design/Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>During the first phase of the lifting of the road bed, the underlying brick layer would be recorded in situ with a photographic archival recording, prior to removal, with a sample of the bricks retained for interpretive purposes.</td>
<td>Roads and Maritime and Contractor</td>
<td>Pre-construction/pre-construction</td>
</tr>
</tbody>
</table>
### Environmental safeguards and management measures

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards and management measures</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Aboriginal heritage</td>
<td>The materials utilised in new works as part of the proposal would be congruent with the aesthetic character of the Sydney Harbour Bridge and surrounding fabric. This includes selection of modern and lightweight materials that are, where appropriate, coloured to match the existing fabric of the Sydney Harbour Bridge including existing neutral concrete and steelwork tones of the overall bridge structure. The material palette of the proposal would be consistent with other Sydney Harbour Bridge related projects.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design/Construction</td>
</tr>
<tr>
<td>Non-Aboriginal heritage</td>
<td>The design and placement of the various elements within the proposal would be developed to minimise visual impact on the heritage items identified within the study area (refer to Section 6.1). Where feasible, works would be designed to reduce the visual prominence of new elements along the roadway. This involves employment of appropriate modern and lightweight designs that seek to reduce the visual ‘bulk’ of new structures. Any new signage, lighting, or associated infrastructure regarding upgrades to the roadway would be sensitively designed and integrated, and wherever possible kept to a minimum to avoid introducing visual clutter on the Sydney Harbour Bridge northern approaches. This will assist in reducing potential visual impact on significant views along the Sydney Harbour Bridge northern approaches and to surrounding heritage items.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design/Construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>To retain and respect the National and State heritage values of the Sydney Harbour Bridge, a heritage induction will be provided to all on-site staff and contractors involved in the project. The induction will clearly describe the heritage constraints of the site in order to retain and respect the National and State heritage values of the Sydney Harbour Bridge.</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Non-Aboriginal Heritage</td>
<td>Wherever possible, utility relocation works would try to minimise physical and visual impacts to the Sydney Harbour Bridge.</td>
<td>Contractor</td>
<td>Detailed Design/Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Where permanent conduits or cable trays are required, they would be neutral in appearance to minimise visual impact.</td>
<td>Contractor</td>
<td>Detailed Design/Pre-construction</td>
</tr>
<tr>
<td>Non-Aboriginal Heritage</td>
<td>Where feasible, existing holes in the fabric would be utilised and new holes minimised. To minimise impacts, it is recommended that a clamping methodology for the temporary utility relocation works be adopted. In the event that a bolting methodology is adopted, bolts for fixing to significant fabric would be designed so that they are easily removable without causing damage to surrounding fabric.</td>
<td>Contractor</td>
<td>Detailed Design/Pre-construction</td>
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<tr>
<td>Non-Aboriginal Heritage</td>
<td>Care would be taken to avoid significant impacts to original fabric in all instances, and hand powered tools would be used for works located in proximity to significant fabric.</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Non-Aboriginal Heritage</td>
<td>There is to be no ground disturbing activities or impacts to significant fabric would occur within the proposed Argyle Street site compound area. Any changes to the proposal that involve potential impacts to the adjacent Sydney Harbour Bridge retaining wall and surrounding heritage items, or excavations or ground disturbing works must be subject to an addendum impact assessment.</td>
<td>Contractor</td>
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| Landscape character and visual impact      | Detail design will be developed in accordance with the following:  
  • Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014)  
  • Sydney Harbour Bridge Conservation Management Plan (Sydney Harbour Bridge CMP) 2007  
  • Bridge Aesthetics (Roads and Maritime 2012)  
  • The detail design project team will consult with the Centre for Urban Design during the development of the design.                                                                 | Detailed Design Contractor/ Roads and Maritime       | Detailed design / pre-construction                      |
<p>| <strong>Landscape character and visual impact</strong>   | <strong>Consistency in choice of material and finishes for road furniture such as barriers and lights to match existing infrastructure.</strong>                                                                                                                     | Detailed Design Contractor/ Roads and Maritime       | Detailed design         |
| Sympathetic choice of materials and finishes|                                                                                                                                                                                                                                           |                                                     |                         |
| <strong>Landscape character and visual impact</strong>   | <strong>Minimisation of any new roadside furniture to limit visual impacts to the historic fabric of the bridge.</strong>                                                                                                                               | Detailed Design Contractor/ Roads and Maritime       | Detailed design         |
| Minimisation of roadside furniture          |                                                                                                                                                                                                                                           |                                                     |                         |
| <strong>Landscape character and visual impact</strong>   | <strong>Maintain a holistic and coordinated approach in the overall urban design treatment and heritage interpretation for the Sydney Harbour Bridge precinct as a whole.</strong>                                                                                 | Detailed Design Contractor/ Roads and Maritime       | Detailed design         |
| Holistic approach to urban design           |                                                                                                                                                                                                                                           |                                                     |                         |</p>
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<td>Noise and vibration</td>
<td>A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <em>Interim Construction Noise Guideline</em> (ICNG) (DECC, 2009) and identify:</td>
<td>Contractor</td>
<td>Construction</td>
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<td>• All potential significant noise and vibration generating activities associated with the activity</td>
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<td>• A monitoring program to assess performance against relevant noise and vibration criteria</td>
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<td>• Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</td>
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<td>• Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</td>
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<tr>
<td>Noise and vibration</td>
<td>The CNVMP must include all feasible and reasonable standard safeguards listed in Appendix B of RMS’s Construction Noise and Vibration Guideline for implementation.</td>
<td>Contractor</td>
<td>Pre-construction/Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>All sensitive receivers (e.g. schools, local residents) likely to be affected will be notified at least 7 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of:</td>
<td>Contractor</td>
<td>Pre-construction/Construction</td>
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<tr>
<td></td>
<td>• The project</td>
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<td></td>
<td>• The construction period and construction hours</td>
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<td>• Contact information for project management staff</td>
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<td>• Complaint and incident reporting</td>
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<td>• How to obtain further information.</td>
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<tr>
<td>Noise and vibration</td>
<td>Construction respite periods are to be implemented as per Appendix C of the CNVG including following measures: • Respite Offers (RO) • Respite Period 1 (R1) • Respite Period 2 (R2) • Duration Respite (DR).</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Noise and vibration</td>
<td>Where feasible and reasonable install temporary barriers around the stationary sources or use alternative quieter equipment.</td>
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<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Fit mobile plant and hydraulic hammer with a muffler or silencer.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Very noisy activities (e.g. construction scenarios S02B, S03C, S04D, S05E, S06A, S07A, S08A, S09A, S10A, S12F and SIM02 OOHW)) should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 12 am (midnight). Where feasible, periods where high noise work is required up to midnight, such activities should be scheduled to restart after 7 am the next morning.</td>
<td>Roads and Maritime</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>The required locations for vibration intensive equipment should be reviewed during construction planning when more specific information is available.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Attended vibration monitoring or vibration trials should be undertaken when proposed works are within the safe working distances to ensure that the levels remain below the criterion.</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Noise and vibration</td>
<td>Building condition/dilapidation surveys should also be completed both before and after the works on all buildings/structures likely to be impacted by construction vibration to identify existing damage and any proposal related damage. The exact receivers should be identified once detailed construction planning has occurred and during the preparation of the CNVMP.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td><strong>Noise and vibration</strong></td>
<td><strong>Due to some residential receivers being located within the highly noise affected distance, additional mitigation measures must be implemented for the proposed construction works at the Argyle Street site. This could consist of notification via letterbox drop detailing the work activities and the expected time periods.</strong></td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Any on site generator installed at the Argyle Street site must be positioned in a location and/or have a sound power level so as not to adversely impact on adjacent residents.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise and Vibration</td>
<td>Prior to works commencing in Ennis Road and the Roads and Maritime Services office carpark, a vibration impact assessment must be undertaken of proposed work methodologies and mitigation measures implemented to prevent cosmetic or structural damage to adjacent buildings.</td>
<td>Contractor</td>
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| Traffic and transport         | A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Roads and Maritime, 2008). The TMP will include:  
  • Confirmation of haulage routes  
  • Measures to maintain access to local roads and properties  
  • Site specific traffic control measures (including signage) to manage and regulate traffic movement  
  • Measures to maintain pedestrian and cyclist access  
  • Requirements and methods to consult and inform the local community of impacts on the local road network  
  • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads.  
  • A response plan for any construction traffic incident  
  • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms. | Contractor     | Construction    |
<p>| Traffic Staging               | The staging and construction program would include measures with the objective of minimising traffic disruption on the Cahill Expressway and/or Bradfield Highway to avoid any impact during peak periods.                                                                 | Contractor     | Pre-construction and construction |
| Traffic Access for emergency vehicles | Access would be maintained for emergency response vehicles. If a stage of the work restricts access from any approach to the Sydney Harbour Bridge alternative arrangements would be developed in consultation with the relevant emergency services. | Contractor     | Construction    |</p>
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<td><strong>Traffic Road diversions and closures</strong></td>
<td>Temporary traffic diversions, clearways and road closures would be implemented during the work in accordance with Transport Management Centre (TMC) requirements.</td>
<td><strong>Contractor</strong> Roads and Maritime</td>
<td>Construction</td>
</tr>
<tr>
<td>Stakeholder engagement</td>
<td>The community would continue to be informed of the future changed traffic conditions, changes to cyclist/pedestrian and the likely disruptions to access in accordance with the project communication strategy.</td>
<td><strong>Contractor</strong> Roads and Maritime</td>
<td>Construction</td>
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<tr>
<td>Waste</td>
<td>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</td>
<td><strong>Contractor</strong></td>
<td>Pre-construction/ construction</td>
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<tr>
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<td>• Measures to avoid and minimise waste associated with the project</td>
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<td>• Classification of wastes and management options (re-use, recycle, stockpile, disposal)</td>
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<td>• Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</td>
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<td>• Procedures for storage, transport and disposal</td>
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<td>• Monitoring, record keeping and reporting.</td>
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<td>The WMP will be prepared taking into account the <em>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</em> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</td>
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| Waste generation and/or resource depletion | The resource management hierarchy will be followed at all times throughout the proposal:  
• Avoid resource consumption  
• Recover recyclable materials for reuse  
• Dispose material unable to be recycled  
If the material is to be re-used it would need to be sampled and tested to meet the criteria and conditions attached to the EPA’s Excavated Public Road Material Exemption or Asphalt Exemption. | Contractor     | Construction |
<p>| Waste Inappropriate waste management        | Do not burn waste or leave waste material onsite once the work is completed.                                                                                                                                                                   | Contractor     | Construction |
| Waste Resource depletion                    | All pavements removed would be reused onsite where possible or removed by a waste contractor to an EPA licensed waste facility or for beneficial reuse.                                                                                                                                         | Contractor     | Construction |
| Waste Resource depletion                    | Waste designated for recycling or reuse would be stored separately and in a suitable location to avoid mixing with other materials/wastes.                                                                                                                                     | Contractor     | Construction |
| Waste Inappropriate waste management        | All working areas would be monitored to ensure construction site and compounds are kept free of rubbish and cleaned up at the end of each working day.                                                                                                                     | Contractor     | Construction |
| Waste Inappropriate waste management        | Send all disposed materials to a suitably licenced waste management / landfill facility according to the waste classification of the material.                                                                                                                   | Contractor     | Construction |
| Waste Inappropriate hazardous waste management | The disposal of asbestos and other hazardous material generated during the removal of toll booth and other structures would be performed by a contractor with the appropriate asbestos removal licence.                                            | Contractor     | Construction |</p>
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| Socio-economic and land use          | Prepare and implement a Communication Plan (CP) as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):  
  • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions  
  • Contact name and number for complaints.  
  The CP will be prepared in accordance with the Community Involvement and Communications Resource Manual (Roads and Maritime, 2012). | Roads and Maritime (Pre-construction)  
Contractor (construction) | Pre-construction/construction |
| Accidental spill                     | A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers). | Contractor | Pre-construction/Construction |
| Exposing workers to asbestos containing materials | Develop an asbestos management plan as part of the CEMP in accordance with NSW EPA Guidelines, How to Manage and Control Asbestos in the Workplace (WorkCover, 2011), and relevant industry codes of practice. The plan is to describe measures to:  
  • Handle, store and dispose of known asbestos  
  • Identify and manage suspected asbestos containing materials. | Contractor | Pre-construction/Construction |
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<tr>
<td>Exposing workers to asbestos containing materials</td>
<td>An occupational hygiene consultant, who would also be a licenced asbestos assessor with NATA accreditation, would carry out perimeter, personal and clearance air monitoring and inspections. Air monitoring would be carried out by a licensed asbestos assessor with NATA accreditation in accordance with National Occupational Health and Safety Commission (NOHSC), Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres [NOHSC:3003(2005)], NOHSC, Australia.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Contamination from spills</td>
<td>Keep emergency spill kits onsite at all times and make all staff aware of their location and trained in their use.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Contamination from fuel spills</td>
<td>Vehicles and plant would be properly maintained and regularly inspected for fluid leaks.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Contamination from fuel spills</td>
<td>Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Soil and water</td>
<td>A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction</td>
<td>Contractor</td>
<td>Pre-construction/ construction</td>
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<tr>
<td>Soil and water</td>
<td>A site specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Soil and Water Management Plan. The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather. The ESCP will be prepared in accordance with relevant guidelines including The Blue Book: Managing Urban Stormwater (MUS: Soils and Construction, Volume 2 (Landcom, 2008).</td>
<td>Contractor</td>
<td>Pre-construction/construction</td>
</tr>
<tr>
<td>Water quality</td>
<td><strong>No storage of fuels or chemicals to be permitted at the James Craig Road construction compound site.</strong> Appropriate bunding and/or sediment and erosion control measures must be implemented to minimise runoff from stockpiled materials.</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Sedimentation</td>
<td>Implement controls on the work site exit points to minimise material tracking onto the surrounding roads.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Sweep and remove all material deposited onto the surrounding roads at the end of each working shift and before rainfall. Ensure that the no swept material enters the stormwater drains.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Prevent sediment moving offsite and sediment laden water entering any stormwater drains</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Routinely check and record that all erosion and sediment controls are maintained and effective. Undertake additional inspections following a rainfall event of 10 millimetres or greater.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Water quality</td>
<td>There is to be no release of dirty water into drainage lines and/or waterways.</td>
<td>Contractor</td>
<td>Construction</td>
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<td>Greenhouse gas and climate change</td>
<td>Ensure opportunities are taken to reduce construction material quantities, where possible.</td>
<td>Roads and Maritime and Contractor</td>
<td>Detailed design/Pre-construction</td>
</tr>
<tr>
<td>Greenhouse gas and climate change</td>
<td>Use recycled materials where possible and failing that use materials with a high recycled content.</td>
<td>Contractor</td>
<td>Pre-construction/Construction</td>
</tr>
<tr>
<td>Greenhouse gas and climate change</td>
<td>Purchase materials with low embodied energies where practical in accordance with Road and Maritime purchasing policy.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Greenhouse gas and climate change</td>
<td>Aim to reduce the proposal’s transport footprint (haul distance) by purchasing materials and disposing of waste locally.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Greenhouse gas and climate change</td>
<td>Preventing equipment idling for an excessive period of time and switch off when not in use to prevent unnecessary emissions.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Air quality</td>
<td>Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Air quality</td>
<td>Works (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.</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Biodiversity</td>
<td>If unexpected flora or fauna are discovered stop work immediately and implement the Roads and Maritime Unexpected Threatened Species Find Procedure in the Biodiversity Guidelines, Guide 1 (pre-clearing process) (Roads and Maritime, 2011)</td>
<td>Contractor</td>
<td>Construction</td>
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<tr>
<td>Aboriginal heritage</td>
<td>The <em>Standard Management Procedure - Unexpected Heritage Items</em> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.</td>
<td>Contractor</td>
<td>Pre-construction/Construction</td>
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| Utilities              | Prior to the commencement of works:  
  - The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners.  
  If the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be undertaken. | Detailed Design and Contractor | Detailed design / pre-construction |
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| Hazards and risk management  | A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:  
  - Details of hazards and risks associated with the activity  
  - Measures to be implemented during construction to minimise these risks  
  - Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials  
  - A monitoring program to assess performance in managing the identified risks  
  - Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations.  
  The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications. | Contactor   | Pre-construction/Construction |
| Cumulative impacts           | Consult with local developers, Roads and Maritime and North Sydney Council to obtain information about project timeframes and impacts. Identify and implement appropriate safeguards and management measures to minimise cumulative impacts when building the proposal. | Roads and Maritime Contractor | Detailed Design/Pre-construction/Construction |
| Cumulative impacts           | All management plans to be prepared as part of the proposal including but not limited to the Construction Noise and Vibration Management Plan and Traffic Management Plan would need to consider other developments in the area. | Roads and Maritime Contractor | Pre-construction/Construction |
| Cumulative impacts           | Discuss the proposal with the CBD Task Force to ensure that road users are not adversely affected by this proposal and the controls implemented under the City Centre Access Strategy. | Roads and Maritime Contractor | Detailed Design/Pre-construction |
Impact | Environmental safeguards and management measures | Responsibility | Timing
--- | --- | --- | ---
**Cumulative Construction impacts** | Ensure that the safeguards and management measures included for this proposal offer sufficient mitigation to minimise noise impacts to adjacent receivers. This includes additive impacts from daytime work taking place at the same time on both projects, cumulative impacts affecting people during the day and at night from overlaps in the work programs or people being exposed to noise impacts. | Roads and Maritime / Contractor | Pre-construction/Construction
Cumulative impacts | Ensure consistency in the design, style, aesthetic character and material palette (in accordance with the *Sydney Harbour Bridge Conservation Management Plan*) of the proposed works within the Sydney Harbour Bridge curtilage, especially the Sydney Harbour Bridge southern toll plaza precinct upgrade. | Roads and Maritime / Contractor | Detailed design/Pre-construction/Construction

4.3 Licensing and approvals

Table 4.2: Summary of licensing and approval required

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<td><em>Heritage Act 1977</em></td>
<td>Prior to any works commencing that impact on the Sydney Harbour Bridge or Argyle Street substation State Heritage Register listed items, a Section 60 NSW Heritage Act 1977 (Heritage act) approval application must be prepared and approval obtained from the NSW Heritage Council.</td>
<td>Prior to start of construction</td>
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Appendix A

List of respondents
Table A1 lists the respondents and each respondent’s allocated submission number. The table also indicates where the issues from each submission have been addressed in Chapter 2 of this report.

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Appendix B

Statement of Heritage Impact (SoHI)
Sydney Harbour Bridge: Northern Toll Plaza Precinct Upgrade

Statement of Heritage Impact

Report to WSP and Roads and Maritime Services

November 2018
EXECUTIVE SUMMARY

Artefact has been engaged by WSP on behalf of Roads and Maritime Services (Roads and Maritime) to prepare a Statement of Heritage Impact (SoHI) for the proposed upgrade and simplification of the northern toll plaza precinct on the Cahill Expressway approaching the Sydney Harbour Bridge (Sydney Harbour Bridge) (the proposal).

The proposal involves removal of the toll booths and toll office located in the northern toll plaza precinct and road surface improvement work. Removal of tolling infrastructure from the precinct allows for simplification and reconfiguration of traffic lanes, the provision of an emergency response and incident management area and the introduction of a uniform speed zone of 70 km/h between Warringah Freeway and the Sydney Harbour Bridge with the capacity to implement variable speed limits (as an extension of the variable speed limit zone across the Sydney Harbour Bridge). Following the installation of new tolling gantries on the northern approach of the Sydney Harbour Bridge in December 2016, the existing toll structures that facilitated manual tolling and e-TAG electronic tolling are no longer required. Removal of the existing toll booth structures and toll office would make the approaches to the Sydney Harbour Bridge safer, enable the existing road lanes to be simplified, provide an improved road surface and provide an improved visual experience for drivers and bridge users.

The Sydney Harbour Bridge, its approaches and curtilage areas are of National and State Heritage Significance and are listed on the National Heritage List (NHL) and the NSW State Heritage Register (SHR). The proposal is also near several heritage items and heritage conservation areas. The works are partly located within a section of the World Heritage Buffer Zone for the World Heritage item, the Sydney Opera House.

The aim of this report is to identify heritage items which may be impacted by the proposed works, determine the level of heritage significance of each item, assess the potential impact to those items, recommend mitigation measures to reduce the level of heritage impact, and identify other management or statutory obligations. A preliminary archaeological assessment has also been undertaken to assess any archaeological potential and impact associated with proposed ground disturbing works on Ennis Road for utilities relocation works.

The SoHI was previously on public display as part of a Review of Environmental Factors (REF) for the proposal. Following proposal design changes, an extended study area has been assessed in this SoHI which has been revised to cover the proposal updates.

Overview of Findings

The proposal would result in the removal of the 1950s toll booths and removal of the 1970s toll office, as well as upgrade works to the road surface, utilities, signage and associated roadway facilities. This report has assessed that the potential physical and visual impacts of the proposal on the significant heritage values of the Sydney Harbour Bridge northern approaches would be minor. The proposal encompasses negligible to major localised impacts to elements of the Sydney Harbour Bridge approaches that are of low to moderate significance.

Given that the northern toll plaza precinct on the Sydney Harbour Bridge northern approaches comprises a small proportion of the Sydney Harbour Bridge, the potential physical and visual impacts of the proposal need to be assessed against the Sydney Harbour Bridge as a whole. Due to the nature of the proposed works and their location away from areas of exceptional heritage significance, the proposal would not degrade, damage, obscure or diminish the National and State heritage values of the Sydney Harbour Bridge.
Overall, the impact of the proposal on the Sydney Harbour Bridge would be minor. The minor impact of the proposal could be offset by the mitigation measures outlined below. The proposal would potentially result in positive heritage outcomes by offering an opportunity to remove clutter and accretions on the Sydney Harbour Bridge northern approaches and offer improved visibility of the exceptionally significant Sydney Harbour Bridge main arch structure for motorists, train users and pedestrians crossing the bridge.

The proposal, involving removal of decommissioned elements, removal of road safety hazards and realignment and simplification of traffic movements, is considered essential to maintain efficiency of the historic use of the Sydney Harbour Bridge as the main transportation route across Sydney Harbour and to support its ongoing longevity. The proposal, as such, is consistent with the policies contained in the Conservation Management Plan (CMP) 2007.1

The proposal would result in positive to negligible visual impacts on nearby heritage items including the Milsons Point Railway Station group, Greenway Flats, “Fern Lodge”, St John the Baptist Anglican Church, Fantasia Preschool, Electricity Substation No 217, the group of Houses at 44, 46, 48 and 50 Jeffreys Street, the group of Houses at 26, 28, 30 and 32 Jeffreys Street, the group of Houses at 34, 36, 38, 40 and 42 Jeffreys Street, pair of Houses at 40 and 42 Kirribilli Avenue, “Bratton”, the group of houses at 41, 43 and 45 Pitt Street, North Sydney bus shelters (St Johns), North Sydney Olympic Pool, Seawall and wharf site, Faux stone balustrade, “Illingullin”, Bradfield Park (including northern section), the Careening Cove Conservation Area and the Jeffreys Street Conservation Area.

The proposal could result in potential vibration impacts to the Milsons Point Railway Station group. Potential visual and vibration impacts are addressed in the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade ‘Construction and Noise and Vibration Impact Assessment’ and ‘Landscape Character and Visual Impact Assessment’, and could be offset by the mitigation measures outlined in the recommendations below.

The removal of the toll booths will have a negligible impact on the social significance of the toll booths and the Sydney Harbour Bridge as a whole. Installation of tolling gantry infrastructure to the north of the existing site will continue the historic tolling function of this precinct, a critical aspect in ensuring this historic function of the Sydney Harbour Bridge and tolling plaza continues, whilst evolving in form and technology, as it has in the past. Recommendations regarding interpretation within this report are designed to reintegrate social connections with the toll collection activities and history as a tangible element of the Sydney Harbour Bridge and are included below.

Due to the highly-disturbed nature of the study area as a result of the bridge’s construction, there is a low potential for archaeological relics being impacted by the proposal.

The establishment of a construction compound (site office) at the proposed Argyle Street location would be consistent with the current use of that site as a works compound. The establishment of the construction compound would result in temporary visual impacts, and overall would result in a negligible physical and visual impact to the SHR listed Sydney Harbour Bridge and a minor physical and visual impact to the SHR listed Argyle Street Railway Substation, the heritage curtilages of which both overlap with the proposed construction compound site. Temporary visual impacts to other nearby heritage items and heritage conservation areas would be negligible to minor.

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1 The Heritage Council endorsement of the Sydney Harbour Bridge CMP 2007 expired in 2012. An updated version of the CMP is currently being prepared. In the interim, the CMP 2007 is being used as the primary SHB conservation document.
Recommendations & Mitigation Measures

The recommendations set out below will aid in mitigating the impact of the proposal on the Sydney Harbour Bridge and nearby heritage items and heritage conservation areas.

Approvals

Prior to any works commencing that impact on the Sydney Harbour Bridge or Argyle Street substation SHR listed items, a Section 60 NSW Heritage Act 1977 (Heritage Act) approval application must be prepared and approval obtained from the NSW Heritage Council. The permit would cover the works described in Section 7.1 and 7.7 of this report, although it is noted that an endorsed Section 57 exemption already exists for the pavement upgrading, waterproofing and resurfacing works of the Cahill Expressway within this proposal. This assessment would be provided to the NSW Heritage Council in support of a Section 60 application.

Archival recording

Prior to construction commencing, a Photographic Archival Recording (PAR) of the 1950s toll booths and 1970s toll office would be prepared. The report must consist of an archival standard photographic record of the site, noting the location and details of the toll booths and toll office as well as demonstrating the overall setting within the Sydney Harbour Bridge northern approaches. The recording shall be undertaken in accordance with the guidelines for Photographic Recording of Heritage Items Using Film or Digital Capture prepared by the NSW Office of Environment & Heritage. The PAR would be submitted to North Sydney Council and the City of Sydney Council, and copies would be retained as per the standards.

The toll booths and toll office would be archived and recorded on the Roads and Maritime Heritage and Conservation Register, and carried out with reference to the Sydney Harbour Bridge Movable Heritage Conservation Strategy 2007, the Roads and Maritime Cultural Heritage Guidelines (2015), and the Sydney Harbour Bridge Interpretation Plan 2007.

The existing endorsed Section 57 exemption will ensure the recording of the brick layer that underlays the road surface.

Consistency of detail design

The detail design of the proposal, including materiality and finish types, would be congruent with the aesthetic character of the Sydney Harbour Bridge and surrounding fabric. This includes selection of modern and lightweight materials that are, where appropriate, coloured to match the existing fabric of the Sydney Harbour Bridge including existing neutral concrete and steelwork tones of the overall bridge structure. The material palette of the proposal would be consistent with other Sydney Harbour Bridge related projects.

Crash barriers and other safety features would be installed in accordance with normal RMS safety procedures, and any deteriorated features would be replaced like for like or with a modern equivalent for safety. Modern roadbed materials and line marking will be appropriate for the works proposed.

Design of elements to minimise visual impact

The design and placement of the various elements within the proposal would be developed to minimise visual impact on the Sydney Harbour Bridge and the Sydney Harbour Bridge northern approaches, and on nearby heritage items with sightlines to the project area including the Milsons Point Railway Station group, St John the Baptist Anglican Church, Greenway Flats and the Careening Cove Conservation Area. This impact is considered to be generally positive, offering improved
visibility of the Sydney Harbour Bridge and decluttering of views and vistas along the roadways of the Sydney Harbour Bridge northern approaches.

Where required, affected signage and lighting would be reinstated as part of the Proposal. Any new signage, lighting, or associated infrastructure regarding upgrades to the roadway would be sensitively designed to be like-for-like and if in adequate condition reintegrated, and wherever possible kept to a minimum to avoid introducing visual clutter on the Sydney Harbour Bridge northern approaches. This will assist in reducing potential visual impact on significant views along the Sydney Harbour Bridge northern approaches and to surrounding heritage items.

**Interpretation strategy**

Given the location of the proposed works near an entry/exit point to the Sydney Harbour Bridge, there is an opportunity for provision of interpretation measures outlining the history, evolution and significance of the Sydney Harbour Bridge and surrounding heritage items and heritage conservation areas to the people that use the bridge, especially in relation to the aspect of toll collection at the Sydney Harbour Bridge. This particularly relates to pedestrians using the walkway on the eastern side of the Sydney Harbour Bridge. Interpretation would outline the history and role of tolling operations at the Sydney Harbour Bridge. The opportunity for interpretation of the evolution of toll collection at the Sydney Harbour Bridge is particularly important given the cumulative impact of the proposal in relation to the Sydney Harbour Bridge Southern Toll Plaza Upgrade project. A Sydney Harbour Bridge tolling oral history has been previously prepared and is available online, and movable heritage items associated with the booths and toll office have been collected and catalogued.

**Cumulative impact**

The cumulative impact of the proposal in conjunction with the Sydney Harbour Bridge Southern Toll Plaza Upgrade would result in the removal of all evidence of the historic methods of manual tolling within the SHR and NHL curtilage of the Sydney Harbour Bridge, although tolls will still be collected electronically. This impact could be offset by exploration of opportunities for interpretation as discussed above.

For future projects on the Sydney Harbour Bridge, the cumulative impact of related projects is to be considered, as it has been for the current works.

Compliance of projects with the *Sydney Harbour Bridge Conservation Management Plan* will assist in the retention and potential enhancement of the significant values of this item across projects.

Cumulative impact assessments for future projects should be undertaken holistically to determine of the threshold for referral to the Minister under the EPBC Act would be made. This will be an important step in ensuring the proper assessment and management of impacts to the highly significant Sydney Harbour Bridge.

**Protection of significant Sydney Harbour Bridge fabric**

The proposal involves works in close proximity to significant fabric of the Sydney Harbour Bridge northern approaches. In particular, this includes the concrete rendered retaining walls and parapet on the eastern side of the Sydney Harbour Bridge northern approaches, the Sydney Harbour Bridge north east stairs and the underlying Milsons Point Tram Station. A Heritage Management subplan shall be prepared as part of the project CEMP to protect these significant heritage components for the duration of the project to minimise potential physical impact.

---

Ongoing heritage specialist advice

A specialist heritage consultant must be engaged to provide heritage advice during the detailed design and construction phases of the proposal.

Heritage induction for workers

A heritage induction would be provided to all on-site staff and contractors involved in the proposal. The induction would clearly describe the heritage constraints of the site in order to retain and respect the National and State heritage values of the Sydney Harbour Bridge and its significant fabric, and surrounding heritage items.

Assessment for vibration impacts

The potential vibration impacts to nearby heritage items and other elements of the Sydney Harbour Bridge including the former Milsons Point Tram Station, is addressed by the ‘Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade Construction Noise and Vibration Impact Assessment’ prepared by WSP for the proposal. The report identifies the need for a detailed assessment pre-construction once construction methodologies are confirmed.

To minimise potential vibration impacts during works to significant fabric, regular inspections of the construction activities and work areas would be undertaken by structural engineers and any other required specialist to monitor and review the construction methodology and confirm the integrity of affected heritage items. Where it is identified that levels of vibration are causing damage to fabric, works would stop and the construction methodology reviewed for its appropriateness in consultation with a Heritage Consultant.

Utility relocation works

Wherever possible, utility relocation works in the vicinity of significant Sydney Harbour Bridge fabric i.e. steelwork or rendered concrete elements, would utilise existing conduits or would otherwise try to minimise physical and visual impacts to the Sydney Harbour Bridge. Where permanent conduits or cable trays are required, they would, where possible, be neutral in appearance to minimise visual impact.

Where feasible for the installation of temporary utility relocation works, existing holes in the fabric would be utilised and new holes minimised. To minimise impacts, it is recommended that a clamping methodology for the temporary utility relocation works be adopted. In the event that a bolting methodology is adopted, bolts for fixing to significant fabric would be designed so that they are easily removable without causing damage to surrounding fabric.

Care would be taken to avoid significant impacts to original fabric in all instances, and hand powered tools would be used for works located in proximity to significant fabric.

Argyle Street construction compound

No ground disturbing activities or impacts to significant fabric would occur within the proposed Argyle Street construction compound. Any changes to the proposal that involve potential impacts to the adjacent Sydney Harbour Bridge retaining wall and surrounding heritage items, or excavations or ground disturbing works must be subject to an addendum impact assessment.

Unexpected Fabric Finds procedure
If unexpected historic fabric is discovered during the proposed works the Roads and Maritime Standard Procedure for Unexpected Heritage Items would be followed.
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1.0 INTRODUCTION

1.1 Background

Artefact has been engaged by WSP on behalf of Roads and Maritime Services (Roads and Maritime) to prepare a Statement of Heritage Impact (SoHI) for the proposed upgrades and simplification of the northern toll plaza precinct on the Cahill Expressway approaching the Sydney Harbour Bridge (Sydney Harbour Bridge) (the proposal).

The proposal involves removal of the toll booths and toll office located in the northern toll plaza precinct and road surface improvement work. Removal of tolling infrastructure from the precinct allows for simplification and reconfiguration of traffic lanes, the provision of an emergency response and incident management area and the introduction of a uniform speed zone of 70 km/h between Warringah Freeway and the Sydney Harbour Bridge with the capacity to implement variable speed limits (as an extension of the variable speed limit zone across the Sydney Harbour Bridge). Following the installation of new tolling gantries on the northern approach of the Sydney Harbour Bridge in December 2016, the existing toll structures that facilitated manual tolling and e-TAG electronic tolling are no longer required. Removal of the existing toll booth structures and toll office would make the approaches to the Sydney Harbour Bridge safer, enable the existing road lanes to be simplified, provide an improved road surface and provide an improved visual experience for drivers and bridge users.

The Sydney Harbour Bridge, its approaches and curtilage areas are of National and State Heritage Significance and are listed on the National Heritage List (NHL) and the NSW State Heritage Register (SHR). The proposal is also near several heritage items and heritage conservation areas. The works are partly located within a section of the World Heritage Buffer Zone for the World Heritage item, the Sydney Opera House.

The aim of this report is to identify heritage items which may be impacted by the proposed works, determine the level of heritage significance of each item, assess the potential impact to those items, recommend mitigation measures to reduce the level of heritage impact, and identify other management or statutory obligations. A preliminary archaeological assessment has also been undertaken to assess any archaeological potential and impact associated with proposed ground disturbing works on Ennis Road for utilities relocation works.

The SoHI was previously on public display as part of a Review of Environmental Factors (REF) for the proposal. Following additional project scope and an extended study area, this SoHI has since been revised as the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade SoHI Version 2 to cover the proposal updates.

1.2 Proposal

Roads and Maritime propose to upgrade the northern toll plaza precinct on the Cahill Expressway between High Street overpass and Fitzroy Street, Milsons Point (the proposal). Work would be undertaken on Cahill Expressway between the High Street overpass to the north, and to the northern pylons of the Sydney Harbour Bridge to the south. The proposal is needed to simplify traffic movements, improve the road surface in the precinct and improve road safety.

Key features of the proposal include:

- Removal of northern toll plaza and associated infrastructure
- Realignment of traffic lanes within the northern toll plaza precinct to provide:
Two southbound general traffic lanes merging into one lane

- Extension of the Mount Street bus lane merge onto the Cahill Expressway
- Minor kerb and drainage works
- Utility upgrades and utility relocation works
- Pavement work, waterproofing and resurfacing of the Cahill Expressway
- Provision of an emergency response and incident management area
- Introduction of a variable speed limit with a default operational speed limit of 70 kilometres per hour (km/hr)
- Provision of supporting roadside infrastructure including re-instating or replacing impacted street lighting and signage as well as temporary warning signage during construction
- Use of construction compounds, which may include the existing Roads and Maritime compounds at Blue Street in North Sydney and Sommerville Road in Rozelle, the James Craig Road site owned by Port Authority of NSW and/or potential establishment of a construction compound at Argyle Street in Millers Point.

A detailed scope of the works is provided in Section 7.1.

An existing Section 57 exemption in currently in place for the works for the pavement works, waterproofing and resurfacing of the Cahill Expressway.

1.3 Site Location

1.3.1 Project area

The project area extends along the Cahill Expressway, with work to be undertaken between the High Street overpass to the northern pylons of the Sydney Harbour Bridge. The Sydney Harbour Bridge spans between Milsons Point in the north and Millers Point in the south.

The Sydney Harbour Bridge comprises the arch, four granite-faced pylons, two railway lines, seven general traffic lanes, one 24-hour dedicated bus lane, a cycleway on the western side, and a pedestrian walkway on the eastern side. Two approach spans connect the arch with the approaches. The northern approach consists of a large reinforced concrete abutment, three concrete arches (over Fitzroy Street, Burton Street and Lavender Street), the flat-top concrete beam occupancies along Ennis Road that carry the Cahill Expressway on the east, Milsons Point train station on the west, and the Bradfield Highway in-between. The focus of the project is the northern toll plaza precinct located on the Cahill Expressway north of Burton Street.

1.3.2 Study area

For the purpose of this investigation, a study area has been defined as a 50-metre buffer around the proposal (Figure 1-1). The application of a buffer helps to identify heritage items within the visual catchment of the project where potential visual impacts on that item may occur. It also supports assessment of other potential indirect impacts on heritage fabric (for example, as a result of vibration). Any reference to the ‘study area’ includes reference to the 50-metre buffer, unless otherwise stated.
1.3.3 Argyle Street construction compound

The proposal comprises an associated construction compound (site office) located at Argyle Street, Millers Point. This site is bound by Cumberland Street to the north, the retaining walls of the Sydney Harbour Bridge southern approaches to the east, the Argyle Street Railway Substation to the south, and terrace housing along Lower Fort Street to the west. For the purpose of this investigation, impacts to heritage items either within or directly abutting the site were assessed as part of the SoHI.
Figure 1-1: Location of study area.
Figure 1-2: Location of project
Figure 1-3: Location of project
Figure 1-4: Location of compound
(Source: Provided by WSP)
1.4 Methodology

This SoHI has been prepared with reference to the following:

- Roads and Maritime requirements for preparation of SoHI reports
- *Sydney Harbour Bridge Conservation Management Plan* (Sydney Harbour Bridge CMP) 2007
- *Sydney Harbour Bridge Conservation Management Plan* (Draft) 2015
- *Assessing Significance for Historical Archaeological Sites and ‘Relics’* 2009 (NSW Heritage Office, Department of Planning).

Statements of significance from existing heritage assessments and registers, such as the State Heritage Inventory (SHI), have been included and additional heritage assessment was not necessary for this report.

1.4.1 Terminology

The CMP 2007 defines the technical terminology for the Sydney Harbour Bridge and its components as they relate to heritage. Therefore, this report refers to relevant components as follows:

- Approaches: ‘Rendered concrete viaducts at the northern and southern extremities of the bridge’.

  The area referred to in this report is the Sydney Harbour Bridge northern approaches.

While the northern toll plaza precinct is not identified specifically in the CMP, the toll booths and toll office are defined as forms within the approaches component of the Sydney Harbour Bridge. Therefore, any reference to the toll plaza precinct should be seen to include the booths and surrounding roadway within the Sydney Harbour Bridge northern approaches.

1.4.2 Argyle Street construction compound

For the purposes of this investigation, this assessment is focused on the specific location of the temporary construction compound at Argyle Street. A high-level assessment of potential temporary impacts associated with the Argyle Street construction compound is provided in Section 8.7.

1.4.3 Significance criteria

**National Heritage Listing Criteria**

Heritage significance for heritage items considered to have national significance are assessed using the National Heritage List Criteria, presented in Table 1.

**Table 1: National heritage assessment criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Historic</td>
<td>The place has outstanding heritage value to the nation because of the place’s importance in the course, or pattern, of Australia’s natural or cultural history.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>B – Rarity</td>
<td>The place has outstanding heritage value to the nation because of the place’s possession of uncommon, rare or endangered aspects of Australia’s natural or cultural history.</td>
</tr>
<tr>
<td>C – Scientific</td>
<td>The place has outstanding heritage value to the nation because of the place’s potential to yield information that will contribute to an understanding of Australia’s natural or cultural history.</td>
</tr>
</tbody>
</table>
| D – Representative | The place has outstanding heritage value to the nation because of the place’s importance in demonstrating the principal characteristics of:  
  i. a class of Australia’s natural or cultural places; or  
  ii. a class of Australia’s natural or cultural environments |
| E – Aesthetic | The place has outstanding heritage value to the nation because of the place’s importance in exhibiting particular aesthetic characteristics valued by a community or cultural group. |
| F – Creative/Technical | The place has outstanding heritage value to the nation because of the place’s importance in demonstrating a high degree of creative or technical achievement at a particular period. |
| G – Social | The place has outstanding heritage value to the nation because of the place’s strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. |
| H – Associative | The place has outstanding heritage value to the nation because of the place’s special association with the life or works of a person, or group of persons, of importance in Australia’s natural or cultural history. |
| I – Indigenous | The place has outstanding heritage value to the nation because of the place’s importance as part of Indigenous tradition. |

**NSW Heritage Assessment Criteria**

Heritage significance for heritage items in New South Wales are assessed using the NSW Heritage Assessment Criteria, presented in Table 2.

**Table 2: NSW heritage assessment criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Historical Significance</td>
<td>An item is important in the course or pattern of the local area’s cultural or natural history.</td>
</tr>
<tr>
<td>B – Associative Significance</td>
<td>An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area’s cultural or natural history.</td>
</tr>
<tr>
<td>C – Aesthetic or Technical Significance</td>
<td>An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.</td>
</tr>
<tr>
<td>D – Social Significance</td>
<td>An item has strong or special association with a particular community or cultural group in the local area for social, cultural or spiritual reasons.</td>
</tr>
<tr>
<td>E – Research Potential</td>
<td>An item has potential to yield information that will contribute to an understanding of the local area’s cultural or natural history.</td>
</tr>
</tbody>
</table>
1.4.4 Significance grading

This report includes an assessment of the relative contributions of individual components of the Sydney Harbour Bridge, nearby heritage items and heritage conservation areas, to the heritage value of the item, as outlined in Table 3.

Table 3: Standard grades of significance

<table>
<thead>
<tr>
<th>Grading</th>
<th>Justification</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceptional (E)</td>
<td>Rare or outstanding element directly contributing to an item’s local and state significance.</td>
<td>Fulfils criteria for local or state listing.</td>
</tr>
<tr>
<td>High (H)</td>
<td>High degree of original fabric. Demonstrates a key element of the item’s significance. Alterations do not detract from significance.</td>
<td>Fulfils criteria for local or state listing.</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.</td>
<td>Fulfils criteria for local or state listing.</td>
</tr>
<tr>
<td>Little (L)</td>
<td>Alterations detract from significance. Difficult to interpret.</td>
<td>Does not fulfil criteria for local or state listing.</td>
</tr>
<tr>
<td>Intrusive (I)</td>
<td>Damaging to the item’s heritage significance.</td>
<td>Does not fulfil criteria for local or state listing.</td>
</tr>
</tbody>
</table>

1.4.5 Impact assessment

In order to consistently identify the potential impact of the proposed works, the terminology contained in Table 4 has been referenced throughout this document.

Table 4: Terminology for assessing the magnitude of heritage impact

<table>
<thead>
<tr>
<th>Grading</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
<td>Actions that would have a long-term and substantial impact on the significance of a heritage item. Actions that would remove key historic building elements, key historic landscape features, or significant archaeological materials, thereby resulting in a change of historic character, or altering of a historical resource. These actions cannot be fully mitigated.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Actions involving the modification of a heritage item, including altering the setting of a heritage item or landscape, partially removing archaeological resources, or the alteration of significant elements of fabric from historic structures. The impacts arising from such actions may be able to be partially mitigated.</td>
</tr>
<tr>
<td>Grading</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>Minor</td>
<td>Actions that would result in the slight alteration of heritage buildings, archaeological resources, or the setting of an historical item. The impacts arising from such actions can usually be mitigated.</td>
</tr>
<tr>
<td>Negligible</td>
<td>Actions that would result in very minor changes to heritage items.</td>
</tr>
<tr>
<td>Neutral</td>
<td>Actions that would have no heritage impact.</td>
</tr>
</tbody>
</table>

1.5 Report Authorship

This report was prepared by Charlotte Simons (Heritage Consultant) with assistance from Elanor Pitt (Heritage Consultant). The project manager was Matthew Alexander (Project Leader) who also provided input and review. Dr Sandra Wallace (Director) provided input and reviewed the report.
2.0 STATUTORY CONTEXT

A number of planning and legislative documents govern how heritage is managed in NSW and Australia. The following section provides an overview of the requirements under each as they apply to the proposal.

2.1 The World Heritage Convention

The Convention Concerning the Protection of World Cultural and National Heritage (the World Heritage Convention) was adopted by the General Conference of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) on 16 November 1972, and came into force on 17 December 1975. The World Heritage Convention aims to promote international cooperation to protect heritage that is of such outstanding universal value that its conservation is important for current and future generations. It sets out the criteria that a site must meet to be inscribed on the World Heritage List (WHL) and the role of State Parties in the protection and preservation of world and their own national heritage.

The concept of a buffer zone was first included in the Operational Guidelines for the Implementation of the World Heritage Convention in 1977 and recognises the value of the environment that surrounds a site. The buffer zone acts as an additional layer of protection for World Heritage sites. It is a space that is itself not of outstanding universal value, but that influences the value of a World Heritage site.

2.1.1 World Heritage List

The Sydney Opera House is listed on the WHL. The buffer for this heritage item covers areas north and south of the harbour due to the visual prominence of the Opera House itself. The study area and project area are partly within this buffer zone (Figure 2-2 and Figure 2-7).

2.2 Commonwealth Legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a legislative framework for the protection and management of matters of national environmental significance, that is, flora, fauna, ecological communities and heritage places of national and international importance. Heritage items are protected through their inscription on the World Heritage List (WHL), Commonwealth Heritage List (CHL) or the National Heritage List (NHL).

Under Part 9 of the EPBC Act, approval under the EPBC Act is required for any action occurring within, or outside, a Heritage place that has, will have, or is likely to have a ‘significant impact’ on the heritage values of a World, National or Commonwealth heritage listed property (referred to as a ‘controlled action’ under the Act). A ‘significant impact’ is defined as:

*an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.*

The EPBC Act stipulates that a person who has proposed an action that will, or is likely to, have a significant impact on a site that is listed on the WHL, National Heritage List or Commonwealth
Heritage List must refer the action to the Minister for Environment and Energy (hereafter Minister). The Minister will then determine if the action requires approval under the EPBC Act. If approval is required, an environmental assessment would need to be prepared. The Minister would approve or decline the action based on this assessment.

2.2.1.1 National Heritage List

The NHL was established under the EPBC Act, which provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. Under the EPBC Act, nationally significant heritage items are protected through listing on the NHL or the Commonwealth Heritage List.

The Sydney Harbour Bridge was included on the NHL in 2007. The listing includes the bridge, pylons, constructed approaches, and parts of Bradfield and Dawes Point Parks. The NHL curtilage is the same as the SHR curtilage (Figure 2-1), except that the northern extent of the NHL listing ends at Lavender Street, Milsons Point, while the SHR curtilage ends at Blues Street, North Sydney.

2.3 State Legislation

2.3.1 Heritage Act 1977

The NSW Heritage Act 1977 (Heritage Act) is the primary piece of State legislation affording protection to heritage items (natural and cultural) in New South Wales. Under the Heritage Act, ‘items of environmental heritage’ include places, buildings, works, relics, moveable objects and precincts identified as significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. State significant items can be listed on the NSW State Heritage Register (SHR) and are given automatic protection under the Heritage Act against any activities that may damage an item or affect its heritage significance. The Heritage Act also protects ‘relics’, which can include archaeological material, features and deposits.

In some circumstances a Section 60 permit may not be required if works are undertaken in accordance with the Standard Exemptions for Works Requiring Heritage Council Approval or in accordance with agency specific exemptions. However, in the case of the current works, a Section 60 will be required.

The following SHR items are located within the project area:

- Sydney Harbour Bridge, approaches and viaducts (road and rail) (SHR #00781).

The following SHR items are located within the study area:

- Milsons Point Railway Station Group (SHR #01194).

2.3.2 Section 170 registers

The Heritage Act requires all government agencies to identify and manage heritage assets under their ownership and control. Under Section 170 of the Heritage Act, government instrumentalities must establish and keep a register which includes all items of environmental heritage listed on the SHR, environmental planning instruments or which may be subject to an interim heritage order that are owned, occupied or managed by that government body. Government agencies must also ensure that all items entered on its register are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Minister on advice of the NSW Heritage Council.
These principles serve to protect and conserve the heritage significance of identified sites, items and objects and are based on relevant NSW heritage legislation and statutory guidelines.

### 2.3.2.1 Roads and Maritime Section 170 Register

The ‘Sydney Harbour Bridge, Approaches and Viaducts’ are included in the Roads and Maritime Section 170 Register. Items of moveable heritage associated with the Sydney Harbour Bridge are also included in the Roads and Maritime Section 170 Register, under the listing for ‘Roads and Maritime Moveable Heritage Collection (SHI 4311604).

The following items listed on the Roads and Maritime Section 170 Register are located within the project area:

- Sydney Harbour Bridge, approaches and viaducts (Roads and Maritime Section 170 Register # 4301067).

### 2.3.2.2 RailCorp (Sydney Trains) Section 170 Register

The following items listed on the RailCorp Section 170 Register are located within the study area:

- Sydney Harbour Bridge (Rail Property Only) (RailCorp Section 170 Register # 4801059)
- Milsons Point Railway Station Group (RailCorp Section 170 Register # 4801026).

### 2.3.3 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process. The EP&A Act requires that environmental impacts are considered prior to land development; this includes impacts on cultural heritage items and places as well as archaeological sites and deposits. The proposal is subject to assessment under Part 5 of the EP&A Act.

The EP&A Act also requires that local governments prepare planning instruments (such as Local Environmental Plans [LEPs] and Development Control Plans [DCPs]) in accordance with the EP&A Act to provide guidance on the level of environmental assessment required.

The current proposal location falls within the boundaries of the North Sydney LGA. Schedule 5 of the North Sydney LEP 2013 includes a list of items/sites of heritage significance within the North Sydney LGA (refer to Section 2.4 below).

### Sydney Regional Environmental Plan (REP) (Sydney Harbour Catchment) 2005

The Sydney REP (Sydney Harbour Catchment) 2005 was prepared under the EP&A Act and includes the ‘Sydney Harbour Bridge, including approaches and viaducts (road and rail)’ in its schedule of heritage items. It also includes the buffer zone for the Sydney Opera House.

### 2.3.4 State Environmental Planning Policy (Infrastructure) [ISEPP] 2007

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

Clause 94 of the Infrastructure SEPP 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.
The definition of road infrastructure facilities of Infrastructure SEPP includes vehicle or pedestrian bridges.

As the proposal is for a road infrastructure facility and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the EP&A Act. Development consent is not required.

The proposal is not located on land reserved under the National Parks and Wildlife Act 1974 and does not affect land or development regulated by State Environmental Planning Policy #14 - Coastal Wetlands, State Environmental Planning Policy #26 - Littoral Rainforests. The proposal does not affect land or development regulated by State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Development) 2005.

Part 2 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

2.4 Local Legislation

2.4.1 North Sydney LEP 2013

The proposal location lies within the North Sydney LGA. Clause 5.10 of the North Sydney LEP 2013 has been prepared in accordance with the NSW Government’s Standard Instrument—Principal Local Environmental Plan, and is consistent with current heritage best practice guidelines, providing for protection of heritage buildings, places, works and trees, Heritage Conservation Areas (HCAs), and archaeological relics. Schedule 5 of the North Sydney LEP 2013 provides a list of identified heritage items, which has been consulted.

The project area contains two locally listed heritage items. These items are summarised in Table 5. The study area contains several locally listed heritage items and heritage conservation areas. These items are summarised in Table 7. Local heritage items are shown in Figure 2-3 and Figure 2-4.

2.4.2 Development Control Plans

Development Control Plans (DCPs) support the provisions of LEPs and the heritage environment. DCPs generally contain detailed development controls which aim to facilitate quality development and protect the amenity of adjoining development. In particular, a DCP may set requirements for site amalgamations, setbacks, building envelopes, landscape treatments, privacy and parking. In town centres, the controls promote design quality, housing choice and more attracted public spaces.

2.4.3 Non Statutory registers

Register of the National Estate

The Register of the National Estate is a list of natural, Aboriginal and historic heritage places throughout Australia. It was originally established under the Australian Heritage Commission Act 1975. Under the Act, the Australian Heritage Commission entered more than 13,000 places on the register. Following amendments to the Australian Heritage Council Act 2003, the Register of the National Estate (RNE) was frozen on 19 February 2007 and ceased to be a statutory register in February 2012. The RNE is now maintained on a non-statutory basis as a publicly available archive and educational resource.
Register of the National Trust

The National Trust of Australia is a community-based, non-government organisation committed to promoting and conserving Australia’s Indigenous, natural and historic heritage. The Register of the National Trust (RNT) was established in 1949. It is a non-statutory register.

2.5 Summary of Heritage Listings

A search of all relevant registers for items within the study area was undertaken on 27 February 2017. A revised search of registers for items within the study area was undertaken on 22 May 2018 following additional proposal scope.

The results for heritage listings of the Sydney Harbour Bridge are displayed below in Table 5. The results for nearby heritage listings within the project area are provided in Table 6. The results for heritage items and heritage conservation areas outside the project area but within the study area are provided in Table 7.

The Sydney Harbour Bridge curtilages of the entries for the NHL and SHR, as well as the curtilages for nearby heritage listings are illustrated in Figure 2-1 to Figure 2-4.

Table 5: Register search for Sydney Harbour Bridge.

<table>
<thead>
<tr>
<th>Register</th>
<th>Listing</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Heritage List</td>
<td>The Sydney Harbour Bridge is not registered on the World Heritage List</td>
</tr>
<tr>
<td>National Heritage List</td>
<td>Sydney Harbour Bridge is registered on the National Heritage List (#105888)</td>
</tr>
<tr>
<td>Commonwealth Heritage List</td>
<td>Sydney Harbour Bridge is not registered on the Commonwealth Heritage List</td>
</tr>
<tr>
<td>State Heritage Register</td>
<td>Sydney Harbour Bridge, approaches and viaducts (road and rail) is registered on the State Heritage Register (#5045703)</td>
</tr>
<tr>
<td>Section 170 Registers</td>
<td>Sydney Harbour Bridge, approaches and viaducts is listed on the Roads and Maritime Section 170 Heritage and Conservation Register (#4301067)</td>
</tr>
<tr>
<td></td>
<td>Sydney Harbour Bridge (Rail Property Only) is listed on the RailCorp Section 170 Heritage and Conservation Register (#4801059)</td>
</tr>
<tr>
<td>North Sydney LEP 2013</td>
<td>Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway is listed on the North Sydney LEP 2013 and is attributed State significance (#10530)</td>
</tr>
<tr>
<td></td>
<td>Sydney Harbour Bridge north pylons is listed on the North Sydney LEP 2013 and is attributed local significance (#10541)</td>
</tr>
<tr>
<td>Sydney LEP 2012</td>
<td>Sydney Harbour Bridge approaches group including pylons, pedestrian stairs and access roads is listed on the Sydney LEP 2012 (#1539)</td>
</tr>
<tr>
<td></td>
<td>This item is outside of the project and study areas.</td>
</tr>
<tr>
<td>Register of the National Estate (non-statutory)</td>
<td>Sydney Harbour Bridge is listed on the Register of the National Estate (#1857)</td>
</tr>
<tr>
<td>Register of the National Trust of Australia (non-statutory)</td>
<td>Sydney Harbour Bridge is listed on the Register of the National Trust of Australia (NSW)</td>
</tr>
</tbody>
</table>
Table 6: Heritage listings within the project area.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Address</th>
<th>Lot No.</th>
<th>Significance</th>
<th>Item/Listing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney Opera House</td>
<td>2 Circular Quay east, Sydney (buffer zone extends to Argyle Street)</td>
<td>Lot 4 DP 787933; Lot 5 DP 775888</td>
<td>World</td>
<td>WHL (#105914); NHL (#105738); SHR (#01685); City of Sydney LEP 2012 (#1064); RNE (#2353)</td>
</tr>
</tbody>
</table>

Table 7: Heritage listings within the study area (50m buffer).

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Address</th>
<th>Lot No.</th>
<th>Significance</th>
<th>Item/Listing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milsons Point Railway Station group</td>
<td>North Shore railway, Milsons Point, NSW</td>
<td>-</td>
<td>State</td>
<td>SHR (#01194); RailCorp Section 170 Register (#4801026); North Sydney LEP 2013 (#10539)</td>
</tr>
<tr>
<td>Greenway Flats</td>
<td>Corner McDougall Street, Kirribilli</td>
<td>Lot 1, DP 901143</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10187)</td>
</tr>
<tr>
<td>Fern Lodge</td>
<td>6 Winslow Street, Kirribilli</td>
<td>Lot 1, DP 901143</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10300)</td>
</tr>
<tr>
<td>St John the Baptist Anglican Church</td>
<td>7-9 Broughton Street, Kirribilli</td>
<td>Lots 5-8, Section B, DP 1537</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10185)</td>
</tr>
<tr>
<td>The Fantasia Preschool</td>
<td>11-17 Broughton Street, Kirribilli</td>
<td>Lots 3 and 4, Section B, DP 1537</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10186)</td>
</tr>
<tr>
<td>Electricity Substation No 217</td>
<td>Bligh Street, Kirribilli</td>
<td>Lot 1, DP 180216</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10183)</td>
</tr>
<tr>
<td>“Illingullin”</td>
<td>14 Fitzroy Street, Kirribilli</td>
<td>Lot 31, DP 748442</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10217)</td>
</tr>
<tr>
<td>House</td>
<td>26 Jeffreys Street, Kirribilli</td>
<td>Lot 1, DP 1074240; Lots 2 and 3, DP 792680</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10243)</td>
</tr>
<tr>
<td>House</td>
<td>28 Jeffreys Street, Kirribilli</td>
<td>Lot 3, DP 230232</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10244)</td>
</tr>
<tr>
<td>House</td>
<td>30 Jeffreys Street, Kirribilli</td>
<td>Lot 2, DP 230232</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10245)</td>
</tr>
<tr>
<td>House</td>
<td>32 Jeffreys Street, Kirribilli</td>
<td>Lot 1, DP 230232</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10246)</td>
</tr>
<tr>
<td>House</td>
<td>34 Jeffreys Street, Kirribilli</td>
<td>Lot 5, DP 207833</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10247)</td>
</tr>
<tr>
<td>House</td>
<td>36 Jeffreys Street, Kirribilli</td>
<td>Lot 4, DP 207833</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10248)</td>
</tr>
<tr>
<td>House</td>
<td>38 Jeffreys Street, Kirribilli</td>
<td>Lot 3, DP 207833</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#10249)</td>
</tr>
<tr>
<td>Item Name</td>
<td>Address</td>
<td>Lot No.</td>
<td>Significance</td>
<td>Item/Listing Number</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>House</td>
<td>40 Jeffreys Street, Kirribilli</td>
<td>SP 39011</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0250)</td>
</tr>
<tr>
<td>House</td>
<td>42 Jeffreys Street, Kirribilli</td>
<td>Lot 1, DP 207833</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0251)</td>
</tr>
<tr>
<td>House</td>
<td>44 Jeffreys Street, Kirribilli</td>
<td>Lot D, DP 377418</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0252)</td>
</tr>
<tr>
<td>House</td>
<td>46 Jeffreys Street, Kirribilli</td>
<td>Lot C, DP 377418</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0253)</td>
</tr>
<tr>
<td>House</td>
<td>48 Jeffreys Street, Kirribilli</td>
<td>Lot B, DP 377418</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0254)</td>
</tr>
<tr>
<td>House</td>
<td>50 Jeffreys Street, Kirribilli</td>
<td>Lot A, DP 377418</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0255)</td>
</tr>
<tr>
<td>House</td>
<td>40 Kirribilli Avenue, Kirribilli</td>
<td>Lot 4, DP 228298</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0257)</td>
</tr>
<tr>
<td>House</td>
<td>42 Kirribilli Avenue, Kirribilli</td>
<td>Lot 5, DP 228298</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0258)</td>
</tr>
<tr>
<td>“Bratton”</td>
<td>38 Pitt Street, Kirribilli</td>
<td>Lot 1, DP 627119</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0283)</td>
</tr>
<tr>
<td>House</td>
<td>41 Pitt Street, Kirribilli</td>
<td>Lot 3, DP 228298</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0284)</td>
</tr>
<tr>
<td>House</td>
<td>43 Pitt Street, Kirribilli</td>
<td>Lot 2, DP 228298</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0285)</td>
</tr>
<tr>
<td>House</td>
<td>45 Pitt Street, Kirribilli</td>
<td>Lot 1, DP 228298</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0286)</td>
</tr>
<tr>
<td>North Sydney bus shelters</td>
<td>Various</td>
<td>Various</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0407)</td>
</tr>
<tr>
<td>North Sydney Olympic Pool</td>
<td>4 Alfred Street South, Milsons Point</td>
<td>Lot 100, DP 875048</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0537)</td>
</tr>
<tr>
<td>Bradfield Park (including northern section)</td>
<td>Alfred Street South, Milsons Point</td>
<td>-</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0538)</td>
</tr>
<tr>
<td>Seawall and wharf site</td>
<td>Milsons Point</td>
<td>Lot 1, DP 849664</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I0540)</td>
</tr>
<tr>
<td>Faux stone balustrade</td>
<td>Kirribilli Avenue (corner Broughton Street), Kirribilli</td>
<td>Kirribilli Avenue road reserve</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#I1133)</td>
</tr>
<tr>
<td>Careening Cove Conservation Area</td>
<td>Bounded by High Street, Broughton Street and Crescent Place</td>
<td>-</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#CA10)</td>
</tr>
<tr>
<td>Jeffreys Street Conservation Area</td>
<td>Bounded by Fitzroy Street, Jeffrey’s Street, Kirribilli Avenue and Broughton Street</td>
<td>-</td>
<td>Local</td>
<td>North Sydney LEP 2013 (#CA26)</td>
</tr>
</tbody>
</table>
2.6 Sydney Harbour Bridge Conservation Management Plan

An endorsed Conservation Management Plan (CMP) for Sydney Harbour Bridge prepared by GML in 2007 provides a framework for its ongoing care and management, including decisions about its conservation, use and development, and to provide a reference for future applications for works to the bridge. The Heritage Council's endorsement of this CMP expired in 2012. At the time of this report the CMP has been revised and submitted to the Heritage Division for review and endorsement. In the absence of an updated CMP, the 2007 version has been referenced in this report to guide conservation and heritage approaches for this assessment.

2.7 Argyle Street Construction Compound: Heritage Listings

Identification of heritage listings within or directly adjoining the proposed Argyle Street temporary construction compound site is provided in Table 8 and Table 9 below and illustrated in Figure 2-5 and Figure 2-6.

Table 8: Heritage listings within Argyle Street construction compound.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Address</th>
<th>Lot No.</th>
<th>Significance</th>
<th>Item/Listing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney Harbour Bridge, approaches</td>
<td>Bradfield Highway and North Shore Railway,</td>
<td></td>
<td>National</td>
<td>NHL (# 105888)</td>
</tr>
<tr>
<td>and viaducts (road and rail)</td>
<td>Milsons Point/Dawes Point</td>
<td></td>
<td></td>
<td>SHR (# 00781)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>City of Sydney LEP 2012 (# I539)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RMS s170 (#4301067)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RailCorp s170 (#4801059)</td>
</tr>
<tr>
<td>Argyle Street Railway Substation</td>
<td>Trinity Avenue, Millers Point</td>
<td>Lot 1 DP 124243</td>
<td>State</td>
<td>SHR (# 01022)</td>
</tr>
</tbody>
</table>

Table 9: Heritage listings abutting Argyle Street construction compound.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Address</th>
<th>Lot No.</th>
<th>Significance</th>
<th>Item/Listing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millers Point Conservation Area</td>
<td>Millers Point</td>
<td>-</td>
<td>State</td>
<td>SHR (#00884)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>City of Sydney LEP 2012 (#C35)</td>
</tr>
<tr>
<td>Millers Point &amp; Dawes Point Village</td>
<td>Upper Fort Street, Millers Point</td>
<td>-</td>
<td>State</td>
<td>SHR (#01682)</td>
</tr>
<tr>
<td>Precinct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbour View Hotel and site</td>
<td>18 Lower Fort Street</td>
<td>Lot 30 D 788671</td>
<td>State</td>
<td>SHR (#00634)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>City of Sydney LEP 2012 (#I542)</td>
</tr>
<tr>
<td>Townhouse</td>
<td>20 Lower Fort Street</td>
<td>Part Lot 38 DP</td>
<td>State</td>
<td>SHR (#00861)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>811936</td>
<td></td>
<td>City of Sydney LEP 2012 (#I543)</td>
</tr>
<tr>
<td>Townhouse</td>
<td>22 Lower Fort Street</td>
<td>Lot 37 DP 811936</td>
<td>State</td>
<td>SHR (#00880)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>City of Sydney LEP 2012 (#I543)</td>
</tr>
<tr>
<td>Item Name</td>
<td>Address</td>
<td>Lot No.</td>
<td>Significance</td>
<td>Item/Listing Number</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------</td>
<td>----------------</td>
<td>--------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Building</td>
<td>24 Lower Fort Street</td>
<td>Lot 4 DP 1221025</td>
<td>State</td>
<td>SHR (#00852) City of Sydney LEP 2012 (# I545/ I546)</td>
</tr>
<tr>
<td>Townhouse</td>
<td>26-28 Lower Fort Street</td>
<td>Lot 3 DP 1221025</td>
<td>State</td>
<td>SHR (# 00881) City of Sydney LEP 2012 (# I545/ I546)</td>
</tr>
<tr>
<td>Residence</td>
<td>30 – 42 Lower Fort Street</td>
<td>Lot 77 DP 816308</td>
<td>State</td>
<td>SHR (# 0894) City of Sydney LEP 2012 (# I547)</td>
</tr>
<tr>
<td>Flats</td>
<td>2, 2a, 4, 4a Trinity Avenue</td>
<td>Part Lot 77</td>
<td>State</td>
<td>SHR (# 0869) City of Sydney LEP 2012 (# I548)</td>
</tr>
<tr>
<td>Building</td>
<td>8, 10, 12 Trinity Avenue</td>
<td>Lot 78 DP 816308</td>
<td>State</td>
<td>SHR (# 0842) City of Sydney LEP 2012 (# I549)</td>
</tr>
<tr>
<td>Terrace</td>
<td>14, 16, 18, 20, 22 Trinity Avenue</td>
<td>Lots 1, 2, 3, 4, DP 1205023</td>
<td>State</td>
<td>SHR (# 0911) City of Sydney LEP 2012 (# I550)</td>
</tr>
</tbody>
</table>
Figure 2-1: National Heritage List curtilage boundary of the Sydney Harbour Bridge.
Figure 2-2: Curtilages of State, National and World listed items within the study area.
Figure 2-3: Curtilages of local heritage items and heritage conservation area within the study area.
Figure 2-4: Detail of curtilages of local heritage items and heritage conservation area within the study area.
Figure 2-5: Curtilages of State, National and World listings surrounding the proposed Argyle Street compound site.
Figure 2-6: Curtilages of local listings surrounding the proposed Argyle Street compound site.
Figure 2-7: Sydney Opera House buffer zone.
3.0 HISTORICAL BACKGROUND

3.1 Sydney Harbour Bridge

As early as 1815, Francis Greenway had suggested to Governor Macquarie that a bridge be constructed across the harbour, and throughout the 19th century various proposals were made. Tenders were eventually called for the design of a bridge in 1923, with specifications set out by J.J.C Bradfield, who had been appointed as Chief Engineer, Sydney Harbour Bridge, City Transit and Metropolitan Railway Construction. Bradfield recommended the arch design of the English firm Dorman Long & Co Ltd, which was accepted by the Government in March 1924.3

During the early 1920s, hundreds of buildings on either side of the harbour were resumed and demolished to make room for the bridge and approaches. The first sod was turned on 28 July 1923, and work on the approach spans was carried out during 1923 and 1924. In January 1925, excavation began at Dawes Point and the foundation stone for the southern abutment towers was laid in March. By the end of March, the first shipment of steel had arrived from England and fabrication workshops were built at Lavender Bay.4

Unlike the bridge and its steel approaches, which were designed and built by Dorman Long & Co Ltd, the approaches were the joint responsibility of the Sydney Harbour Bridge Branch of the Public Works Department and the Metropolitan Railway Construction Branch of NSW Government Railways. Architect R.C.G (Charles) Coulter carried out the architectural design of the approaches, which continued the style used for the sandstone-faced concrete bridges and retaining walls of the Sydney electric railway lines built in the early 1920s. The areas of resumed land around and over the approaches were seen by chief engineer Bradfield as an opportunity for major developments of buildings and public parks.

The construction of the approaches of the Sydney Harbour Bridge included the construction of the railway infrastructure. From 1929 to 1932, Milsons Point Railway Station Group was constructed at the northern approach. Construction finished in January 1932, and in February the bridge was test loaded. The Ennis Road viaduct was designed for heavy railway loadings, although this did not eventuate, and it was used for trams with a matching station.

At the time of its completion, the Sydney Harbour Bridge was the largest structure in Sydney. It was officially opened on 19 March 1932 by Premier Jack Lang, followed by a parade over the bridge.5 It was at the top of the south bridge stairs that the famous incident when Captain F.E. de Groot prematurely slashed the blue ribbon with his sword at the Bridge opening occurred.

Various changes have been made to the Sydney Harbour Bridge since its construction, generally in response to changes in transport, traffic management and safety standards. The spaces in the archways and bays under the Sydney Harbour Bridge northern approaches were originally left open, apart from six bays in Ennis Road at the entrance to Milsons Point Station, which were fitted out as shops in 1932. Between 1936 and 1941, other bays were enclosed, using reinforced concrete beams and columns in conjunction with steel windows.

The approaches of the Sydney Harbour Bridge have been modified over time to facilitate increased traffic since the opening of the bridge. In 1958, the trams were replaced and the tram tracks were converted to a roadway for vehicular use in conjunction with construction of the Cahill Expressway. The tramway arch remained in use by motor traffic until 1966. At this time, the arch was removed.

3 GML 2007:12.
along with the four northernmost bays of the Ennis Road viaduct and another concrete ramp was erected to give vehicular access to the deck over the remaining occupancies. In 1972, bus lanes were added to the Cahill Expressway.  

Other changes have involved additions of new features along the deck of the bridge. In 1935, protective barriers were added to the water side of the footways on each side of the Bridge, primarily to discourage suicide attempts. Roadway crash barriers were installed in 1958, and in 2005 mesh fencing was erected along the roadway side of each footway to prevent pedestrian access to the road deck.  

Figure 3-1: Construction of Sydney Harbour Bridge with ferry terminal in foreground, 1930  (Source: National Library Australia)  

3.2 Milsons Point  

The earliest evidence of subdividing or farming taking place in present-day Kirribilli was in 1806, when prominent merchant Robert Campbell purchased a grant. In 1822, the whole area was leased to James Milson, the first European to permanently settle in the Kirribilli area and after whom Milsons Point is now named. Milson kept cattle and grew various crops on the land and the property remained undisturbed until the late 1820s, with no records of subdivision, lease or development in existence.

The early development of Milsons Point was influenced by the suburb’s proximity to the city, which meant it was the location for the connection of the first water supply to the northern shores. This water supply was established in 1885, piped from Dawes Point, the closest southern point to Milsons

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Point. Prior to this supply, the watering needs of landowners and residents relied on springs, creeks and wells.⁹

The dependency of the lower north shore on water travel to and from the city resulted in the development of the ferry trade. The establishment of the North Shore Ferry Company in 1861 resulted in increased development in the area, and facilitated the construction of a road network and associated services. The promise of a harbour bridge or tunnel from the 1880s further increased the popularity of the area, and the areas away from the harbour frontage were popular for the construction of smaller cottages and terraces for local workers.

*Figure 3-2: Ferry at Milsons Point by Cazneaux, 1908*  
(Source: National Library Australia)

The first railway station opened in 1893 following the extension of the Hornsby to St Leonards line to Wollstonecraft and Waverton, around Lavender Bay to Milson’s Point. The station was moved to a new site north of this in 1915, and then again in 1924 when construction works on the Sydney Harbour Bridge began.¹⁰

In the 1920s, hardship was a way of life for many local residents at Milsons Point. While the construction of the Sydney Harbour Bridge provided a degree of employment, some residents lost their homes and livelihood without compensation. The Milsons Point Ferry Arcade, a local landmark, was demolished along with a host of shops, churches, terrace houses, workers’ cottages, local businesses and hotels.¹¹

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¹⁰ Park 2008

¹¹ Park 2008
By the end of 1929, the ferries crossing the harbour waterways were carrying more than 40 million passengers each year. Following the opening of the Sydney Harbour Bridge in 1932, this peak dramatically fell to a third due to the scaling down of ferry services.\textsuperscript{12}

The design of the Sydney Harbour Bridge included two tram tracks on its eastern side and two railway lines on the western side. In 1932, following completion of the bridge, the tramway and railway line began operating, servicing the newly completed Milsons Point Railway Station and Milsons Point Tram Station. Rebuilding of the Milsons Point area proceeded slowly, with decisions by the state and local governments required to allocate the land for private or public use. The area beneath the bridge was dedicated as a park, and named in honour of the government engineer JJC Bradfield.\textsuperscript{13}

Figure 3-3: Milsons Point Station under construction shortly after Sydney Harbour Bridge completion
(Source: National Library Australia)
3.3 Sydney Harbour Bridge Tramways and Cahill Expressway

The Sydney Harbour Bridge was designed with a pair of rail tracks on each side of the bridge, including an eastern pair of railway lines to link Mosman, Manly and the Northern Beaches with Sydney CBD. These eastern lines, however, only carried trams. In 1958, the tramways on the east side of the Sydney Harbour Bridge were removed and two lanes of roadway were constructed level with the main roadway, to connect with the Cahill Expressway over the Circular Quay railway viaduct.\[^{14}\]

Conversion of the tramways to roadway involved removal of the tracks and station platform, and infill with curved corrugated asbestos cement formwork with conventional concrete on top, which considerably increased the weight of the bridge. In 1958, the tram service operating across the bridge was replaced by buses. At this time, the old light fittings were removed and replaced with modern light standards and fittings along the new roadway, and the toll booths were introduced.\[^{15}\]

Between 1959 and 1966, the Tramway Arch over Bradfield Highway remained in use for motor vehicles. In 1966, the Tramway Arch was removed and the Bradfield Highway was widened at North Sydney in preparation for the Warringah Expressway. The four northernmost bays on Ennis Road were demolished during this time, and the deck level was straightened and lowered into its current form.\[^{16}\]

\[^{14}\] GML 2015 ‘Sydney Harbour Bridge: Conservation Management Plan Volume 1’:26-7
\[^{15}\] GML 2015:26-7
\[^{16}\] GML 2015:26-7
Figure 3-5: Workers on the Sydney Harbour Bridge northern approach prior to bridge opening showing tramline to left, 1932.
(Source: National Library Australia)
Figure 3-6: Sydney Harbour Bridge northern approaches showing the original Tramway Arch, 1932.

Figure 3-7: View towards Sydney Harbour Bridge along northern approaches from tramlines at Milsons Point Tram Station adjoining Bradfield Highway, c1950s. (Source: Reddit)
3.4 Traffic Management and Toll History

Between 1932 and 1951, traffic management on the Sydney Harbour Bridge involved police on point duty at both the northern and southern ends during peak hour. From 1951 onwards, lanes were marked out by removable rubber lane markers, which were installed and removed by hand twice daily during peak hour. In 1977, this system was modified by the introduction of movable median strips. In 1986, new overhead gantries with lane indicator lights and electric lane control signals were installed, which phased out the rubber lane markers.\(^{17}\)

Since the opening of the Sydney Harbour Bridge in 1932, tolls were charged from vehicles crossing the bridge. Toll collection was initially met with objection from local North Shore residents, whom had been paying an additional land tax to fund the bridge’s construction since 1923. The toll collectors were originally installed at a traffic island with only a small rail around them.\(^{18}\)

In December 1923, toll booths and toll bars were added to the bridge. Tolls were collected outside the Toll House at the southern end of the bridge from both northbound and southbound traffic. In 1959, the toll bars were modified, and two new groups of toll booths were installed at the northern end of the bridge following conversion of the tramway to roadway, collecting tolls from southbound traffic. The streamlined toll booths added to the northern approaches in 1959 were designed by Sydney architects Rudder, Littlemore & Rudder.\(^{19}\)

\(^{17}\) GML 2015:27
\(^{18}\) GML 2015:27
\(^{19}\) GML 2015:27
The toll bars were modified again in 1970 when automatic one-way toll collection was brought into operation, with only southbound traffic being charged the toll. The location of toll collection remained the same. During this time, automatic booths and new movable booths were installed on the southern approaches to serve alternating northbound and southbound traffic lanes, and a toll office was constructed on the northern approach to the bridge. The 1970 toll office included toilet facilities and access via Bay 18 Ennis Road.

In December 2016, the existing toll structures that facilitated manual tolling and e-TAG electronic tolling became redundant following the installation of new tolling gantries on the northern approach of the Sydney Harbour Bridge.

Figure 3-9: Toll officers working in the rain at Sydney Harbour Bridge, 1933 (Source: National Library of Australia)

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20 GML 2015:27
Figure 3-10: Peak hour at Milsons Point, new toll booths seen in foreground 1959
(Source: Roads and Maritime)
4.0 SITE ANALYSIS

4.1 Introduction

A site inspection of the study area was conducted on 23 February 2017 by Charlotte Simons (Heritage Consultant) and Matthew Alexander (Project Leader). The aim of the survey was to inspect the study area to assess the current condition of heritage items and areas that may be impacted by the proposal. The inspection was undertaken on foot and a photographic record was made. Due to restrictions in access, the interior of the toll office was not able to be inspected.

4.2 Site Description

The northern approach of the Sydney Harbour Bridge is characterised by large reinforced concrete retaining walls and an approach span comprising open steel trusses mounted on concrete abutments. The Cahill Expressway comprises the two easternmost southbound lanes on the Sydney Harbour Bridge. At the northern end of the Cahill Expressway are four traffic lanes, which merge to form two traffic lanes across the bridge itself (Sydney Harbour Bridge Lanes 7 &8). The site contains two 1959 toll booths and a 1970s toll office.

The toll booths and toll office are accessible via a sequence of stairways and corridors from Bay 18 Ennis Road, beneath the Cahill Expressway (Figure 4-2). This access route is directly adjacent to the decommissioned stairway to the former tramline platform (Figure 4-1).

Emerging at road level, the toll office has been constructed on a raised concrete median, which is located between the two toll booths. The simple structure, which is clad with corrugated metal sheeting, is directly opposite the State heritage listed Milsons Point Station platform (Figure 4-8). The toll office comprises an external stairway that provides access to a second storey office space (Figure 4-5).

At its northern end the toll office comprises an enclosed walkway that extends along a narrow median strip in the direction of the north-most set of toll booths within the northern toll plaza precinct (Figure 4-3). This structure services the two east-most traffic lanes on the northern approach of the Cahill Expressway. The Greenway Flats, a locally listed heritage item, can be seen to the north (Figure 4-10).

A narrow median strip extending from the south of the toll office provides access to the south-most set of toll booths within the northern toll plaza precinct. This structure services three traffic lanes on the northern approach of the Cahill Expressway, including a bus lane (Figure 4-11 and Figure 4-12).
Figure 4-1: Stairway to former Milsons Point tramline platform (note toll office floor directly above landing.

Figure 4-2: Stairway leading up to toll office at level of Cahill Expressway roadway.

Figure 4-3: Looking north along walkway within toll office, leading to north-most toll booths within the northern toll plaza precinct.

Figure 4-5: External view of toll office, showing door to office space and stairway to second storey.

Figure 4-4: Looking north in ground floor of toll office.
(Source: Cosmos Archaeology Pty Ltd)

Figure 4-6: Looking north in second storey of toll office.
(Source: Cosmos Archaeology Pty Ltd)
Figure 4-7: Looking north towards toll office showing median strip, and staircase leading to second storey.

Figure 4-8: Looking south west from toll office towards adjacent Milsons Point Railway Station group.

Figure 4-9: Looking south along median strip from north-most toll booth towards entry door to toll office.

Figure 4-10: Looking north to north-most toll booths within northern toll plaza precinct, Greenway Flats seen in distance.

Figure 4-11: Looking south from toll office to south-most toll booths within northern toll plaza precinct, Sydney Harbour Bridge seen in distance.

Figure 4-12: Looking south from second storey of toll office towards toll booths, Sydney Harbour Bridge seen in distance.
Figure 4-13: Looking southeast from second storey of toll office towards Kirribilli shops on Broughton Street.

Figure 4-14: Looking north from pedestrian stairs to bridge showing north-most toll booths and Milsons Point Station in distance.

Figure 4-15: Western side of the north pylons of the Sydney Harbour Bridge, looking east from the North Sydney Olympic Pool.

Figure 4-16: Eastern side of the north pylons of the Sydney Harbour Bridge, looking north-west from the southern end of Bradfield Park.
Figure 4-17: The main span of the Sydney Harbour Bridge from the southern end of the study area, looking south-west.

Figure 4-18: Underside of the Sydney Harbour Bridge northern approach from Bradfield Park, looking south towards the north pylons and the main span.

Figure 4-19: Looking south along Ennis Road showing Ennis Road occupancies adjacent to Milsons Point Station entrance.

Figure 4-20: Looking north along Ennis Road showing Ennis Road occupancies, Greenway Flats in distance.

Figure 4-21: Looking south west to Chainage 390, at location where the Sydney Harbour Bridge northern approaches meet the modern Cahill Expressway structure, carpark beneath.

Figure 4-22: Looking west across existing hardstand carpark off Ennis Road, beneath the Cahill Expressway.
4.3 View Study

A view study was carried out during the site inspections on 23 February and 22 May 2018 to document the visual catchment of the project area. The study helps illustrate the surrounding context and key views of the site from the public domain. Views are taken from surrounding streets, intersections and from heritage items in the vicinity.

A number of heritage listed items are located within the study area. Of the buildings on the east side of Broughton Street, St John the Baptist Anglican Church and the Fantasia Preschool are in view of the project area, along with the Careening Cove and Jeffrey Street Conservation Areas. On the bridge roadway level, the Milsons Point Railway Station group is located directly west and southwest of the project area. Heritage-listed terrace houses within the study area have direct or limited views of the project area (see Section 5.3 of this report), as do the nearby items of the Seawall and wharf site, faux stone balustrade and the St Johns North Sydney bus shelter.

Due to oblique angles of sightlines or screening from vegetation and nearby buildings, several heritage items located within the study area are not visible from the project area, including dwellings on Jeffrey Street, “Fern Lodge” on Winslow Street, “Illingullin” on Fitzroy Street, Electricity Substation No 217 and Bradfield Park (including northern section).
Figure 4-27: View to the Sydney Opera House from beneath the eastern side of the project area, at the base of the Sydney Harbour Bridge.

Figure 4-28: View east to the Sydney Opera House from near the western side of the base of the Sydney Harbour Bridge north pylons.

Figure 4-29: Toll office as seen from intersection of Ennis Road, Broughton Street and Burton Street.

Figure 4-30: View from Careening Cove Conservation Area at corner of Broughton Street and Willoughby Street, north toll booth concealed by vegetation.

Figure 4-31: Toll office seen directly overhead Milsons Point Station entrance from Broughton Street.

Figure 4-32: Toll booths seen from corner of Broughton Street and Burton Street.
Figure 4-33: Toll booths seen from St John the Baptist Church on Broughton Street.

Figure 4-34: Toll booths glimpsed from corner of Broughton Street and Bligh Street.

Figure 4-35: Looking north from corner Broughton Street and Fitzroy Street (toll booths/office not seen).

Figure 4-36: Looking northeast from Alfred Street towards Milsons Point Station (toll booths/office not seen).

Figure 4-37: Looking southeast from Chinese Christian Church (toll booths/office concealed by existing vegetation).

Figure 4-38: Looking east from Milsons Point Station platform to toll booths directly opposite.
Figure 4-39: Looking northeast from Milsons Point Station platform to toll office/booths directly opposite.

Figure 4-40: Looking northwest from Bradfield Park towards project area overhead (limited direct sightline).

Figure 4-41: Looking west from Electricity Substation No 217 towards project area (no direct sightline due to setback and surrounding buildings).

Figure 4-42: Looking west from opposite “Illingullin” across Fitzroy Street towards project area (no direct sightline due to setback and surrounding buildings).

Figure 4-43: Looking north west from near rear of terraces houses at 44, 46, 48 and 50 Jeffreys Street towards project area (limited direct sightline due to setback and surrounding buildings).

Figure 4-44: Looking north west from south-eastern corner of North Sydney Olympic Pool (partially obstructed direct sightline due to trees).
Figure 4-45: Looking south-west from “Bratton” at 38 Pitt Street (partially obstructed direct sightline due to setback and trees within Bradfield Park).

Figure 4-46: Looking south-west from the rear of 44 to 50 Jeffreys Street (partially obstructed direct sightline due to setback and trees within Bradfield Park).
5.0 HERITAGE SIGNIFICANCE

5.1 Introduction

This section identifies the significance of the Sydney Harbour Bridge, and listed heritage items adjacent to and in proximity to the project area.

5.2 Sydney Harbour Bridge

The Sydney Harbour Bridge is a monumental landmark in the centre of the city of Sydney, and one of the most globally recognised bridges. It is an important visual element in the Sydney cityscape which can be viewed from many key points around the harbour. The steel arched form, Art Deco inspired granite pylons and composite approach spans create an iconic and dramatic composition that consistently evokes a positive response from observers.

The Sydney Harbour Bridge is listed on several registers and has heritage value at a local, State and National level. The statement of significance included in the NHL and SHR listings are provided below. The assessments of the Sydney Harbour Bridge against the national and NSW heritage assessment criteria is provided in Table 10 and Table 11 below.

5.2.1 National heritage values

The NHL database contains the following statement of significance:\footnote{Department of Environment and Energy Australian Heritage Database 2007, "Sydney Harbour Bridge, Bradfield Hwy, Dawes Point – Milsons Point, NSW, Australia".}

\begin{quote}
The building of the Sydney Harbour Bridge was a major event in Australia's history, representing a pivotal step in the development of modern Sydney and one of Australia's most important cities. The bridge is significant as a symbol of the aspirations of the nation, a focus for the optimistic forecast of a better future following the Great Depression. With the construction of the Sydney Harbour Bridge, Australia was felt to have truly joined the modern age, and the bridge was significant in fostering a sense of collective national pride in the achievement.

The Sydney Harbour Bridge was an important economic and industrial feat in Australia's history and is part of the nationally important story of the development of transport in Australia. The bridge is significant as the most costly engineering achievement in the history of modern Australia, and this was extraordinary feat given that it occurred at the severest point of the Great Depression in Australia.

The bridge is also significant for its aesthetic values. Since its opening in 1932, the Sydney Harbour Bridge has become a famous and enduring national icon, and remains Australia’s most identifiable symbol. In its harbour setting, it has been the subject for many of Australia’s foremost artists, and has inspired a rich and diverse range of images in a variety of mediums – paintings, etchings, drawings, linocuts, photographs, film, poems, posters, stained glass - from its construction phase through to the present.

The Sydney Harbour Bridge is also significant as one of the world's greatest arch bridges. Although not the longest arch span in the world, its mass and load
\end{quote}
capacity are greater than other major arch bridges, and no other bridge in Australia compares with the Sydney Harbour Bridge in its technical significance. In comparing Sydney Harbour Bridge with overseas arch bridges, Engineers Australia has drawn attention to its complexity in combining length of span with width and load carrying capacity. The construction of Sydney Harbour Bridge combined available technology with natural advantages provided by the site. The designers took advantage of the sandstone base on which Sydney was built, which enabled them to tie back the support cables during construction of the arch, and to experiment with massive structures. Although designed more than 80 years ago, the bridge has still not reached its loading capacity.

The bridge is also significant for its important association with the work of John Job Crew Bradfield, principal design engineer for the New South Wales Public Works Department, who ranks as one of Australia's greatest civil, structural and transport engineers.

The NHL database contains the following assessment of significance outlined in Table 10:22

Table 10: Significance assessment for the Sydney Harbour Bridge against the National heritage assessment criteria

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The building of the Sydney Harbour Bridge as a transport facility linking the city with the north shore was a major event in Australia's history, and represented a pivotal step in the development of modern Sydney and one of Australia's most important cities. The bridge became a symbol for the aspirations of the nation, a focus for 'optimistic prognostications of a better future' following the Depression. The bridge represented an important step in transforming the city of Sydney into a modern metropolis. Internationally, the bridge was recognised as a symbol of progress and a vision of a splendid future.</td>
</tr>
<tr>
<td></td>
<td>The building of the Sydney Harbour Bridge was an important part of the technical revolution of the 1930s and seen as evidence of Australia's industrial maturity. The bridge represented the mechanical age displacing the pastoral and agricultural way of life on which Australia's economy had been based. The scale of the operations was enormous and at the time of its construction, it was the widest long-span bridge in the world.</td>
</tr>
<tr>
<td>A – Events, Processes</td>
<td>The Sydney Harbour Bridge includes a steel arch spanning the harbour between Milsons Point on the north side and Dawes Point on the south side, and elevated approaches to the arch from both the north and south sides. The arch is made up of two 28-panel arch trusses set in vertical planes, 30 metres apart centre to centre, and braced together laterally. Two granite-faced concrete pylons, with a height of 89 metres above mean sea level, are located at each end of the arch. A deck carrying road and rail traffic is suspended from the arch. Pairs of hangers, ranging in length from 7.3 metres to 58.8 metres, support cross-girders, each weighing 110 tonnes, which support the deck. The northern and southern approaches each contain five spans, constructed as pairs of parallel-chord, six-panel steel trusses. The spans are supported by pairs of concrete piers faced with granite. The combined length of the approach spans is 646 metres.</td>
</tr>
<tr>
<td></td>
<td>The Sydney Harbour Bridge is an outstanding cultural landmark for the nation and represents a highly significant place in Australia's cultural history. The opening of the Sydney Harbour Bridge was a momentous occasion, drawing remarkable crowds estimated at nearly one million people.</td>
</tr>
</tbody>
</table>

22 Department of Environment and Energy Australian Heritage Database 2007, "Sydney Harbour Bridge, Bradfield Hwy, Dawes Point – Milsons Point, NSW, Australia".
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E – Aesthetic characteristics</strong></td>
<td>Since its opening in 1932, the Sydney Harbour Bridge has become a famous and enduring national icon and symbol of Australia. The bridge remains one of Australia’s most identifiable symbols. Sydney Harbour Bridge is an integral component of the Sydney Harbour vista and represents one of the most recognisable and iconic images in the world. It is the picturesque blending of the natural environment and man-made structures around the harbour foreshores that has proved an inspiration for generations of artists and writers. In its harbour setting, it has inspired a rich and diverse range of images in a variety of mediums – paintings, etchings, drawings, linocuts, photographs, film, poems, posters, stained glass - from the date of its construction through to the present day. The bridge is conceivably one of Australia’s most photographed cultural landmarks, and striking images of the bridge have been captured by some of Australia’s best-known photographers. The Sydney Harbour Bridge has also been replicated in tourist posters, postcards, crafts and the folk arts, its image reproduced in media including glass, ceramic, metal, shells and crochet cotton, embroidery and etchings in a huge array of objects.</td>
</tr>
<tr>
<td><strong>F – Creative or technical achievement</strong></td>
<td>The Sydney Harbour Bridge may be considered the world’s greatest arch bridge. Although not the longest arch span in the world, its mass and load capacity are greater than other major arch bridges. No other bridge in Australia compares in its technical significance with the structure of the Sydney Harbour Bridge and its pylons and constructed approaches between Argyle Street in the south and Arthur Street in the north. The construction of Sydney Harbour Bridge combined available technology with natural advantages provided by the site. The bridge is an outstanding technical and construction achievement of the Twentieth Century. The designers took advantage of the sandstone base on which Sydney was built - which enabled them to tie back the cables during construction of the arch and to experiment with massive structures. Although designed during the 1920s and 1930s the bridge has still not reached its loading capacity.</td>
</tr>
<tr>
<td><strong>G – Social value</strong></td>
<td>It was part of John Job Crew Bradfield's vision for the bridge that it be used at times of national rejoicing. Since its opening it has regularly supported flags, banners, and especially fireworks, becoming a focus for national and local celebrations. Community ceremonial and celebratory occasions centred on Sydney Harbour Bridge, either for the people of Sydney or the broad Australian community, are well recognised and have been widely noted. Since 1932, the broad Australian community has identified the Sydney Harbour Bridge as one of the most nationally and internationally recognised symbol of Australia and the bridge in its harbour setting represents a composite national symbolic image.</td>
</tr>
<tr>
<td><strong>H – Significant people</strong></td>
<td>John Job Crew Bradfield ranks with other engineers whose close involvement in a broad range of projects contributed to Australia’s national development. As principal design engineer for the New South Wales Public Works Department, Bradfield was largely responsible for finally bringing the Sydney Harbour Bridge to fruition. As Chief Engineer, he prepared the general design specification and supervised the whole project on behalf of the Government of New South Wales, also integrating the bridge into the Sydney road, tram and rail system. Bradfield was nationally recognised through his appointments to the Australian National Research Council and the Australian Commonwealth Standards Advisory Committee. The Institution of Engineers, Australia awarded him the Peter Nicol Russell Memorial Medal in 1932, and he also received the Kernot Memorial Medal from the University of Melbourne in 1933, and the Telford Gold Medal from the Institution of Civil Engineers, London in 1934.</td>
</tr>
</tbody>
</table>
5.2.2 State heritage significance

Sydney Harbour Bridge, approaches and viaducts (road and rail) is listed on the SHR and has historical, aesthetic or technical, social and research potential heritage values. The State Heritage Inventory (SHI) database contains the following statement on the significance:\(^{23}\)

*The bridge is one of the most remarkable feats of bridge construction. At the time of construction and until recently it was the longest single span steel arch bridge in the world and is still in a general sense the largest. The bridge, its pylons and its approaches are all important elements in townscape of areas both near and distant from it. The curved northern approach gives a grand sweeping entrance to the bridge with continually changing views of the bridge and harbour. The bridge has been an important factor in the pattern of growth of metropolitan Sydney, particularly in residential development in post World War II years. In the 1960s and 1970s the Central Business District had extended to the northern side of the bridge at North Sydney which has been due in part to the easy access provided by the bridge and also to the increasing traffic problems associated with the bridge (Walker and Kerr 1974).*

The SHI database contains the following assessment of the significance outlined in Table 11:\(^{24}\)

**Table 11: Significance assessment for the Sydney Harbour Bridge, approaches and viaducts (road and rail) against the NSW heritage assessment criteria**

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
</tr>
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<tbody>
<tr>
<td><strong>A – Historical Significance</strong></td>
<td>The bridge is one of the most remarkable feats of bridge construction. At the time of construction and until recently it was the longest single span steel arch bridge in the world and is still in a general sense the largest. (Walker and Kerr 1974).</td>
</tr>
<tr>
<td><strong>BRADFIEL PARK NORTH (SANDSTONE WALLS):</strong></td>
<td>“The archaeological remains are demonstrative of an earlier phase of urban development within Milsons Point and the wider North Sydney precinct. The walls are physical evidence that a number of 19th century residences existed on the site which were resumed and demolished as part of the Sydney Harbour Bridge construction” [Statement of Heritage Impact - Sandstone Walls: Bradfield Park North, Milsons Point (2003: 8), McFadyen and Stuart, HLA Envirosiences].</td>
</tr>
<tr>
<td><strong>B – Associative Significance</strong></td>
<td>The Sydney Harbour Bridge has strong associations with Dr JJC Bradfield, who was primarily responsible for its conception, design and construction. Bradfield was the Chief Engineer, Sydney Harbour Bridge, City Transit and Metropolitan Railway Construction, and the leading figure in the development of Sydney’s transport system in the first part of the twentieth century. The construction of the bridge is also associated with the British team of engineers, Sir Ralph Freeman and contractors Dorman Long and Co. The bridge was the outstanding work of Freeman’s career but his contribution was marred by a dispute with Bradfield regarding who was actually responsible for its design. The bridge has strong associations with the families and descendants of the workers who built it, and who recognise its role during the Depression as the so-called ‘iron lung’ in providing employment and protection from hardship or the dole.</td>
</tr>
<tr>
<td><strong>C – Aesthetic or Technical Significance</strong></td>
<td>The bridge, its pylons and its approaches are all important elements in townscape of areas both near and distant from it. The curved northern approach gives a grand sweeping entrance to the bridge with continually changing views of the bridge and harbour. (Walker and Kerr 1974)</td>
</tr>
</tbody>
</table>

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\(^{23}\) OEH SHI 2007  
\(^{24}\) OEH SHI 2007
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D – Social Significance</strong></td>
<td>The bridge has been an important factor in the pattern of growth of metropolitan Sydney, particularly in residential development in post-World War II years. In the 1960s and 1970s the Central Business District had extended to the northern side of the bridge at North Sydney which has been due in part to the easy access provided by the bridge and also to the increasing traffic problems associated with the bridge. (Walker and Kerr 1974)</td>
</tr>
<tr>
<td><strong>E – Research Potential</strong></td>
<td>BRADFIELD PARK NORTH (SANDSTONE WALLS): “The archaeological remains have some potential to yield information about the previous residential and commercial occupation of Milsons Point prior to the construction of the Sydney Harbour Bridge transport link” [Statement of Heritage Impact - Sandstone Walls: Bradfield Park North, Milsons Point (2003: 8), McFadyen and Stuart, HLA Envirosiences].</td>
</tr>
<tr>
<td><strong>F – Rarity</strong></td>
<td>The bridge is a uniquely important development in Sydney’s transportation network. As it introduced a main road and rail connection across Sydney Harbour, the bridge was the single most important factor in the expansion of metropolitan Sydney north of the harbour. The Sydney Harbour Bridge Movable Heritage Collection is a collection of rare surviving relics relating to the construction methodology, technology and materials of the bridge, assembled as part of the overall construction program, the first time in Australia that the construction of a bridge had been approached in this manner. The Sydney Harbour Bridge Movable Heritage Collection comprises original relics of the ceremonies and celebrations for the Opening Day of the Bridge and represents a rare record of Sydney society in the period during the construction of the Bridge. It also contains rare surviving relics of the fiftieth birthday celebrations of the Bridge and of the Bicentennial celebrations in 1988</td>
</tr>
<tr>
<td><strong>G - Representative</strong></td>
<td>The bridge is representative of a significant stage in the development of Sydney and associated changes in modes of transport, including the growing reliance on private motor vehicles. The Sydney Harbour Bridge Movable Heritage Collection comprises components, materials, original memorabilia of the ceremonies and celebrations for the Opening Day of the Bridge. These items are representative of the technologies in use at the time and utilised for the construction of the bridge, and is representative of the aesthetic and cultural context during the construction of the bridge.</td>
</tr>
</tbody>
</table>

### 5.2.3 Local heritage significance

The Sydney Harbour Bridge is listed under three separate LEP listings, namely:

- Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway (North Sydney LEP 2013, #I0530);
- Sydney Harbour Bridge north pylons (North Sydney LEP 2013, #I0541); and
- Sydney Harbour Bridge approaches group including pylons, pedestrian stairs and access roads (Sydney LEP 2012, #I539).

Note, however, that the Sydney LEP 2012 item, Sydney Harbour Bridge approaches group including pylons, pedestrian stairs and access roads (#I539) is outside of the study and project areas and so is not considered in this SoHI.

### 5.2.4 Project area components

Table 12 lists the individual elements of the Sydney Harbour Bridge which are associated with the northern toll plaza precinct and provides a significance grading for each, as per the CMP.
Table 12: Grades of significance for Sydney Harbour Bridge northern approach components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Grading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Views of the Sydney Harbour Bridge end-on from the northern and southern approach roads.</td>
<td>The northern approach affords impressive views of the Sydney Harbour Bridge end-on, including distant views of the steel structure and pylons from deck level. The Sydney Harbour Bridge affords the public with primary views of Sydney Harbour and its foreshores from its eastern side, including the eastern pedestrian walkway.</td>
<td>Exceptional</td>
</tr>
<tr>
<td>Views of the steel structure and pylons from deck level.</td>
<td>Two cast iron lanterns are present at the Broughton Street stairs (one at the top and one at the bottom), adjacent to the northern study area. These consist of cast iron fittings designed to be mounted on a reinforced concrete post. These were used to light the approaches and approach spans.</td>
<td>High</td>
</tr>
<tr>
<td>Original bridge lighting: bronze lantern and concrete post</td>
<td>About 70 percent of the approach viaducts are supported on mass concrete retaining walls, varying in height from zero metres at the northern end to 13 metres at the southern end of the northern approaches. The eastern portion of the study area borders the concrete rendered retaining wall of the northern approach.</td>
<td>High</td>
</tr>
<tr>
<td>Overall form of the approaches, including: the rendered retaining walls divided into bays</td>
<td>Portions of the study area at deck level are immediately adjacent to original rendered parapets on the eastern side of the Sydney Harbour Bridge northern approaches.</td>
<td>High</td>
</tr>
<tr>
<td>Rendered architectural elements, eg walls, parapets, pilasters, spandrels</td>
<td>The project area comprises the two sets of 1950s toll booths within the northern toll plaza precinct on the Sydney Harbour Bridge. The toll booths are considered physical evidence of the provision considered necessary for toll collection when traffic began to increase in the 1950s. They are familiar landmarks to the thousands of people who regularly use the bridge and have changed little over the past 40 years. Their streamlined shape and use of materials make them characteristic design products of their time.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Vestiges of 1950s toll booths in Milsons Point</td>
<td>The project area comprises evidence of the tramway conversion. The tramway was converted to a roadway with asbestos fibre cement formwork and a reinforced concrete slab.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Evidence of conversion from tramway to roadway</td>
<td>The project area comprises the 1970s toll office. This toll collection facility, of recent origin, is considered to be of little significance.</td>
<td>Little</td>
</tr>
<tr>
<td>1970s toll office in Milsons Point</td>
<td>The study area comprises modern lamps that were installed following conversion of the tramway to a roadway.</td>
<td>Little</td>
</tr>
<tr>
<td>Steel lamp posts with curved arms</td>
<td>The study area comprises a pedestrian footpath located along the east side of the Sydney Harbour Bridge at the northern approach.</td>
<td>Little</td>
</tr>
<tr>
<td>Wearing surfaces of road, rail, foot and cycle ways</td>
<td>Security cameras have been installed at the entrance to the south eastern Bridge Stairs and within tunnels and stairwells.</td>
<td>Little</td>
</tr>
</tbody>
</table>

25 The schedule of significant fabric is based on the SHB CMP (2015) and items noted during site inspections and historical research conducted in 2016.
5.3 Nearby Heritage Items

5.3.1 Sydney Opera House buffer zone (WHL #105914)

The Sydney Opera House is a building recognised worldwide as an iconic landmark overlooking the waters of Sydney Harbour, and is listed on the WHL. In acknowledgement of its cultural significance, the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 has inserted buffer zone controls for the Sydney Opera House.

The buffer is intended to give additional protection to the world heritage values of the Sydney Opera House. The buffer intends to protect views of the site from public places on the foreshores that contribute to its world heritage significance balanced against the need for orderly and economic development of the land. The proposal is partly within the Sydney Opera House buffer zone.

Figure 5-1: Looking south-east towards the Opera House from below the northern ramp of the Sydney Harbour Bridge.

Figure 5-2: Looking north-west towards the study area from the western broadwalk of the Sydney Opera House.

5.3.2 Milsons Point Railway Station group (SHR #01194)

Milsons Point station consists of a platform office and shelter, along with platform faces, subway entrances, concourse, walls and abutments and the Burton Street Underbridge, and is located approximately 25 metres west of the project area. The station was constructed between 1929 and 1932 as part of the northern approaches to the Sydney Harbour Bridge. It was originally called Kirribilli Station, but was changed to Milsons Point prior to its opening.

Milsons Point Railway Station is listed as a state significant heritage item due to its historical, associative, aesthetic, social and research potential heritage values. The SHI database contains the following statement of significance for the item:

* Milsons Point station has state historical significance as an essential component of the northern approaches to the Sydney Harbour Bridge. The form and detail of the subway and tunnels in particular are significant as part of the overall design and specifications for the bridge as set down by Chief Engineer JJC Bradfield. The
Milsons Point station retains a number of original features and decorative elements from its original construction phase including the platform building and entrance way awning from the Alfred Street side.

Figure 5-3: Looking north west to Milsons Point Station Ennis Road entrance.

5.3.3 Greenway Flats

- North Sydney Local Environment Plan 2013, Item #0187

Opened in 1948 as part of the post-war housing crisis, Greenway Flats is a large complex of attached apartment blocks constructed of brick with metal framed windows and flat roofs. Designed in the Inter-War Functionalist style, Greenway Flats consists predominantly of 12 storey blocks with 6 storey and 4 storey intermediate wings.

Greenway Flats is considered to be of local significance due to its representativeness heritage values. The SHI database contains the following statement of significance for the item:

A unique development in North Sydney when built and one which influenced later government housing developments elsewhere. An example of the post-war international trend to the centralisation of government housing into monolithic developments, now discredited for social reasons. A particularly prominent expression of the Functionalist idiom in architecture.

Figure 5-4: Looking north east to Greenway Flats from Cahill Expressway on northern approaches of Sydney Harbour Bridge.
5.3.4 “Fern Lodge”

- North Sydney Local Environment Plan 2013, Item #I0300

This dwelling is a small stone cottage of Georgian proportions located approximately 50 metres east of the project area. The house features a gabled main roof and ogee veranda roof clad in corrugated iron. Designed in the Old Colonial Georgian style, the building was constructed circa 1840 by James Milson and is one of the earliest houses surviving on the North Shore.

Fern Lodge is considered to be of local significance due to its historical, associative, aesthetic, social, research potential, rarity and representative heritage values. The SHI database contains the following statement of significance for the item:

One of the earliest houses surviving on the North Shore and the only modest stone example amongst the pre-1850 survivors. Important associations with James Milson, early landowner and influential resident. Relic of early colonial social structure. Contains material evidence of early building materials and techniques.

See also Group Card NSHS0025.

Figure 5-5: Looking west from Electricity Substation No 217 towards project area (no direct sightline due to setback and surrounding buildings).

5.3.5 St John the Baptist Anglican Church

- North Sydney Local Environment Plan 2013, Item #I0185

The church is a single storey brick building designed in the Victorian Romanesque style, that is located approximately 40 metres east of the project area. The church features semi-circular arched windows, a gabled slate roof and a pyramidal tower. The church was originally a branch of Christ Church St Leonards, with its opening service being held in 1884.

The St John the Baptist Anglican Church is considered to be of local significance due to its rarity and representative heritage values. The SHI database contains the following statement of significance for the item:

A good small scale Romanesque church in a central location in the Kirribilli commercial centre. Important church in the development of the locality and attended by prominent colonials and Australian dignitaries, particularly admirals and Governors General, over the years. The interior is also of significance.
5.3.6 The Fantasia Preschool

- North Sydney Local Environment Plan 2013, Item #I0186

The preschool consists of a single storey dichromatic brick hall designed in the Federation Free Style, located approximately 40 metres east of the project area. The building features an off-set portico entrance, a corrugated iron and pressed steel gabled roof, which features four concrete capped piers at the front, four pane windows and a sympathetic brick addition at the rear. The building was originally constructed as a Church Hall 1909 by the adjacent St John the Baptist Church.

The Fantasia Preschool is considered to be of local significance due to its historical, aesthetic, social and representative heritage values. The SHI database contains the following statement of significance for the item:

Associated with St. Johns Church and the activities of the church. An interesting design which complements the adjacent church. An important element in the Kirribilli village centre streetscape.

Figure 5-7: Looking south east to Fantasia Preschool from pedestrian walkway on east side of Sydney Harbour Bridge.
5.3.7 Electricity Substation No 217

- North Sydney Local Environment Plan 2013, Item #I0183

The substation is a small rectangular brick building with flat roof behind a simple brick parapet, located approximately 50 metres east of the project area. Constructed by Sydney Municipal Council's Electricity Supply Department, the building is designed in the Inter-War Georgian Revival style.

Electricity Substation No 217 is considered to be of local significance due to its representative heritage values. The SHI database contains the following statement of significance for the item:

Part of the original electricity supply infrastructure of the north shore. Relic of the original electricity generation activities of the Sydney Municipal Council. Design and detailing are a relic of a now discarded philosophy regarding public utilities and their role and relationship to the public.

Figure 5-8: Looking south east towards Electricity Substation No 217.

5.3.8 “Illingullin”

- North Sydney Local Environment Plan 2013, Item #I0217

“Illingullin” is a single storey, double fronted, symmetrical rendered brick house located approximately 50 metres east of the project area. The dwelling features a hipped slate roof set with rendered masonry chimneys and decorated cappings, and veranda to front with a bullnose corrugated metal roof on cast iron columns. Built by Prosper Orleans Williams and Fitzjames Hartwell Williams in 1886, the building is designed in the Victorian Regency style.

“Illingullin” is considered to be of local significance due to its historical, associative, aesthetic, research potential, rarity and representative heritage values. The SHI database contains the following statement of significance for the item:

A good example of a single storey Victorian Georgian style house in its original setting with associations with H.H. Bligh and the James Hartwell Williams, the first US consul to Australia. It is associated with prominent local personality and indirectly with the Milson family.

A fine example of a simply detailed Victorian cottage in an important Kirribilli street. Associated with prominent local personality and indirectly with the Milson family.
5.3.9 House (26 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0243

The dwelling at 26 Jeffreys Street is one of a group of four two-storey Victorian Filigree rendered brick terrace houses that step down along Jeffreys Street, located approximately 50m east of the project area and partly within the study area. The rear of the property faces the project area, as the primary façade faces east. The dwelling, similar to the other four terrace houses in the group (28, 30 and 32 Jeffreys Street), has a pitched slate roof, rendered brick chimney with decorated capping and a timber veranda. The building was built in the late nineteenth century contemporaneously with the other terrace houses in the group.

The dwelling at 26 Jeffreys Street is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:

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A good example of a two storey Victorian Filigree style terrace house. See Group Card NSHS0080. A varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson’s Point prior to the Bridge’s construction.

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Figure 5-10: The primary façade of 26 Jeffreys Street along Jeffreys Street, looking west.
5.3.10 House (28 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #l0244

The dwelling at 28 Jeffreys Street is one of a group of four two-storey Victorian Filigree rendered brick terrace houses that step down along Jeffreys Street, located approximately 50m east of the project area and partly within the study area. The rear of the property faces the project area, as the primary façade faces east. The dwelling has a pitched tile roof, rendered brick chimney with decorated capping and a timber veranda. The building was built in the late nineteenth century contemporaneously with the other terrace houses in the group.

The dwelling at 28 Jeffreys Street is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:

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A good example of a two storey Victorian Filigree style terrace house. See Group Card NSHS0080. It is part of a varied collection of late nineteenth century terrace houses which exhibit [sic] a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point prior to the Bridge's construction.

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Figure 5-11: The primary façade of 28 Jeffreys Street along Jeffreys Street, looking west.

5.3.11 House (30 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #l0245

The dwelling at 30 Jeffreys Street is one of a group of four two-storey Victorian Filigree rendered brick terrace houses that step down along Jeffreys Street, located approximately 50m east of the project area and partly within the study area. The rear of the property faces the project area, as the primary façade faces east. The dwelling has a pitched corrugated steel roof, rendered brick chimney with decorated capping and a timber. The building was built in the late nineteenth century contemporaneously with the other terrace houses in the group, that being 26, 28 and 32 Jeffreys Street.

The dwelling at 30 Jeffreys Street is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:
A good example of a two storey Victorian Filigree style terrace house. See Group Card NSHS0080. It is part of a varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson’s Point prior to the Bridge’s construction.

Figure 5-12: The primary façade of 30 Jeffreys Street along Jeffreys Street, looking west.

5.3.12 House (32 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0246

The dwelling at 32 Jeffreys Street is one of a group of four two-storey Victorian Filigree rendered brick terrace houses that step down along Jeffreys Street, located approximately 50m east of the project area and partly within the study area. The rear of the property faces the project area, as the primary façade faces east. The dwelling has a pitched concrete tile roof, rendered brick chimney with decorated capping and a timber veranda. The building was built in the late nineteenth century contemporaneously with the other terrace houses in the group.

The dwelling at 32 Jeffreys Street is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

A good example of a two storey Victorian Filigree style terrace house. See Group Card NSHS0080. It is part of a varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson’s Point prior to the Bridge’s construction.
Figure 5-13: The primary façade of 32 Jeffreys Street along Jeffreys Street, looking west.

5.3.13 House (34 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0247

The dwelling at 34 Jeffreys Street is one of a group of five two-storey Victorian Free Classical rendered brick terrace houses that step down along Jeffreys Street, located approximately 45m east of the project area and partly within the study area. The rear of the property, comprising rear extensions and garage, faces the project area, as the primary façade faces east. As one of the flanking houses in the group, 34 Jeffreys Street has a projecting gable to the street frontage. The building was built in the 1880s contemporaneously with the other terrace houses in the group.

The dwelling at 34 Jeffreys Street is considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An outstanding and unusual example of a two storey Victorian Free Classical style terrace house, one of a group of five that have been designed as a whole with high quality stucco decoration to the facades, joinery and cast iron lacework. See Group Card NSHS0080.

It is part of a varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson’s Point prior to the Bridge’s construction. The interior is also of significance.
Figure 5-14: The primary (western) and southern façade of 34 Jeffreys Street, looking towards the project area to the west.

5.3.14 House (36 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0248

The dwelling at 36 Jeffreys Street is one of a group of five two-storey Victorian Free Classical rendered brick terrace houses that step down along Jeffreys Street, located approximately 45m east of the project area and partly within the study area. The rear of the property, comprising rear extensions, faces the project area, as the primary façade faces east. The building was built in the 1880s contemporaneously with the other terrace houses in the group, that being 34 to 42 Jeffreys Street.

The dwelling at 36 Jeffreys Street is considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An outstanding example of a two storey Victorian Free Classical style terrace house, one of a group of five that have been designed as a whole with high quality stucco and brick decoration to the facades and cast iron lacework. See Group Card NSHS0080.

A varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point prior to the Bridge's construction. The interior is also of significance.
5.3.15 House (38 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0249

The dwelling at 38 Jeffreys Street is one of a group of five two-storey Victorian Free Classical rendered brick terrace houses that step down along Jeffreys Street, located approximately 45m east of the project area and partly within the study area. The rear of the property, comprising rear extensions, faces the project area, as the primary façade faces east. As the middle house in the group, 38 Jeffreys Street has a projecting gable to the street frontage. The building was built in the 1880s contemporaneously with the other terrace houses in the group, 36 to 42 Jeffreys Street.

The dwelling at 38 Jeffreys Street is considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:

---

An outstanding example of a two storey Victorian Free Classical style terrace house, one of a group of five that have been designed as a whole with high quality stucco and brick decoration to the facades, joinery and cast iron lacework. See Group Card NSHS0080.

A varied [sic] collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point prior to the Bridge's construction. The interior is also of significance.

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Figure 5-15: The primary (western) façade of 36 Jeffreys Street, looking north-west.

Figure 5-16: The primary (western) façade of 38 Jeffreys Street, looking south-west.
5.3.16 House (40 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0250

The dwelling at 40 Jeffreys Street is one of a group of five two-storey Victorian Free Classical rendered brick terrace houses that step down along Jeffreys Street, located approximately 45m east of the project area and partly within the study area. The rear of the property, comprising rear extensions, faces the project area, as the primary façade faces east. The building was built in the 1880s contemporaneously with the other terrace houses in the group, that being 34 to 42 Jeffreys Street.

The dwelling at 40 Jeffreys Street is considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An outstanding example of a two storey, Victorian Free Classical style terrace house, one of a group of five that have been designed as a whole with high quality stucco and brick decoration to the facades. See Group Card NSHS008.

It is part of a varied collection of late nineteenth [sic] century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point prior to the Bridge's construction. The interior is also of significance.

Figure 5-17: The primary (western) façade of 40 Jeffreys Street, looking west.

5.3.17 House (42 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0251

The dwelling at 42 Jeffreys Street is one of a group of five two-storey Victorian Free Classical rendered brick terrace houses that step down along Jeffreys Street, located approximately 45m east of the project area and partly within the study area. The rear of the property, comprising rear extensions, faces the project area, as the primary façade faces east. As the northern flanking house in the group, 42 Jeffreys Street has a projecting gable to the street frontage. The building was built in the 1880s contemporaneously with the other terrace houses in the group, that being 34 to 40 Jeffreys Street.
The dwelling at 42 Jeffreys Street is considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An outstanding example of a two storey, Victorian Free Classical style terrace house, one of a group of five that have been designed as a whole with high quality stucco decoration to the facades, joinery and cast iron fencing. See Group Card NSHS0080.

A varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point prior to the Bridge's construction. The interior is also of significance.

Figure 5-18: The primary (western) façade of 42 Jeffreys Street, looking west.

5.3.18 House (44 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0252

This dwelling is one of a group of four three storey terraces in the Victorian Filigree style, comprising 44, 46, 48 and 50 Jeffreys Street, located approximately 45 metres east of the project area. The three/four storey coursed rendered terrace is set above the street on a sandstone base, with steps up from the street. The rear four storey elevation with veranda at the first floor, backs onto rear gardens with garaging to Broughton Street.

The dwelling at 46 Jeffreys Street is considered to be of local significance due to its historical, associative, aesthetic, research potential and representative heritage values. The SHI database contains the following statement of significance for the item:
A very good example of a three storey Victorian Filigree style terrace house, one of a group of four that provide an imposing streetscape. See Group listing NSHS0080.

It is part of a varied collection of late nineteenth century terrace houses which exhibit a variety of period detailing and layouts, whilst having a similar basic form. They mark the former central township of Milson's Point to the Bridge's construction. The interior is also of significance.

Figure 5-19: Looking north-west to the front façade of 44 Jeffreys Street, along Jeffreys Street.

5.3.19 House (46 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #10253

This dwelling is one of a group of four three storey terraces in the Victorian Filigree style, comprising 44, 46, 48 and 50 Jeffreys Street, located approximately 45 metres east of the project area. The three/four storey coursed rendered terrace is set above the street on a sandstone base, with steps up from the street. The rear four storey elevation with veranda at the first floor, backs onto rear gardens with garaging to Broughton Street.

The dwelling at 46 Jeffreys Street is considered to be of local significance due to its historical, associative, aesthetic, research potential and representative heritage values. The SHI database contains the following statement of significance for the item:

A very good example of a three storey Victorian Filigree style terrace house, one of a group of four that provide an imposing streetscape. See Group listing NSHS0080. The interior is also of significance.
Figure 5-20: Looking east to rear of group of terrace houses at 44, 46, 48 and 50 Jeffreys Street.

5.3.20 House (48 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0254

This dwelling is one of a group of four three storey terraces in the Victorian Filigree style, comprising 44, 46, 48 and 50 Jeffreys Street, located approximately 45 metres east of the project area. The three/four storey coursed rendered terrace is set above the street on a sandstone base, with steps up from the street. The rear four storey elevation with veranda at the first floor, backs onto rear gardens with garaging to Broughton Street.

The dwelling at 48 Jeffreys Street is considered to be of local significance due to its historical, associative, aesthetic, research potential and representative heritage values. The SHI database contains the following statement of significance for the item:

A very good example of a three storey Victorian Filigree style terrace house, one of a group of four that provide an imposing streetscape. See Group listing NSHS0080. The interior is also of significance.

Figure 5-21: The front façade of 48 Jeffreys Street, looking west.

5.3.21 House (50 Jeffreys Street)

- North Sydney Local Environment Plan 2013, Item #I0255
This dwelling is one of a group of four three storey terrace in the Victorian Filigree style, comprising 44, 46, 48 and 50 Jeffreys Street, located approximately 45 metres east of the project area. The three/four storey coursed rendered terrace is set above the street on a sandstone base, with steps up from the street. The rear four storey elevation with veranda at the first floor, backs onto rear gardens with garaging to Broughton Street.

The dwelling at 50 Jeffreys Street is considered to be of local significance due to its historical, associative, aesthetic, research potential and representative heritage values. The SHI database contains the following statement of significance for the item:

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A very good example of a three storey Victorian Filigree style terrace house, one of a group of four that provide an imposing streetscape. See Group listing NSHS0080. The interior is also of significance.

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Figure 5-22: The front façade of 50 Jeffreys Street, looking south-west.

5.3.22 House (40 Kirribilli Avenue)

- North Sydney Local Environment Plan 2013, Item #0257

The dwelling at 40 Kirribilli Avenue is one of a pair of two-storey brick Victorian Filigree semi-detached terraced houses. The dwelling is located approximately 40m east of the project area and within the study area. The western side of the property faces the project area, as the primary façade faces south. A garage is located to the rear. The dwelling has a hipped slate roof, rendered brick chimney with decorated capping and a timber veranda with cast iron and timber detailing. Surrounding the property on the western and southern sides is a high brick wall.

The dwelling at 40 Kirribilli Avenue is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:

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One of a fine pair of Victorian Filigree terrace houses with string details sited in a prominent location with extensive views. Although isolated now by the Harbour Bridge to west and new buildings to the east, it is an important relic of the pre-bridge development of the area…

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One of a fine pair of Victorian terrace houses with string details sited in a prominent location with extensive views. Although isolated now by the Harbour Bridge to west
and new buildings to the east, it is an important relic of the pre-bridge development of the area.

Figure 5-23: The western and front (southern) façade of 40 Kirribilli Avenue, looking north-east from Bradfield Park.

5.3.23 House (42 Kirribilli Avenue)

- North Sydney Local Environment Plan 2013, Item #0258

The dwelling at 42 Kirribilli Avenue is one of a pair of two-storey brick Victorian Filigree semi-detached terraced houses. The dwelling is located approximately 45m east of the project area and is located within the study area. The western side of the property faces the project area, as the primary façade faces south. A garage is located to the rear. The dwelling has a hipped slate roof, rendered brick chimney with decorated capping and a timber veranda with cast iron lace balustrading. Surrounding the property on the southern sides is a high brick wall.

The dwelling at 42 Kirribilli Avenue is considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance:

One of a fine pair of Victorian terrace houses with string details sited in a prominent location with extensive views. Although isolated now by the Harbour Bridge to west and new buildings to the east, it is an important relic of the pre-bridge development of the area.

Figure 5-24: The front façade of 40 and 42 Kirribilli Avenue, looking north.
5.3.24  “Bratton” (38 Pitt Street)

- North Sydney Local Environment Plan 2013, Item #I0283

The dwelling at 38 Pitt Street comprises a Victorian Italianate two-storey sandstone and rendered brick house with a gabled concrete tile roof, rendered masonry chimneys with stepped cappings. The front inner wall on the ground floor is coursed sandstone. The front elevation has a triple-arched veranda with stucco capitals and decoration. The dwelling is located approximately 30m east of the project area and is located within the study area. The western side of the property faces the project area, as the primary façade faces south. There is a rear skillion extension to the north, as well as a garage, which opens on the western side. The building was constructed during the late nineteenth century but has been altered over the course of the twentieth and twenty-first centuries.

The dwelling at 38 Pitt Street considered to be of local significance due to its historical, aesthetic, rare and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An unusual example of a two storey Victorian Italianate style house with an imposing front elevation on a prominent corner site. A surviving example of the early development of the local area. See Group Card NSHS0080.

Figure 5-25: The front façade of 38 Pitt Street, looking north-east.

5.3.25 House (41 Pitt Street)

- North Sydney Local Environment Plan 2013, Item #I0284

The dwelling at 41 Pitt Street comprises one of a group of three Victorian Italianate two-storey painted brick terrace houses with a gabled terracotta tile roof, expressed party walls and rendered brick chimney with a stepped face-brick capping. The dwelling is located approximately 35m east of the project area and is located within the study area. The front pitched roof has a dormer window. The western side elevation of the property faces the project area, as the primary façade faces north. There is a rear extension to the south, as well as a garage, which opens on the western side. The building was constructed during the late nineteenth century but has been altered over the course of the twentieth and twenty-first centuries.

The dwelling at 41 Pitt Street considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:
An example of a two storey late Victorian Italianate style terrace house. See Pitt & Jeffreys Street Group Card NSHS0080

Figure 5-26: The front façade of 41 (on right) to 43 Pitt Street, looking south-east.

5.3.26 House (43 Pitt Street)

- North Sydney Local Environment Plan 2013, Item #I0285

The dwelling at 43 Pitt Street comprises one of a group of three Victorian Italianate two-storey painted brick terrace houses with a gabled terracotta tile roof, expressed party walls and rendered brick chimney with a stepped face-brick capping. The dwelling is located approximately 40m east of the project area and is located within the study area. The front pitched roof has a dormer window. As the primary façade faces north, the western side elevation of the property faces the project area, but the views to the project area are mostly blocked due to the abutting house at 41 Pitt Street.

The dwelling at 43 Pitt Street considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An example of a two storey late Victorian Italianate style terrace house. See Pitt & Jeffreys Street Group Card NSHS0080.

Figure 5-27: The front façade of 43 Pitt Street, looking south.
5.3.27 House (45 Pitt Street)

- North Sydney Local Environment Plan 2013, Item #I0286

The dwelling at 45 Pitt Street comprises one of a group of three Victorian Italianate two-storey painted brick terrace houses with a gabled terracotta tile roof, expressed party walls and rendered brick chimney with a stepped face-brick capping. The dwelling is located approximately 45m east of the project area and is located within the study area. The front pitched roof has a dormer window. The house has reproduction aluminium filigree balustrades on the front veranda and front fence. As the primary façade faces north, the western side elevation of the property faces the project area, but the views to the project area are mostly blocked due to the abutting houses at 41 and 43 Pitt Street. There is a rear extension to the south, as well as a garage, which opens on the southern side. The building was constructed during the late nineteenth century but has been altered over the course of the twentieth and twenty-first centuries.

The dwelling at 45 Pitt Street considered to be of local significance due to its historical, aesthetic and representative heritage values, and is considered to have potential for research and associative significance. The SHI database contains the following statement of significance for the item:

An example of a two storey late Victorian Italianate style terrace house. See Pitt & Jeffreys Street Group Card NSHS0080.

Figure 5-28: The front façade of 43 Pitt Street, looking south.

5.3.28 North Sydney bus shelters

- North Sydney Local Environment Plan 2013, Item #I0407

The St Johns bus shelter (BS038) is located opposite 7-9 Brought Street, designed in a late twentieth century nostalgic style. The shelter abuts the project area and is located within the study area, but is located on the ground level below the project area. The shelter is a square timber-framed structure with a pyramidal terracotta tiled roof. The shelter is one of a large number of bus shelters constructed in 1984, modelled on a 1920s former tram shelter at North Sydney Oval. The construction of bus shelters was supervised by architect Hugh Slatyer and undertaken by Stephen Edwards Construction, as part of an attempt at municipal civic design.

The bus shelter, along with the other shelters, is considered to be of local significance due to its historical, associative and social heritage values. The SHI database contains the following statement of significance for the item:
Small and effective functional buildings of handsome design and good workmanship. They are traditional and conservative in form and detail and designed to their varied locations. Historic interest as elements of a particular and controversial [sic] attempt at Municipal civic design.

Figure 5-29: The St Johns bus shelter adjacent to the north-eastern Sydney Harbour Bridge stairs, looking west.

5.3.29 North Sydney Olympic Pool (4 Alfred Street South, Milsons Point)

North Sydney Olympic Pool, designed by Rudder and Grout, comprises a full Olympic public swimming pool with grandstand on the north side, offices and plant rooms on the west side, boundary walls on the south and east sides, with a kiosk and garden area in south-east end. The entrance building is designed in the Inter-War Free Classical style. The North Sydney Pool is located approximately 25 metres west of the project area and is partly located within the study area. After the Sydney Harbour Bridge was completed in 1932, the area on the north-west side of the bridge was vacated by the Dorman Long and the land was returned to the government. North Sydney Council acquired the site, constructing and opening the Olympic Pool by 1936.

North Sydney Olympic Pool is considered to be of local significance due to its historical, aesthetic and social rarity. The SHI database contains the following statement of significance for the item:

The North Sydney Olympic Pool is an outstanding example of a 1930s Olympic Pool, principally due to its architectural style and detailing, its integration with its magnificent harbourside setting, and the 1930s sophistication of its facilities. Historically significant as the venue for two Empire Games (1938 and 1958) and the setting for the establishment of 86 world records in swimming and diving events. Associated with adjacent Luna Park stylistically and functionally. Popular and significant recreational facility in the region, used by many from outside North Sydney.
Figure 5-30: The entrance building and garden at the eastern end of the North Sydney Olympic Pool, looking west from near the base of the Sydney Harbour Bridge.

5.3.30 Bradfield Park (Alfred Street South, Milsons Point)

- North Sydney Local Environment Plan 2013, Item #I0538

Bradfield Park consists of a broad expanse of grassed parkland, sloping towards the water’s edge below the Harbour Bridge. The main pylons of the Sydney Harbour Bridge and the northern approach span run through the centre of the park. After the Sydney Harbour Bridge was constructed, the area around the northern approaches was landscaped as a park and named after the Chief Engineer for the bridge’s construction, J.J Bradfield.

Bradfield Park (including northern section) is considered to be of local significance due to its rarity and representativeness heritage values. The SHI database contains the following statement of significance for the item:

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**Important local park with extensive views of Sydney harbour and the city skyline.**

**Important locale for the historic icon of the Bow of the H.M.A.S. Sydney, a significant ship in Australian history. Associated with the harbour bridge construction and named for J.J.C. Bradfield. Formerly central township of Milsons Point and historically a most significant area for the North Shore.**

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Figure 5-31: View north across Bradfield Park beneath Sydney Harbour Bridge.
5.3.31 Seawall and wharf site

- North Sydney Local Environment Plan 2013, Item #I0540

The seawall and wharf site is located beneath the Sydney Harbour Bridge and at the southern edge of the sea-wall. The heritage item comprises a section of seawall with evidence of early sandstone wharf structures. The seawall and wharf site is located approximately 40m south of the project area and within the study area. The wharf was first established in 1861 and rebuilt in 1890-1893 for the tram, ferry and bus interchange. The terminal was moved in 1924 to provide space for the construction of the Sydney Harbour Bridge and was reopened in 1935 for access to Luna Park. The wharf was demolished in 1993 and a new wharf constructed to the east, but the sandstone seawall remains.

The seawall and wharf site is considered to be of local significance due to its historically, aesthetically and socially rare heritage values. The SHI database contains the following statement of significance for the item:

---

Site and remains of the once vital transport interchange that provided the major point of access to the North Shore from Sydney. One of the early wharf sites in the area, with virtually continuous use from the 1860s. Structural remains are evidence of traditional wharf and seawall construction. Also major access to Luna Park from 1935.
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Figure 5-32: The remains of the seawall and wharf site beneath the Sydney Harbour Bridge.

5.3.32 Faux stone balustrade (corner of Kirribilli Avenue and Broughton Street)

- North Sydney Local Environment Plan 2013, Item #I1133

The faux stone balustrade on the corner of Kirribilli Avenue and Broughton Street comprises a decorative faux sandstone wall with ashlar style walling at the base and decorative railings and posts at the top. The wall is located 50m to the east of the project area and within the study area. Based on the materials and style of construction, the wall appears to date from the mid-twentieth century (1940s-1960s). The North Sydney Council insignia is stamped on the western curved end of the balustrade.

No statement of significance provided for this heritage item on the SHI database, but the wall appears to display aesthetic, historic, social and associative significance.
Figure 5-33: The faux stone balustrade at the corner of Kirribilli Avenue and Broughton Street.

5.3.33 Careening Cove Conservation Area

- North Sydney Local Environment Plan 2013, Item #CA10

The project area is located west of the Careening Cove Conservation Area. The landform of the Conservation Area slopes to the Bay with a flat area of reclaimed land close to Careening Cove. The Conservation Area is characterised by two storey, late Victorian terraces, single and two storey Federation and Inter-War dwelling houses and residential flat buildings.

The North Sydney DCP 2013 contains the following statement of significance for the item:  

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*The Careening Cove Conservation Area is significant:

(a) as a largely consistent early 20th century residential area with an unusual and irregular pattern of street layout and irregular subdivision pattern that give the area a particular character.

(b) as retaining much of the urban detail and fabric seen in gardens, fencing, street formations, use of sandstone for retaining and building bases, sandstone kerbing and natural rock faces.

(c) for the amphitheatre like form around the reclaimed Milson Park and the head of the bay.

(d) for the remaining waterfront industrial and recycled industrial development that gives the area much of its character.

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5.3.34 Jeffreys Street Conservation Area

- North Sydney Local Environment Plan 2013, Item #CA26

The project area is located north west of the Jeffreys Street Conservation Area. The landform of the Conservation Area slopes down from the north towards the south and west, with a sandstone

retaining wall at Jeffreys Street and Kirribilli Avenue. The Conservation Area, as a remnant of the early development of Milsons Point, is characterised by two to three storey attached dwellings.

The North Sydney DCP 2013 contains the following statement of significance for the item: 27

The Jeffrey Street Conservation Area is significant:

(a) for the unity of its subdivision history which is evident in the built form of the area and that overlays its sloping and stepped topography.

(b) as an area of mid to late Victorian and Federation speculative terraces that are a remnant of the early development of the area prior to the clearances for the construction of the Sydney Harbour Bridge.

27 North Sydney Council, DCP 2013, Part C:C8-21.
6.0 ARCHAEOLOGICAL ASSESSMENT

6.1 Introduction

This section assesses the archaeological potential and significance of the study area. The assessment particularly focuses on the area of proposed ground disturbance, comprising a section of Ennis Road and an adjacent carpark beneath the Cahill Expressway.

6.2 Previous studies

To date there have been a number of archaeological investigations that have been carried out in proximity to the study area in Milsons Point.

Di Fazio, 2001 ‘Bradfield Park North, Milsons Point Archaeological Assessment’

This archaeological assessment was carried out by Di Fazio in 2001 as part of an Assessment of Heritage Impact for the proposed landscaping upgrades to Bradfield Park North. The assessment concluded that due to the evidence of demolition and subsequent use of the site for construction works, which involved heavy disturbance combined with levelling and dumping of soil from outside the site, archaeological material was likely to have been removed or damaged. The assessment identified a small possibility that some structural remains of the residential buildings, such as basements and foundations, would remain in the subsurface areas of the site, although it would be unlikely they would be in good condition. It is noted this archaeological assessment was not able to be accessed during the preparation of this report, and was not available at the Heritage Division library.

HLA Envirosciences 2003 Statement of Heritage Impact – Sandstone Walls: Bradfield Park North, Milsons Point

During landscaping works carried out in Bradfield Park in 2003, the remains of sandstone walls were identified and recorded by HLA Envirosciences. The sandstone walls were determined to date to the late 1800s, and were an intact part of the original boundaries surrounding the residence located at 115-117 Alfred Street. They were assessed as being of local significance for their association with the early period of occupation of Milsons Point and their representativeness of the initial phase of use of Bradfield Park. HLA Envirosciences concluded that the surviving walls demonstrate that the construction of the Sydney Harbour Bridge had both a positive and negative impact on the local community. It was stated that the walls “demonstrate that the Bridge resulted in the destruction of established houses and other buildings at Milsons Point” and that the construction of the bridge had disturbed any potential sub-surface remains in the area.28

HLA Envirosciences 2003, Section 65a Research Design ‘Cesspit or Well, Bradfield Park North, Milsons Point’

During landscaping works carried out in Bradfield Park, the remains of a cesspit or well were exposed in July 2003. Following uncovering of these remains, a Section 65a was provided as an amendment to the original Section 60 approval for the project, with a research design accompanying the application prepared by HLA Envirosciences. The cesspit or well is located approximately 60 metres to the north of the Milsons Point Station entrance, positioned between the two sandstone walls previously identified by HLA Envirosciences. The significance of the cesspit or well was assessed as being associated with the existing established significance of Bradfield Park, being reflective of the

occupation and use of Bradfield Park, along with having local significance under Criterion E of the State Heritage Criteria. 

6.3  Overview development of the study area

There are three identifiable phases of development for the study area, which may be present in the archaeological record:

- Phase 1: Early land grants (1800 – 1861)
- Phase 2: Residential and commercial development (1861 – 1920s)
- Phase 3: Resumption and major construction (Sydney Harbour Bridge) (1920s – 1932).

6.3.1  Phase 1: Early land grants (1800 – 1861)

Phase 1 relates to the earliest European developments in the area, and the early period of settlement at Milsons Point. The study area was originally part of land grants that were provided to James Milson (50 acres) and Robert Ryan (120 acres). A plan of Campbell’s Estate dating to 1840-49 indicates that the study area, including the area of proposed ground disturbance for trenching, did not feature any major developments at this time, and likely did not feature any prior to that (Figure 6-1). During this phase, the area was likely used for pastoral activities as suggested in the plan by the immediately adjacent barn, yards and calf pens. A reserved road appears to have been formed within the study area.

Archaeological remains from this period are likely to consist of ephemeral evidence of land clearing and pastoral activities, such as tree boles, burnt stumps, furrows and irrigation channels, post holes from fence lines, and charcoal patches and isolated artefact scatters from informal camps. There is potential for evidence of earlier road alignments. However, any road during this phase would have likely been an informal dirt or gravel track, which are poorly visible within the archaeological record.

6.3.2  Phase 2: Residential and commercial development (1861 – 1920s)

Development in the area increased after the establishment of the North Shore Steam Ferry Company in 1861. This facilitated the construction of a formalised road network and services, including the establishment of Alfred Street (originally called Lane Cove Road) in 1861. By 1891, a block plan of the area indicates the study area had been considerably developed by this time, featuring cottages, terraces and freestanding residences and structures. In the area of proposed ground disturbance work for trenching, several structures are depicted as having been present by this time including a freestanding residence off Brisbane Street and associated outbuildings, and terrace housing/cottages off Lincoln Street (Figure 6-2). Sources from this period indicate that these structures within the study area were largely associated with the working class community of Milsons Point, and comprised a combination of commercial and residential dwellings. The road network within the study area is seen to comprise Broughton Street and Brisbane Street, both running along a north-south axis, intersected by Willoughby Street and McDougall Street to the north, and Burton Street, Fitzroy Street, Pitt Street and Campbell Street to the south. By this time a tramline had been established along Alfred Street to the west.

Archaeological remains from this phase are likely to consist of stone or brick footings, yard surfaces, evidence of lot boundaries, and minor occupation-related deposits. Archaeological remains of

29 HLA Envirosciences 2003 Section 65a Research Design: ‘Cesspit or Well, Bradfield Park North, Milsons Point’ pp5-6.
30 Sands directory ‘1886 Part 4’, p. 348
properties established prior to the provision of reticulated water and municipal garbage collection in the late nineteenth century could possibly include cesspits, privies, wells or cisterns. Due to the presence of municipally provided waste management towards the end of the nineteenth century, deposits containing artefacts would be less likely in archaeological remains dating from this time onwards. Potential archaeological remains from Phase 2 could also include the remains of roads demolished to make way for the Sydney Harbour Bridge including Brisbane Street, the section of Willoughby Street between Alfred Street and Broughton Street, a section of McDougall Street, and Milson Street which was located between Alfred Street and Broughton Street. Remains associated with these roads could include evidence of the road surfaces, kerbing, drainage and associated deposits.

6.3.3 Phase 3: Resumption and major construction (Sydney Harbour Bridge) (1920s – 1932)

There appears to have been limited development within the study area until construction started for the Sydney Harbour Bridge. At this time the study area was resumed by the government, the workers terraces and cottages were demolished and the immediate area was excavated and infilled for the construction of the Sydney Harbour Bridge northern approaches. Since the construction of the Sydney Harbour Bridge approaches, the main notable developments within the study area involve the establishment of the raised Ennis Road to the east of the Sydney Harbour Bridge northern approaches, which previously connected to the Bradfield Highway beneath the tramline. This section of roadway and the eastern side of the Sydney Harbour Bridge northern approaches was modified in 1959 with the conversion of the tramline into the Cahill Expressway. Archaeological remains in the area would primarily consist of the backfill deposits associated with the Sydney Harbour Bridge.

6.4 Previous impacts

The study area, in comparison to the southern approaches of the Sydney Harbour Bridge, has undergone less phases of development. However, the consolidation of Milsons Point involving development of buildings and the road network within the study area during the mid to late nineteenth century would have likely impacted or removed archaeological remains associated with Phase 1. The construction of the Sydney Harbour Bridge northern approaches would have had similar extensive impacts to archaeological remains from the earlier two phases. Demolition works and significant modifications to the terrain within the study area are illustrated in Figure 6-3 to Figure 6-5. Since the construction of the bridge, adjustments to Bradfield Highway, Ennis Road and Cahill Expressway would have further impacted archaeological remains in the study area (Figure 6-6). The area beneath the Cahill Expressway off Ennis Road was further modified in recent years with the construction of a hardstand carpark, which remains extant.
Figure 6-1: Historical overlay of study area with c1840s map of Campbell Estate, indicating location of proposed ground disturbing works (trenching).
(Source: Map overlay from National Library Australia)
Figure 6-2: Historical overlay of study area with 1890s Block Plan map, indicating location of proposed ground disturbing works (trenching).
(Source: Map overlay from North Sydney Council Heritage Databases)
Figure 6-3: Construction of Sydney Harbour Bridge northern approaches and Ennis Road, showing demolition in process, 1927
(Source: Roads & Maritime Services)

Figure 6-4: Construction of Sydney Harbour Bridge northern approaches, 1929
(Source: Roads & Maritime Services)
Figure 6-5: Construction of Sydney Harbour Bridge northern approaches, 1931
(Source: Roads & Maritime Services)

Figure 6-6: Construction of the Warringah Freeway and adjoining Cahill Expressway, c1950s.
(Source: Roads & Maritime Services)
6.5 Summary of archaeological potential

The archaeological potential of the study area is provided in Table 13.

**Table 13: Archaeological potential summary for the study area**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Potential archaeological remains</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Evidence of land clearance and use, informal camps and early road surfaces, such as tree boles, burnt stumps, furrows, irrigation channels, post holes, fire pits, isolated artefact scatters and informal road surfaces, kerbing and drainage. It is possible remains associated with the quarry may be present although these would likely have been infilled and be difficult to discern.</td>
<td>Nil-low</td>
</tr>
<tr>
<td>Phase 2</td>
<td>Evidence of the residential and commercial development of workers cottages and terraces, including brick or stone building footings, lot boundaries, yard surfaces and minor occupation-related deposits. Evidence of more formal road surfaces, drainage and kerbing.</td>
<td>Low</td>
</tr>
<tr>
<td>Phase 3</td>
<td>Backfill deposits from the Sydney Harbour Bridge construction.</td>
<td>High (Nil potential for relics)</td>
</tr>
</tbody>
</table>

6.6 Archaeological significance

6.6.1 Research Potential (Criterion E)

Phase 1 dates to the earliest European settlement of the North Shore. As historical research suggests that there was little development on the Ryan and Milson grant and that it was primarily used for agricultural pursuits, it is unlikely that this phase would have produced any substantial archaeological remains. Archaeological remains associated with land clearance, quarrying and grazing activities would be ephemeral in nature. The potential for archaeological evidence from this phase is nil-low. Any intact remains would be locally significant for their ability to contribute to our knowledge of the early development and occupation of Sydney’s North Shore.

Archaeological remains from Phase 2 are primarily associated with the commercial and residential development of the study area during the mid to late nineteenth century. Substantial remains from this phase may have research potential associated with the development of the North Shore during this period, analysis of which may provide insight into the preferences and ways of life of the working-class community of Milsons Point at this time. Archaeological remains may also provide information on the material expressions of the relative isolation of the North Shore prior to construction of the bridge, and the difference with the CBD. The relatively short occupation of the site between the 1860s and the 1920s could offer a ‘snap shot’ of life prior to the easy access to the city and the acceleration of development. If intact archaeological remains are located, they would be locally significant.

Phase 3 is associated with the Sydney Harbour Bridge construction. Archaeological remains of this phase would primarily consist of backfill deposits. These deposits do not hold any research potential.
6.6.2 Association with Individuals, Events, or Groups of Historical Importance (Criteria A, B and D)

The study area was part of the grants provided to Robert Ryan and James Milson, both well-known local figures. However, the likely ephemeral nature of the remains means it would be difficult to directly associate them with the works of Ryan or Milson and therefore remains from Phase 1 would not reach the level of local significance under this criterion.

Although the Phase 3 backfill deposits within the study area are associated with the construction of the Sydney Harbour Bridge, the deposits themselves are of little significance. This historical phase would not reach the level of local significance under this criterion.

6.6.3 Aesthetic or Technical Significance (Criterion C)

It is considered unlikely that the potential archaeological resources would be extensive or indeed intact. Considering they primarily represent the later nineteenth century development commercial development of a suburban area, it is not considered the potential archaeology would have any particular aesthetic or technical significance.

6.6.4 Ability to Demonstrate the Past through Archaeological Remains (Criteria A, C, F and G)

There is some potential that the archaeological remains could demonstrate the transition from a primarily agricultural area to a city fringe suburban area in the second half of the nineteenth century. The remains may meet the threshold of local significance under this criteria.

6.7 Statement of archaeological significance

The potential archaeological remains within the study area are associated with early agricultural land use and the historical development of the Milsons Point/Kirribilli settlement and community. Any remains recovered could provide information regarding domestic life, agricultural development, living conditions and the growth of the local economy from the late nineteenth century to the early twentieth century. Archaeological remains would mainly be structural, primarily footings of former structures.

A summary of the archaeological significance of the potential archaeological remains is provided in Table 14 below.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Potential</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>Nil-low</td>
<td>Local</td>
</tr>
<tr>
<td>(1788 – 1860s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 2</td>
<td>Low</td>
<td>Local</td>
</tr>
<tr>
<td>(1860s – 1920s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 3</td>
<td>High (Nil potential for relics)</td>
<td>Unlikely to reach the threshold of local significance</td>
</tr>
<tr>
<td>(1920s – 1930s)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 14: Archaeological potential summary for the study area
7.0 PROPOSED WORKS

7.1 Proposed Works

The proposal consists of a series of proposed works which are detailed below. These works are illustrated in Error! Reference source not found..

7.1.1 Work activities

Details of the proposed works to upgrade the northern toll plaza precinct are provided below:

- **Pre-work activities:**
  - Establish the temporary site compound
  - Introduce traffic management controls
  - Establish site entry and exit points
  - Establish environment and safety controls

- **Work activities** (comprising 10 key stages, which may not be undertaken in the order as numbered)
  - Activity 1: Install temporary concrete barriers and traffic management controls
  - Activity 2: Isolate/decommission services to toll booths and relocate any utilities as an early works package, prior to the start of demolition and pavement upgrade works
  - Activity 3: Install scaffolding to demolish toll booths and associated infrastructure in stages
  - Activity 4: Remove the existing asphalt, brickwork and concrete slabs
  - Activity 5: Where needed, remove and replace kerb and gutter
  - Activity 6: Install new concrete slabs and waterproof
  - Activity 7: Asphalt the road including the coloured bus lane surface
  - Activity 8: Reinstall any lighting impacted by the works
  - Activity 9: Install pavement marking and delineation
  - Activity 10: Install new signs and posts and remove redundant sign and posts

- **Post-work activities:**
  - Remove temporary environmental and traffic controls
  - Demobilisation from site
  - Reopen traffic lanes

7.1.2 Additional utility relocation works

Following display of the REF, the extent of utility relocation works was further defined. These utilities are government owned and interface with the northern toll plaza precinct. Utility relocations would occur prior to starting the main work activities, which are outlined in the REF.

There are seven items of work relating to utilities relocations, as summarised in the following table:
<table>
<thead>
<tr>
<th>Item of works</th>
<th>Location</th>
<th>Description of works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1 – New utility cable conduit under bridge connecting to the existing North Pylon utility node</td>
<td>Under the bridge deck, parallel to the eastern side of the Cahill Expressway from north of Fitzroy Street to the northern bridge pylon</td>
<td>Installation of a new permanent utility cable conduit alongside an existing conduit in areas of steel work under the road deck on the approach span of the Sydney Harbour Bridge. The area would be accessed via an existing maintenance catwalk. No disturbance of the road surface would be required. The installation of a new utility cable conduit would be carried out using an electric hand drill.</td>
</tr>
<tr>
<td>Item 2 – New utility cable conduit behind the existing W-beam barrier</td>
<td>Parallel to the eastern side of the Cahill Expressway from north of Fitzroy Street to Burton Street stairs</td>
<td>Installation of a new permanent cable conduit behind the existing W-beam barrier to route new temporary and/or permanent utility cables through. The installation of a new utility cable conduit would be carried out at night using an electric hand drill.</td>
</tr>
<tr>
<td>Item 3 - Temporary attachment of utilities to eastern parapet</td>
<td>Parallel to the eastern side of the Cahill Expressway from the top of the Burton Street stairs to chainage 390</td>
<td>Temporary attachment of utilities to the eastern parapet along the Cahill Expressway during construction. The utilities would be housed in steel galvanised pipes and connected to the parapet using bolts or clamps. These utilities would eventually be moved into new permanent conduits within the eastern kerb once they are constructed (as per Item 4).</td>
</tr>
<tr>
<td>Item 4 – Relocation of utilities within and above a new eastern kerb</td>
<td>Parallel to the eastern side of the Cahill Expressway from the top of the Burton Street stairs to chainage 390</td>
<td>The kerb adjustment works between Burton Street stairs to Chainage 340 would be carried out during the day. In this section, the kerb would be reinstated to the same height as the existing kerb. The kerb adjustment works between Chainage 340 and Chainage 390 would increase the existing kerb from 150 mm to about 400 mm in height. This section of works would be undertaken at night. The existing water main on the eastern parapet would also need to be raised to a higher position on the parapet.</td>
</tr>
<tr>
<td>Item 5 – Works at chainage 390</td>
<td>Near chainage 390</td>
<td>Coring of a hole through the bridge deck to enable the conduit to drop through the bridge deck to Ennis Road below. These works would take place at night in one to two night shifts and use a concrete corer. The utility relocation would involve digging a trench that would be about 500 mm wide and 1500 mm deep.</td>
</tr>
<tr>
<td>Item 6 - Trenching along Ennis Road and/or RMS Carpark</td>
<td>Along a section of Ennis Road near Greenway Apartments and the existing Roads and Maritime carpark</td>
<td>The works are expected to take about two weeks to complete. Most of the works would occur during the day, with access for pedestrians and the Roads and Maritime carpark maintained. However, one of the footpaths and/or traffic lanes as well as the existing parking along Ennis Road would be temporarily blocked off during construction. The trenching works are expected to use a concrete saw, small excavator, small crew truck, site ute, wacker packer and concrete agitator.</td>
</tr>
<tr>
<td>Item of works</td>
<td>Location</td>
<td>Description of works</td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Item 7 – Connection to Lavender Street utility node</td>
<td>Across the Bradfield Highway (lanes 1 to 6 of the Sydney Harbour Bridge approach) to the existing Lavender Street utility node</td>
<td>The utility relocation would occur at night and is likely to require temporary road closures. The cables would be installed within existing conduits and no new road trenching would be required. The works are expected to be carried out using an electric hand drill.</td>
</tr>
</tbody>
</table>
8.0 HERITAGE IMPACT ASSESSMENT

8.1 Introduction

This section will assess heritage impacts to the listed items within and adjacent to the study area. Impacts to the Sydney Harbour Bridge will be assessed in terms of its National Heritage Listing significance, as well as the State Heritage Register significance of the approaches and viaducts group (north).

8.2 Assessment of Impact to Sydney Harbour Bridge

8.2.1 Impact to fabric

Removal of 1950s toll booths

The proposal involves removal of the 1950s toll booths within the northern toll plaza precinct on the Sydney Harbour Bridge northern approaches. These toll booths are assessed in the CMP 2007 as being of moderate significance. It is noted that the approaches to the Sydney Harbour Bridge have been modified over time in response to traffic management and improvements. While these toll booths were once part of the day-to-day operations and functionality of the Sydney Harbour Bridge, they are now redundant following installation of new toll gantries north of the project area in December 2016.

The impact to the social values that were integral to the 1950s toll booths was previously impacted significantly by change of function to electronic tolling in 2009. In 2007, Roads and Maritime prepared a Sydney Harbour Bridge Tolling oral history to capture the social values of the toll booths, and moveable heritage items were collected and catalogued to ameliorate this impact. Therefore, the removal of the now decommissioned toll booths will have a negligible impact on the social significance of the toll booths and the Sydney Harbour Bridge as a whole. Relocation of tolling infrastructure to the north of the existing site will continue the historic tolling function of this precinct along the Sydney Harbour Bridge northern approaches. Recommendations regarding interpretation within this report are designed to reintegrate social connections with the toll collection activities and history as a tangible element of the Sydney Harbour Bridge.

While the removal of these components of the Sydney Harbour Bridge will have a tangible impact on the bridge’s other significant values, the proposal does not involve removal or intervention to fabric of exceptional significance. As such, the proposal will maintain the overall significance and key attributes of the Sydney Harbour Bridge including its physical and visual character, setting and structural integrity.

The proposed removal of the 1950s toll booths would have a minor physical impact on the overall heritage significance of the Sydney Harbour Bridge. This minor impact to the overall significance encompasses what is a major impact to an element of the Sydney Harbour Bridge approaches which is of moderate contributory significance to the Sydney Harbour Bridge.

Removal of 1970s toll office

The proposal involves removal of the 1970s toll office on the Sydney Harbour Bridge northern approaches. The toll office is assessed in the CMP 2007 as being of low significance. The removal of

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this redundant element, therefore, is not considered to result in any adverse impact affecting the significant values of the Sydney Harbour Bridge.

While the 1970s toll office itself is not considered significant, it is located directly above the former Milsons Point Tram Station stairs. There is potential for the removal of the overhead 1970s toll office to physically impact on this significant item and for vibrations during works to affect the historic tile surfaces. Roads and Maritime should follow the ‘Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade Construction Noise and Vibration Impact Assessment’ report and the recommendations relating to temporary protection measures, as covered in Section 9.0 of this SoHI.

The proposed removal of the 1970s toll office would have a minor physical impact on the overall heritage significance of the Sydney Harbour Bridge. This minor impact to the overall significance encompasses what is a major impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance to the Sydney Harbour Bridge.

Upgrade works to existing roadway

The proposal involves upgrade works to the existing roadway including repairing the pavement, kerb and drainage works, resurfacing works, installation of new and replacement traffic devices, replacement of impacted lighting, and upgrading signage and associated infrastructure along the Cahill Expressway. These works, considered essential in the management and maintenance of the Sydney Harbour Bridge road networks, will affect the wearing surfaces of the road that are assessed in the CMP 2007 as being of little significance.

The upgrade works to the existing roadway could potentially impact on the underlying brick infill, and this aspect of the works is already covered by the Section 57 exemption SF2015/000329. The underlying brick infill fabric is evidence of the conversion from tramway to roadway on the Sydney Harbour Bridge, and is of moderate significance. Retention of the bricks in situ or reinstatement is not advised, due to earlier issues sited in the Section 57 exemption, which noted that the bricks caused the ingress of water into the bridge and retail premises below. The bricks would be recorded and removed as part of the Section 57 exemption works.

The upgrade works to the existing roadway would have a negligible physical impact on the overall heritage significance of the Sydney Harbour Bridge. This negligible impact to the overall significance encompasses what is a minor impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance to the Sydney Harbour Bridge.

Upgrade works to lighting and signage

The proposal involves upgrade works to sections of kerb on the roadway and includes the replacement of any impacted street lighting as part of these works. These works, considered essential in the management and maintenance of the Sydney Harbour Bridge road networks, will affect the modern steel lamp posts with curved arms that are assessed in the CMP 2007 as being of little significance. The works will not involve removal of any original Sydney Harbour Bridge signage.

The proposal would require installation of a new changeable message sign between the Bradfield Highway and Cahill Expressway between chainage 200 to chainage 300, attached to the underside of the modern Bradfield Highway road structure (refer to Figure 8-1). This section of the roadway is non-original and is identified in the CMP 2007 as being of little significance. This aspect of the proposal is therefore not considered to result in any physical impacts to significant fabric or components of the Sydney Harbour Bridge northern approaches.
The works to street lighting and road directional signage would have a negligible physical impact on the overall heritage significance of the Sydney Harbour Bridge. This negligible impact to the overall significance encompasses what is a negligible impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance to the Sydney Harbour Bridge.

**Utility relocation works**

The proposal involves relocation of utilities, including optic fibre cables, traffic CCTV and electrical lines. It is understood that utility relocation works would occur in areas where the road surface is proposed to be disturbed and would involve, where possible, installation of utilities within or alongside existing conduits. These works would affect areas of the roadway that are assessed in the CMP 2007 as being of little significance, areas of steelwork beneath the road deck on the approach spans that are assessed in the CMP 2007 as being of high significance, and sections of parapet that are assessed in the CMP 2007 as being of high significance. Aspects of the proposed utility relocation works that are associated with fabric that is above little significance are covered in further detail in the discussion that follows.

In the location of the steelwork on the approach spans, it is understood that a new cable tray would be installed next to an existing optic fibre cable tray next to a catwalk from the north pylon to the start of Fitzroy Street. Installation of a new cable tray on the steelwork of the approach spans would introduce a new component within the bridge approaches and would involve direct impact to significant fabric, potentially requiring fixing to significant steelwork. It is noted that the presence of an existing cable tray has already introduced a new component in this locality.
In the location of the Cahill Expressway, kerb adjustment works and temporary attachment of utilities to the eastern parapet would be carried out. This work would extend from the top of the Burton Street stairs to chainage 390. Kerbing works would involve building on top of a portion of the existing eastern kerb between Chainage 340 and Chainage 390, which would result in the height of the kerb being increased from 150mm to 400mm in this locality, and reinstatement of the remaining portion of kerbing to the existing height between Chainage 340 and the Burton Street stairs. Parallel to the eastern side of the Cahill Expressway from north of Fitzroy Street to Burton Street stairs, a new permanent cable conduit would be installed behind the existing modern W-beam barrier.

The wearing surfaces of the road are identified as elements of little significance in the CMP 2007, and removal and reinstatement of kerbing to encase relocated utilities is not considered to impact significant fabric. It is noted, however, that this work would be adjacent to the rendered concrete fabric of the eastern parapet, which is an element of high significance as per the CMP 2007. While the proposal has been developed to minimise where possible direct impacts to the parapet, temporary attachment of utilities housed in steel galvanised pipes would be required either using bolts or clamps. Utilisation of a clamping method would avoid the requirement to directly impact the parapet, while the alternative use of bolts would result in direct physical impacts. The level of impact associated with temporary utilities attached to the eastern parapet would be dependent on the methodology selected during design development, with the clamping method resulting in a minor localised physical impact, and bolting method resulting in a moderate localised physical impact.
Utility relocation works would have a minor physical impact on the overall heritage significance of the Sydney Harbour Bridge. This minor impact to the overall significance encompasses what is a moderate impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance (wearing surfaces of road), and a moderate impact to elements of the Sydney Harbour Bridge approaches that are of high significance (steelwork of the trusses, lateral bracing and hangers, portal frames at end posts, floor laterals, cross girders, stringers, joists and bearings, and rendered architectural elements eg walls, parapets, pilasters, spandrels). Impact to the eastern parapet, of high significance, would be dependent on the method of attaching temporary utilities, being either minor (clamping) or moderate (bolting).

8.2.2 Visual impact

Removal of 1950s toll booths

The proposed removal of the 1950s toll booths on the northern approach of the Sydney Harbour Bridge will change the visual experience of travelling south across the Sydney Harbour Bridge from North Sydney to the Sydney CBD. From the second half of the twentieth century onwards, these toll booths were once part of the day-to-day operations of the bridge, and are an intrinsic part of its
historical function. The proposed removal of the toll booths, would not impact on the overall form and
visual character of the Sydney Harbour Bridge, or impact the heritage values of its significant setting.

The removal of the 1950s toll booths would have a minor visual impact on the overall heritage
significance of the Sydney Harbour Bridge. This minor impact to the overall significance encompasses what is a moderate impact to an element of the Sydney Harbour Bridge approaches which is of moderate contributory significance to the Sydney Harbour Bridge.

**Removal of 1970s toll office**

The proposed removal of the 1970s toll office on the northern approach of the Sydney Harbour Bridge would change the visual experience of travelling south across the Sydney Harbour Bridge from North Sydney to the Sydney CBD. The proposed removal of the toll office, would not impact on the overall form and visual character of the Sydney Harbour Bridge, or impact on its significant setting. Given the height of this structure and its low significance, it is anticipated that removal of the 1970s toll office would remove visual clutter and enhance the significant views and approach experience to the Sydney Harbour Bridge from the northern approaches, a key component of the bridge's aesthetic significance.

The removal of the 1970s toll booths would have a negligible visual impact on the overall heritage
significance of the Sydney Harbour Bridge. This negligible impact to the overall significance encompasses what is a negligible impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance to the Sydney Harbour Bridge.

**Upgrade works to existing roadway**

The proposed upgrade works to the existing roadway including repairing the pavement upgrade works, kerb and drainage works, installation of new and replacement traffic devices, new signage and resurfacing works to the northern approach along the Cahill Expressway, are considered essential in the management and maintenance of the Sydney Harbour Bridge road networks. These works constitute minor operational upgrades and are not considered to cause any visual impact to the Sydney Harbour Bridge.

The upgrade works to the existing roadway would have a negligible visual impact on the overall heritage significance of the Sydney Harbour Bridge. This negligible impact to the overall significance encompasses what is a negligible impact to an element of the Sydney Harbour Bridge approaches which is of low contributory significance to the Sydney Harbour Bridge.

**Upgrade works to lighting and signage**

The proposal involves upgrade works to sections of kerb on the roadway and includes the replacement of any impacted street lighting within the northern toll plaza precinct. Wherever possible, affected signage and lighting that is in good condition would be reinstated as part of the proposal, while any elements that are not found to be in good condition would be replaced like for like. Wherever possible, lighting will be kept to a minimum to avoid introducing visual clutter on the Sydney Harbour Bridge northern approaches. Dependent on the detail design of these works, the proposal will introduce new elements to the Sydney Harbour Bridge northern approaches that would be coordinated and designed with consideration of the recommendations provided in Section 9.0.

Dependent on the detailed design, the proposed upgrade works to lighting and signage would have negligible to minor visual impact on the heritage significant fabric of the Sydney Harbour Bridge.
Utility relocation works

The proposed utility relocation works, including relocation of optic fibre cables, traffic CCTV and electrical lines, would be in relatively discrete locations. This would involve relocating utilities beneath the road surface and road deck, either within or alongside existing conduits. As such, it is not considered this aspect of the proposal would result in any discernible visual changes along the Sydney Harbour Bridge northern approaches. The proposed installation of a new cable tray alongside an existing optic fibre tray on the steelwork of the approach spans would introduce a new visual feature within this component, although given the oblique angle of views and the overall scale of this part of the bridge, any associated visual impacts are likely to be minimal.

The proposed increase in height of a portion of existing kerbing by 250mm on the eastern side of the Cahill Expressway between Chainage 340 and Chainage 380 to encase conduit routes would result in localised visual changes. The increased height of the kerb in this locality would partially obscure views of the adjoining eastern parapet, and would diminish appreciation of the form and proportion of this significant element of the Sydney Harbour Bridge approaches in this location. The legibility of the parapet would be further diminished by the relocation of an existing water main as part of the works in this area to a higher position on the parapet, which would conceal much of the remaining parapet viewed above the modified kerb. It is noted the visual amenity of this section of parapet currently comprises utilities and services, and that these visual changes to the parapet would be restricted in extent to a length of around 40 metres. Visual impact associated with temporary attachment of utilities (either clamped or bolted) would be temporary in nature. As such, the visual impact associated with utility relocation works on the Cahill Expressway would be minor in the overall context of the Sydney Harbour Bridge and its approaches.

Utility relocation works would have a minor visual impact on the overall heritage significance of the Sydney Harbour Bridge. This minor impact to the overall significance encompasses what is a minor impact to elements of the Sydney Harbour Bridge that are of low and high contributory significance to the Sydney Harbour Bridge.

8.2.3 Summary of impact to Sydney Harbour Bridge

A summary of the various proposed works and associated heritage impact assessment is provided in the Table 16.

Table 16: Summary of impact to heritage significant fabric.

<table>
<thead>
<tr>
<th>Proposed work</th>
<th>Impact to heritage significant fabric</th>
<th>Impact to heritage views and setting</th>
<th>Overall impact to Sydney Harbour Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of 1950s toll booths</td>
<td>Major (to element)</td>
<td>Moderate</td>
<td>Minor</td>
</tr>
<tr>
<td>Removal of 1970s toll office</td>
<td>Major (to element)</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Upgrade works to existing roadway</td>
<td>Minor</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Upgrade works to lighting &amp; signage</td>
<td>Negligible</td>
<td>Negligible-Minor</td>
<td>Negligible-Minor</td>
</tr>
<tr>
<td>Utility relocation works</td>
<td>Moderate</td>
<td>Minor</td>
<td>Minor</td>
</tr>
</tbody>
</table>
8.2.4 Justification

The proposal involves works that would result in neutral to major physical and visual impacts to elements of low to moderate contributory significance to the Sydney Harbour Bridge approaches. The proposed works would not impact on any fabric of exceptional significance, or negatively impact on the setting and important views to and from the Sydney Harbour Bridge. The proposed removal of the northern toll booths and toll office, which are now redundant following the introduction of cashless toll operations, would not adversely affect the overall significance or integrity of the Sydney Harbour Bridge. The overall impact to the Sydney Harbour Bridge is therefore considered minor. Moreover, the proposal has been developed to minimise bulking elements in order to visually declutter the Sydney Harbour Bridge northern approaches and create a generally positive heritage impact.

The proposal forms part of a broader traffic management upgrade scheme that would improve traffic safety and efficiency, and support the ongoing use and historic function of the bridge as the main transportation route between North Sydney and Sydney CBD. This is a fundamental aspect of the significance of the Sydney Harbour Bridge.

8.3 Impacts Against NHL Values of the Sydney Harbour Bridge

The listing of the Sydney Harbour Bridge on the NHL potentially has implications for the proposal, and may require referral under the EPBC Act depending on the level of impact. Proposed development (or ‘actions’) that will have, or are likely to have, a ‘significant impact’ on the world heritage values of a declared World Heritage property (the Sydney Opera House), or on the National Heritage values of a National Heritage Place (the Sydney Harbour Bridge), must be referred to the Minister.

A ‘significant impact’ is defined as an action that has an important, notable consequence, dependent upon the sensitivity, value and quality of the environment that is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. The Significant Impact Guidelines state that an action is likely to have a significant impact on the National Heritage values of a place is there is a real chance or possibility that it will cause:

- One or more of the National Heritage values to be lost;
- One or more of the National Heritage values to be degraded or damaged; or
- One or more of the National Heritage values to be noticeably altered, modified, obscured or diminished.

This report has assessed that following the proposed works the national heritage values of the Sydney Harbour Bridge would not be significantly impacted, and would continue to meet the criteria of events/processes, aesthetic characteristics, creative or technical achievement, social value and significant people heritage values. The proposal will result in a minor impact to aspects of the Sydney Harbour Bridge and its elements. However, the impact is generally restricted to localised areas that are relatively small in relation to the overall size of the individual elements and the Sydney Harbour Bridge, and the overall impact is considered minor.

As a result, the proposal would not result in the loss, damage or notable alteration of any of the Sydney Harbour Bridge National Heritage values.

RMS has previously met with the Department of the Environment and Energy (17 Nov 2016) to discuss a range of Sydney Harbour Bridge projects. Although the northern toll plaza was not

specifically discussed, the southern toll plaza was, and it was not considered to be a significant impact in terms of its national heritage values.

8.4 Conservation Management Plan Policies

A number of conservation policies have been established for the management of the Sydney Harbour Bridge in the CMP 2007 prepared by GML. Policies relevant for the proposal are described below, with an assessment of the project impacts against each of these policies.

Policy 9—Management Objectives

9.1 Ongoing management of the bridge should provide for:

- retention of the fundamental cultural heritage values and attributes of the bridge;
- conservation (including ongoing maintenance) of significant elements;
- enhanced opportunities for presentation and interpretation of the bridge and its history for public appreciation; and
- continued and enhanced linkage with associated elements adjacent to the bridge, including Bradfield Park and Plaza, Dawes Point and other foreshore areas within the view lines of the bridge (via interpretation, related activities, transport routes etc).

The proposed northern toll plaza precinct upgrade, as part of the ongoing management of the bridge, would provide for the operational requirements necessary to support fundamental role of the Sydney Harbour Bridge as the main traffic network across Sydney Harbour. The proposal also retains the tolling functions of the Sydney Harbour Bridge, albeit within an ever evolving and changing technological format. Opportunities for interpretation at the north-east stairs, as part of a holistic interpretation strategy, would increase and strengthen public appreciation and engagement with the Sydney Harbour Bridge and nearby heritage items and conservation areas.

Policy 11—Maintaining Key Views of the Sydney Harbour Bridge in its Setting

11.1 The significant physical and visual character of the Sydney Harbour Bridge within its harbour setting should be appropriately conserved.

11.2 Views and vistas to and from Sydney Harbour Bridge to the north, south, east and west should be maintained.

The proposal maintains significant views and vistas to and from Sydney Harbour Bridge from the northern approaches, along with the significant physical and visual character of the bridge within its harbour setting. The proposed removal of the toll office will remove clutter on the roadway and potentially enhance views along the Cahill Expressway on the Sydney Harbour Bridge northern approaches.
Policy 13—Integrity of Original Design

13.4—The fabric and design integrity of the main components of the bridge, comprising the arch, hangers, roadway, pylons, approach spans, piers and approaches including tunnels, tenancy spaces and Milsons Point railway station, should be conserved.

13.6—The arrangement of internal spaces in the abutment towers, pylons and approach structures should be conserved.

The proposal, including removal of redundant toll booths and toll office and upgrade works to the existing roadway, will maintain the fabric and design integrity of the Sydney Harbour Bridge northern approaches. The cumulative impact of the suite of projects underway or envisaged for the Sydney Harbour Bridge has potential to obscure the integrity and legibility of the original design and would therefore be managed in accordance with the recommendations in Section 9.0.

Policy 16—Records of Intervention and Maintenance

16.1 All works to the Sydney Harbour Bridge should be appropriately recorded and permanently stored as part of the archival recording of the history and significance of the item.

16.2 Documentation of conservation works should include the rationale and methods employed and monitor performance.

Design plans for the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade project would be included in planning archives for the Sydney Harbour Bridge. Refer to the recommendations in Section 9.0 regarding these processes.

Policy 18—Management of Adaptation and Change

18.1—All decisions for intervention and change should be evaluated in terms of the nature of the proposal, its purpose, long term context and how this relates to the identified cultural heritage values of the bridge. Protection and enhancement of the fundamental significant elements of the place through appropriate adaptation and change for new or additional necessary functions should be a key management goal.

The provision of improved accessibility, efficiency and safety of the roadway on the Sydney Harbour Bridge northern approach is consistent with the heritage significance of the bridge as a transportation route of significant public utility. While the proposal would result in impacts to physical fabric and the setting of the Sydney Harbour Bridge, the works would be localised to small areas of the bridge structure. Increased and improved traffic conditions on the Sydney Harbour Bridge would enhance

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33 SHB CMP, GML 2007, Section 7.5.3, p. 97
the iconic role of the bridge as the main public transportation route across Sydney Harbour.

**Policy 19—New Development**

19.1—New development should enhance the function and use of the bridge without obscuring or damaging the integrity of the original design or significant fabric.

19.2—New work should be designed to respond to the character of the existing significant design and fabric.

The proposal, as an operational requirement to enhance the function of the Sydney Harbour Bridge as a public transportation route, supports the role of Sydney Harbour Bridge as a critical component of Sydney’s transport system. While significant fabric would be impacted by the proposed works, primarily the removal of the toll booths of moderate significance, the area that would be impacted is relatively small compared to the total expanse of the bridge. The proposal avoids impacting fabric of exceptional significance and does not obscure or damage fabric of exceptional significance. The proposal also retains the tolling functions of the Sydney Harbour Bridge, albeit within an ever evolving and changing technological format.

**Policy 26—Movable Items**

26.1—All equipment or elements considered redundant or surplus to requirements and assessed to be of heritage significance must be suitably archived and recorded on the RTA Heritage and Conservation Register.


An archival recording of the proposed removed structures would be carried out prior to commencement of works. Refer to the recommendations in Section 9.0 regarding these processes.

**Policy 36—Interpretation Requirements**

36.1—Measures to appropriately interpret the major aspects of significance of the bridge should be considered in conjunction with all future proposals for change and development.

The location of the proposal is near an entry/exit point for access to the bridge (i.e. near the existing north east bridge stairs). This location would allow opportunities for increased interpretation, heritage signage and information presentations to pedestrians using this route on the tolling operations and history of the Sydney Harbour Bridge. Refer to the recommendations in Section 9.0 regarding these
processes.

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**Policy 37—Machinery and Equipment**

37.1—The history and heritage significance of machinery and equipment specifically related to the bridge should be actively interpreted to the public.

The location of the proposal would allow opportunities for increased interpretation, heritage signage and information presentations to pedestrians using the pedestrian path on the east side of the bridge on the tolling operations and history of the Sydney Harbour Bridge. Refer to the recommendations in Section 9.0 regarding these processes.

**Summary**

The proposed works represent an opportunity to enhance the efficiency and functionality of the existing traffic provisions on the Sydney Harbour Bridge northern approaches in accordance with the policies and recommendations contained in the endorsed CMP 2007.

The proposal is anticipated to cater for increased traffic travelling across Sydney Harbour in the future. The assessment of impact to the heritage fabric of the Sydney Harbour Bridge northern approaches has determined the impact to be minor. The overall impact on the significance of the Sydney Harbour Bridge would be minor.

**8.5 Cumulative Impact Assessment**

The proposal forms part of a suite of projects that are underway or otherwise planned for the Sydney Harbour Bridge. These projects, which involve upgrades to provide improved accessibility and maintenance and upgrades for increased vehicle traffic safety and efficiency, seek to support and enhance the accessibility and functionality of the Sydney Harbour Bridge as the main transportation route across Sydney Harbour.

The context of the proposal in relation to these other projects is an important consideration to understand its cumulative impact on the significant values of the Sydney Harbour Bridge. Key projects to consider include the Sydney Harbour Bridge Southern Toll Plaza Upgrade that is underway, the Sydney Harbour Bridge Step Free Access project, the planned Ennis Road Retail Refresh, Sydney Harbour Bridge Northern Cycle Ramp and Sydney Harbour Bridge Southern Cycleway. The cumulative impact assessment of these projects is covered in the discussion that follows.

**Impact to fabric**

As described in the preceding assessment, the proposal involves interventions to the fabric of the Sydney Harbour Bridge northern approaches including removal of the 1950s toll booths, removal of the 1970s toll office, upgrade works to the existing roadway, impacted lighting, signage and associated roadway facilities. These interventions have been assessed as having a minor physical impact on the Sydney Harbour Bridge northern approaches and a minor impact to the overall significance of the Sydney Harbour Bridge. Other projects relating to the Sydney Harbour Bridge may have similar potential impacts to the fabric of the Sydney Harbour Bridge and its approaches.

The Sydney Harbour Bridge Southern Toll Plaza Upgrade that is currently underway aims to improve driver and passenger experience travelling on the Sydney Harbour Bridge by simplifying traffic movements, improving connectivity for buses, improving operational flexibility for lane management
on the Sydney Harbour Bridge, and reducing road safety hazards. The proposal involves removal of the southern toll booths, realignment and upgrading of traffic lanes between the Sydney Harbour Bridge and the Western Distributor/northern CBD, reconfiguration of the intersection at York and Grosvenor streets and widening works to the eastern offload ramp to York Street. These interventions have been assessed as having a minimal impact to the Sydney Harbour Bridge. Combined with the Sydney Harbour Bridge Southern Toll Plaza Upgrade, the proposal would result in the removal of all evidence of historic manual tolling within the SHR and NHL curtilage of the Sydney Harbour Bridge, although electronic tolling would still occur. It is noted that while the original toll building on the southern approaches and the newly installed toll gantries would remain, these items are outside of the bridge’s heritage curtilage.

The Sydney Harbour Bridge Step Free Access project aims to provide step free access to the Sydney Harbour Bridge walkway from the southern and northern approaches through the provision of passenger lifts. This project involves removal of two sections of parapet wall at localised areas along the Sydney Harbour Bridge walkways. It is anticipated the removed parapet sections are to be adaptively re-used into the street-level design of the lift shaft entrances and pavement areas for interpretive uses. These interventions have been assessed as having moderate physical impact to the heritage significant fabric of the Sydney Harbour Bridge, and minor impact to the heritage values of the Sydney Harbour Bridge as a whole.

The planned Ennis Road Retail Refresh project aims to upgrade the existing retail amenities that are located in a series of bays beneath the Cahill Expressway between the Burton Street tunnel and the northern end of Ennis Road. The project involves structural strengthening of awnings and repair of steel framed windows of moderate significance, and cleaning of the render of the approaches, of high significance.

The concept design for a northern ramp connecting to the existing Sydney Harbour Bridge cycleway is in early stages of development. The Sydney Harbour Bridge Northern Cycle Ramp project seeks to improve cyclist access to the Sydney Harbour Bridge cycleway at the northern approach in Milsons Point. Similarly, the planned Sydney Harbour Bridge Southern Cycleway project proposes construction of a new cyclist and pedestrian bridge over the Cahill Expressway cutting and a cycleway along the retaining wall of the southern approaches, as well as modifications to existing road provisions. These projects aim to improve cyclists’ safety and access to the Sydney Harbour Bridge and to support future growth in cyclist activity between the Lower North Shore and the CBD. The Sydney Harbour Bridge Northern Cycle Ramp project would involve removal of a section of parapet and introduction of a new structural element along the rendered concrete retaining wall of the northern approaches. The Sydney Harbour Bridge Southern Cycleway project would involve removal of a section of the concrete retaining wall of the southern approaches.

While these projects, independently, are considered to involve relatively minor impact to the physical fabric of the Sydney Harbour Bridge, their collective impact is greater. Numerous interventions to the configuration of the northern and southern approaches could potentially undermine the integrity and intactness of these significant elements of the Sydney Harbour Bridge. It is noted, though, that the proposal does not involve elements or fabric of exceptional significance. In order to minimise the cumulative impact of works, physical impact to the fabric of the Sydney Harbour Bridge northern approaches would, wherever possible, be avoided and restricted to localised areas.

**Visual impact**

As previously discussed, the proposal involves interventions that will have a negligible visual impact on the Sydney Harbour Bridge and the northern approaches and surrounding heritage items including removal of the 1950s toll booths, removal of the 1970s toll office, upgrade works to the existing roadway, and upgrade works to lighting and associated roadway facilities. These interventions have been assessed as having a negligible visual impact on the Sydney Harbour Bridge northern
approaches and a minor impact to the overall significance of the Sydney Harbour Bridge. It is noted that the proposed removal of the toll booths and toll office will reduce the visual clutter on the Sydney Harbour Bridge northern approaches. As far as Artefact is aware, the design detail of proposed upgraded signage and lighting has not yet been resolved.

The Sydney Harbour Bridge Southern Toll Plaza Upgrade that is currently underway involves removal of the southern toll booths and introduction of a new electronic directional signage scheme with changeable message signs located on existing and new gantries between the northern abutment of the Sydney Harbour Bridge and Grosvenor Street. The utilisation of existing gantries for signage has been assessed as minimising the visual impact of the work, while the new gantry installed at the existing location of the southern toll booths was assessed as being recessive in appearance given its lightweight construction and paint finish, which complement the significant visual character and material palette of the Sydney Harbour Bridge.

The Sydney Harbour Bridge Step Free Access project involves provision of passenger lifts on the Sydney Harbour Bridge walkway at the northern and southern approaches. These lifts will introduce a new visual element that could potentially obscure views to the Sydney Harbour Bridge and undermine the legibility and appreciation of the significant retaining walls. In order to reduce potential visual impact, the passenger lifts have employed a lightweight design, and feature unobtrusive materials including steel and glass that are consistent with the existing material palette and character of the Sydney Harbour Bridge. These features of the design will assist in reducing the visual bulk and prominence of the new element.

The planned Sydney Harbour Bridge Northern Cycle Ramp is in early stages of design development. This includes preparation of concept design options that indicate the style, materiality and overall appearance of the proposed elevated cycleway extending from the north of the existing Sydney Harbour Bridge cycleway overhead the Milsons Point train station entrance on Alfred Street. These design options have been developed in response to the existing material palette and character of the Sydney Harbour Bridge, and aim to reduce the visual ‘bulk’ and prominence of the new element against the Sydney Harbour Bridge northern approach retaining wall. The planned Sydney Harbour Bridge Southern Cycleway project has been designed to enhance accessibility and functionality of the Sydney Harbour Bridge for cyclists and pedestrians while minimising impact on views and vistas towards the Sydney Harbour Bridge from the southern approaches by way of siting and the overall appearance of new structures. It is noted, however, that the detail design of this project in terms of style and materiality has not yet been resolved. Collectively, the two projects involving upgrades to the cyclist provisions on the Sydney Harbour Bridge will, while minimising removal of or impact to significant fabric, introduce visually prominent elements on the Sydney Harbour Bridge northern and southern approaches.

While these other projects relating to the Sydney Harbour Bridge have respectively sought to minimise potential visual impact, their collective visual impact must be considered. Should the designs be developed in isolation of one another, there is a risk of potential cumulative impact whereby the visual clarity and character of the Sydney Harbour Bridge and its southern and northern approaches is diminished by projects of conflicting or contrasting designs.

In order to avoid this potential impact, it is important that the design of the proposal be consistent, where feasible, with the design of other related Sydney Harbour Bridge projects. In order to retain the visual clarity and character of the Sydney Harbour Bridge southern and northern approaches, the materiality, finishes, style and interpretation of any works in the proposal would be compatible with the existing material palette and character of the Sydney Harbour Bridge and be consistent with other Sydney Harbour Bridge projects. This will assist in maintaining and enhancing appreciation and legibility of the Sydney Harbour Bridge and its significant values. It is important that the design of the proposed upgraded signage and lighting take into account this key consideration to minimise potential cumulative impact.
**Justification**

The proposal forms part of a suite of current or otherwise planned projects relating to the Sydney Harbour Bridge that seek to support and enhance the accessibility and functionality of the Sydney Harbour Bridge as the main transportation route across Sydney Harbour. The overall combined impact of these projects will maintain the key function of the Sydney Harbour Bridge and support its ongoing use and longevity.

While the cumulative impact of these projects could potentially affect the fabric and culturally significant aesthetic character and visual setting of the Sydney Harbour Bridge including the northern approaches, it is considered this impact can be mitigated and managed with careful coordination and consideration of design consistency across the projects. Key recommendations to mitigate or reduce potential impact are outlined in Section 9.0.

The cumulative impact assessment indicates that the proposal, in conjunction with the Sydney Harbour Bridge Southern Toll Plaza Upgrade, would result in the removal of all evidence of historic manual tolling within the SHR and NHL curtilage of the Sydney Harbour Bridge, though electronic tolling would still occur. This impact could be offset by recommendations and mitigation measures in Section 9.0, including potential opportunities for interpretation measures. It is noted the proposal retains the tolling functions of the Sydney Harbour Bridge, albeit beyond the item’s heritage curtilage, within an ever evolving and changing technological format.

The cumulative impact of these projects is not currently considered to require referral under the EPBC Act, however, with additional projects proposed to follow those listed above, levels of impact may threshold at the requirement for referral to the Minister. As such, Section 9.0 provides recommendations for future cumulative impact assessment and management.

**8.6 Impact to Nearby Heritage Items**

Heritage items located near the project area will not be directly affected by the proposed works. The physical and visual impact of the proposal to heritage items located with the study area are outlined in Table 17. Note that in order to reduce the repetitive nature of the assessment, heritage items considered to be within a particular group or pair of terraces are assessed together.
Table 17: Impact to heritage items within study area

<table>
<thead>
<tr>
<th>Item name</th>
<th>Physical Impact</th>
<th>Visual impact</th>
</tr>
</thead>
</table>
| Sydney Opera House buffer zone |                 | The proposal is partly located within the Sydney Opera House buffer zone. The buffer zone aims to preserve the significant views and settings of the Opera House, refer to visual impact.  
  **The proposal would result in a neutral physical impact to the Sydney Opera House buffer zone.** |
<table>
<thead>
<tr>
<th>Item name</th>
<th>Physical Impact</th>
<th>Visual Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milsons Point Railway Station group</td>
<td>The proposal does not involve any works that directly affect physical fabric of the Milsons Point Railway Station group. The project area is located 25 metres away from the Milsons Point Railway Station platform, and is located above the entrances, ticketing areas and tunnels below. Vibration range impacts are therefore anticipated. <strong>The proposal would result in potential minor physical impacts to the Milsons Point Railway Station group.</strong></td>
<td>There is a direct sightline between the project area (including toll booths and toll office) and the Milsons Point Railway Station platform. There are a number of views towards the Milsons Point Railway Station group Ennis Road entry point that feature the 1970s toll office overhead. The proposed removal of the toll booths and toll office would be visible, but would ultimately reduce visual clutter and enhance views out from the Milsons Point Railway Station platform and towards the Ennis Street entrance. Associated utility relocation works would not result in any permanent visual impact on the Milsons Point Railway Station group, as works would be concealed, beneath the road surface or under the road deck of the approach span. <strong>The proposal would result in positive visual impacts to the Milsons Point Railway Station group.</strong></td>
</tr>
<tr>
<td>Greenway Flats</td>
<td>The proposal does not involve any works that directly affect physical fabric of the Greenway Flats. The project area is located over 25 metres away from Greenway Flats, located approximately 60 metres to the south west. Vibration range impacts are therefore not anticipated. <strong>The proposal would result in a neutral physical impact to Greenway Flats.</strong></td>
<td>The project area is located in the vicinity of the Greenway Flats and there is a direct sightline between the two. The proposed removal of the northern toll booths and toll office would reduce clutter on the existing roadway and therefore enhance end-on views towards the Sydney Harbour Bridge. Proposed works to the kerbing on the eastern side of the Cahill Expressway would be in the vicinity of the Greenway Flats, although these modifications would be concealed by the adjoining parapet and would not result in any associated visual impact. <strong>The proposal would result in positive visual impacts to the Greenway Flats.</strong></td>
</tr>
<tr>
<td>“Fern Lodge”</td>
<td>The proposal does not involve any works that directly affect physical fabric of “Fern Lodge”. The project area is located over 25 metres away from “Fern Lodge”, located approximately 50 metres to the west. Vibration range impacts are therefore not anticipated. <strong>The proposal would result in a neutral physical impact to “Fern Lodge”.</strong></td>
<td>The project area is located in the vicinity of “Fern Lodge”, but there are no direct sightlines between the two. <strong>The proposal would result in a neutral visual impact to “Fern Lodge”.</strong></td>
</tr>
<tr>
<td>Item name</td>
<td>Physical Impact</td>
<td>Visual impact</td>
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<tr>
<td>-----------------------------------</td>
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</tr>
<tr>
<td>St John the Baptist Anglican Church</td>
<td>The proposal does not involve any works that directly affect physical fabric of St John the Baptist Anglican Church.</td>
<td>The project area is located over 25 metres away from St John the Baptist Anglican Church, located approximately 40 metres to the west. Vibration range impacts are not anticipated. The proposal would result in a neutral physical impact to St John the Baptist Anglican Church.</td>
</tr>
<tr>
<td>The Fantasia Preschool</td>
<td>The proposal does not involve any works that directly affect physical fabric of the Fantasia Preschool.</td>
<td>The project area is located over 25 metres away from the Fantasia Preschool, located approximately 40 metres to the west. Vibration range impacts are not anticipated. The proposal would result in a neutral physical impact to the Fantasia Preschool.</td>
</tr>
<tr>
<td>Electricity Substation No 217</td>
<td>The proposal does not involve any works that directly affect physical fabric of the Electricity Substation No 217.</td>
<td>The project area is located in the vicinity of the Electricity Substation No 217, but there are no direct sightlines between the two. The proposal would result in a neutral visual impact to the Electricity Substation No 217.</td>
</tr>
<tr>
<td>“Illingullin”</td>
<td>The proposal does not involve any works that directly affect physical fabric of “Illingullin”.</td>
<td>The project area is located in the vicinity of “Illingullin”, but there are no direct sightlines between the two. The proposal would result in a neutral visual impact to “Illingullin”.</td>
</tr>
</tbody>
</table>
Group of Houses (26, 28, 30 and 32 Jeffreys Street)

The proposal does not involve any works that directly affect physical fabric of the group of houses located at 26, 28, 30 and 32 Jeffreys Street.

The project area is located over 25 metres away from the houses, elevated and located approximately 50 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a neutral physical impact to the group of houses at 26, 28, 30 and 32 Jeffreys Street.

The project area is located over 25 metres away from the houses, elevated and located approximately 50 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a negligible visual impact to views from the group of houses at 26, 28, 30 and 32 Jeffreys Street.

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Group of Houses (34, 36, 38, 40 and 42 Jeffreys Street)

The proposal does not involve any works that directly affect physical fabric of the group of houses located at 34, 36, 38, 40 and 42 Jeffreys Street.

The project area is located over 25 metres away from the houses, located approximately 45 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a neutral physical impact to the group of houses 34, 36, 38, 40 and 42 Jeffreys Street.

The project area is located over 25 metres away from the houses, located approximately 45 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a negligible visual impact to the views from the group of houses at 34, 36, 38, 40 and 42 Jeffreys Street.

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Group of Houses (44, 46, 48 and 50 Jeffreys Street)

The proposal does not involve any works that directly affect physical fabric of the group of houses located at 44, 46, 48 and 50 Jeffreys Street.

The project area is located over 25 metres away from the houses, located approximately 45 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a neutral physical impact to the group of houses at 46, 48 and 50 Jeffreys Street.

The project area is located over 25 metres away from the houses, located approximately 45 metres to the west. Vibration range impacts are not anticipated.

The proposal would result in a negligible impact to the views from the group of houses at 44, 46, 48 and 50 Jeffreys Street.
<table>
<thead>
<tr>
<th>Item name</th>
<th>Physical Impact</th>
<th>Visual impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair of Houses (40 and 42 Kirribilli Avenue)</td>
<td>The proposal does not involve any works that directly affect physical fabric of the pair of houses located at 40 and 42 Kirribilli Avenue. The project area is located over 25 metres away from the houses, located approximately 40 to 45 metres to the west. Vibration range impacts are not anticipated.</td>
<td>The project area is located above and to the west of the pair of houses located at 40 and 42 Kirribilli Avenue. There are direct sightlines to the southern end of the project area due to the unobstructed views from the front elevations of the buildings and from the western elevation of 40 Kirribilli Avenue. The views from 42 Kirribilli Avenue are mostly obstructed by 40 Kirribilli Avenue and the trees within Bradfield Park. The oblique angle of views and the trees within Bradfield Park obstruct the north-western views from the heritage items. The proposal would result in a <strong>neutral</strong> physical impact to the pair of houses at 40 and 42 Kirribilli Avenue. The proposal would result in a <strong>negligible</strong> impact to the views from pair of houses at 40 and 42 Kirribilli Avenue.</td>
</tr>
<tr>
<td>“Bratton” (38 Pitt Street)</td>
<td>The proposal does not involve any works that directly affect physical fabric of the dwelling at 38 Pitt Street. The project area is located over 25 metres away from the houses, located approximately 30 metres to the west. Vibration range impacts are not anticipated.</td>
<td>The project area is located above and to the west of the dwelling at 38 Pitt Street, and there are direct sightlines to the project area which are partially obstructed due to the setback of the houses from Broughton Street, the oblique angle of views and the trees within Bradfield Park. The direct views from the house are from the western side elevation, the front veranda and the rear garage along Broughton Street. The proposal would result in a <strong>neutral</strong> physical impact to the dwelling at 38 Pitt Street. The proposal would result in a <strong>negligible</strong> impact to the views from the dwelling at 38 Pitt Street.</td>
</tr>
<tr>
<td>Group of Houses (41, 43 and 45 Pitt Street)</td>
<td>The proposal does not involve any works that directly affect physical fabric of the group of houses located at 41, 43 and 45 Pitt Street. The project area is located over 25 metres away from the houses, located approximately between 35 and 45 metres to the west. Vibration range impacts are not anticipated.</td>
<td>The project area is located above and to the west of the group of houses located at 41, 43 and 45 Pitt Street. There are direct sightlines to the project area which are partially obstructed due to the oblique angle of views and the trees within Bradfield Park. The direct views from the house are from the western side elevation, the front veranda and the rear yards/garages along Broughton Street. The proposal would result in a <strong>neutral</strong> physical impact to the group of houses at 41, 43 and 45 Pitt Street. The proposal would result in a <strong>negligible</strong> impact to the views from the group of houses at 41, 43 and 45 Pitt Street.</td>
</tr>
<tr>
<td>Item name</td>
<td>Physical Impact</td>
<td>Visual impact</td>
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<td>-----------------------------------------</td>
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<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>North Sydney bus shelters (St Johns)</strong></td>
<td>The proposal does not involve any works that directly affect physical fabric of the St Johns Shelter of the North Sydney bus shelters group.</td>
<td>The proposal could result in a negligible physical impact to the St Johns Shelter due to vibration.</td>
</tr>
<tr>
<td></td>
<td>The St Johns bus shelter is located adjacent to the eastern side of the project area and is located within the study area, and therefore is located within 25m of the project area. The shelter is located below the level of the works. There is potential for vibration range impacts.</td>
<td>The project area is located above and directly to the west of St Johns bus shelter. There are no direct sightlines from the item to the project area due to the oblique angle of the views. The proposal would result in a neutral impact to the views to and from St Johns Shelter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>North Sydney Olympic Pool</strong></td>
<td>The proposal does not involve any works that directly affect physical fabric of the North Sydney Olympic Pool.</td>
<td>The proposal could result in a neutral physical impact to the North Sydney Olympic Pool.</td>
</tr>
<tr>
<td></td>
<td>The North Sydney Olympic Pool is located approximately 25m west of the project area and is located within the study area. The pool is located below the level of the works. Vibration range impacts are not anticipated.</td>
<td>The project area is located above and to the east of the North Sydney Olympic Pool. There are direct sightlines to the project area which are partially obstructed due to the oblique angle of views and the trees within Bradfield Park. The direct views from the item are from the eastern end of the pool curtilage on Alfred Street South. The proposal would result in a negligible impact to the views from the North Sydney Olympic Pool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bradfield Park (including northern section)</strong></td>
<td>The proposal does not involve any works or interventions that directly affect physical fabric of Bradfield Park.</td>
<td>The proposal would result in a neutral physical impact to Bradfield Park.</td>
</tr>
<tr>
<td></td>
<td>The project area is elevated from the ground surface. Vibration range impacts are therefore not anticipated.</td>
<td>Associated utility relocation works would result in the installation of a new cable tray beneath the road deck on the approach spans, alongside an existing cable tray. Given the relatively concealed location of the new cable tray, it is anticipated that the proposal would not be discernible from most areas of Bradfield Park. Any visual impacts would be mainly associated with work during construction, which would be temporary in nature. The proposal would result in a negligible visual impact to Bradfield Park.</td>
</tr>
<tr>
<td>Item name</td>
<td>Physical Impact</td>
<td>Visual impact</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>Seawall and wharf site</td>
<td>The proposal does not involve any works or interventions that directly affect physical fabric of the seawall and wharf site.</td>
<td>The project area is located above and to the north of the seawall and wharf site, with direct sightlines between the heritage item and the works obstructed by the fence and elevated pedestrian platform, as well as the pylons of the Sydney Harbour Bridge. The proposal would result in a <strong>neutral</strong> visual impact to views from the seawall and wharf.</td>
</tr>
<tr>
<td>Faux stone balustrade</td>
<td>The proposal does not involve any works or interventions that directly affect physical fabric of the faux stone balustrade.</td>
<td>The project area is located above and to the west of the faux stone balustrade. There are direct sightlines to the southern end of the project area due to the unobstructed views from the balustrade. It is noted that the oblique angle of views and the trees within Bradfield Park obstruct the north-western views from the heritage item. The proposal would result in a <strong>negligible</strong> impact to the views from the faux stone balustrade.</td>
</tr>
<tr>
<td>Careening Cove Conservation Area</td>
<td>The proposal does not involve any works that directly affect the Careening Cove Conservation Area.</td>
<td>The project area is located in the vicinity of the Careening Cove Conservation Area and there is a direct minor sightline between the two. The proposed works would not diminish or undermine the character of the conservation area or impact the form and fabric of the development it contains. The proposal would result in a <strong>neutral</strong> visual impact to the Careening Cove Conservation Area.</td>
</tr>
<tr>
<td>Jeffreys Street Conservation Area</td>
<td>The proposal does not involve any works that directly affect the Jeffreys Street Conservation Area.</td>
<td>The project area is located in the vicinity of the Jeffreys Street Conservation Area and there is a distant oblique sightline between the two. The proposed works would not diminish or undermine the character of the conservation area or impact the form and fabric of the development it contains. The proposal would result in a <strong>neutral</strong> visual impact to the Jeffreys Street Conservation Area.</td>
</tr>
</tbody>
</table>

The proposal would result in a *neutral* physical impact to the Careening Cove Conservation Area.
8.7 Archaeological impact assessment

The majority of the proposed works consist of above ground works on the Cahill Expressway and Sydney Harbour Bridge northern approaches at deck level. Only a small number of works would potentially impact archaeology, relating to the proposed trenching works within a localised area comprising the northern section of Ennis Street and a hardstand area beneath the road deck of the Cahill Expressway. Proposed excavations within the study area have a low potential to impact significant archaeological remains. Remains which may be disturbed would be related to late nineteenth and early twentieth century urban buildings. It is expected that the proposed excavation areas have been previously disturbed and impacted by the construction of the Sydney Harbour Bridge and later by the construction of the Cahill Expressway. However, it is possible there may be isolated areas of truncated archaeological remains which would be impacted by the proposed works.

8.8 Argyle Street Construction Compound

The proposed temporary construction compound at Argyle Street would result in the establishment of a site office within the area identified in Figure 1-2. This would require installation of demountable buildings on an existing hardstand area, powered by an onsite generator, and provision of five onsite carpark spaces. As identified in Section 2.7, the proposed Argyle Street construction compound would be within the SHR heritage curtilage for the Sydney Harbour Bridge and Argyle Street Railway Substation, and would be in the vicinity of numerous heritage items and heritage conservation areas.

Establishment of demountable buildings is considered to result in a reversible physical impact, in that installation, use, and demobilisation will not result in any impacts to significant fabric. It is noted that the proposed Argyle Street construction compound site is presently owned by Rail Corporation and used by Sydney Trains as a civil site shed and compound area. As such, the proposed temporary establishment of the site office in this locality would represent a continuation of its current use and would not result in any permanent direct impacts to the Sydney Harbour Bridge, Argyle Street Railway Substation, or surrounding heritage items and conservation areas.

*Figure 8-7: Limited view corridor to proposed location for Argyle Street construction compound from Cumberland Street.*
(Source: Google Maps, 2018)

Given the flat topography of the surrounding site and overlooking four-storey Argyle Street Railway Substation building and two-storey terrace housing, it is anticipated that the use of this area as a construction compound would result in temporary localised visual impacts to nearby heritage items. This particularly relates to the terrace housing abutting the site. The proposed demountable buildings
would introduce new visual elements within the surrounding historic precinct, although it is noted that existing demountable buildings are in the location and any visual impact would be temporary in nature. Moreover, the retaining walls of the Sydney Harbour Bridge southern approaches and surrounding terrace housing mean that the site is relatively concealed from the surrounding streetscape and conservation areas, with views from the public domain limited to the entry drive off Cumberland Street (Figure 8-7).

Overall, it is considered the use of the Argyle Street construction compound would result in a negligible physical and visual impact to the SHR listed Sydney Harbour Bridge and a minor physical and visual impact to the SHR listed Argyle Street Railway Substation, both of which are within the proposed compound site. The proposed Argyle Street construction compound would result in negligible to minor temporary visual impacts to surrounding nearby heritage items.

8.9 Statement of Heritage Impact

Table 18 includes a summary assessment of the respectful aspects of the proposal in contrast with the aspects that may have a detrimental impact on the Sydney Harbour Bridge. A summary of the justifications of impacts is also included. This has been prepared in accordance with the guidelines contained within Statements of Heritage Impact (OEH, 2001).

Table 18: Summary of impact as per OEH guidelines

<table>
<thead>
<tr>
<th>Development</th>
<th>Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>What aspects of the proposal respect or enhance the heritage significance of Sydney Harbour Bridge and nearby heritage Items?</td>
<td>The proposed Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade, as part of a broader traffic management upgrade scheme, supports and maintains the historic function of the bridge as the main transportation route across Sydney Harbour. This is a fundamental component of its heritage significance. The proposed removal of the northern toll booths and toll office, as part of a scheme to improve traffic flow and ease congestion along the northern approach of the Sydney Harbour Bridge, combined with associated works, will enhance traffic efficiency and safety on this major transportation route. The proposal also retains the tolling functions of the Sydney Harbour Bridge, albeit within an ever evolving and changing technological format. There is potential for a positive visual impact by removing accretions and visually decluttering this area of the Sydney Harbour Bridge northern approaches. This includes positive visual impacts for nearby heritage items including Milsons Point Railway Station Group and the Greenway Flats, with the proposed removal of the toll booths and toll office minimising visual clutter on the roadway. This would potentially enhance identified significant views along the northern approach to the Sydney Harbour Bridge. Visual impacts to other nearby heritage items have been assessed as being neutral to negligible.</td>
</tr>
<tr>
<td>What aspects of the proposal could have a detrimental impact on the heritage significance of the Sydney Harbour Bridge and nearby heritage Items?</td>
<td>The proposal involves removal of evidence of the tolling operations that have been an intrinsic factor in the daily operations of the bridge since its opening. The proposed removal of the toll booths, identified in the CMP 2007 as being of moderate significance, has potential to result in a minor impact to the heritage significance of the Sydney Harbour Bridge. This impact could be offset with the mitigation measures outlined in Section 9.2 of this report, including interpretation opportunities and the undertaking of a photographic archival recording. Given the toll booths are now redundant following installation of new tolling gantries north of the project area in 2016 and the relatively minor contribution the existing booths make to the significance of the bridge as a</td>
</tr>
</tbody>
</table>
### Development

whole, it is considered that their removal will not result in a substantial adverse impact on the overall heritage values of the Sydney Harbour Bridge including social significance.

The proposed upgrade works to the existing roadway has the potential to impact underlying fabric that provides evidence of the conversion of the tramway to roadway on the northern approach to the Sydney Harbour Bridge. This includes brick infill and the concrete slab identified as being of moderate significance in the CMP 2007. This aspect of the works is covered by the Section 57 exemption SF2015/000329.

The proposed removal of the toll office has potential to impact underlying fabric of the former Milsons Point Tram Station stairs located directly beneath during works and through vibration impacts to the historic tile surfaces within the former station. The proposal has the potential to impact the nearby Milsons Point Railway Station group through vibration impacts.

The proposed temporary utilities relocation works on the eastern side of the Sydney Harbour Bridge northern approach would impact fabric that is of high significance, by way of kerbing adjustments next to and installation of conduits and utilities on the inner face of the iconic rendered concrete parapets. It is acknowledged that the affected sections of parapet currently comprise a water main and utilities, and as such, the proposal would not drastically change the existing visual amenity of this part of the Sydney Harbour Bridge northern approaches.

### Discussion

What are the justifications for impact?

The proposal supports the significant core function of the bridge as a major transportation route across Sydney Harbour. The efficiency, safety and functionality of the day-to-day bridge operations is an essential part of its ongoing use and significance. The proposed works form part of a broad traffic management upgrade scheme that will support the bridge’s ongoing use and longevity.

While the northern toll booths and toll office are an important feature that reflect the historic operations of the Sydney Harbour Bridge, they have since become redundant and pose an unnecessary traffic obstruction that restricts the ability to realign traffic lanes.
9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The proposal would result in the removal of the 1950s toll booths and removal of the 1970s toll office, as well as upgrade works to the road surface, utilities, signage and associated roadway facilities. This report has assessed that the potential physical and visual impacts of the proposal on the significant heritage values of the Sydney Harbour Bridge northern approaches would be minor. The proposal encompasses negligible to major localised impacts to elements of the Sydney Harbour Bridge approaches that are of low to high significance.

Given that the northern toll plaza precinct on the Sydney Harbour Bridge northern approaches comprises a small proportion of the Sydney Harbour Bridge, the potential physical and visual impacts of the proposal need to be assessed against the Sydney Harbour Bridge as a whole. Due to the nature of the proposed works and their location away from areas of exceptional heritage significance, the proposal would not degrade, damage, obscure or diminish the National and State heritage values of the Sydney Harbour Bridge.

Overall, the impact of the proposal on the Sydney Harbour Bridge would be minor. The minor impact of the proposal could be offset by the mitigation measures outlined below. The proposal would potentially result in positive heritage outcomes by offering an opportunity to remove clutter and accretions on the Sydney Harbour Bridge northern approaches and offer improved visibility of the exceptionally significant Sydney Harbour Bridge main arch structure for motorists, train users and pedestrians crossing the bridge.

The proposal, involving removal of decommissioned elements, removal of road safety hazards and realignment and simplification of traffic movements, is considered essential to maintain efficiency of the historic use of the Sydney Harbour Bridge as the main transportation route across Sydney Harbour and to support its ongoing longevity. The proposal, as such, is consistent with the policies contained in the Conservation Management Plan (CMP) 2007.

The proposal would result in positive to negligible visual impacts on nearby heritage items including the Milsons Point Railway Station group, Greenway Flats, “Fern Lodge”, St John the Baptist Anglican Church, Fantasia Preschool, Electricity Substation No 217, the group of Houses at 44, 46, 48 and 50 Jeffreys Street, the group of Houses at 26, 28, 30 and 32 Jeffreys Street, the group of Houses at 34, 36, 38, 40 and 42 Jeffreys Street, pair of Houses at 40 and 42 Kirribilli Avenue, “Bratton”, the group of houses at 41, 43 and 45 Pitt Street, North Sydney bus shelters (St Johns), North Sydney Olympic Pool, Seawall and wharf site, Faux stone balustrade, “Illingullin”, Bradfield Park (including northern section), the Careening Cove Conservation Area and the Jeffreys Street Conservation Area. The proposal could result in potential vibration impacts to the Milsons Point Railway Station group. Potential visual and vibration impacts are addressed in the Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade ‘Construction and Noise and Vibration Impact Assessment’ and ‘Landscape Character and Visual Impact Assessment’, and could be offset by the mitigation measures outlined in the recommendations below.

The removal of the toll booths will have a negligible impact on the social significance of the toll booths and the Sydney Harbour Bridge as a whole. Installation of tolling gantry infrastructure to the north of the existing site will continue the historic tolling function of this precinct, a critical aspect in ensuring this historic function of the Sydney Harbour Bridge and tolling plaza continues, whilst evolving in form

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34 The Heritage Council endorsement of the Sydney Harbour Bridge CMP 2007 expired in 2012. An updated version of the CMP is currently being prepared. In the interim, the CMP 2007 is being used as the primary SHB conservation document.
and technology, as it has in the past. Recommendations regarding interpretation within this report are designed to reintegrate social connections with the toll collection activities and history as a tangible element of the Sydney Harbour Bridge and are included below.

Due to the highly-disturbed nature of the study area as a result of the bridge’s construction, there is a low potential for archaeological relics being impacted by the proposal.

The establishment of a construction compound (site office) at the proposed Argyle Street location would be consistent with the current use of that site as a works compound. The establishment of the construction compound would result in temporary visual impacts, and overall would result in a negligible physical and visual impact to the SHR listed Sydney Harbour Bridge and a minor physical and visual impact to the SHR listed Argyle Street Railway Substation, the heritage curtilages of which both overlap with the proposed construction compound site. Temporary visual impacts to other nearby heritage items and heritage conservation areas would be negligible to minor.

9.2 Recommendations & Mitigation Measures

The recommendations set out below will aid in mitigating the impact of the proposal on the Sydney Harbour Bridge and nearby heritage items and heritage conservation areas.

**Approvals**

Prior to any works commencing that impact on the Sydney Harbour Bridge or Argyle Street substation SHR listed items, a Section 60 NSW *Heritage Act 1977* (Heritage Act) approval application must be prepared and approval obtained from the NSW Heritage Council. The permit would cover the works described in Section 7.1 and 7.7 of this report, although it is noted that an endorsed Section 57 exemption already exists for the pavement upgrading, waterproofing and resurfacing works of the Cahill Expressway within this proposal. This assessment would be provided to the NSW Heritage Council in support of a Section 60 application.

**Archival recording**

Prior to construction commencing, a Photographic Archival Recording (PAR) of the 1950s toll booths and 1970s toll office would be prepared. The report must consist of an archival standard photographic record of the site, noting the location and details of the toll booths and toll office as well as demonstrating the overall setting within the Sydney Harbour Bridge northern approaches. The recording shall be undertaken in accordance with the guidelines for *Photographic Recording of Heritage Items Using Film or Digital Capture* prepared by the NSW Office of Environment & Heritage. The PAR would be submitted to North Sydney Council and the City of Sydney Council, and copies would be retained as per the standards.

The toll booths and toll office would be archived and recorded on the Roads and Maritime Heritage and Conservation Register, and carried out with reference to the *Sydney Harbour Bridge Movable Heritage Conservation Strategy 2007*, the Roads and Maritime Cultural Heritage Guidelines (2015), and the *Sydney Harbour Bridge Interpretation Plan 2007*.

The existing endorsed Section 57 exemption will ensure the recording of the brick layer that underlays the road surface.

**Consistency of detail design**

The detail design of the proposal, including materiality and finish types, would be congruent with the aesthetic character of the Sydney Harbour Bridge and surrounding fabric. This includes selection of modern and lightweight materials that are, where appropriate, coloured to match the existing fabric of the Sydney Harbour Bridge including existing neutral concrete and steelwork tones of the overall
bridge structure. The material palette of the proposal would be consistent with other Sydney Harbour Bridge related projects.

Crash barriers and other safety features would be installed in accordance with normal RMS safety procedures, and any deteriorated features would be replaced like for like or with a modern equivalent for safety. Modern roadbed materials and line marking will be appropriate for the works proposed.

**Design of elements to minimise visual impact**

The design and placement of the various elements within the proposal would be developed to minimise visual impact on the Sydney Harbour Bridge and the Sydney Harbour Bridge northern approaches, and on nearby heritage items with sightlines to the project area including the Milsons Point Railway Station group, St John the Baptist Anglican Church, Greenway Flats and the Careening Cove Conservation Area. This impact is considered to be generally positive, offering improved visibility of the Sydney Harbour Bridge and decluttering of views and vistas along the roadways of the Sydney Harbour Bridge northern approaches.

Where required, affected signage and lighting would be reinstated as part of the Proposal. Any new signage, lighting, or associated infrastructure regarding upgrades to the roadway would be sensitively designed to be like-for-like and if in adequate condition reintegrated, and wherever possible kept to a minimum to avoid introducing visual clutter on the Sydney Harbour Bridge northern approaches. This will assist in reducing potential visual impact on significant views along the Sydney Harbour Bridge northern approaches and to surrounding heritage items.

**Interpretation strategy**

Given the location of the proposed works near an entry/exit point to the Sydney Harbour Bridge, there is an opportunity for provision of interpretation measures outlining the history, evolution and significance of the Sydney Harbour Bridge and surrounding heritage items and heritage conservation areas to the people that use the bridge, especially in relation to the aspect of toll collection at the Sydney Harbour Bridge. This particularly relates to pedestrians using the walkway on the eastern side of the Sydney Harbour Bridge. Interpretation would outline the history and role of tolling operations at the Sydney Harbour Bridge. The opportunity for interpretation of the evolution of toll collection at the Sydney Harbour Bridge is particularly important given the cumulative impact of the proposal in relation to the Sydney Harbour Bridge Southern Toll Plaza Upgrade project. A Sydney Harbour Bridge tolling oral history has been previously prepared and is available online, and movable heritage items associated with the booths and toll office have been collected and catalogued.

**Cumulative impact**

The cumulative impact of the proposal in conjunction with the Sydney Harbour Bridge Southern Toll Plaza Upgrade would result in the removal of all evidence of the historic methods of manual tolling within the SHR and NHL curtilage of the Sydney Harbour Bridge, although tolls will still be collected electronically. This impact could be offset by exploration of opportunities for interpretation as discussed above.

For future projects on the Sydney Harbour Bridge, the cumulative impact of related projects is to be considered, as it has been for the current works.

Compliance of projects with the *Sydney Harbour Bridge Conservation Management Plan* will assist in the retention and potential enhancement of the significant values of this item across projects.

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Cumulative impact assessments for future projects should be undertaken holistically to determine of the threshold for referral to the Minister under the EPBC Act would be made. This will be an important step in ensuring the proper assessment and management of impacts to the highly significant Sydney Harbour Bridge.

**Protection of significant Sydney Harbour Bridge fabric**

The proposal involves works in close proximity to significant fabric of the Sydney Harbour Bridge northern approaches. In particular, this includes the concrete rendered retaining walls and parapet on the eastern side of the Sydney Harbour Bridge northern approaches, the Sydney Harbour Bridge north east stairs and the underlying Milsons Point Tram Station. A Heritage Management subplan shall be prepared as part of the project CEMP to protect these significant heritage components for the duration of the project to minimise potential physical impact.

**Ongoing heritage specialist advice**

A specialist heritage consultant must be engaged to provide heritage advice during the detailed design and construction phases of the proposal.

**Heritage induction for workers**

A heritage induction would be provided to all on-site staff and contractors involved in the proposal. The induction would clearly describe the heritage constraints of the site in order to retain and respect the National and State heritage values of the Sydney Harbour Bridge and its significant fabric, and surrounding heritage items.

**Assessment for vibration impacts**

The potential vibration impacts to nearby heritage items and other elements of the Sydney Harbour Bridge including the former Milsons Point Tram Station, is addressed by the ‘Sydney Harbour Bridge Northern Toll Plaza Precinct Upgrade Construction Noise and Vibration Impact Assessment’ prepared by WSP for the proposal. The report identifies the need for a detailed assessment pre-construction once construction methodologies are confirmed.

To minimise potential vibration impacts during works to significant fabric, regular inspections of the construction activities and work areas would be undertaken by structural engineers and any other required specialist to monitor and review the construction methodology and confirm the integrity of affected heritage items. Where it is identified that levels of vibration are causing damage to fabric, works would stop and the construction methodology reviewed for its appropriateness in consultation with a Heritage Consultant.

**Utility relocation works**

Wherever possible, utility relocation works in the vicinity of significant Sydney Harbour Bridge fabric i.e. steelwork or rendered concrete elements, would utilise existing conduits or would otherwise try to minimise physical and visual impacts to the Sydney Harbour Bridge. Where permanent conduits or cable trays are required, they would, where possible, be neutral in appearance to minimise visual impact.

Where feasible for the installation of temporary utility relocation works, existing holes in the fabric would be utilised and new holes minimised. To minimise impacts, it is recommended that a clamping methodology for the temporary utility relocation works be adopted. In the event that a bolting methodology is adopted, bolts for fixing to significant fabric would be designed so that they are easily removable without causing damage to surrounding fabric.
Care would be taken to avoid significant impacts to original fabric in all instances, and hand powered tools would be used for works located in proximity to significant fabric.

**Argyle Street construction compound**

No ground disturbing activities or impacts to significant fabric would occur within the proposed Argyle Street construction compound. Any changes to the proposal that involve potential impacts to the adjacent Sydney Harbour Bridge retaining wall and surrounding heritage items, or excavations or ground disturbing works must be subject to an addendum impact assessment.

**Unexpected Fabric Finds procedure**

If unexpected historic fabric is discovered during the proposed works the Roads and Maritime Standard Procedure for Unexpected Heritage Items would be followed.
10.0 REFERENCES


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(13/02/2017)

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(28/06/2017)

Office of Environment and Heritage: “Bratton”. Accessed online at:
(23/05/2018)

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(23/05/2018)

Office of Environment and Heritage: “House”. Accessed online at:
(23/05/2018)


Appendix C

NVIA Addendum
Further to our noise and vibration impact assessment (NVIA) for the Sydney Harbour Bridge Northern Tolling Plaza Precinct Upgrade (SHB NTPPU) (reference 2270550PA-SHB NTPPU-Noise Vibration-REF-R1 170919), this document provides additional information relating to the additional utility relocation and kerb adjustment works, and removal of temporary buildings and on-site power generation at the Argyle Street site compound during the construction phase of the project. This document should be read in conjunction with the NVIA.

1. PROJECT DESCRIPTION

Additional utility relocation and kerb adjustment works have been defined following the finalisation of the REF. Two scenarios for the additional utility relocation works have been defined for this noise assessment:

- Scenario 1, which includes the utility relocation work from the north pylon utility node (Item 1) to Burton Street stairs (Item 2) and the connection to the Lavender Street utility node (Item 7)
- Scenario 2, which includes the kerb and utilities relocation work from Burton Street stairs to Chainage 390 (Items 3 and 4), Chainage 390 coring (Item 5) and trenching along Ellis Road (Item 6).

Figure A.1 in Appendix A shows the location of the utility relocation works in Scenarios 1 and 2.

In addition, the Argyle Street site (on Cumberland Street in Dawes Point) has been identified as an alternative site compound location to the Blue Street site (identified in Section 3.4 of the REF). The existing site buildings will be removed and replaced by new temporary site buildings in addition to power for the Argyle Street compound to be supplied by an on-site generator operating 24 hours a day during the construction works. The site boundary of the Argyle Street Compound is shown in Figure A.2 in Appendix A.

2. NOISE CRITERIA

Unattended noise measurements have been conducted in the vicinity of the project and are detailed in the NVIA. A summary of the noise measurement locations is provided in Table 2.1.
Table 2.1  Noise monitoring locations

<table>
<thead>
<tr>
<th>NOISE MONITORING LOCATION</th>
<th>ADDRESS</th>
<th>MONITORING PERIOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NM01^1</td>
<td>263-296 Alfred Street, North Sydney</td>
<td>9-17/9/2015</td>
</tr>
<tr>
<td>NM02^1</td>
<td>1-3 McDougall Street, Kirribilli</td>
<td>9-17/9/2015</td>
</tr>
<tr>
<td>NM03^2</td>
<td>3a-9b Broughton Street, Kirribilli</td>
<td>22-29/6/2016</td>
</tr>
<tr>
<td>NM04</td>
<td>143 Kurraba Road, Kurraba Point</td>
<td>15-23/5/2017</td>
</tr>
<tr>
<td>NM05</td>
<td>14 East Crescent Street, McMahons Point</td>
<td>15-23/5/2017</td>
</tr>
<tr>
<td>NM06^3</td>
<td>Pier 2 Hickson Rd, Dawes Point</td>
<td>5-11/11/2013</td>
</tr>
</tbody>
</table>

1. NM01, NM02 noise monitoring data were obtained from Sydney Harbour Bridge and Sydney Harbour Tunnel Tolling Systems Upgrade Project Noise and Vibration Assessment report (WSP, March 2016)
2. NM03 noise monitoring data were obtained from Sydney Harbour Bridge Step-free Access Noise Impact Assessment report (Cardno, February 2017)
3. NM06 noise monitoring data was obtained from Walsh Bay Art Precinct Event Operational Noise Management Plan (WSP, December 2014)

Based on these measurements, noise management levels (NMLs) have been established for the project, and are summarised in Table 2.2.

Table 2.2  Noise management levels at residential receivers

<table>
<thead>
<tr>
<th>NCA</th>
<th>NOISE MONITORING LOCATION</th>
<th>NML L_{eq(15MIN)} dBA^2</th>
<th>HIGHLY NOISE AFFECTED</th>
<th>SH</th>
<th>OOHW 1</th>
<th>OOHW 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D^1</td>
<td>D^1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E^1</td>
<td>E^1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N^1</td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>NM01</td>
<td>75</td>
<td>70</td>
<td>65</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>NCA01.1W</td>
<td>NM01</td>
<td>75</td>
<td>70</td>
<td>65</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>NM02</td>
<td>75</td>
<td>67</td>
<td>62</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>NM02</td>
<td>75</td>
<td>67</td>
<td>62</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>NM03</td>
<td>75</td>
<td>69</td>
<td>64</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>NM03</td>
<td>75</td>
<td>69</td>
<td>64</td>
<td>64</td>
<td>64</td>
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<tr>
<td>NCA02.2E</td>
<td>NM04</td>
<td>75</td>
<td>56</td>
<td>51</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>NM04</td>
<td>75</td>
<td>56</td>
<td>51</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>NM05</td>
<td>75</td>
<td>58</td>
<td>53</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Argyle Street Compound</td>
<td>NM06</td>
<td>75</td>
<td>69</td>
<td>64</td>
<td>59</td>
<td>59</td>
</tr>
</tbody>
</table>

1. Day (D) = 7am to 6pm, Evening (E) = 6pm to 10pm and Night-time (N) = 10pm to 7am.
2. Where the evening and night-time RBLs are higher than the day, in accordance with the INP application notes, the NMLs have been set using an RBL no higher than the day RBL.
3. VIBRATION CRITERIA

Construction related vibration may lead to;

— Cosmetic and structural building damage; and / or
— Loss of amenity due to perceptible vibration, human comfort.

Cosmetic damage is regarded as only minor in nature; it tends to be no more than hairline cracks on drywall surfaces or mortar joints and cement render. As it has a much lower threshold than structural damage, and is readily repaired, there is no risk of structural damage occurring if cosmetic damage is avoided.

3.1 COSMETIC BUILDING DAMAGE

The present guidelines for assessing and controlling construction related vibration are the Construction Noise and Vibration Guideline 2016 (CNVG), which itself references British Standard BS 7385-2:1993 *Evaluation and measurement for vibration in buildings*.

BS 7385 provides guidance for the categorisation of, and limits at which cosmetic, minor, and major damage occur.

The peak vibration limits are set such that the risk of cosmetic damage in residential and commercial buildings is minimal. This has been done by setting limits below levels at which damage has been credibly demonstrated. The limits also assume intermittent use of vibrating equipment and therefore it may be necessary to reduce the limits by up to 50% for continuous operation.

The limits from BS 7385 are summarised in Table 3.1 below.

<table>
<thead>
<tr>
<th>TYPE OF STRUCTURE</th>
<th>4 – 15 Hz (mm/s)</th>
<th>15 – 40 Hz (mm/s)</th>
<th>40 Hz AND ABOVE (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforced or framed structures</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unreinforced or light framed structures</td>
<td>15 – 20²</td>
<td>20 – 50</td>
<td>50</td>
</tr>
<tr>
<td>Industrial and heavy commercial buildings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential or light commercial type buildings</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Values referred to are at the base of the building.
2. For frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.
3.2 STRUCTURAL DAMAGE TO UNDERGROUND UTILITIES

As there is no current Australian Standard or guidelines relating to damage to underground services, DIN 4150-3 1999 *Structural Vibration – Part 3: Effects of Vibration on Structures* has been used to provide vibration criteria for buried utilities.

DIN 4150 further defines vibration impacts by whether the vibration is short or long term as follows:

- Short term: Vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated.
- Long term: All types of vibration not covered by the definition of short term vibration.

The relevant vibration limits from DIN 4150 may be found in Table 3.2.

*Table 3.2 DIN 4150 Part 3 – Damage to buried pipes vibration limits*

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>PEAK WALL VIBRATION VELOCITY mm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short Term Works</td>
</tr>
<tr>
<td>Steel</td>
<td>100</td>
</tr>
<tr>
<td>Clay, concrete, reinforced concrete, prestressed concrete, metal with or without flange (other than steel)</td>
<td>80</td>
</tr>
<tr>
<td>Masonry, plastic</td>
<td>50</td>
</tr>
</tbody>
</table>

Based on WSP’s experience a vibration level of 50 mm/s is suggested for underground electrical cables and telecommunication cables (including fibre optic).

4. CONSTRUCTION NOISE ASSESSMENT

Construction noise impacts at the nearest sensitive receivers have been assessed with respect to the nominated criteria. Noise emissions were modelled in SoundPLAN 7.4, as detailed in the NVIA.

4.1 ADDITIONAL UTILITY RELOCATION WORKS

4.1.1 SCENARIO 1

Scenario 1, which includes the utility relocation work from:

- The north pylon utility node (Item 1) to Burton Street stairs (Item 2)
- The connection to the Lavender Street utility node (Item 7).

It is understood that the utilities relocation works would be conducted with an electric hand drill. For this reason, a hammer drill with a sound power level of L_{eq,15min} 102 dBA was adopted for the noise modelling. The sound power level in the model was corrected for duration, as it is assumed that the drill will be operating for 10 minutes of a 15 minute period. For the sleep disturbance assessment, a sound power level of L_{max} 108 dBA was adopted.

Table 4.1 outlines the assessed time periods.
### Table 4.1 Exceedance time periods

<table>
<thead>
<tr>
<th>NAME</th>
<th>TIME PERIODS</th>
<th>PREDICTED PERIOD</th>
<th>EXCEEDANCE INDICATION</th>
</tr>
</thead>
</table>
| Standard Hours (SH)         | Monday to Friday – 7am to 6pm  
Saturday – 8am to 1pm  
Sunday / Public Holiday - Nil | Daytime (D)      | Orange shaded cells        |
| Out of Hours Work Period 1 (OOHW 1) | Monday to Friday – 6pm to 10pm  
Saturday – 7am to 8am  
and 1pm to 10pm  
Sunday / Public Holiday – 8am to 6pm | Daytime OOHW (DOOH) | Yellow shaded cells         |
| Out of Hours Work Period 2 (OOHW 2) | Monday to Friday – 10pm to 7am  
Saturday – 10pm to 8am  
Sunday / Public Holiday – 6pm to 7am | Evening (E)      | Green shaded cells          |
| Highly noise affected       | All periods                                                                 | -               | Italicised and bolded red text |

The highest noise levels ($L_{eq\ 15min\ dBA}$) at each NCA due to the utilities relocation works in Scenario 1 are summarised in Table 4.2.

### Table 4.2 Predicted construction noise levels utility relocation works

<table>
<thead>
<tr>
<th>NCA</th>
<th>NML</th>
<th>HNA¹</th>
<th>D¹</th>
<th>DOOH¹</th>
<th>E¹</th>
<th>N¹</th>
<th>Scenario 1 Predicted highest noise level range per scenario ($L_{eq(15min)}\ dBA$)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential receivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>75</td>
<td>70</td>
<td>65</td>
<td>64</td>
<td>51</td>
<td>&lt;30-43</td>
<td></td>
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<tr>
<td>NCA02.1E</td>
<td>75</td>
<td>67</td>
<td>62</td>
<td>61</td>
<td>50</td>
<td>&lt;30-68</td>
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</tr>
<tr>
<td>NCA02.1W</td>
<td>75</td>
<td>67</td>
<td>62</td>
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<td>50</td>
<td>32-63</td>
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<td>75</td>
<td>56</td>
<td>51</td>
<td>47</td>
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<td>47</td>
<td>&lt;30-57</td>
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<td>69</td>
<td>64</td>
<td>64</td>
<td>47</td>
<td>&lt;30-58</td>
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<td>&lt;30-41</td>
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<td>NCA03.2W</td>
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<td>58</td>
<td>53</td>
<td>50</td>
<td>45</td>
<td>&lt;30-36</td>
<td></td>
</tr>
<tr>
<td>Commercial receivers</td>
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<td></td>
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<tr>
<td>NCA01.1E</td>
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<tr>
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<td>34-42</td>
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<td>70</td>
<td>n/a</td>
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<td></td>
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<tr>
<td>NCA02.1W</td>
<td>n/a</td>
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<td>70</td>
<td>70</td>
<td>n/a</td>
<td>&lt;30-42</td>
<td></td>
</tr>
</tbody>
</table>
### Predicted highest noise level range per scenario (Leq(15min), dBA)

<table>
<thead>
<tr>
<th>NCA</th>
<th>NML</th>
<th>Scenario 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HNA¹</td>
<td>D¹</td>
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<tr>
<td>NCA02.2E</td>
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</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>70</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>70</td>
</tr>
<tr>
<td>NCA03.2E</td>
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<td>Industrial receivers</td>
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</tr>
<tr>
<td>NCA02.1E</td>
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<td>75</td>
</tr>
<tr>
<td>Place of worship</td>
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</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>55</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>n/a</td>
<td>55</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>55</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>55</td>
</tr>
<tr>
<td>Educational institution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>55</td>
</tr>
<tr>
<td>Child care centre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>n/a</td>
<td>50</td>
</tr>
<tr>
<td>Active recreational areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>65</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>65</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>65</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>n/a</td>
<td>65</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>n/a</td>
<td>65</td>
</tr>
<tr>
<td>Passive recreational areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>60</td>
</tr>
</tbody>
</table>

1. HNA - Highly noise affected, D – daytime standard hours (SH), DOOH – Daytime (OOHW1), E – Evening (OOHW1 and OOHW2), N – Night-time (OOHW2)
2. Where predicted noise level is 30 dBA or less, noise level of <30 dBA is shown as the predicted noise level.

Maximum noise levels (L_{max} dBA) at each NCA due to the utilities relocation works in Scenario 1 are summarised in Table 4.3. Predicted exceedances are highlighted in yellow.
Table 4.3 Predicted construction noise levels, sleep disturbance

<table>
<thead>
<tr>
<th>NCA</th>
<th>LMAX, dBA</th>
<th>PREDICTED NOISE LEVEL RANGE (LMAX, dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SLEEP DISTURBANCE CRITERION</td>
</tr>
<tr>
<td>Residential receivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>65</td>
<td>48</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>65</td>
<td>44-52</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>65</td>
<td>44</td>
</tr>
<tr>
<td>NCA02.2E</td>
<td>65</td>
<td>37-52</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>65</td>
<td>31-40</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>65</td>
<td>56-72</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>65</td>
<td>35-64</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>65</td>
<td>32-43</td>
</tr>
</tbody>
</table>

Based on the modelling results:

— The day NML is predicted to be exceeded for residential receivers in NCA02.1E by up to 1 dBA.
— The daytime OOHW NML is predicted to be exceeded for residential receivers in NCA02.1W by up to 1 dBA.
— The night NML is predicted to be exceeded for residential receivers in NCA03.1E and NCA03.1W by up to 10-11 dBA.
— All other residential areas are expected to meet the NMLs for all periods.
— With the exception of a place of worship in NCA03.1E (1 dBA above the NML), noise levels at all non-residential receivers within the NCAs are expected to meet the NMLs.
— The sleep disturbance criterion is predicted to be exceed by up to 7 dBA within NCA03.1W.

It should be noted that the noise predictions assume 10 minutes (out of 15 minutes) of continuous use of the electric drill. Shorter durations would reduce the Leq 15min noise emissions, for example 5 minutes’ use would reduce the predicted noise levels by 3 dB.

Additional mitigation measures, as summarised from the Roads and Maritime Construction Noise and Vibration Guideline, are given in the NVIA.

Construction noise impacts at the nearest sensitive receivers have been assessed with respect to the nominated criteria. Noise emissions were modelled in SoundPLAN 7.4, as detailed in the NVIA.
4.1.2 SCENARIO 2

It is understood these kerb and utility relocation works in Scenario 2 would include:

— Kerb and utilities relocation works from Burton Street stairs to Chainage 390 (Item 3 and Item 4)
— Installation of advanced warning signage on High Street (additional High Street works).
— Chainage 390 hole-coring (Item 5)
— Trenching along Ennis Rd (Item 6).

The construction works would be carried out at various times of day and night dependent upon the construction and traffic staging. We have assumed dBA levels for the works based on information supplied by Roads and Maritime.

The equipment modelled for the works is outlined within Table 4.4. The sound power levels have been sourced from the CNVG in the first instance. Where data were not available for specific items, the levels in AS 2436 – Guide to noise and vibration control on construction, demolition and maintenance sites, or BS 5228 - Code of practice for noise and vibration control on construction and open sites – Part 1: Noise have been used.

Table 4.4  Modelled equipment

<table>
<thead>
<tr>
<th>WORKS</th>
<th>EQUIPMENT MODELLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burton Street Stairs to Chainage 390</td>
<td>— Nail gun: 101 dBA</td>
</tr>
<tr>
<td>kerb and utility relocation works</td>
<td>— Concrete Vibrator: 102 dBA</td>
</tr>
<tr>
<td>(Items 3 and 4)</td>
<td>— Combined: 104 dBA</td>
</tr>
<tr>
<td>Additional High Street Works</td>
<td>— Small excavator: 95 dBA</td>
</tr>
<tr>
<td></td>
<td>— Site ute: 88 dBA</td>
</tr>
<tr>
<td></td>
<td>— Combined: 95 dBA</td>
</tr>
<tr>
<td>Chainage 390 hole-coring (Item 5)</td>
<td>— Concrete Corer: 101 dBA</td>
</tr>
<tr>
<td>Ennis Road Trenching (Item 6)</td>
<td>— Concrete Saw: 118 dBA</td>
</tr>
<tr>
<td></td>
<td>— Small excavator: 105 dBA</td>
</tr>
<tr>
<td></td>
<td>— Small crew truck: 108 dBA</td>
</tr>
<tr>
<td></td>
<td>— Site ute: 88 dBA</td>
</tr>
<tr>
<td></td>
<td>— Wacker packer: 106 dBA</td>
</tr>
<tr>
<td></td>
<td>— Concrete agitator for reinstatement: 109 dBA</td>
</tr>
<tr>
<td></td>
<td>— Combined: 118 dBA</td>
</tr>
</tbody>
</table>

It should be noted that the noise predictions assume the equipment is being used continuously for the 15-minute period. Shorter durations would reduce the $L_{eq \, 15min}$ noise emissions,

Table 4.5 outlines the assessed time periods.
### Table 4.5  Exceedance time periods

<table>
<thead>
<tr>
<th>NAME</th>
<th>TIME PERIODS</th>
<th>PREDICTED PERIOD</th>
<th>EXCEEDANCE INDICATION /FORMATTING IN TABLE 4.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Hours (SH)</td>
<td>Monday to Friday – 7am to 6pm</td>
<td>Daytime (D)</td>
<td>Orange shaded cells</td>
</tr>
<tr>
<td></td>
<td>Saturday – 8am to 1pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sunday / Public Holiday – Nil</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Daytime</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of Hours Work</td>
<td>Monday to Friday – 6pm to 10pm</td>
<td>Daytime</td>
<td>Yellow shaded cells</td>
</tr>
<tr>
<td>Period 1 (OOHW 1)</td>
<td>Saturday – 7am to 8am and 1pm to 10pm</td>
<td><strong>OOHW (DOOH)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sunday / Public Holiday – 8am to 6pm</td>
<td></td>
<td><em>Green shaded cells</em></td>
</tr>
<tr>
<td></td>
<td><strong>Daytime</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out of Hours Work</td>
<td>Monday to Friday – 10pm to 7am</td>
<td>Evening (E)</td>
<td><em>Green shaded cells</em></td>
</tr>
<tr>
<td>Period 2 (OOHW 2)</td>
<td>Saturday – 10pm to 8am</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sunday / Public Holiday – 6pm to 7am</td>
<td><strong>Night-time (N)</strong></td>
<td><em>Blue shaded cells</em></td>
</tr>
<tr>
<td></td>
<td><strong>Evening</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highly noise affected</td>
<td>All periods</td>
<td></td>
<td><em>Italicised and bolded red text</em></td>
</tr>
</tbody>
</table>

The highest noise levels (L eq 15min dBA) at each NCA due to the utilities relocation and kerb adjustment works in Scenario 2 are summarised in Table 4.6.
Table 4.6  Predicted construction noise levels additional utility relocation works

<table>
<thead>
<tr>
<th>NCA</th>
<th>Residential receivers</th>
<th>Commercial receivers</th>
<th>Industrial receivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HNA¹</td>
<td>D¹</td>
<td>DOOH¹</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>75</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>75</td>
<td>67</td>
<td>62</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>75</td>
<td>67</td>
<td>62</td>
</tr>
<tr>
<td>NCA02.2E</td>
<td>75</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>75</td>
<td>69</td>
<td>64</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>75</td>
<td>69</td>
<td>64</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>75</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>75</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>NCA01.1W</td>
<td>n/a</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>NCA01.1E</td>
<td>n/a</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>70</td>
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</tr>
<tr>
<td>NCA02.1W</td>
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<td>70</td>
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<tr>
<td>NCA02.2E</td>
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<tr>
<td>NCA03.1E</td>
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<td>70</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>n/a</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>75</td>
<td>n/a</td>
</tr>
</tbody>
</table>
### PREDICTED HIGHEST NOISE LEVEL RANGE PER LOCATION

<table>
<thead>
<tr>
<th>NCA</th>
<th>NML</th>
<th>HNA</th>
<th>DOOH</th>
<th>E</th>
<th>N</th>
<th>CHAINAGE 340 TO 390</th>
<th>BURTON ST STAIRS TO CHAINAGE 340</th>
<th>CHAINAGE 390 CORING</th>
<th>ELLIS RD TRENCHING</th>
<th>ADDITIONAL HIGH ST WORKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of worship</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>n/a</td>
<td>36-40</td>
<td>38-40</td>
<td>32</td>
<td>41-43</td>
<td>&lt;30-30</td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>n/a</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>n/a</td>
<td>&lt;30-39</td>
<td>&lt;30-37</td>
<td>&lt;30-37</td>
<td>&lt;30-37</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>n/a</td>
<td>&lt;30-45</td>
<td>38-51</td>
<td>&lt;30-39</td>
<td>37-56</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>n/a</td>
<td>&lt;30-47</td>
<td>&lt;30-48</td>
<td>&lt;30-43</td>
<td>&lt;30-58</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Educational institution</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>55</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30-34</td>
<td>&lt;30-41</td>
<td>&lt;30-31</td>
<td>31-49</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Child care centre</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1W</td>
<td>n/a</td>
<td>50</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30</td>
<td>&lt;30-36</td>
<td>&lt;30-32</td>
<td>38-56</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Active recreational areas</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA02.1E</td>
<td>n/a</td>
<td>65</td>
<td>65</td>
<td>n/a</td>
<td>n/a</td>
<td>39-40</td>
<td>38-42</td>
<td>30</td>
<td>37</td>
<td>&lt;30-31</td>
</tr>
<tr>
<td>NCA03.1E</td>
<td>n/a</td>
<td>65</td>
<td>65</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30-34</td>
<td>36-39</td>
<td>30</td>
<td>31-53</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>65</td>
<td>65</td>
<td>n/a</td>
<td>n/a</td>
<td>30-39</td>
<td>35-47</td>
<td>&lt;30-36</td>
<td>45-50</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.2E</td>
<td>n/a</td>
<td>65</td>
<td>65</td>
<td>n/a</td>
<td>n/a</td>
<td>36</td>
<td>37-37</td>
<td>33</td>
<td>35</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>n/a</td>
<td>65</td>
<td>65</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30</td>
<td>&lt;30</td>
<td>30</td>
<td>31-32</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Passive recreational areas</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCA03.1W</td>
<td>n/a</td>
<td>60</td>
<td>60</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30</td>
<td>&lt;30</td>
<td>&lt;30</td>
<td>42</td>
<td>&lt;30</td>
</tr>
<tr>
<td>NCA03.2W</td>
<td>n/a</td>
<td>60</td>
<td>60</td>
<td>n/a</td>
<td>n/a</td>
<td>&lt;30</td>
<td>30</td>
<td>&lt;30</td>
<td>43</td>
<td>&lt;30</td>
</tr>
</tbody>
</table>

1. HNA - Highly noise affected, D – daytime standard hours (SH), DOOH – Daytime (OOHW1), E – Evening (OOHW1 and OOHW2), N – Night-time (OOHW2)
2. Where predicted noise level is 30 dBA or less, noise level of <30 dBA is shown as the predicted noise level.
Based on the modelling results:

- The day NML is not predicted to be exceeded for residential receivers except for NCA02.1E which exceeds the HNA (and therefore day) NML requirement by 13 dBA during trenching.

- The daytime OOHW NML is predicted to be exceeded for residential receivers in NCA02.1E, NCA02.1W, NCA03.1W, NCA03.2E, and NCA03.2W by 1-5 dBA.

- The night NML is predicted to be exceeded for residential receivers in NCA01.1E, NCA02.1E, NCA02.1W, NCA03.1E, and NCA03.1W by 1-15 dBA.

- All other residential areas are expected to meet the NMLs for all periods.

- With the exception of 2 places of worship in NCA03.1E and NCA03.1W (1-3 dBA above the NML), and the childcare centre in NCA02.1W (6 dBA above NML), noise levels at all non-residential receivers within the NCAs are expected to meet the NMLs.

Additional mitigation measures, as summarised from the Roads and Maritime Construction Noise and Vibration Guideline, are given in the NVIA.

### 4.2 ARGYLE STREET COMPOUND

The project will use an existing Sydney Trains compound located in Dawes Point on Argyle Street. The site is situated on the eastern boundary of residential receivers on Lower Fort Street, and a commercial receiver (Harbour View Hotel) on the corner of Cumberland Street and Lower Fort Street.

The existing temporary site buildings will be removed and replaced in the same location with new buildings. During the construction period, a generator will be required to operate 24 hours a day to supply the site buildings. The following sections provide an assessment of the most significant construction activities at this compound.

#### 4.2.1 REMOVAL OF EXISTING TEMPORARY BUILDINGS

It is proposed that in order to suit the planned Roads and Maritime use of the Argyle Street site compound, that the existing facilities be removed from site and replaced with new site sheds, site offices, and meal rooms of a similar size to current. It is expected that these works will be completed within approximately one day.

The assessment is concerned with the main construction activity of the removal of the existing, and construction of new site offices.

The proposed activities are likely to impact few receivers for less than three weeks as the work is scheduled to occur over approximately one day. Therefore, in accordance with the CNVG, the Construction Noise Estimator has been used to calculated the affected distance and determine additional mitigation measures using the noisiest plant method.

For input into the Construction Noise Estimator, the relevant background levels conducted at NM06 in Table 2.2 show that the relevant noise category area is R4. Using this category, the standard hours noise management level used for the estimator was $L_{eq(15\text{min})}$ 65 dBA.

The work is planned to be carried out with a small excavator in addition to trucks. The CNVG provides that the noisiest plant may be used for distance based assessment. We have assumed a small excavator and/or rigid truck to be used with a sound power level equivalent to $L_{eq(15\text{min})}$ 103 dBA as the noisiest plant.
The Construction Noise Estimator indicated that the affected distance for residential is 30 metres and highly noise affected distance is 15 metres. The residential receivers which are immediately adjacent to the compound boundary are all within both the affected and highly noise affected distance and so mitigation needs to be considered.

The Construction Noise Estimator indicated that the affected distance is 25 metres for commercial type receivers. The closest commercial receiver (Harbour View Hotel) is located near to the compound entrance and is within the affected distance. No other non-residential sensitive receivers were located within the affected distances.

Standard mitigation measures to be taken should include community consultation or notification, selection of quieter equipment and planning of the work site and activities to minimise noise.

Due to the receivers being within the highly noise affected distance, additional mitigation measures must be used in tandem with the standard mitigation measures. The additional mitigation measures are notification, respite periods, and duration respite offers. Notification can be such as a letterbox drop detailing work activities and the time periods they are expected to be carried out, and respite periods or duration respites. As the works are to be completed over the course of approximately one day only, it is not considered reasonable for respite periods or a duration respite offer.

An increase in road traffic noise is not anticipated due to the works as the associated traffic is would generate less than 5 vehicles movements over the course of the day, and this is not considered significant with likely volumes on surrounding roads.

4.2.2 SITE OFFICE ARGYLE STREET GENERATOR

A generator is proposed to provide power for site offices at the Argyle Street and may be in use 24 hours a day. As a result, noise from the generator has been assessed against the more stringent night-time noise management level.

As the generator location and sound power level is not yet confirmed, a calculation to the rear façade of the neighbouring buildings has been conducted to determine the acceptable sound power level for a generator located in given areas of the compound. Noise emissions have been modelled using SoundPLAN 7.4.

Based on the topography data obtained for the area, the second-floor level appears to be the most affected location on the rear façade of the neighbouring buildings. Due to the local topography, additional shielding may be afforded to ground floor receivers. For this reason, the second floor has been assessed as this location would be more exposed and may have line of sight to the generator.

Figure 4.1 shows the areas where a generator of a given sound power level may be situated when running during the night.
Figure 4.1 Generator sound power level, night

Based on the noise modelling, the highest acceptable sound power level for the generator operation during the night time period is 95 dBA (this is equivalent to a generator with a SPL of 85 dBA at 1 metre with a longest side surface area of 10m²), if it is situated in the south east corner of the compound. For example, a Cummins C80 generator has a typical sound power of 94 dBA. Should the generator be located on the boundary adjacent to residents, a sound power level in the order of 70 dBA or less would be required. These levels assume no significant contribution from other construction noise sources.

As these numbers are based upon the night time noise management levels, which are the most stringent, it is possible to use a louder generator outside of these hours. In the daytime, the noise management level is 12 dB higher than during the night, 7 dB higher for day outside of standard hours, and 2 dB higher during the evening. The difference in night time and other period noise criteria may be considered when selecting a generator, for example, a generator with a sound power level of up to 107 dBA may operate in the south east corner of the compound during daytime standard hours only.

As the noise modelling does not include barrier effects from site buildings etc., it may be considered conservative. Therefore, attenuation in the form of an acoustic enclosure or barrier...
which breaks line of sight to the nearest noise sensitive receiver may permit a louder generator to be used.

5. VIBRATION IMPACT ASSESSMENT

The predicted maximum vibrations levels for plant relating to trenching along Ellis Road, detailed in Section 4.1.2 have been compared against the cosmetic damage criteria (Figure 5.1), and underground utility criteria (Figure 5.2). It should be noted that as these are based on a geometric loss spreading model based on generic plant vibration levels, these levels should be used for guidance only.

5.1 PREDICTION OF VIBRATION LEVELS

Ground vibration is attenuated as it travels from the source by a number of factors, predominately geometric spreading, and internal damping of the ground material.

For the purpose of our assessment, soil damping has been assumed to be controlled by geometric spreading. To calculate geometric spreading at distances, the following equation is used:

$$V_{pp} = V_{pp(ref)} \times \left(\frac{r_{(ref)}}{r}\right)^n$$

Where $V_{pp}$ is the vibration level at a distance, $r$, from the source, and $V_{pp(ref)}$ is the vibration level of the source at a reference distance, $r_{(ref)}$. The parameter $n$ is used to account for the attenuation rate and it varies for different soil classifications.

To allow for different propagation losses, $n$ is varied. $n$ is generally selected based on soil type and typically varies between 0.5 and 2.0. In the initial empirical studies $n$ was set to 1.5, as such, we have used this as assumed average conditions found in the Sydney Harbour area.

Reference vibration levels have been based on previously published and measured data for a 500kg plate compactor. Due to the nature of the equipment and its proposed use, it has conservatively assumed to be a continuous source of vibration in accordance with BS 7385-2, and so the criteria of 15 mm/s is reduced by 50% to 7.5 mm/s. These levels are not based on the actual plant items proposed to be used by the contractor. It is recommended that on-site measurements are undertaken to validate the predictions.

Within the work areas, plant may operate as close as <10 m to the nearest residential receiver within NCA 02.1E. The predicted vibration levels at the potential nearest receiver have been assessed with consideration to the proposed compactor only and are predicted to be 9.2 mm/s which is above the relevant criteria of 7.5 mm/s. It is therefore important that a specific site law based upon site measurements is obtained prior to any works within the minimum working distances for these buildings. The minimum working distance is expected to be approximately 12 m.
Figure 5.1  Vibration assessment for buildings

Figure 5.2  Vibration assessment for underground utilities

Regards,

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Figure A.1  Extended project boundary and locations of additional works
Figure A.2  Argyle Street site compound boundary