

# Sydney Harbour Bridge Southern Cycleway

Review of environmental factors

Roads and Maritime Services | November 2017

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# **Sydney Harbour Bridge Southern Cycleway**

## **Review of environmental factors**

**November 2017**

Prepared by Coffey Environments Australia Pty Ltd and Roads and Maritime Services

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## Document controls

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### Approval and authorisation

<b>Title</b>	Sydney Harbour Bridge Southern Cycleway review of environmental factors
<b>Accepted on behalf of NSW Roads and Maritime Services by:</b>	Lily Wu Project Development Manager
<b>Signed:</b>	
<b>Dated:</b>	20 November 2017



# Executive summary

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## The proposal

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the existing cycleway facility between the Kent Street cycleway and the Sydney Harbour Bridge cycleway.

In 2013, Transport for NSW released a strategic plan Sydney City Centre Access Strategy which acknowledges the rapid rate of growth in cyclists travelling to and from the Sydney Central Business District (CBD) and envisions an integrated cycleway network within the city centre to support this growth. The strategy identified the need for improvement works between the Kent Street cycleway and the Sydney Harbour Bridge cycleway.

The proposal area is located within the City of Sydney local government area (LGA) and is bound by the Observatory Hill precinct to the west and Upper Fort Street and the Bradfield Highway to the east.

Site construction compounds would be located in the outdoor exercise area at Observatory Hill and in front of the National Trust Centre/S.H. Ervin Gallery.

Key features of the proposal would include:

- Provision of a 3m-wide dedicated bi-directional cycleway from the Kent Street cycleway to the Sydney Harbour Bridge cycleway
- Upgrade of the existing pedestrian footpath from Kent Street to Fort Street Public School, with the width varying from 1.5m to 2.2m. Cyclists and pedestrians would be separated through markings and different surfaces on the cycleway and footpath
- Provision of a 1.8m-wide pedestrian footpath on the eastern side of Upper Fort Street from Fort Street Public School to Watson Road
- Demolition of the existing shared use bridge over the Cahill Expressway and provision of a new pedestrian and cyclist bridge with improved width and sight lines
- Removal of the existing pedestrian and cyclist ramp on the southern approach to the Cahill Expressway footbridge; and replacement with a new 4.5m-wide spiral ramp for cyclists and pedestrians with an improved gradient
- Removal of a 60m section of existing concrete retaining wall next to the Roads and Maritime Incident Response Area adjacent to the Bradfield Highway to accommodate the proposed new cycleway alignment; and construction of a 62m section of new concrete retaining wall with a maximum height of about 4.5m between the proposed cycleway alignment and the Incident Response Area
- Modification of lane merging arrangements between Kent Street and Clarence Street on-ramps from a general lane change to a 'zipper' merge
- Reconfiguration of the existing outdoor exercise area at Observatory Hill to accommodate the proposed new cycleway alignment
- Ancillary works for construction including construction compounds
- Relocation of utilities, including water and sewer mains, telecommunications cables, and electricity and gas services.

## Need for the proposal

The cycleway route is a critical link connecting the Sydney Harbour Bridge, the Millers Point precinct and the Kent Street cycleway which in turn link into the Sydney CBD. Around 2,000 to 3,000 cyclist trips are taken on the Sydney Harbour Bridge cycleway every weekday, making it the busiest link in the Metro Sydney Bike Network.

The new cycleway would join the southern end of the existing Sydney Harbour Bridge cycleway to create a purpose built connection to the existing cyclist network on Kent Street. The connection would alleviate the need for cyclists to share public roads and footpaths between the bridge and Kent Street.

The proposal is required to improve safety for cyclists, pedestrians and motorists, improve access for cyclists and pedestrians between the Sydney Harbour Bridge and the Sydney CBD, and support future growth in cyclists travelling between Sydney's CBD and the Lower North Shore. The cycleway would also provide a connection to Millers Point and Barangaroo Headland Park via the existing on-road cycleway on Watson Road and Argyle Street.

## **Proposal objectives and development criteria**

The objectives of the proposal are to:

- Improve safety for cyclists, pedestrians and motorists
- Improve access for cyclists and pedestrians
- Support future growth in cyclists travelling between the Sydney CBD and the Lower North Shore
- Provide a cycleway facility that sensitively fits in with the existing heritage precinct.

Supporting objectives are to minimise impacts to the community and to the natural and built environments, while providing a cost-effective design solution.

## **Options considered**

The City of Sydney developed a concept design for the area in 2015 with a preferred alignment for a new bi-directional separated cycleway alongside Upper Fort Street and the Bradfield Highway. Discussions with the City of Sydney in late 2016 led to an agreement that Roads and Maritime would be the proponent for the development and construction phases of the proposal.

The City of Sydney's Feasibility and Concept Design Report (2015) investigated strategic alignment options for the new cycleway. Building on the City's investigations, Roads and Maritime held two value management and value engineering workshops, on 7 November 2016 and 10 March 2017, to progress the options identification process with key stakeholders.

The options considered by Roads and Maritime included the entry ramp design at the southern approach to the Sydney Harbour Bridge cycleway and along Upper Fort Street (ground level versus elevated), potential widening of the existing pinch point on Upper Fort Street, and the design of a new cyclist and pedestrian bridge over the Cahill Expressway with a new southern approach ramp.

The preferred option was selected by stakeholders at the second value engineering workshop on 10 March 2017. The preferred option included:

- An elevated cycleway connecting from the cycleway opening (portal) in the southwestern pylon of the Sydney Harbour Bridge to the Incident Response Area
- Widening of the existing 'pinch point' on Upper Fort Street
- A new retaining wall facing the Bradfield Highway near the Cahill Expressway cutting
- A new spiral approach ramp to a new pedestrian/cyclist bridge over the Cahill Expressway
- Retaining of the eastern roadway edge on the Kent Street and Clarence Street on-ramps to the Bradfield Highway.

Further design refinements have been made, including a change to a ground level (rather than elevated) cycleway from the Sydney Harbour Bridge to the Incident Response Area.

## Statutory and planning framework

The objective of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) is to facilitate the effective delivery of infrastructure across NSW. Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the current proposal includes road infrastructure facilities and is to be carried out on behalf of Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from council is not required.

This Review of Environmental Factors (REF) fulfils the requirements of Section 111 of the EP&A Act and has been prepared in accordance with Clause 228 of the *Environmental Planning and Assessment Regulation 2000*.

## Community and stakeholder consultation

The proposal has incorporated consultation with directly and indirectly affected landowners including Property NSW, City of Sydney, and Department of the Education.

Consultation with the affected stakeholders commenced in 2015 and included a preliminary design presentation meeting with the Fort Street Public School, Observatory Hill Environmental Education Centre and Department of Education. A Sydney Harbour Bridge community update released in December 2016 informed the community about the start of the design and REF process and where to access information, including on the Roads and Maritime website. A similar recent update was released in September 2017.

All stakeholders consulted were generally supportive of the changes proposed to improve the cycleway. The main comments received related to concerns about:

- Loss of car parking spaces
- Potential impacts to outdoor exercise facilities
- Lighting and maintaining access during construction and operation
- Impacts to the existing footpath and cycleway along Kent Street
- Impacts to views at the frontage of the National Trust Centre building
- The proximity of the proposed new cyclist and pedestrian bridge over the Cahill Expressway to the Environmental Education Centre building
- Potential for cumulative impacts of the proposal and the Department of Education's planned redevelopment at Fort Street Public School.

Roads and Maritime will continue to consult with the community and stakeholders throughout development of the proposal. In particular, the REF will be placed on public display and comments invited. Submissions received will be addressed in a formal submissions report and considered when finalising the concept design and during development of the detailed design.

## Environmental impacts

The potential environmental impacts of the proposal, particularly on heritage, visual and landscape, social and biodiversity values of the area were considered as part of the design process, and avoided where possible.

Strategies to avoid impacts through the design of the proposal included:

- Minimising the need for physical alterations and increases in paving area
- Designing 'light and transparent' structures to reduce the overall visual impact
- Retaining the existing landscape setting
- Avoiding the loss of significant existing trees and vegetation
- Retaining important public views.

Roads and Maritime commissioned technical experts to assess the potential impacts of the proposal and to identify safeguards and management measures to avoid or limit these impacts. The main impacts likely to occur as a result of the proposal are summarised below.

### **Non-Aboriginal heritage**

The proposal would be located close to, but outside of, the National Heritage Listing and State Heritage Register curtilages of the Sydney Harbour Bridge, although the proposal could impact on its overall heritage values. The work is of a relatively small scale and its location on the approaches to the Sydney Harbour Bridge (rather than on the bridge itself) means that the proposal would not degrade, damage or diminish national or state heritage values. Overall impacts to the Sydney Harbour Bridge are predicted to be minor.

The proposed work would enhance the accessibility and functionality of the existing cycleway on the Sydney Harbour Bridge, including improved connectivity with the Millers Point and Dawes Point precincts, consistent with the current Sydney Harbour Bridge Conservation Management Plan (2007). The proposal also presents an opportunity to strengthen public engagement and understanding of the national and state heritage values of the bridge.

Other planned projects relating to the Sydney Harbour Bridge are underway or planned, and seek to support and enhance the accessibility and functionality of the bridge as the main transportation route across Sydney Harbour. The overall combined impact of these projects would maintain the key function of the Sydney Harbour Bridge and support its ongoing use and longevity. Taken together, these projects could affect the heritage values and setting of the Sydney Harbour Bridge including its southern approaches. Careful project coordination and consistency of design across the projects would effectively mitigate any cumulative impact.

The proposal would indirectly and directly affect other heritage items in the vicinity, including minor physical and visual impact to the state heritage listed Millers Point and Dawes Point Village Precinct. Impacts to the precinct would be restricted to those heritage items within and near the proposal area through the introduction of prominent visual elements and the removal of several trees. The proposal would have positive impacts on the Millers Point and Dawes Point Village Precinct including improved pedestrian and cyclist connectivity, and opportunities for enhanced public engagement and interpretation of the heritage values of the area. Overall, the proposal would not diminish or undermine the state significant values of the Millers Point and Dawes Point Village Precinct.

The proposal would result in a range of potential physical and visual impacts on other nearby local heritage items including the Millers Point Heritage Conservation Area, National Trust Centre/S.H. Ervin Gallery, Fort Street Primary School, Messenger's Cottage for Sydney Observatory, Observatory Hill Park and Sydney Observatory. The greatest impacts would be restricted to relatively small areas around the proposed spiral approach ramp and bridge over the Cahill Expressway and ground level cycleway on the southern approaches to the Sydney Harbour Bridge. Most impacts on heritage items are negligible, neutral or minor.

A potentially high impact is predicted through the introduction of the spiral ramp which would introduce a prominent visual feature in the northeast corner of the National Trust Centre/S.H. Ervin Gallery. The ramp would not exceed the height of the National Trust Centre/S.H. Ervin Gallery, although would closely border the main heritage view corridor to the site, and would affect views. Several trees would be removed in this area, potentially affecting the visual and cultural setting of the National Trust Centre/S.H. Ervin Gallery. The proposal would retain the Moreton Bay Fig tree listed on the City of Sydney Significant Tree Register, located within the National Trust Centre/S.H. Ervin Gallery, to help screen the ramp and reduce the visual prominence of the elevated structures. Design measures to reduce the visual impact of the proposal (see below) would also assist in reducing impacts on heritage values.

## **Landscape and visual**

The proposal would introduce new or enlarged structures into an area with high landscape character and heritage values that are sensitive to change, in particular Observatory Hill and the National Trust Centre/S.H. Ervin Gallery environs. The proposal has been designed as far as feasible to integrate within the existing character of these areas, including minimising the overall footprint, retaining as many large trees as practical, and ensuring the cycleway and pedestrian spiral ramp and bridge appear as unobtrusively as possible in the landscape.

Two views would be affected by the proposal, as experienced by people who live and/or work next to or pass through the proposal area, resulting in moderate to high impacts. These views include the frontage of the National Trust Centre/S.H. Ervin Gallery when seen from the carpark, and the northern section of the approach to the Sydney Harbour Bridge. Both locations are sensitive to change due to the history of the site or its vegetated state. Further refinement of the design would seek to reduce the visual impact of the proposal, such as providing structures that are light and transparent, and minimising overall visual intrusion through sympathetic design. The existing landscape setting would be retained.

## **Noise and vibration**

The proposal area is subject to relatively high daytime noise from existing road traffic. Work activities would take place mainly during the evening and night time (to minimise disruption to the travelling public).

The highest noise levels would be from the use of jackhammers, concrete saws and chainsaws. The most potentially affected noise sensitive receivers include properties close to, and in direct line of sight to the proposal area, including:

- High-rise commercial and/or residential towers to the south including Observatory Tower
- Residential townhouses and some commercial and religious land uses to the west and north
- Sydney Observatory, Fort Street Public School and the National Trust Centre/S.H. Ervin Gallery directly next to the works
- Commercial and residential buildings to the east.

Worst-case noise levels at these receivers are predicted to exceed both daytime and night time noise management levels for the proposal a number of times throughout construction. The greatest exceedance is predicted at Observatory Tower (exceeds by 25 decibels at night). However, construction noise levels on a representative night would vary depending on the location and operation of different equipment and machinery, and would typically be less than the maximum predicted level. The work would be planned to minimise the duration of exposure to construction noise at individual receivers on a night-by-night basis.

All practical and feasible measures would be implemented to reduce noise levels during construction and would be detailed in a noise and vibration management plan. Measures could include, for example:

- Notifying all sensitive receivers prior to work commencing
- Using temporary noise barriers and enclosures for high noise generating equipment
- Ceasing use of high noise equipment prior to midnight
- Scheduling work to reduce the duration of exposure at individual receiver locations, such as commencing high noise activities adjacent to the most affected receivers and moving further away during the night.

The proposal would also generate vibration which could cause structural or cosmetic damage to nearby heritage buildings and structures. However, the distance of the work sites from these buildings is generally sufficient to avoid vibration-related impacts. The Sydney Observatory and the Bureau of Meteorology sites hold instruments (such as telescopes and meteorological sensors) that may be sensitive to ground-borne vibration. Predicted vibration levels are likely to comply with the nominated trigger levels for most construction activities except if a vibratory roller is used.



Where vibration intensive works are required within the specified minimum working distances, vibration monitoring would be undertaken to check that acceptable levels of vibration are not being achieved. As exceedances are predicted at several identified sensitive receivers for various work activities, all feasible and reasonable mitigation measures would be implemented to reduce the potential impacts of vibration during the work. These measures would be included in the noise and vibration management plan.

## **Traffic and transport**

The work would require about 10 months to complete. The existing cycleway from Kent Street to Sydney Harbour Bridge would be closed during this time and a detour provided on Watson Road, Argyle Street and Kent Street. The western footpath on Upper Fort Street would remain available for pedestrians, and access for pedestrians and vehicles would be maintained to the Fort Street Public School and National Trust Centre/S.H. Ervin Gallery. Some sections of road may be closed for construction and certain deliveries. Where possible, large deliveries and work would occur at night or during off peak hours and would avoid peak school drop off and pick up times.

Full closures at night of the Cahill Expressway and the Kent Street on-ramp to the Bradfield Highway may be needed during the work. Night time closures of the expressway and on ramp could occur for between one and two nights a week during the construction period. Traffic would be diverted to alternative routes during closure periods.

Existing traffic conditions are expected to change to a minor extent on the Clarence Street and Kent Street on-ramps to the Bradfield Highway where the merge between both on-ramps would be modified from a general lane change to a zip merge. This change would decrease traffic build-up at this merge point, particularly during the evening peak period.

Once the proposal is built, cyclists travelling northbound from Clarence Street would be required to use the Kent Street underpass. This route is about 120m longer than travelling via the Clarence Street on-ramp, but would reduce the risk of collisions between cyclists and vehicles. The proposal would improve the gradient of the Cahill Expressway approach ramp for cyclists from 1 in 6 to 1 in 20. A lesser gradient would improve speed management for cyclists traveling downhill and ease of travel uphill. The proposed separated pedestrian footpath and cycleway from the Kent Street on-ramp to Upper Fort Street would reduce the likelihood of collisions between pedestrians and cyclists.

The proposal would not affect the road geometry or on-street parking on Upper Fort Street once built. The cycleway and pedestrian footpath would overlap at the access onto Upper Fort Street, similar to existing conditions. Appropriate signage would warn cyclists of pedestrians and would prohibit pedestrian use of the cycleway.

## **Socio-economic and land use**

Some short-term, mostly localised, socio-economic impacts are expected from the proposal during construction and include temporary disruption of local amenity, congestion and delays for cyclists, pedestrians and vehicles, and the displacement of homeless people living near the Cahill Expressway. The existing outdoor exercise area would also be unavailable during the 10 month construction period and would be reinstated once the work is completed. The effective implementation of safeguards and management measures would assist in minimising or avoiding many of these socio-economic impacts.

The proposal would provide important long-term benefits to the Sydney LGA and would encourage cyclist and pedestrian activity and assist in meeting the expected growth in the demand for cycle facilities on the Sydney Harbour Bridge. The proposal would contribute to alleviating road congestion and reducing pressure on the public transport system, and would improve overall access and connectivity for the local and regional cycleway network.

## Biodiversity

The majority of the proposal area would be in already disturbed areas. Biodiversity values of the proposal area are limited to those associated with heavily urbanised landscapes. The proposal was developed to firstly avoid and then reduce impact to vegetation. The design seeks to avoid removal of individual trees, particularly species identified as potential foraging trees for the grey-headed flying-fox listed as Vulnerable under the *NSW Biodiversity Conservation Act 2016*. The location of construction compound sites enables trees to be retained or transplanted (where possible). The proposal would remove 19 trees, and relocate nine trees and two artificial bird nesting boxes.

Three threatened species listed under the *NSW Biodiversity Conservation Act 2016* and one listed under the *Environment Protection and Biodiversity Conservation Act 1999* were found to have a moderate potential to occur within the study area, including the powerful owl (*Ninox strenua*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and grey-headed flying-fox (*Pteropus poliocephalus*).

The area where work would occur supports limited biodiversity values, and is used primarily as foraging habitat for highly mobile species adapted to urban environments. No significant impact is expected on any threatened species, populations or ecological communities.

## Soils and contamination

The majority of the site is paved, with the exception of a small landscaped area next to an outdoor exercise area in the northern section of the site between Upper Fort Street and the Sydney Harbour Bridge.

A preliminary site assessment concluded that the potential for encountering contaminated soil during the work is low. The potential for the proposal to contaminate soils or water in the proposal area and surrounds is negligible to low. Measures would be in place during the work to respond to any unexpected finds of contaminated soil or other materials.

## Justification and conclusion

The proposal has substantial benefits relating to improving safety and access for cyclists, pedestrians and motorists between the Kent Street cycleway and the Sydney Harbour Bridge cycleway. The proposal would also support future growth in cyclists travelling between the Sydney CBD and the Lower North Shore.

The concept design process has been instrumental in avoiding and/or reducing the severity of several potential environmental impacts to non-Aboriginal heritage, traffic and transport, landscape and visual, socio-economic, noise and vibration and biodiversity values. The safeguards and mitigation measures detailed in this REF would reduce the significance of the expected impacts.

The benefits of the proposal would outweigh the potential negative environmental impacts, which can be managed effectively with implementation of the safeguards proposed.

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# 1 Introduction

This chapter introduces the proposal and provides the context of the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

## 1.1 Proposal identification

Roads and Maritime Services NSW (Roads and Maritime) proposes to upgrade the existing cycleway facility between the Kent Street cycleway and the Sydney Harbour Bridge southern cycleway (the 'proposal').

Key features of the proposal would include:

- Provision of a dedicated bi-directional cycleway from the Kent Street cycleway to the Sydney Harbour Bridge cycleway with an effective width of 3m
- Upgrade of the existing pedestrian footpath from Kent Street to Fort Street Public School, with the width varying from 1.5m to 2.2m. Cyclists and pedestrians would be separated through delineation and contrasting surface treatments
- Provision of a 1.8m-wide pedestrian footpath on the eastern side of Upper Fort Street from Fort Street Public School to Watson Road
- Demolition of the existing shared use bridge over the Cahill Expressway and provision of a new pedestrian and cyclist bridge with improved width and sight lines
- Removal of existing pedestrian and cyclist ramp on the southern approach to the Cahill Expressway footbridge; and replacement with a new spiral ramp for cyclists and pedestrians with an improved gradient and an effective width of 4.5m
- Removal of a 60m section of existing concrete retaining wall adjacent to the Incident Response Area to accommodate the proposed new cycleway alignment; and construction of a 62m section of new concrete retaining wall with a maximum height of 4.5m between the proposed cycleway alignment and the Incident Response Area
- Modification of merge treatment between Kent Street and Clarence Street on-ramps from general lane change to a 'zipper' merge
- Reconfiguration of the existing outdoor exercise area at Observatory Hill to accommodate the proposed new cycleway alignment
- Ancillary works for construction including construction compounds
- Utility relocations, including water, sewer mains, telecommunication, electricity and gas services.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal area provided in Figure 1-2. Chapter 3 of this REF describes the proposal in more detail.

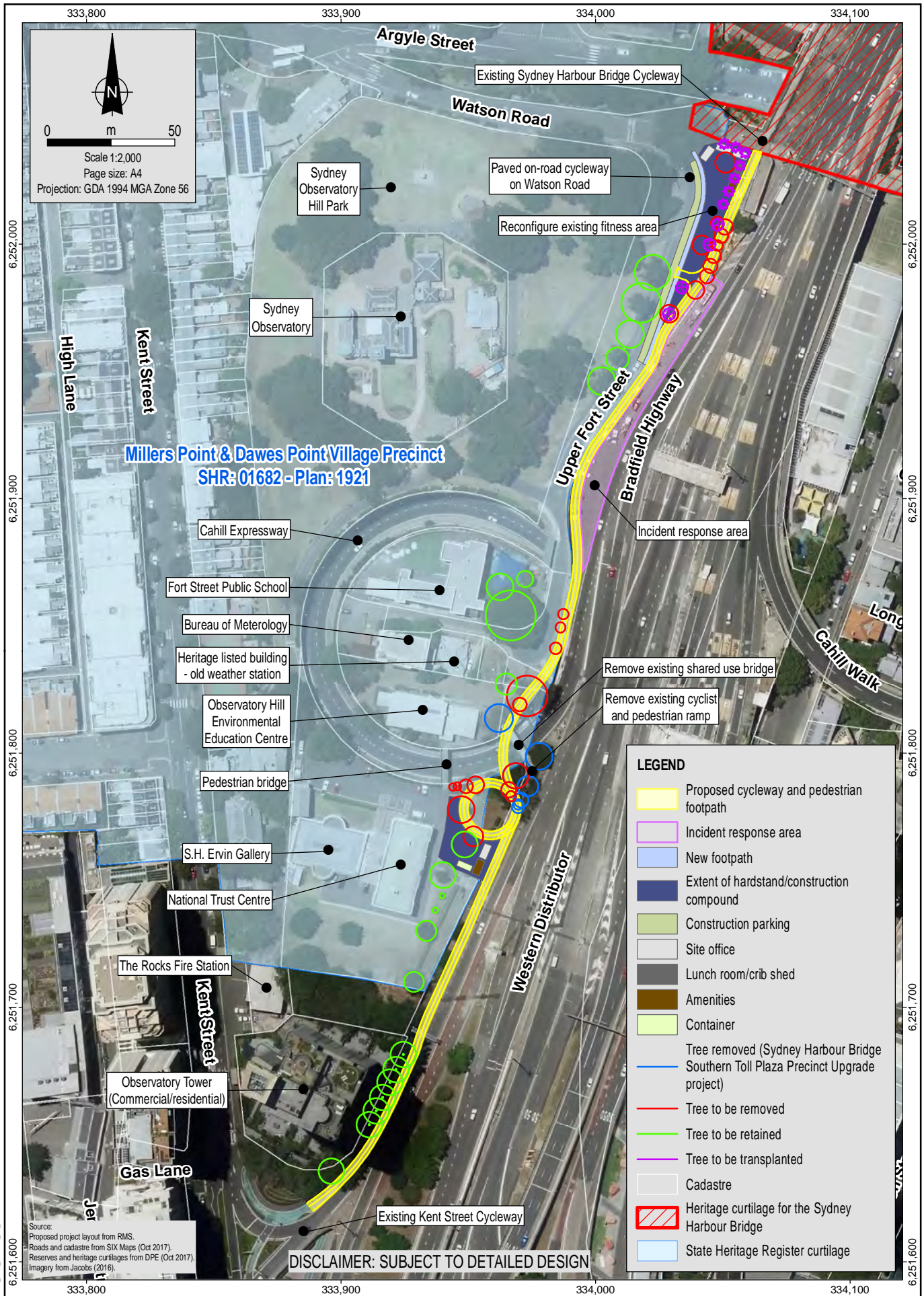
In 2013, Transport for NSW released the 'Sydney City Centre Access Strategy' which acknowledges the rapid rate of growth in cyclists travelling to and from the central business district (CBD). The plan envisions an integrated cycleway network within the city centre to support this growth and identifies the need for improvement works between the Kent Street cycleway and the Sydney Harbour Bridge cycleway. The plan also recognises that separating a cycleway from vehicles, buses and pedestrians provides safer and more direct access for cyclists. Encouraging cyclists to use dedicated routes effectively reduces the conflict between cyclists and other modes of transport.

The proposal aims to improve safety and access for cyclists and pedestrians and to cater for the projected future growth in cyclists travelling between the Sydney CBD and the Lower North Shore. The proposal is also being delivered as part of the Sydney Harbour Bridge access projects, which includes installing lifts on the north and south ends of the eastern walkway of the bridge to allow for access by people with disabilities, prams, or those who have difficulty climbing stairs.









MAD Reference: 3119AF1\_R01\_GIS02\_v0.4

The proposal area is located in the Roads and Maritime Sydney Region within the City of Sydney Local Government Area (LGA). The proposal area is bounded by the Observatory Hill precinct to the west (which includes the Observatory Hill parkland, Sydney Observatory, Fort Street Primary School and National Trust Centre/S.H. Ervin Gallery), and Upper Fort Street and the Bradfield Highway to the east. The Sydney Harbour Bridge and train line used for the T1 North Shore and Northern Line services are located to the north of the proposal area.

The Observatory Hill precinct, located to the east of the proposal, is part of the Millers Point and Dawes Point Village Precinct conservation area, listed as state-heritage (SHR:01682). The proposal would extend into the eastern boundary of the conservation area. The heritage curtilage for the Sydney Harbour Bridge is also located adjacent to the northern boundary of the proposal. The heritage curtilage is listed as national and state heritage.

The proposal is expected to commence in mid-2019 and be completed by early 2020, taking approximately 10 months to complete. The proposal would be funded under the NSW Government's Active Transport Program. Funding for construction is subject to final business case approval.

## 1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Coffey Services Australia Pty Ltd (Coffey) on behalf of Roads and Maritime's Greater Sydney Program Office. For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the proposal and associated environmental impacts have been undertaken in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *Biodiversity Conservation Act 2016*, *Fisheries Management Act 1994*, and Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

- Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared, and approval to be sought, from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the Biodiversity Conservation Act and/or Fisheries Management Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.



## 2 Need and options considered

This chapter describes the need for the proposal and the options that Roads and Maritime has considered in selecting the preferred option.

### 2.1 Strategic need for the proposal

The cycleway route is a critical link connecting the Sydney Harbour Bridge, Millers Point precinct and Kent Street cycleway, which in turn link into the Sydney CBD. Around 2,000 to 3,000 cyclist trips are taken on the Sydney Harbour Bridge cycleway every weekday, making it the busiest link in the Metro Sydney Bike Network.

In partnership with City of Sydney, the new cycleway would adjoin the southern end of the existing Sydney Harbour Bridge cycleway to create a purpose built connection to the cyclist network on Kent Street. The connection would alleviate the need for cyclists to share public roads and footpaths between the bridge and Kent Street.

The proposal is required to improve safety for cyclists, pedestrians and motorists and access for cyclists and pedestrians, and support future growth in the number of cyclists travelling between Sydney's CBD and the Lower North Shore. The cycleway would also provide a connection to Millers Point and Barangaroo Headland Park via Watson Road.

The proposal is part of a suite of projects that aim to make it easier for people to access and use the Sydney Harbour Bridge. Other proposals include upgrades of the bridge's northern cycle ramp and access lifts. This proposal is the planning stage of the southern cycleway which will be followed by the northern cycle ramp. Planning for the access lifts is also being conducted.

#### 2.1.1 Strategic planning and policy context

The following strategic planning and policy documents provide a framework and guidance for the delivery of the proposal:

- Sydney City Centre Access Strategy (Transport for NSW, 2013a)
- NSW Long Term Transport Master Plan (Transport for NSW, 2012)
- A Plan for Growing Sydney (NSW Government, 2014)
- Sydney's Cycling Future (Transport for NSW, 2013b)
- NSW Government Premier's Priorities (NSW Government, 2015)
- Sydney Harbour Bridge Conservation Management Plan (RTA, 2007).

These documents and their relevance to the proposal are discussed in this section.

#### ***Sydney City Centre Access Strategy***

The Sydney City Centre Access Strategy (Transport for NSW, 2013a) is NSW's first detailed plan showing how people will enter, exit and move in and around the CBD over the next 20 years. The strategy demonstrates how light rail, buses, trains, ferries, cars, taxis, pedestrians and cyclists will interact in the heart of Sydney and how different transport modes will work together in the city centre. The goal is to reduce congestion, provide for future growth and improve the customer experience.

The strategy also acknowledges the rapid rate of growth in cyclists travelling to and from the CBD, and envisions an integrated cycleway network within the city centre to support this growth. The proposed work is specifically mentioned within the strategy, which states that:

*Extending the existing bi-directional separated Kent Street cycleway to Liverpool Street and implementing related improvements through The Rocks to connect to the Harbour Bridge.*  
(Transport for NSW, 2013a)

The proposal would fulfil the objective to upgrade a section of the strategic cycleway network between Kent Street cycleway and the Sydney Harbour Bridge cycleway.

### **NSW Long Term Transport Master Plan**

The NSW Long Term Transport Master Plan outlines the framework for the NSW Government to deliver an integrated, modern transport system. The plan identifies the need for better access to, and within, the CBD and to provide transport to a growing CBD. A key aim of the plan is to invest in short- and long-term initiatives to support and grow cycling across Sydney.

The proposal would contribute to achieving the following actions identified within the plan:

- Action: 4.7.5 Continue to invest in the cycling network with a focus on dedicated cycling paths and pinch point improvements
- Action: 4.7.6: Design new links in off-road pathway networks that are able to provide walkers and cyclists with separated space where possible.

### **A Plan for Growing Sydney**

The Plan for Growing Sydney presents a clear strategy for accommodating Sydney's future population growth for the next 20 years. The plan provides key directions and actions to guide Sydney's productivity, environmental management, and liveability, including the delivery of housing, employment, infrastructure and open space.

The plan focuses on four set-down goals. Goals 3 and 4 are relevant to the proposal as follows:

- Goal 3: A great place to live with communities that are strong, healthy and well connected
- Goal 4: A sustainable and resilient city that protects the natural environment and has a balanced approach to the use of land and resources.

Specifically the proposal is aligned with the following direction within the plan:

- Direction 3.3: Create healthy built environments which focuses on encouraging healthy communities by providing separated footpaths and cycleways to safely connect people to destinations.

### **Sydney's Cycling Future**

Sydney's Cycling Future outlines how the bicycle network will be improved and the needs of bike riders built into the planning of new transport and infrastructure projects. The overarching goal is to make cycling a safe, convenient and enjoyable transport option for short trips.

The proposal is aligned with the second and third pillars contained in Sydney's Cycling Future – to make better use of existing infrastructure and to partner with councils to target missing links and problem intersections in local bicycle networks.

### **NSW Government Premier's Priorities**

To set the agenda for the NSW Government over the coming years, State Priorities were developed in September 2015. These priorities were developed to achieve the following outcomes across NSW:

- Grow the economy
- Deliver infrastructure
- Protect the vulnerable
- Improve health, education and public services.

Twelve Premier's priorities and 18 State priorities were developed. Specific priorities related to this proposal include building infrastructure and improving road travel reliability; comment on these is provided below.

The proposal contributes to achieving the following priority:

- **Improving road travel reliability.** This priority was developed to improve existing road infrastructure, develop infrastructure to address capacity issues and encourage the use of public and active transport.

Specifically, the proposal would work towards encouraging active transport travel through cycling between the Sydney CBD and Lower North Shore.

### ***Sydney Harbour Bridge Conservation Management Plan***

The Sydney Harbour Bridge Conservation Management Plan provides a framework for the bridge's ongoing care and management, including decisions about conservation, use and development. The plan also provides a reference for future applications for works to the bridge.

The plan outlines access opportunities that should be investigated for the southern Sydney Harbour Bridge cycleway including significant alterations to the existing southern ramp (too steep and narrow) and resolving the inherent dangers associated with cyclists and wheelchair users (and possibly their carers) sharing the cycleway. The plan also recognises opportunities to link with existing bike paths and footpaths within the City of Sydney Council and North Sydney Council areas. These additions to the existing infrastructure are preferred so that the impact on "*the integrity of the bridge's fabric and form can be minimised*" (RTA, 2007).

The proposal is consistent with the opportunities outlined within the plan, specifically to improve access to the Sydney Harbour Bridge while minimising the potential impacts on the bridge's heritage significance.

## **2.1.2 Crash/incident data**

Crash data report for the proposal area was obtained from RMS Network Sydney, for the period 1 January 2006 to 31 December 2015 (10 years). No crashes were reported involving cyclists or pedestrians from the Kent Street Cycleway to the Sydney Harbour Bridge Cycleway. A number of incidents involving cyclists and pedestrians did occur in Kent Street and Upper Fort Street in the same period. Many more incidents involving pedestrians and cyclists were reported in the surrounding area, highlighting the need for providing dedicated pedestrian footpaths and cycleways.

## **2.2 Existing infrastructure**

The existing cycleway from the southern end of the Sydney Harbour Bridge connects to Upper Fort Street. Recent cyclist counts conducted by Bitzios recorded around 1,500 cyclists using the shared path on a typical work day. Around 20 per cent of cyclists use the cycleway in peak periods, with approximately 350 cyclists recorded in both the morning and evening peak.

On Upper Fort Street, cyclists share the road in mixed traffic conditions, with no separation from pedestrians from alongside Observatory Hill Park to the front of the Fort Street Primary School. Limited access for vehicles (cars and buses) is available to the school and observatory (see Figure 1-2). This area is a particularly congested road environment between cyclists and vehicles during school drop-off which coincides with the morning peak cycleway traffic.

The Incident Response Area for the Sydney Harbour Bridge is accessed from Upper Fort Street via boom gates.



The Observatory Hill Environmental Education Centre is adjacent to Fort Street Public School (separated by an access road). The cycleway is separated by a fence and a tree. The Cahill Expressway is located beneath the cycleway on the other side of the cycleway railing. Both ends of the bridge contain a 90 degree corner bend where there is no line of sight in either direction. The grade of the access bridge is very steep on the southern approach to the bridge across the Cahill Expressway.

The cycleway continues as a shared path between Fort Street Public School and the Kent Street cycleway, including a 2.4m-wide bridge over the Cahill Expressway cutting. From here, a steep 3m-wide shared ramp (gradient of about 1:6) descends along the frontage of the National Trust Centre/S.H. Ervin Gallery to Kent Street.

## 2.3 Proposal objectives and development criteria

Urban design objectives and principles developed for this proposal have been determined in conjunction with relevant guidelines and policies. Roads and Maritime has also consulted with City of Sydney Council, Office of Environment and Heritage, Fort Street Public School, Sydney Observatory, the National Trust Centre/S.H. Ervin Gallery, Bureau of Meteorology, Australian Government Department of Environment and Energy and Sydney Trains.

The objectives of the proposal are consistent with the Sydney City Centre Access Strategy. The cycleway would contribute towards a fully integrated transport network in Sydney's city centre. The proposal also actions one of the specific opportunities mentioned within the strategy as discussed in Section 2.1.1.

### 2.2.1 Proposal objectives

The objectives of the proposal are to:

- Improve safety for cyclists, pedestrians and motorists
- Improve access for cyclists and pedestrians between the Sydney Harbour Bridge southern approach and the Sydney CBD
- Support future growth in cyclists travelling between the Sydney CBD and the Lower North Shore
- Provide a cycleway facility that sensitively fits in with the existing heritage precinct.

Supporting objectives are to:

- Minimise impacts to the community
- Minimise impacts to the natural and built environments
- Provide a cost-effective solution.

### 2.2.2 Development criteria

The development criteria for the proposal are to (Figure 2-1):

- Address shared path conflicts by providing separation between cyclists, pedestrians and vehicles, including conflicts between Fort Street Public School drop-off traffic and the cycle route, wherever feasible
- Retaining the existing frontage to the National Trust Centre/S.H. Ervin Gallery
- Address the bridge crossing over Cahill Expressway
- Utilise space becoming available due to tollbooth removal and realignment of the Incident Response Area
- Protect and complement Observatory Hill Park.

### 2.2.3 Urban design objectives

Urban design objectives for the proposal are to:

- Provide a safe experience for all user groups including cyclists, pedestrians and motorists

- Be integrated with the adjoining heritage precinct and buildings
- Be integrated with adjoining broader active transport network
- Minimise impacts to the broader transport network both during construction and operation.

Further information on the design objectives can be found in Appendix A.



**Figure 2-1: Development criteria for the proposal (Source: Tract, 2016)**

## 2.3 Alternatives and options considered

Upgrade work (currently underway) for the Sydney Harbour Bridge Southern Toll Plaza Precinct by Roads and Maritime will realign existing traffic lanes on the Bradfield Highway. The area being freed up by these works was identified by Roads and Maritime and the City of Sydney as an opportunity to provide a separated cycleway from the Sydney Harbour Bridge cycleway to Kent Street cycleway.

The City of Sydney and Group GSA developed a concept design for the area in 2015 with a preferred alignment for a new bi-directional separated cycleway alongside Upper Fort Street and the Bradfield Highway. The design aimed to maintain the existing functionality and amenity for pedestrians, the current uses of Observatory Hill Park and the essential traffic operations of Upper Fort Street, as well as the Bradfield Highway. This process was documented in the *Feasibility and Concept Design Report* (City of Sydney, 2015).

The majority of the proposed cycleway is situated on Roads and Maritime land. Discussions with the City of Sydney in late 2016 led to an agreement that Roads and Maritime would be the proponent for the remaining planning and delivery phases of the proposal as well as the asset owner following completion.

### 2.3.1 Methodology for selection of preferred option

The concept design plan (City of Sydney, 2015) divided the proposal area into sections (later consolidated into four 'precincts') to identify development options. The five sections are shown in Figure 2-2 and included:

- Section 1 - Harbour Bridge
- Section 2 - Upper Fort Street
- Section 3 - Fort Street Public School
- Section 4 - Cahill Expressway Overpass
- Section 5 - S.H. Ervin Gallery to Kent Street.

The consolidated four precincts are shown in Figure 2-3 and included:

- Precinct 1 - Harbour Bridge Link and Incident Response Area
- Precinct 2 - Fort Street Public School and Incident Response Area
- Precinct 3 - Cahill Expressway Overpass
- Precinct 4 - National Trust Centre/S.H. Ervin Gallery to Kent Street.

A strategic assessment of the different options for each section was carried out against the nine aspects to identify the preferred option. The aspects directly relate to the core project objectives of improving safety and providing a cycleway facility that fits sensitively with the existing heritage precinct. The aspects were:

- Cost
- Approvals
- Land ownership
- Construction time
- Heritage impacts
- Tree impacts
- Parking
- Safety
- Built form integration.

No weighting was applied to the aspects in the preliminary options assessment. Each option was assessed on its potential level of impact (using a rating of positive, negligible, low, medium or high) for each aspect. The option assessed as having the least overall impact was selected as the preferred option.





**Figure 2-2: Location of the five sections within the proposal area**





**Figure 2-3: Location of the four precincts within the proposal area**

## 2.3.2 Identified options

Several options were developed for each of the five sections, as listed below. The preferred option following the strategic assessment is highlighted in bold text and indicated by a '(P)', if applicable, alternative options are indicated by '(A)'. Refer to Appendix L for the options testing process undertaken by City of Sydney and Group GSA.

### Section 1 - Harbour Bridge

- 1a. Retain existing entry ramp ('do minimal' option)
- 1b. New ramp, above door and connection to Upper Fort Street
- 1c. Elevated, above door and connection to Upper Fort Street (and excavation)
- 1d. Elevated, above door and no connection to Upper Fort Street (P)**

### Section 2 – Upper Fort Street

- 2a. At grade and lose parking
- 2b. At grade and move roadway
- 2c. Elevated and cut into Bradfield Highway
- 2d. Elevated and no cut into Bradfield Highway (P)**

### Section 3 – Fort Street Public School

- 3a. Retain road and cantilever footpath and cycleway ('do minimal' option)
- 3b. Widen road and new wall to minimum
- 3c. Widen road, new wall and new green space (P)**

### Section 4 – Cahill Expressway Overpass

- 4a. Retain bridge and new approach
- 4b. New bridge and possible new ramp down
- 4c. New bridge and new ramp down (to S. H. Ervin Gallery frontage)
- 4d. New bridge and circular down ramp
- 4e. New bridge, spiral down ramp and pedestrians on inside
- 4f. New bridge, spiral down ramp, pedestrians on outside and minimal overlap
- 4g. New bridge, S-curve and no overlap
- 4h. New bridge, spiral down ramp (different design to 4f), pedestrians on outside and minimal overlap
- 4i. New bridge, hairpin turn and landscape solution
- 4j. New bridge and spiral down ramp (P)**
- 4k. New bridge and straight down ramp (A)

### Section 5 – National Trust Centre/S.H. Ervin Gallery to Kent Street

- 5a. Rebuild roadway edges and retain traffic lane widths
- 5b. Retain roadway edges and reduce lane widths (P)**

The initial preferred option developed by City of Sydney and Group GSA performed best against other the options considered, including the 'do minimal option' as it would:

- Feature a gentler gradient from the Sydney Harbour Bridge portal to the Incident Response Area (Precinct 1)
- Have no impact on parking on Upper Fort Street (Precinct 2)
- Effectively utilise the additional space created on the western edge of the Incident Response Area as a result of realignment of the traffic lanes on the Bradfield Highway (under the Sydney Harbour Bridge Southern Toll Plaza Precinct Upgrade project) (Precinct 2)
- Achieve a maximum gradient of 1 in 20 in Precinct 3 (from the frontage of the National Trust Centre/S.H. Ervin Gallery to Fort Street Public School), in accordance with AustRoads guidelines for design of bicycle paths
- Require less civil works and disruption to traffic in Precinct 4.

Roads and Maritime held value management and value engineering workshops on 7 November 2016 and 10 March 2017 to progress the options identification process with key stakeholders, building on the options investigated by City of Sydney and Group GSA.

Key recommendations from the first workshop on 7 November 2016 included:

- Further review was required for Precinct 1 (Sydney Harbour Bridge link to Incident Response Area) on how the proposed cycleway would transition from Observatory Hill to being adjacent to the Bradfield Highway
- Further review was required for Precinct 3 (Cyclist and pedestrian bridge over the Cahill Expressway including approach ramps) to test whether the overall length of elevated sections could be reduced.

Following the workshop, Roads and Maritime, City of Sydney and Tract Consultants carried out further investigations to address the recommendations. The key outcome was an alternative alignment for the proposed cyclist and pedestrian bridge over the Cahill Expressway, including approach ramps.

The alternative alignment for the new cyclist and pedestrian bridge would be located further to the west to minimise the difference in height between the Cahill Expressway crossing and the tie-in point along the existing path in front of the National Trust Centre/S.H. Ervin Gallery. This change marginally reduced the height and length of the proposed elevated spiral ramp. The alternative alignment also featured a circular spiral ramp on the southern side with a compliant horizontal curve radius, in accordance with Austroads design guidelines. This option provides a reduced setback distance from the main view corridor of the National Trust Centre/S.H. Ervin Gallery.

A second workshop was held on 10 March 2017 with a similar group of stakeholders. Key outcomes and recommendations from this workshop included:

- Participants generally agreed that the alternative option for the Cahill Expressway bridge and approaches developed by Tract Consultants was an improvement on the earlier concept developed by Group GSA
- Participants expressed a preference for the 'elevated option' from the Sydney Harbour Bridge portal to the Incident Response area. The workshop agreed that potential impacts of 'elevated' and 'on-grade' (at ground level) options needed to be more fully identified, in particular potential impacts to the Incident Response Area and Upper Fort Street.

## 2.4 Preferred option

The preferred option for the proposal was modified following the second value engineering workshop to include:

- An elevated cycleway connecting from the entrance portal to Sydney Harbour Bridge cycleway to the Incident Response Area
- Widening of the existing pinch point on Upper Fort Street
- A new retaining wall facing the Bradfield Highway near the Cahill Expressway cutting
- A new pedestrian/cyclist bridge over the Cahill Expressway and a spiral ramp (as per Tract's design)
- Retaining of the eastern roadway edge on the Kent Street and Clarence Street on-ramps to the Bradfield Highway.

This preferred option would satisfy the proposal's objectives. The separated cycleway would improve safety for cyclists, pedestrians and motorists by removing significant 'conflict' points and providing upgraded signage, safer surfaces and clear signage. The improved gradients along the cycleway would also facilitate greater access and use. Future growth in cyclists travelling between the Sydney CBD and the Lower North Shore would be supported through providing a design option that clearly caters for cyclists and provides good connections to other parts of the Sydney cycle network. Finally, the design has been developed to fit into the existing heritage precinct as sensitively as possible, through use of sympathetic materials and a slender profile.



## 2.5 Design refinements

Further design refinements (building on the preferred option in the City of Sydney concept design) have been developed by Tract Consultants (2017). The revised design is largely similar to the preferred options identified in the concept design. The main refinements are described below.

### 2.5.1 Precinct 1 – Sydney Harbour Bridge link and Incident Response Area

The preferred option has been amended from an elevated cycleway to 'on-grade' cycleway. The elevated cycleway would have created a 'sag' curve at the portal opening to the Sydney Harbour Bridge cycleway. The portal is narrower than the adjoining cycleway sections and was assessed as a significant safety risk for cyclists travelling in opposing directions. Accordingly, the design team investigated an alternative option to eliminate or mitigate this risk.

A new preferred option in Precinct 1 was developed which includes an 'on-grade' cycleway from the portal to the Incident Response Area. The on-grade cycleway would require excavating into the Incident Response Area to achieve compliant gradients. A 60-m-long section of retaining wall adjacent to the Incident Response Area would need to be removed to accommodate the proposal. A new retaining wall would be constructed 4m east of the existing wall.

### 2.5.2 Precinct 2 – Upper Fort Street pinch point

The width and alignment of Upper Fort Street was changed when the southern toll plaza was constructed and the Incident Response Area created in 1957. This change created a 'pinch point' on Upper Fort Street with a road width of only 3m near the Cahill Expressway cutting. The early concept design for the proposal, prepared by the City of Sydney, included a widening of Upper Fort Street to provide a consistent road width of 6m. The significant civil works required to construct the cycleway were seen as an opportunity to remove the pinch point and alleviate congestion in this location, particularly during school drop-off and pick-up times.

The design team later reassessed the benefit of the widening in light of the larger redevelopment of Fort Street Public School planned by the Department of Education. The department has acquired parcels of land, including this section of the road, and is currently developing designs which may change requirements for vehicle access. Hence, the preferred option was amended to retain the existing road geometry on Upper Fort Street. Retaining the pinch point would also reduce the impact of the proposal on the Incident Response Area.

### 2.5.3 Precinct 3 – Cyclist and pedestrian bridge over the Cahill Expressway

The development of the design for the bridge and elevated approach ramp drew on other similar or relevant projects and bridge forms. Following a review by Tract Consultants, several options were considered for the design of the bridge over the Cahill Expressway and the southern approach ramp to the bridge including:

- Option 1: Standard Roads and Maritime pedestrian bridge design with a steel arch and truss with post and tie beams supporting a roof structure
- Option 2a and b: Steel box truss, closed and open options
- Option 3: Traditional T-beam (pre-stressed concrete) or concrete box girder to support the bridge deck
- Option 4: Steel box girder to support the bridge deck.
- Option 5: Cable stay, where one or more towers support the bridge deck with cables running from the tower to the deck
- Option 6: Architectural feature bridge to meet particular site constraint, for example a steel beam with a cantilevered structure.



Further details of these bridge options are provided in Appendix A.

The options were assessed against several design parameters which included:

- The aesthetics of the proposed structure including physical limitations such as depth of structure and span, flexibility of form, and any legislative constraints related to the heritage values of the proposal area and surrounds
- How easily the bridge could be constructed considering the location and space available for assembly, transport of material and equipment, and the limitations of working over the Cahill Expressway
- Cost, in particular the value offered by variation of the bridge form.

Option 6 was chosen as the preferred bridge design as it provides flexibility to address the specific constraints of the site, can be prefabricated offsite and transported in different sections, and would be aesthetically pleasing, with a more slender and lightweight form. This option also provides a constant grade and smooth transition between the bridge and its approaches.

## 2.5.4 Alternative route options considered for the dedicated cycleway

Roads and Maritime, City of Sydney and National Trust of Australia held discussions in early 2017 on possible alternative alignments for the dedicated cycleway from Sydney Harbour Bridge to Kent Street. Two routes were suggested by the National Trust of Australia:

- **Route A:** Provision of a new dedicated cycleway from the Sydney Harbour Bridge cycleway via Watson Road, Argyle Street, and Kent Street to connect to the Kent Street cycleway
- **Route B:** Construction of a cantilevered cycleway along the Bradfield Highway cutting.

Roads and Maritime and City of Sydney undertook preliminary investigations to assess the feasibility of these options and found that:

### Route A:

- Riders would generally take the shortest route and unless the existing footbridge (and pedestrian access) was removed completely, riders would continue to use it with the existing conflict between school students, their parents and other pedestrians would remain
- Watson Road is very steep (1:12 to 1:15 gradient) and not wide enough to provide a separated cycleway
- A separated cycleway along Kent Street would have a significant impact on parking and the occupants of the terrace houses on the eastern side of Kent Street which have no rear lane access.

### Route B:

- Three conflict points between cyclists and pedestrians were identified along the length of the proposed route. This option was not considered further given that the primary project objective is to improve safety for all road users (pedestrians, cyclists and motorists).

These two alternative route options were not considered for further design development.

## 3 Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the proposed construction method and associated infrastructure and activities.

### 3.1 The proposal

Roads and Maritime proposes to upgrade the existing cycleway between the Kent Street cycleway and the Sydney Harbour Bridge southern cycleway. The proposal is shown in Figure 1-2 and is defined as all areas potentially disturbed by proposal activities including the physical footprint of the proposed cycleway upgrades, including the replacement pedestrian/cyclist bridge and ramp.

The study area for this REF generally encompassed an area about 50m from either side of the centre of the proposal footprint. The actual study area was specific to each specialist study carried out (refer to Chapter 6).

Key features of the proposal would include:

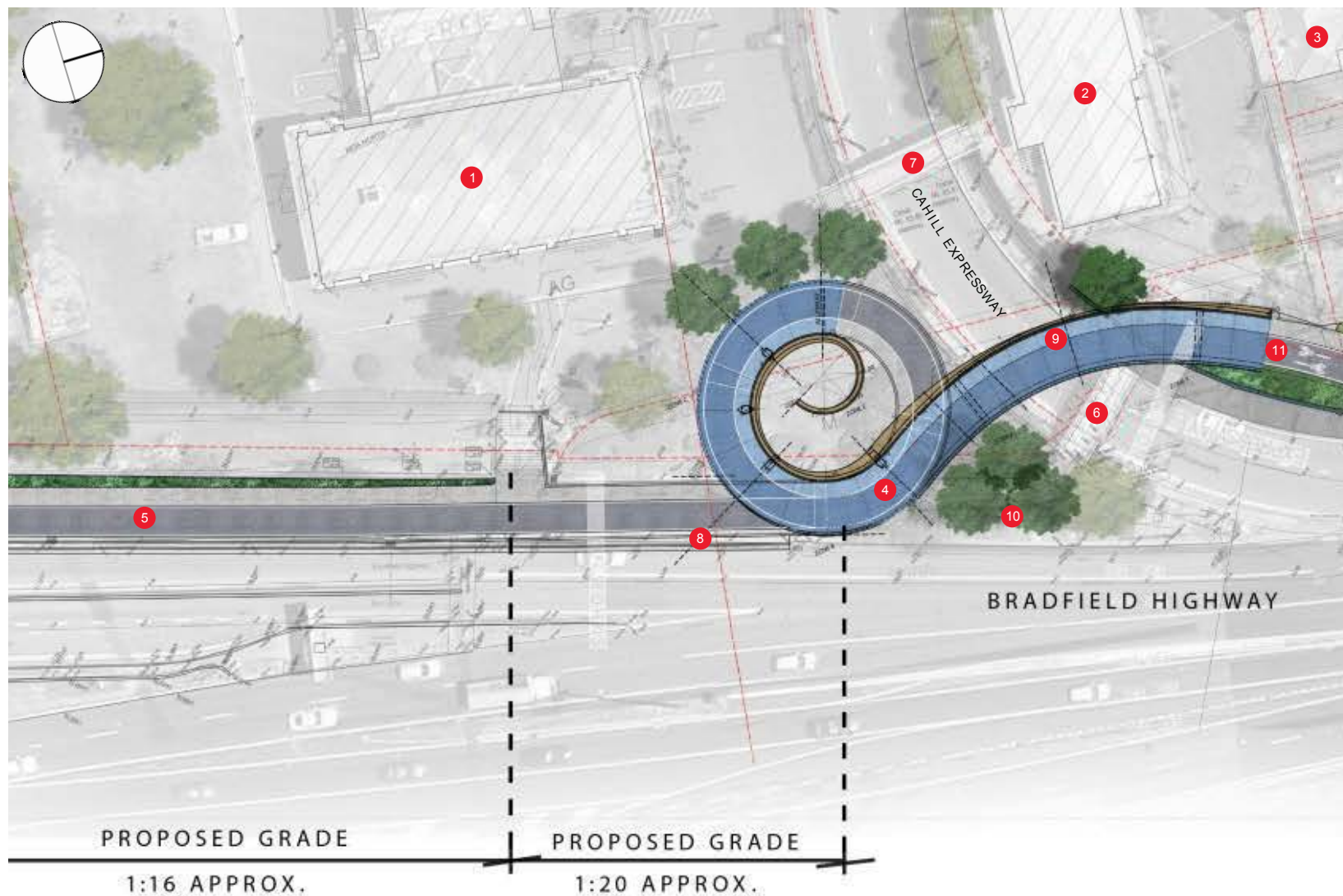
- Provision of a dedicated bi-directional cycleway from the Kent Street cycleway to the Sydney Harbour Bridge cycleway with an effective width of 3m
- Upgrade of the existing pedestrian footpath from Kent Street to Fort Street Public School, with the width varying from 1.5m to 2.2m. Cyclists and pedestrians would be separated through delineation and contrasting surface treatments
- Provision of a 1.8m-wide pedestrian footpath from Fort Street Public School to Watson Road
- Demolition of the existing shared use bridge over the Cahill Expressway and provision of a new pedestrian and cyclist bridge with improved width and sight lines
- Removal of existing pedestrian and cyclist ramp on the southern approach to the Cahill Expressway footbridge; and replacement with a new spiral ramp for cyclists and pedestrians with an improved gradient and an effective width of 4.5m
- Removal of a 60m section of existing concrete retaining wall adjacent to the Incident Response Area to accommodate the proposed new cycleway alignment; and construction of a 62m section of new concrete retaining wall with a maximum height of 4.5m between the proposed cycleway alignment and the Incident Response Area
- Modification of merge treatment between Kent Street and Clarence Street on-ramps from general lane change to a 'zipper' merge
- Reconfiguration of the existing outdoor exercise area at Observatory Hill to accommodate the proposed new cycleway alignment
- Ancillary works for construction including construction compounds
- Utility relocations, including water, sewer mains, telecommunication, electricity and gas services.

Details of the proposal design are shown in figures 3-1 to 3-3. Figure 3-1 illustrates the southern section of the proposal from Kent Street north to the approach ramp and pedestrian/cyclist bridge over the Cahill Expressway. Figure 3-2 provides details of the ramp and bridge and Figure 3-3 illustrates the northern section of the cycleway to the portal on the Sydney Harbour Bridge.

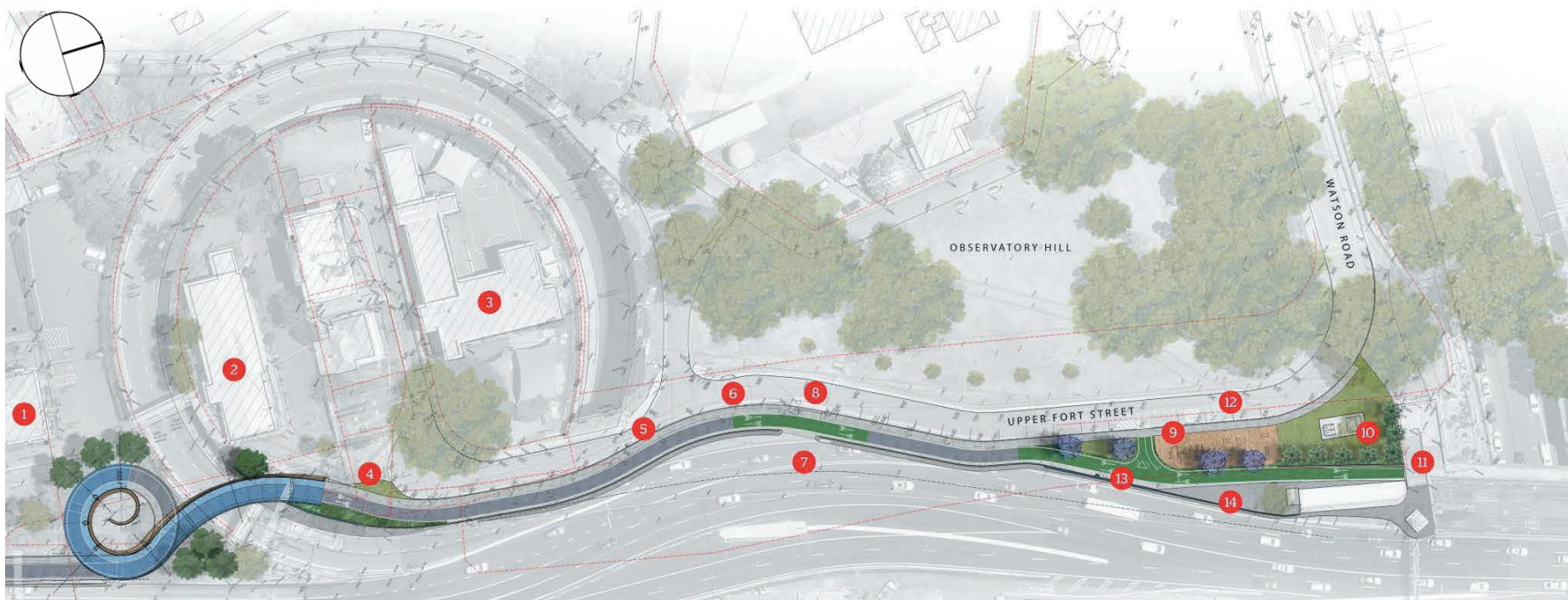
Construction of the proposal is expected to commence in mid-2019 and be completed by early 2020, taking approximately 10 months to complete. The work would be carried out in stages to coincide with scheduling of routine maintenance activities where possible. Site compounds to be used during construction would be located in the outdoor gym area in Precinct 1 and on the frontage to the National Trust Centre/S.H. Ervin Gallery (see Figure 1-2).







- |                        |  |   |   |   |                                |
|------------------------|--|---|---|---|--------------------------------|
| 1 S.H ERVIN GALLERY    | 3 FORT STREET PUBLIC SCHOOL                        | 5 NEW 1.8M WIDE PEDESTRIAN PATH + 3M WIDE SEPARATED CYCLEWAY                          | 7 EXISTING PEDESTRIAN BRIDGE TO BE RETAINED       | 9 NEW 3M CYCLEWAY + 1.5M PEDESTRIAN BRIDGE OVER CAHILL EXP. | 11 ELEVATED BRIDGE MEETS GRADE |
| 2 OBSERVATORY HILL EEC | 4 3M WIDE ELEVATED CYCLEWAY + 1.5M PEDESTRIAN PATH | 6 EXISTING FOOTBRIDGE TO BE REMOVED AND REPLACED WITH A NEW CYCLIST/PEDESTRIAN BRIDGE | 8 NEW KERB HOB WALL + SAFETY FENCE (1M CLEARANCE) | 10 NEW LANDSCAPE PLANTING                                   |                                |



- |                                   |   |  |  |
|-----------------------------------|---|--|--|
| 1 S.H. ERVIN GALLERY              | 5 UPPER FORT STREET ALIGNMENT RETAINED  | 9 EXISTING FITNESS AREA RECONFIGURED TO SUIT                               | 13 SECTION OF EXISTING RETAINING WALL REMOVED TO ALLOW CYCLEWAY ALIGNMENT  |
| 2 OBSERVATORY HILL EEC            | 6 NEW PEDESTRIAN RAMPS TO CONNECT TO WESTERN FOOTPATH   | 10 PROPOSED AMENITIES BLOCK BY CITY OF SYDNEY COUNCIL (FINAL LOCATION TBC) | 14 EXISTING SERVICE DOORS. PATH ALIGNMENT TO MEET DOOR COVER TO RETAIN ACCESS. WARNING SIGNAGE LIGHTING TO BE IMPROVED |
| 3 FORT STREET PUBLIC SCHOOL       | 7 SLIDING BOOM GATE RELOCATED FORWARD TO ALLOW FOR CYCLEWAY ALIGNMENT. EMERGENCY INCIDENT RESPONSE AREA | 11 RAMP CONNECTION TO EXISTING ARCH ENTRY TO SYDNEY HARBOUR BRIDGE         |  |
| 4 PEDESTRIAN CONNECTION TO SCHOOL | 8 WARNING + CYCLEWAY SAFETY SIGNS AT BOOM GATE INTERSECTION   | 12 EXISTING ROAD + PARKING RETAINED  |  |

## 3.2 Design

The proposal design is described below and would be further refined during detailed design.

### 3.2.1 Design criteria

The design for the proposal has been developed using the following guidelines and standards:

- Austroads Guide to Road Design - Part 6A: Paths for Walking and Cycling (Austroads, 2017)
- RMS Supplement to AS 1742, version 2.4 (RMS, 2016a)
- NSW Bicycle Guidelines (RTA, 2005)
- AS 5100 Bridge Design (Standards Australia, 2007)
- Roads and Maritime Bridge Technical Directions (RMS, undated)
- Roads and Maritime Services Beyond the Pavement: Urban Design Policy, Procedures, and Design Principles (RMS, 2014a)
- Roads and Maritime Services Bridge Aesthetics - Design Guidelines to improve the appearance of bridges in NSW (RMS, 2012).

The adopted design criteria for the proposal are set out in Table 3-1, with further detail provided in the following sections. Design features and cross-sections of the proposal are shown in figures 3-4 to 3-7.

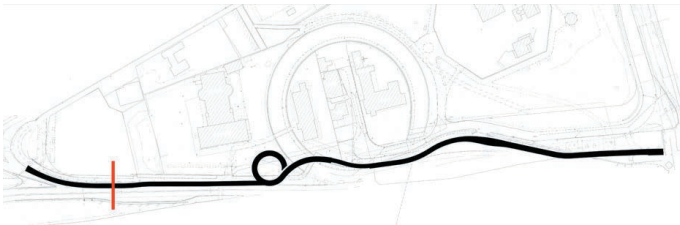
**Table 3-1: Design criteria for the proposal**

Design Criteria	
<b>Bicycle path</b>	
Effective path width	<ul style="list-style-type: none"> <li>• 3.0m desirable minimum (1.5m in each direction).</li> </ul>
Offset from obstructions	<ul style="list-style-type: none"> <li>• 1.0m desirable, 0.5m minimum.</li> </ul>
Grades	<ul style="list-style-type: none"> <li>• The existing gradient of 1:16 would be retained from Kent Street to the base of the National Trust Centre/S.H. Ervin stairs due to existing topography. This section of the proposal does not comply with Austroads Guide to Road Design Part 6A</li> <li>• Maximum 1:20 gradient from the proposed spiral approach ramp to the Sydney Harbour Bridge cycleway connection.</li> </ul>
Radius of horizontal curves	<ul style="list-style-type: none"> <li>• Minimum 10m at 20km/hr design speed.</li> </ul>
Layout	<ul style="list-style-type: none"> <li>• Separated with clear delineation of use through signage, line marking and contrasting surface treatments where applicable.</li> </ul>
<b>Pedestrian path</b>	
Effective path width	<ul style="list-style-type: none"> <li>• 2.0m desirable, 1.5m minimum.</li> </ul>
Grades	<ul style="list-style-type: none"> <li>• The existing gradient of 1:16 would be retained from Kent Street to the base of the National Trust Centre/S.H. Ervin stairs due to existing topography</li> <li>• Maximum 1:20 gradient from the proposed spiral approach ramp to Upper Fort Street.</li> </ul>
Continuity	<ul style="list-style-type: none"> <li>• Provide safe pedestrian access to destinations and connects to the existing network</li> <li>• Minimise the need for pedestrians to cross roads.</li> </ul>

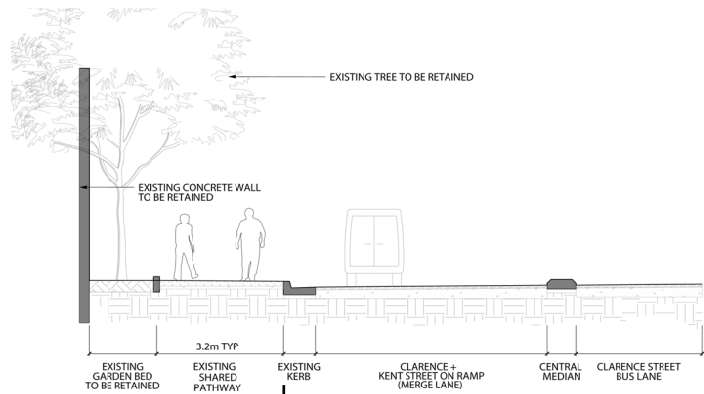
Design Criteria	
Priority	<ul style="list-style-type: none"> <li>In accordance with City of Sydney policy, pedestrians must have priority where cycle and pedestrian movements cross.</li> </ul>
Bridge	
Clearance	<ul style="list-style-type: none"> <li>Minimum vertical clearance of 5.5m between Cahill Expressway and underside of the bridge.</li> </ul>
Safety	<ul style="list-style-type: none"> <li>Safety screen required in accordance with RMS Bridge Technical Direction BTD 2012/01</li> <li>Cycle barrier rail at 1.4m height.</li> </ul>
Bridge approach ramp	
Clearance	<ul style="list-style-type: none"> <li>2.7m overhead clearance for cycle paths</li> <li>2.4m overhead clearance for pedestrian paths.</li> </ul>
Safety	<ul style="list-style-type: none"> <li>Cycle barrier rail at 1.4m height</li> <li>Handrail required along pedestrian path</li> <li>Minimum 1.2m high balustrade to pedestrian areas to bridge and ramp.</li> </ul>



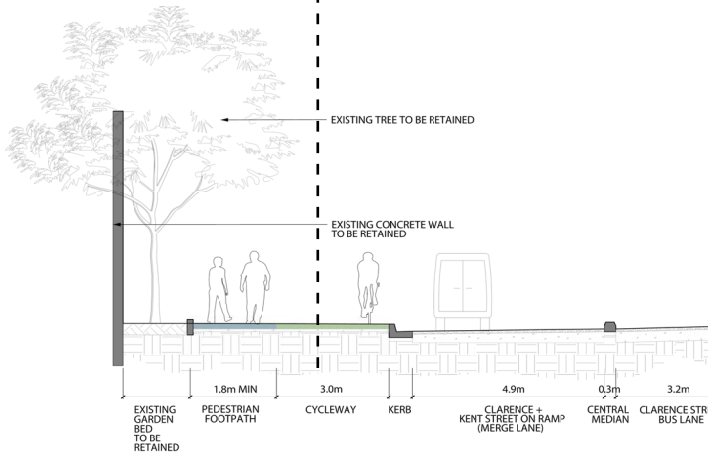
Existing Site Condition



Existing



Proposed



AIReference: 3119AF1\_02\_GRA004.a2

Section indicative only  
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Date:  
17.10.2017  
Project:  
ENAU RHOD03119AF1  
File Name:  
3119AF1\_01\_F03-4\_GRA

NSW Roads and Maritime Services  
SHB Southern Cycleway REF



Transport  
Roads & Maritime  
Services

Cross-section of the existing and  
proposed upgrades to  
southern end of Kent Street approach

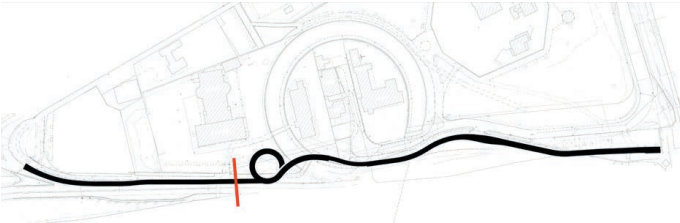
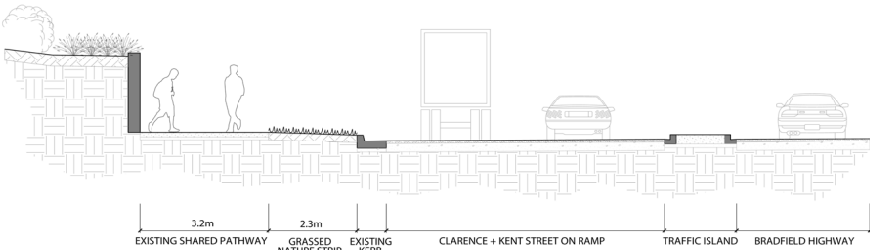
Figure No:  
**3-4**



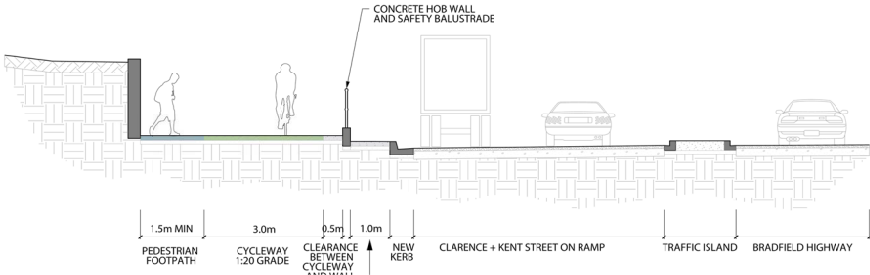
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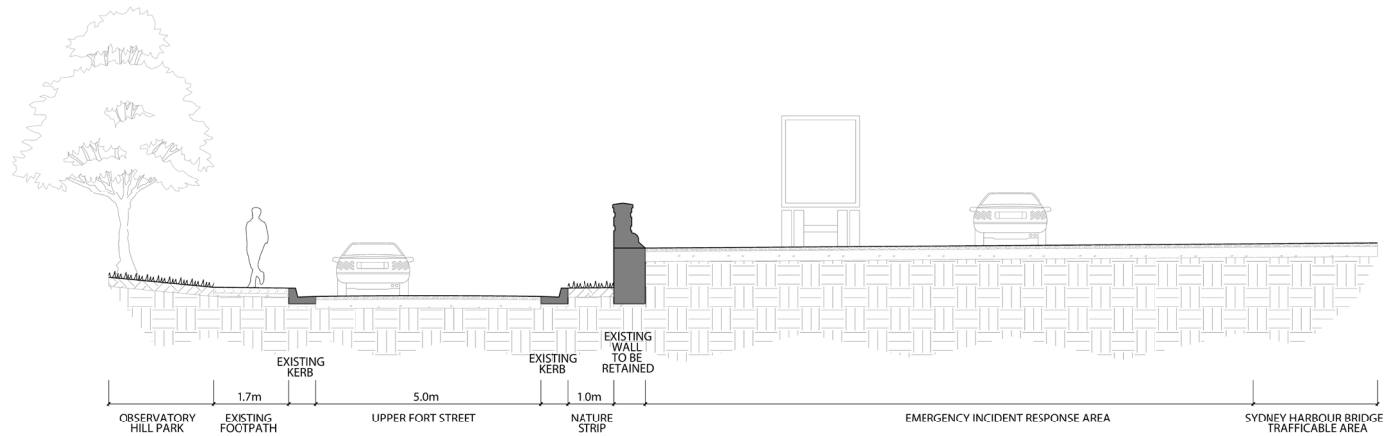
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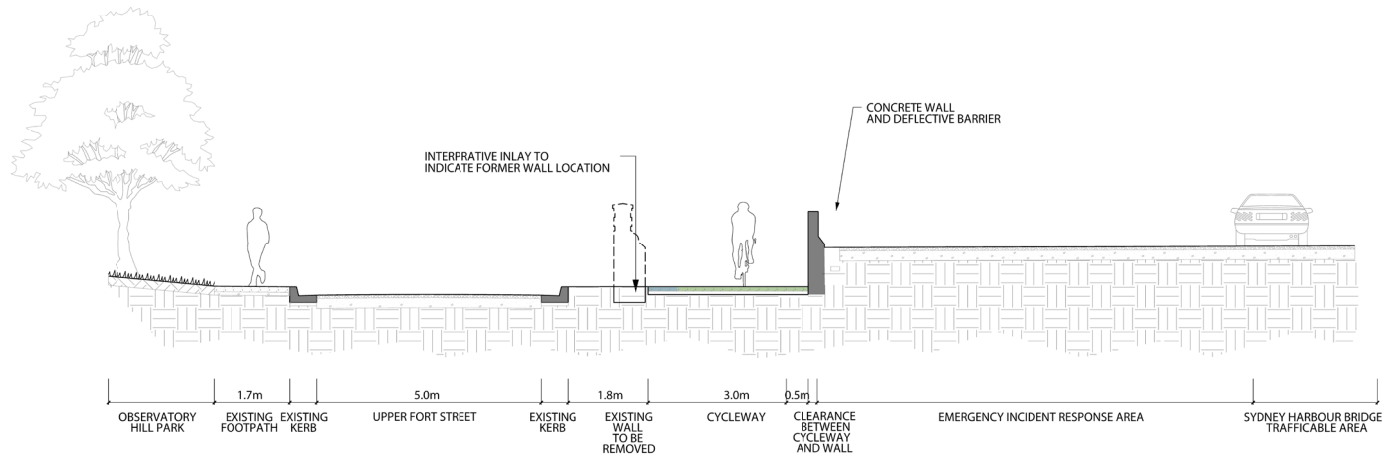
Proposed



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Project:  
ENAU RHOD03119AF1  
File Name:  
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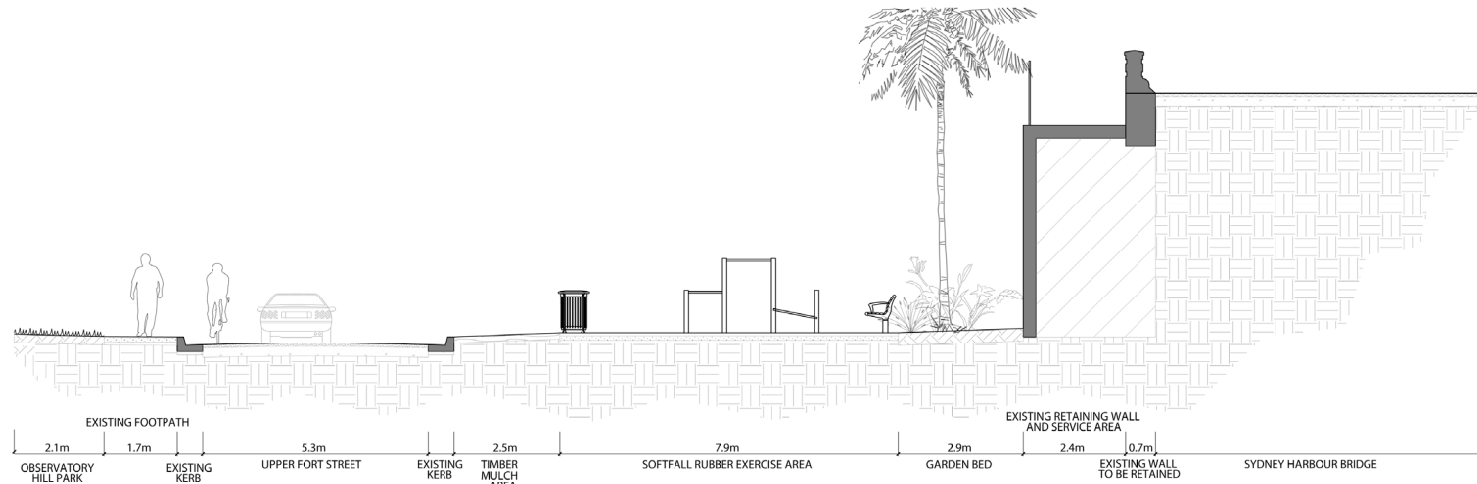
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**Transport**  
Roads & Maritime  
Services  
**NSW**  
GOVERNMENT

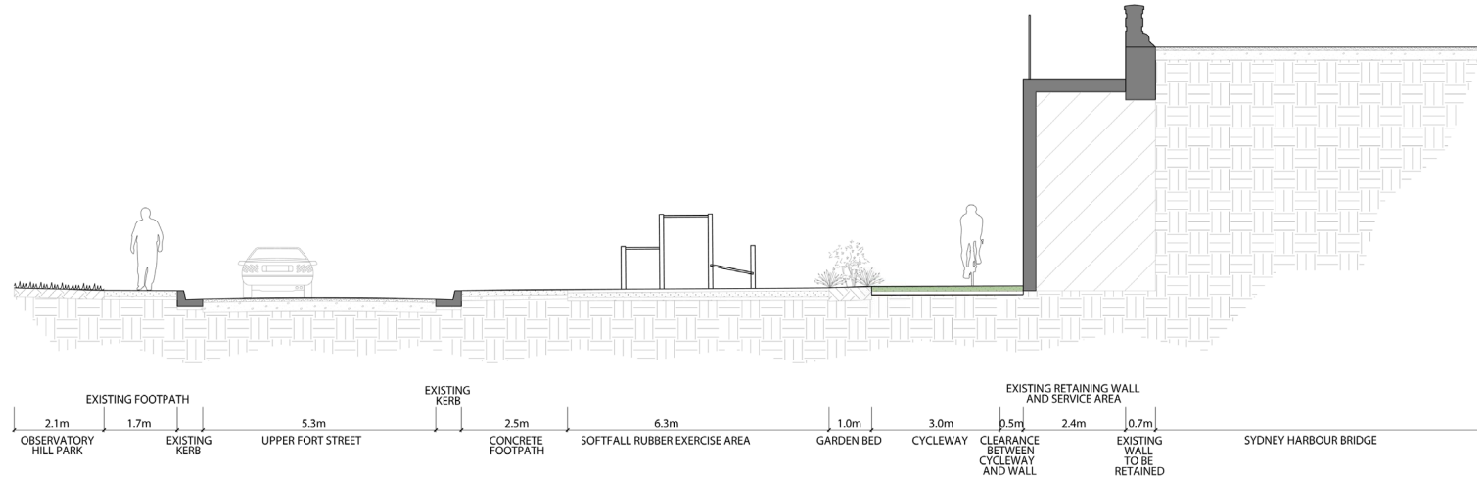
Cross-section of the existing and proposed  
cycleway on Upper Fort Street, adjacent to  
the Incident Response Area

Figure No:  
**3-6**

Existing



Proposed



Section indicative only  
**Tract**



Date:  
20.04.2017  
Project:  
ENAU RHOD03119AF1  
File Name:  
3119AF1\_01\_F03-7\_GRA

NSW Roads and Maritime Services  
SHB Southern Cycleway REF



Transport  
Roads & Maritime  
Services

Cross-section of the existing and proposed  
cycleway on Upper Fort Street, adjacent to  
the outdoor exercise area

Figure No:  
**3-7**

## 3.2.2 Engineering constraints

Roads and Maritime has identified a number of engineering constraints for designing and building the proposal, as shown in Table 3-2. These constraints have informed the design process.

**Table 3-2: Main engineering constraints for the proposal**

Constraint	Description
Natural features - topography	<ul style="list-style-type: none"><li>Varied topography within the study area (including the adjacent Bradfield Highway and the Cahill Expressway cutting) and the need to stay with minimum horizontal radii (i.e. sharpness of bends) and not exceed maximum gradients for the cycleway.</li></ul>
Environmental	<ul style="list-style-type: none"><li>Location of several heritage buildings and other features in the proposal area including:<ul style="list-style-type: none"><li>Millers Point and Dawes Point Conservation Area (C35) and the National Trust Centre/S.H. Ervin Gallery, Bureau of Meteorology, Sydney Observatory Hill Park and Fort Street Primary School</li><li>Existing retaining wall between Upper Fort Street and the Incident Response Area built in the 1970s as part of the upgrade of the southern side of the Sydney Harbour Bridge</li><li>Sydney Trains railway tunnel emergency exit door located along the Sydney Harbour Bridge approach wall</li><li>Outdoor exercise area between the Sydney Harbour Bridge approach wall and Upper Fort Street</li><li>National and state heritage curtilages for the Sydney Harbour Bridge</li><li>Trees listed on the City of Sydney's <i>Register of Significant Trees</i> (2013)</li></ul></li><li>Important view lines, of visual and heritage significance within the proposal area.</li></ul>
Road corridor	<ul style="list-style-type: none"><li>Existing on-street parking on Upper Fort Street</li><li>Access from the Incident Response Area to Upper Fort Street</li><li>Existing limited vehicular access to Fort Street Public School, National Trust Centre/S.H. Ervin Gallery, Sydney Observatory and Observatory Hill Park.</li></ul>
Utilities	<ul style="list-style-type: none"><li>A number of existing utilities fixed to the Bradfield Highway retaining wall and within the Cahill Expressway corkscrew.</li><li>Gas main located within Precinct 3.</li></ul>
Other developments	<ul style="list-style-type: none"><li>Redevelopment planned for Fort Street Public School including key access points for vehicles and students, as well as the construction timeframes and alignment with the construction of the proposal.</li></ul>

### 3.2.3 Major design features

Table 3-3 describes the major design features of the proposal.

**Table 3-3: Major design features for the proposal**

Aspect	Design features
New dedicated cycleway from Kent St Cycleway to the National Trust Centre/S.H. Ervin Gallery steps	<ul style="list-style-type: none"> <li>• Effective width of 4.8m including 3.0m bi-directional cycleway and 1.8m pedestrian footpath</li> <li>• Existing gradient of 1:16 retained from Kent Street to the base of the National Trust Centre/S.H. Ervin Gallery steps</li> <li>• Safety barrier along road carriageway from existing gantry to elevated loop.</li> </ul>
New cyclist and pedestrian approach ramp on southern approach to Cahill Expressway crossing	<ul style="list-style-type: none"> <li>• Effective width of 4.8m, 3.0m bi-directional cycleway, 1.8m footpath</li> <li>• 1:20 gradient from base of National Trust Centre/S.H. Ervin Gallery steps to start of spiral ramp structure.</li> </ul>
Spiral ramp structure	<ul style="list-style-type: none"> <li>• Envisioned as a ribbon structure in the landscape</li> <li>• Transparent balustrade and safety screens</li> <li>• Effective width of 4.5m, gradient of 1:20 for cyclists and 1:14 for pedestrians</li> <li>• Profile to replicate that of main bridge deck</li> <li>• Minimum horizontal radius of 10m.</li> </ul>
New cyclist and pedestrian bridge over the Cahill Expressway	<ul style="list-style-type: none"> <li>• Effective width of 4.5m, 3.0m bi-directional cycleway, 1.5m footpath</li> <li>• Slim profile of the main bridge deck to minimise the mass and visibility of the structure</li> <li>• Transparent balustrade and safety screens</li> <li>• Minimum vertical clearance of 5.5m over the Cahill Expressway.</li> </ul>
New dedicated cycleway from Cahill Expressway bridge to southern end of the Sydney Harbour Bridge Cycleway	<ul style="list-style-type: none"> <li>• Effective width of 3.0m bi-directional cycleway</li> <li>• The proposed cycleway occupies the western edge along the Incident Response Area and is defined by a new retaining wall and fence.</li> </ul>

## 3.3 Construction activities

This section provides a summary of the likely methodology, staging, work hours, plant and equipment, and associated activities that would be used to build the proposal. For the purpose of this REF, an indicative construction methodology is provided.

The detailed construction staging plans and methods would be determined by the contractor after completion of the detailed design. The method used may vary from the description in this chapter due to:

- The final identified locations of utilities and services
- On-site conditions identified during pre-construction activities
- Ongoing refinement of the detailed design
- Outcomes of community consultation including submissions received on the REF.

A construction environmental management plan (CEMP) would be developed for the proposal.



The methods used would be consistent with statutory requirements, including any work, health and safety regulations and conditions of approval issued following determination of the proposal. Environmental mitigation and management measures specific to this proposal are included in Chapter 7. The CEMP would be consistent with these measures.

### 3.3.1 Work methodology

The likely activities required to build the proposal in each precinct, and their sequencing are presented in Table 3-4.

**Table 3-4: Key proposal activities**

Area	Key activities
Site compounds and cycleway detour	<ul style="list-style-type: none"> <li>Establish construction compounds (north and south) including temporary removal of existing Observatory Hill exercise area</li> <li>Establish cyclist detour (via Upper Fort Street, Argyle Street and Kent Street).</li> </ul>
Precinct 1 : Sydney Harbour Bridge Cycleway connection and Incident Response Area	<ul style="list-style-type: none"> <li>Construct temporary detour for cyclists through the Sydney Harbour Bridge south-western portal stairs</li> <li>Clear and grub trees</li> <li>Install contiguous piles for new retaining wall</li> <li>Excavate for new cycleway and install wall lining, stormwater and floor slab</li> <li>Demolish existing concrete retaining wall</li> <li>Construct new retaining wall on the western side of the Incident Response Area</li> <li>Construct on-grade cycleway from the Sydney Harbour Bridge Cycleway southern portal to the Incident Response Area.</li> </ul>
Precinct 2: Incident Response Area and Fort Street Public School	<ul style="list-style-type: none"> <li>Protect existing utilities attached to the existing retaining wall facing the Cahill Expressway</li> <li>Construct new kerb and retaining wall along Incident Response Area to support cycleway widening</li> <li>Construct new cycleway alignment including new handrail along retaining wall, shared path, lighting and landscaping.</li> </ul>

Area	Key activities
Precinct 3: Bridge Crossing and National Trust Centre/S.H. Ervin Gallery Frontage	<ul style="list-style-type: none"> <li>• Preparatory works including relocation of gas main in the southern approach ramp, installing lifting frame under existing bridge, and removal of bridge handrails</li> <li>• Demolition of bridge span including use of a crane to lift span into a truck where it would be transported off site for demolition</li> <li>• Reinstatement of existing Cahill Expressway retaining wall below northern abutment</li> <li>• Demolish southern approach ramp including removing handrails, pathway and walls with an excavator mounted hammer</li> <li>• Removal of materials by small truck via access road to the National Trust Centre/S.H. Ervin Gallery carpark</li> <li>• Construct new cyclist and pedestrian bridge including construction of new abutments on the northern and southern sides of the Cahill Expressway, installing the new span using a large crane positioned in the Cahill Expressway cutting, pouring concrete deck slab and installing handrails, lights and surface treatments</li> <li>• Construct southern approach (elevated spiral) including removing trees, installing piles for pier foundations, constructing on ground ramp section, installing concrete pile caps and piers on the western side and structural steel spans, pouring deck slab and installing handrails, lights and surface treatments.</li> </ul>
Precinct 4: National Trust Centre/S.H. Ervin Gallery to Kent Street	<ul style="list-style-type: none"> <li>• Relocate utilities</li> <li>• Adjust kerb line on western side of Kent Street on-ramp</li> <li>• Demolish existing central median within on-ramp to the Bradfield Highway and install temporary pavement</li> <li>• Install temporary traffic barriers along edge of works on Kent Street on-ramp</li> <li>• Adjust stormwater to accommodate new kerb alignment</li> <li>• Adjust existing retaining wall (north of the existing National Trust Centre/S.H. Ervin Gallery stairs), ramp and stairs</li> <li>• Construct new kerb and pavement</li> <li>• Reinstate central median within on-ramp to the Bradfield Highway</li> <li>• Install surface (asphalt), line markings, sign posts and lighting.</li> </ul>
Completion works	<ul style="list-style-type: none"> <li>• Disestablish site compounds</li> <li>• Reinstate construction areas and carry out landscape works (including the Observatory Hill exercise area)</li> <li>• Remove cyclist detour.</li> </ul>

### 3.3.2 Construction hours and duration

Roads and Maritime expects construction to commence in mid-2019 and be completed by early 2020 subject to approval and available funding. The works are programmed to take about 10 months to complete.

The expected duration of works in each precinct is set out in Table 3-5.

**Table 3-5: Indicative duration of works**

Area	Duration	Comments
Site compounds and cycleway detour	3 weeks	<ul style="list-style-type: none"> <li>Requires some temporary works and traffic controls.</li> </ul>
Precinct 1 : Harbour Bridge Link and Incident Response Area	About five months	<ul style="list-style-type: none"> <li>Night works required for construction (piling) of retaining wall including demolition of existing wall.</li> </ul>
Precinct 2: Incident Response Area and Fort Street Public School	About six months	<ul style="list-style-type: none"> <li>Night works for delivery and installation of precast concrete elements.</li> </ul>
Precinct 3: Bridge Crossing and S.H. Ervin Gallery Frontage	About eight months	<ul style="list-style-type: none"> <li>Night works required as demolition of the existing bridge and construction of the new pedestrian and cyclist bridge would require full road closures of the Cahill Expressway.</li> </ul>
Precinct 4: National Trust Centre/S.H. Ervin Gallery to Kent Street	About seven months	<ul style="list-style-type: none"> <li>Night works required as works would require full road closures of the Kent Street on-ramp.</li> </ul>
Completion works	4 weeks	<ul style="list-style-type: none"> <li>Disestablish site compounds</li> <li>Reinstatement and landscaping</li> <li>Remove cyclist detour</li> </ul>

Standard construction working hours in accordance with the Interim Construction Noise Guideline (DECC, 2009) and Roads and Maritime's Construction Noise and Vibration Guidelines (RMS, 2016a) are as follows:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- Sunday and public holidays - no work.

High traffic volumes on the Cahill Expressway and the large numbers of cyclists and pedestrians using the Sydney Harbour Bridge mean that the construction of the proposal has the potential to impact on network efficiency into the Sydney CBD and North Sydney. Working hours and conditions may also be subject to conditions imposed by Sydney Trains, such as ensuring horizontal clearances and rail shutdown periods.

Significant work would be carried out in the evening and night-time and/or during routine scheduled shutdown periods to minimise access disruption during the day. To reduce impacts on traffic, the proposed working hours for the proposal would involve a combination of day work, night work including work on weekends, and 24-hour continuous work during road closure periods. Working up to five nights a week at regular intervals may be required at various stages of the construction period and would only be undertaken with adequate justification, such as where it is critical for constructability, or required for safety or licence reasons. Where longer road closures are required partial road closures from Friday night to Monday morning would be the preferred methodology. Temporary road closures may be necessary during work periods to allow for safe lane shutdowns.

Work carried out outside of standard working hours would be in accordance with the Office of Environment and Heritage's Interim Construction Noise Guideline (DECC, 2009) and the Roads and Maritime's Construction Noise and Vibration Guideline (2016). The community would be consulted with and notified before any proposed works outside the standard hours.

### 3.3.3 Plant and equipment

The type of equipment and plant requirements to build the proposal in each precinct would be refined by the contractor following detailed design. Plant and equipment expected to be used during the works includes:

- Vacuum sucker truck
- Backhoe diggers
- Line marking machines
- Small excavators (< 20 tonnes(t))
- Excavators (20-30t)
- Pneumatic hammer (excavator mounted)
- Concrete saws
- Cranes (including large mobile 200t crane for bridge removal/installation)
- Trucks (tipper and semi-trailer trucks)
- Concrete agitator trucks
- Concrete vibrators
- Rollers (10-16t)
- Portable lights
- Generators
- Air compressors
- Air tools
- Hand tools (grinders, circular saws etc.)
- Light vehicles

### 3.3.4 Earthworks

Some excavation works would be required to build the proposal, in the following areas:

- Base of the new ramp from the Sydney Harbour Bridge portal to the on-grade cycleway in Precinct 1
- Foundations for new retaining wall and kerb in Precinct 2
- New bridge abutments on each side of the Cahill Expressway cutting and footings/piling for the southern approach ramp to the bridge across the Cahill Expressway in Precinct 3
- New kerb and cycleway pavement in Precinct 4.

### 3.3.5 Source and quantity of materials

A range of materials would be used to build the proposal including quarry materials such as select fill, base and sub base, aggregates, and steel. The source and quantity of materials required to build the proposal would be finalised during detailed design in a construction materials and resources plan or similar.

### 3.3.6 Traffic management and access

Traffic would be managed through a traffic management plan (TMP) in accordance with AS 1742 3 – 2009 and Traffic Control at Work Sites (RTA, 2010). The TMP would include the guidelines, general requirements and procedures to be used when activities or areas of work have the potential to impact on existing traffic arrangements. Details of any haulage routes, detours and temporary lane closures would be included in the plan, in accordance with a road occupancy licence. Standard traffic management measures would be used to minimise short-term traffic impacts, and maintain traffic flow along the Bradfield Highway throughout the work.

A section of the proposed works are within the Incident Response Area and in the vicinity of an existing boom gate which provides access from the area to Upper Fort Street. The works could impact emergency vehicles accessing the Incident Response Area. The staging of works and coordination with Roads and Maritime and other users of the Incident Response Area would be contained within the TMP.

The proposed works are next to Fort Street Public School and the S.H. Ervin Gallery. Limited space is available in this area for student drop-off and cycle and pedestrian movements. The NSW Department of Education is proposing a significant redevelopment of Fort Street Public School. Works required for this redevelopment could coincide with works for the proposal. The TMP would include coordination and other requirements to minimise disruption during any periods of construction overlap. Sections of the existing cycleway route would not be available during construction. An alternative route along Upper Fort Street, Argyle Street and Kent Street would be established for the duration of the works (Figure 3-8).





#### NOTES

##### 1. AGAR STEPS

2. PEDESTRIAN DETOURS WOULD BE IMPLEMENTED FOR ABOUT 8 MONTHS DURING DEMOLITION OF EXISTING FOOTBRIDGE AND CONSTRUCTION OF NEW CYCLIST/PEDESTRIAN BRIDGE AND SPIRAL RAMP.

3. CYCLIST DETOUR WOULD BE IMPLEMENTED FOR ABOUT 10 MONTHS DURING CONSTRUCTION OF THE PROPOSAL

#### LEGEND

PROPOSED PEDESTRIAN DETOUR (ROUTE 1) VIA AGAR STEPS



PROPOSED PEDESTRIAN DETOUR (ROUTE 2) - STEP-FREE ROUTE



PROPOSED CYCLIST DETOUR



EXISTING CYCLEWAYS



CONSTRUCTION ZONE - PRECINCT 3



Source: NSW Roads & Maritime Services, November 2017



The Bradfield Highway would remain open to traffic throughout the work. Night closures of the Cahill Expressway would be required to carry out the works in Precinct 3, in particular to demolish the existing bridge and install the new pedestrian/cyclist bridge. Night closures of the Kent Street on-ramp to Sydney Harbour Bridge would also be required to build the cycleway in Precinct 4.

Potential traffic and access impacts of the proposal are discussed in Chapter 6, together with associated safeguards and management measures. A detailed construction traffic and access assessment would be carried out before construction when the detailed staging and work methodology has been developed.

### 3.4 Ancillary facilities

Two ancillary sites are proposed:

- Site 1: Site office, ablutions and compound located at the foot of the Sydney Harbour Bridge cycleway southern portal on the existing exercise area
- Site 2: Site compound located within the grassed area in front of the National Trust Centre/S.H. Ervin Gallery building adjacent to the Cahill Expressway cutting.

The proposed ancillary sites are shown in Figure 1-2. The ancillary sites would operate during construction work hours as described in Section 3.3.2. No stockpiles would be kept on the sites and any spoil not reused in the work would be hauled off-site by truck.

Vehicular access to Site 1 would be via Kent Street, Argyle Street, Watson Road and Upper Fort Street and to Site 2 via Kent Street, Argyle Street, Watson Road, Upper Fort Street to the access road leading into the National Trust Centre/S.H. Ervin Gallery carpark.

The compound sites would store materials and equipment required to build the proposal and allow for parking of light vehicles. Hazardous materials such as concrete curing compounds, various oils, grease, fuel and acetylene would be stored at the compound sites in secured and bunded areas. Site compounds would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of work, the contractor would remove the compound sites, including any waste materials. Sites would be rehabilitated in consultation with the relevant property owner.

### 3.5 Public utility adjustment

Some public utility assets would be affected by the proposal. Utilities would be retained, although some would be adjusted within the proposal area to accommodate the work, including the relocation of lighting and power poles.

Utilities identified in the vicinity of the works are provided in Table 3-6.

**Table 3-6: Public utilities in the vicinity of the proposal**

Precinct	Utilities	Owner	Details of adjustment
Precinct 1	Utilities fixed to the Bradfield Highway retaining wall at the level of the existing cycleway.	Various	Services in this location would be unlikely to be affected by the proposed cycleway.
	Underground fibre optic and electricity conduits in the park adjacent to the Sydney Harbour Bridge portal.	Telstra, Verizon, Ausgrid	Services in this location would likely be impacted by the proposal and would require relocation/adjustment.

Precinct	Utilities	Owner	Details of adjustment
	Underground power and water supply services underneath existing exercise area.	Ausgrid, Sydney Water	These services would need to be relocated.
	Stormwater pits along the retaining wall on western side of Bradfield Highway.	Roads and Maritime	Location of pits and some pipework would need to be adjusted.
Precinct 2	Utilities in conduits along the existing retaining wall adjacent to the Incident Response Area.	Roads and Maritime	These utilities would likely be impacted and would require relocation.
	Underground optic fibre behind the eastern kerb of Upper Fort Street.	Telstra	
	Overhead electricity supply on southern end of Upper Fort Street close to Fort Street Public School.	Ausgrid	
Precinct 3	Gas main penetrating the existing southern approach structure.	Jemena	This main would need to be relocated.
	Sewage, water supply and electricity services at the frontage of the National Trust Centre/S.H. Ervin Gallery.	Various	These utilities would likely be impacted and would require relocation.
	Utilities within the Cahill Expressway corkscrew (firefighting water supply).	Roads and Maritime	These utilities would need to be protected during the works.
Precinct 4	Stormwater pits along the Kent Street on-ramp to the Bradfield Highway.	Roads and Maritime	New kerb inlet pits would be installed to suit the new kerb alignment and existing pits would be demolished.
	Sewer and electricity service pits along the Kent Street on-ramp to the Bradfield Highway.	Sydney Water, Ausgrid	These pits would need to be adjusted to suit the new cycleway and pedestrian footpath level.
	Stormwater main underneath existing shared path adjacent to the Kent Street on-ramp to the Bradfield Highway.	Roads and Maritime	This main is unlikely to be impacted by the proposal.

## 3.6 Property acquisition

The proposal and surrounding land ownership is shown in Figure 3-9. The proposal would be built largely on land owned by the City of Sydney and Roads and Maritime. The southern approach to the bridge across the Cahill Expressway would be constructed on land in front of the National Trust Centre/S.H. Ervin Gallery. This land is owned by Property NSW and the proposal would require property acquisition in this location.

The proposal would potentially involve partial property acquisition. Potential property acquisitions are shown in Figure 3-10 and detailed in Table 3-7.

**Table 3-7: Potential property acquisition for the proposal**

Area reference (see Figure 3-10)	Existing owner	Lot and DP	Acquisition type	Approximate area (m <sup>2</sup> )
A	Property NSW	Lot 1 DP 244444	Partial	247
B	Property NSW	Lot 1 DP 250813	Partial	195
C	Department of Education	Lot 2 DP 244444	Partial	97
D	Department of Education	Lot 9 DP 732592	Partial	58
E	Department of Education	Lot 108 DP 748340	Partial	150
F	City of Sydney	Lot 8863 DP 1219782	Partial	297
G	City of Sydney	Lot 1 DP55195	Partial	23
H	City of Sydney	Lot 1 DP53540	Partial	40

Landowners have been consulted as part of the preparation of this REF.


City of Sydney has stated to Roads and Maritime that the City does not intend to charge any fee for a license (or similar) for construction of the proposed cycleway situated on 'community land' owned by the City.

The Department of Education has stated to Roads and Maritime that they would grant an easement for the proposed cycleway and pedestrian footpath alignment in proximity to Fort Street Public School and Environmental Education Centre.





#### LEGEND

Selected property 

0 50 100 200 Metres

Property Ownership Schedule - Millers Point					
Schedule No	Lot	DP	Lot/DP	Ownership	Address
1	8863	1219782	8863/1219782	COUNCIL OF THE CITY OF SYDNEY	Upper Fort Street, Millers Point
2	1	55195	1/55195	SYDNEY CITY COUNCIL	N/A
3	1	53540	1/53540	SYDNEY CITY COUNCIL	N/A
4	2	909499	2/909499	SYDNEY CITY COUNCIL	1 Bradfield Highway, Millers Point
5	7302	1163733	7302/1163733	THE STATE OF NEW SOUTH WALES	3 Watson Road, Millers Point
6	1	1175372	1/1175372	STATE TRANSIT AUTHORITY OF NEW SOUTH WALES	Argyle Street, Millers Point
7	7301	1163733	7301/1163733	THE STATE OF NEW SOUTH WALES	2 Watson Road, Millers Point
9	7003	1071940	7003/1071940	THE STATE OF NEW SOUTH WALES	96-108 Kent Street, Millers Point
10	110	872752	110/872752	THE TRUSTEES OF THE MUSEUM OF APPLIED ARTS AND SCIENCES	1003 Upper Fort Street, Millers Point
11	2	732592	2/732592	MINISTER FOR EDUCATION	1005 Upper Fort Street, Millers Point
12	108	748340	108/748340	MINISTER FOR EDUCATION	9c Upper Fort Street, Millers Point
13	3	732592	3/732592	MINISTER FOR EDUCATION	N/A
14	4	732592	4/732592	MINISTER FOR EDUCATION	9 Upper Fort Street, Millers Point
15	106	748340	106/748340	MINISTER FOR EDUCATION	9a Upper Fort Street, Millers Point
16	107	748340	107/748340	MINISTER FOR EDUCATION	9d Upper Fort Street, Millers Point
17	9	732592	9/732592	MINISTER FOR EDUCATION	N/A
18	2	244444	2/244444	MINISTER FOR EDUCATION	1010a Upper Fort Street, Millers Point
19	5	258013	5/258013	THE STATE OF NEW SOUTH WALES	10 Upper Fort Street, Millers Point
20	1	244444	1/244444	GOVERNMENT PROPERTY NSW	1001 Bradfield Highway, Millers Point
21	1	258013	1/258013	GOVERNMENT PROPERTY NSW	1001 Bradfield Highway, Millers Point
22	2	258013	2/258013	GOVERNMENT PROPERTY NSW	N/A
23	CP	SP53158	CP/SP53158	THE OWNERS - STRATA PLAN NO. 53158 (Total 421 lots)	168-170 Kent Street, Millers Point

Source: NSW Transport & Maritime Services (13 November 2017)  
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Date:  
14.11.2017  
Project:  
ENAU RHOD03119AF1  
File Name:  
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NSW Roads and Maritime Services  
SHB Southern Cycleway REF

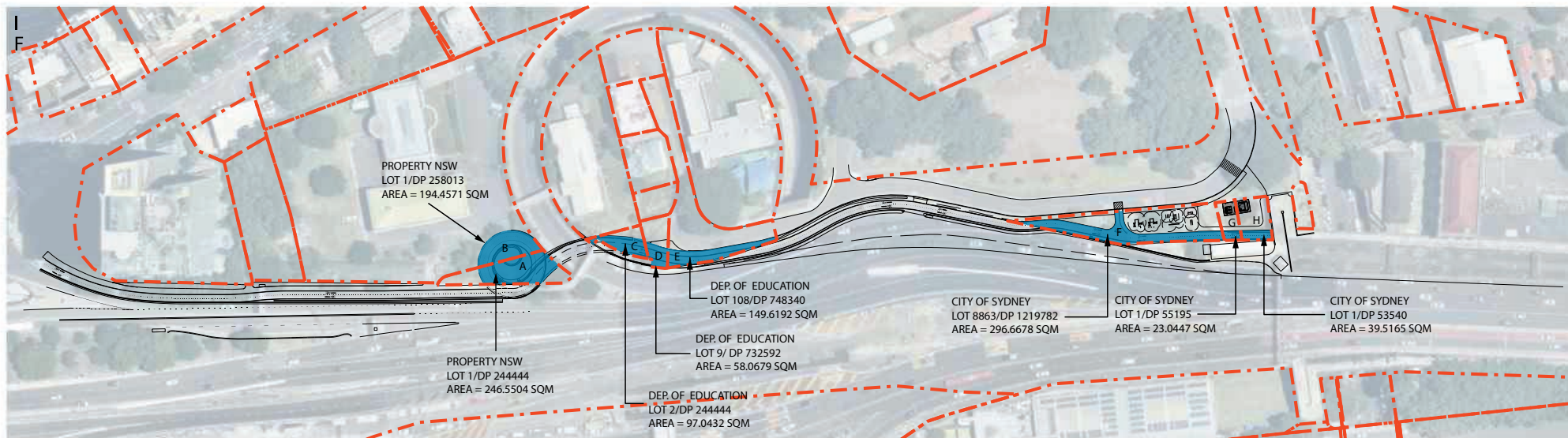


Transport  
Roads & Maritime  
Services

Proposal area and  
surrounding property ownership

Figure No:  
3-10





Source: Tract, November 2017

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Date:  
16.11.2017  
Project:  
ENAU RHOD03119AF1  
File Name:  
3119AF1\_01\_F03-10\_GRA

NSW Roads and Maritime Services

SHB Southern Cycleway REF

**NSW**  
GOVERNMENT

**Transport**  
Roads & Maritime  
Services

Potential property acquisition  
for the proposal

Figure No:

3-10

## 4 Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers provisions of relevant State and Commonwealth legislation, plans and policies.

### 4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* provides an assessment framework for consideration of impacts on threatened species and communities listed under the *Biodiversity Conservation Act 2016*. Section 5A of the Act lists five factors to be considered in assessing the impacts of a project, and is used to determine if a project is likely to have a significant impact on threatened biodiversity, and the need for further assessment. This Act also requires impacts from proposed development on heritage values to be appropriately assessed.

The Act requires local governments to establish environmental plans for their areas including items of state and local heritage significance, and authorises the making of other instruments including State Environmental Planning Policies.

#### 4.1.1 State Environmental Planning Policies

##### ***State Environmental Planning Policy (Infrastructure) 2007***

*State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. To achieve this aim, the ISEPP permits certain infrastructure without the need for development consent from the relevant local council.

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

As the proposal is for a cycleway, which under the ISEPP is considered a road infrastructure facility, and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. Development consent from City of Sydney 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 No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests, State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Development) 2005.

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

##### ***State Regional Environment Plan (Sydney Harbour Catchment) 2005***

The Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (Harbour REP) aims to protect, enhance and maintain the Sydney Harbour catchment. The Harbour REP applies to all the waterways of the Harbour, the foreshores and entire catchment.

The proposal is located within the Harbour REP catchment, however is not located within the Foreshores and Waterways Area Boundary of the Harbour REP.

Part 3, Division 2 of the Harbour REP requires Roads and Maritime to consider a number of matters relating to the functioning of the harbour. These matters generally pertain to environmental

impacts of the proposal and have been considered as part of the environmental assessment carried out in this REF, as shown in Table 4-1.

**Table 4 1: Matters for consideration under the Harbour REP**

Matters for consideration	Required outcome	Comment
Biodiversity, ecology and environment protection	Neutral or beneficial effect on the quality of water entering the waterways.	The potential impacts to the quality of water entering the waterways is assessed in Section 6.8 Surface water and Section 6.9 Other impacts (soils and contamination).
	The proposed work should protect and enhance terrestrial and aquatic species, populations and ecological communities, avoid any indirect impacts and maintain ecological connectivity.	The potential impacts to biodiversity is assessed in Section 6.6 – Biodiversity.
	Development should protect and reinstate natural intertidal foreshore areas, including wetlands and riparian land.	See Section 6.8 Surface water and Section 6.9 Other impacts (soils and contamination).
	Consider the cumulative environmental impact of development.	Cumulative impacts have been assessed in Section 6.10 Cumulative impacts.
Public access to, and use of, foreshores and waterways	The proposed work should maintain and improve public access to and along the foreshore and waterways, without adversely impacting on watercourses, wetlands, riparian lands or remnant vegetation.	The proposal would improve access to the foreshore.
	Public access to the harbour and its foreshores and waterways should be maintained at all times and for all purposes including for recreational purposes without adversely impacting on watercourses, wetlands, riparian lands or remnant vegetation.	During construction, access may be restricted within the proposal area to create a safe working environment. Access would be managed via a Traffic Management Plan – see Section 6.4 Traffic and transport.
Maintenance of a working harbour	The harbour is a working harbour and this vital function of the harbour should be maintained at all times during the construction period to the benefit of the NSW community and economy.	The proposal would not impact on the working of the harbour.



Matters for consideration	Required outcome	Comment
Interrelationship of waterway and foreshore uses	The proposal should consider the interrelationship of foreshores and waterways uses and should avoid conflict between the various uses in the waterways and along the foreshore at all times.	The proposal would not impact on the interrelationship of the foreshores and waterways uses.
Foreshore and waterways scenic quality	This sub-clause requires that any proposed development should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands, foreshores and tributaries.	<p>The scenic qualities of the Sydney Harbour foreshore and waterways have been considered during the design of the proposal.</p> <p>The potential impacts to the scenic qualities of Sydney Harbour are assessed in Section 6.2 Landscape character and visual impacts.</p>
Maintenance, protection and enhancement of views	The development should maintain, protect and enhance views and to and from public places, landmarks and heritage items.	<p>The Sydney Harbour Bridge is registered as an item of State and National heritage significance and Roads and Maritime acknowledge that the Sydney Harbour Bridge is a landmark of immense importance to the people of NSW.</p> <p>The potential impacts to maintenance, protection and enhancement of views of Sydney Harbour are assessed in Section 6.1 Non-Aboriginal Heritage and Section 6.2 Landscape character and visual impacts.</p>
Boat storage facilities.	This sub-clause relates to development for the purposes of boat storage facilities.	Not applicable to this proposal.

## 4.1.2 Local Environmental Plans

### *Sydney Local Environment Plan 2012*

The proposal is located on land that is zoned as B8 Metropolitan Centre, SP2 Infrastructure (Classified Road), and RE1 – Public Recreation under the *Sydney Local Environment Plan 2012*.

Having regard to the Land Use Tables for each of these zones in Sydney LEP 2012, the proposed cycleway would be permissible with development consent in each of these zones.

## 4.2 Other relevant state legislation

Other legislation and its relevance to the proposal is summarised in Table 4-2.

**Table 4 2: Summary of relevant legislation and applicability to the proposal**

Relevant legislation	Summary of relevant legislation	Applicability to the proposal
<i>Heritage Act 1977</i>	<p>The Office of Environment and Heritage administers this act, maintains the State Heritage Register and operates the NSW Heritage Council.</p> <p>Approval must be obtained from the Heritage Council where the proposal affects a place listed on the State Heritage Register, or where excavation may affect an archaeological relic.</p>	<p>The northern end of the proposal area is adjacent to (but not within) the heritage curtilage of the Sydney Harbour Bridge. Precincts 2 and 3 of the proposal area includes the state heritage listed Millers and Dawes Point Village Precinct.</p> <p>A section 60 application may be required if any significant works are proposed within the heritage listed curtilage, namely the National Trust Centre/S.H. Ervin Gallery and Observatory Hill.</p> <p>Refer to Section 6.1 for further information.</p>
<i>Environmental Planning and Assessment Act 1979</i>	<p>This Act provides an assessment framework for consideration of impacts on threatened species and communities listed under the <i>Biodiversity Conservation Act 2016</i>. Section 5A of the act lists five factors to be considered in assessing the impacts of a project, and is used to determine if a project is likely to have a significant impact on threatened biodiversity, and the need for further assessment.</p> <p>This act also requires impacts from proposed development on heritage values to be appropriately assessed. The act requires local governments to establish environmental plans for their areas including items of state and local heritage significance, and authorises the making of other instruments including State Environmental Planning Policies.</p>	<p>A strategic assessment, prepared in accordance with section 146 of the EPBC Act and approved by the Federal Minister for the Environment, ensures that Roads and Maritime activities currently assessed under Part 5 of the EP&amp;A Act will no longer require an additional Commonwealth approval for specified matters.</p>
<i>Noxious Weeds Act 1993</i>	<p>This act classifies noxious weeds in each LGA of the state and imposes obligations on landowners or occupiers to control weeds declared in their LGA.</p>	<p>Chinese Hackberry (<i>Celtis sinensis</i>) which was recorded in the study area is a locally controlled weed (Class 4). The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.</p>

Relevant legislation	Summary of relevant legislation	Applicability to the proposal
<i>Protection of the Environment Operations Act 1997</i>	<p>This Act regulates and controls pollution of land, air, water, and noise and provides for notices and offences.</p> <p>Scheduled activities (as defined in schedule 1 of the Act) require licensing in the form of an Environment Protection License (EPL).</p> <p>Schedule 1 Section 19 of the Act deals with the extraction, processing or storage of extracting materials, either by sale or re-use, by means of excavation, blasting, tunnelling, quarrying or other such land-based methods. Extractive materials are defined as clay, sand, soil, stone, gravel, rock, sandstone, or similar substances.</p>	<p>The proposal would not exceed the 30,000t per year trigger for an EPL.</p> <p>Attachment A of the Management of Wastes on Roads and Maritime Services Land Procedure (RMS, 2014) lists potential waste streams for a proposal and whether the proposed waste activity triggers the need for an EPL. The contractor would be required to review Attachment A once estimated waste volumes are known.</p> <p>The Protection of the Environment Operations (Waste) Regulation 2014 (NSW) sets out requirements related to the storage and transportation of waste, as well as reporting requirements including environment levy fees for disposal of waste at licenced facilities.</p> <p>Waste is classified under the NSW Environmental Protection Agency (EPA) Waste Classification Guidelines (EPA, 2014) as being special waste or general waste. Once a waste is correctly classified it can be managed as required under this regulation.</p> <p>Resource recovery exemptions are available for certain waste types, including excavated spoil, raw mulch and reclaimed pavement asphalt or aggregate, if it is shown the waste type is being beneficially re-used.</p>
<i>Fisheries Management Act 1994</i>	<p>This Act controls the management of fish and fish habitat in the state and conservation of fisheries resources. A Part 7 Fisheries Management Act permit is required when the proposed work site is within or adjacent to a waterway that is considered Key Fish Habitat.</p>	<p>Tributaries close to the proposal area are mapped as Key Fish Habitat. No direct disturbance is proposed to these tributaries.</p>

Relevant legislation	Summary of relevant legislation	Applicability to the proposal
<i>Biodiversity Conservation Act 2016</i>	<p>The Act aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.</p> <p>The Act lists threatened species, populations and communities for which likely impacts must be assessed.</p>	<p>Three threatened fauna species listed under the Act had a moderate potential to forage within the study area.</p> <p>The removal of a limited amount of forage habitat was not considered to be significant given the abundance of forage habitat within the locality and the minor impact of the proposal.</p> <p>Further information, including management and mitigation measures are provided in Section 6.6.</p>

## 4.3 Commonwealth legislation

### 4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix B and Chapter 6 of the REF.

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

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

The Sydney Harbour Bridge is listed as a National Heritage Place under the EPBC Act. The extent of the area of National Heritage listing is just to the north of the proposal and the proposal area does not intersect with the heritage area.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment under the EPBC Act.

#### ***Findings – nationally listed biodiversity matters***

The assessment of the proposal's impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. No EPBC Act listed species or endangered ecological communities were recorded during field surveys.



## 4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State Significant Infrastructure or State Significant Development. The proposal can be assessed under Part 5 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

## 5 Stakeholder and community consultation

This chapter discusses the consultation carried out to date for the proposal and the consultation proposed for the future. The consultation strategy and approaches used to consult on the proposal are described along with the results of consultation with relevant government agencies and stakeholders.

### 5.1 Consultation strategy

Roads and Maritime has prepared a community consultation and stakeholder engagement plan (communications plan) to guide consultation activities and identify key objectives and outcomes of consultation activities with the community, stakeholders and government agencies.

The communication and engagement objectives for the proposal include:

- To keep the local community and other key stakeholders regularly informed of proposal progress
- To provide the community and stakeholders with regular and targeted information to build awareness about the proposal
- To provide clear information about what we are seeking feedback on, when and why
- To ensure community and stakeholder feedback is continuously fed into communication, engagement and development and delivery of the proposal
- To be transparent in all proposal activities
- To encourage participation from communities and other stakeholders
- To listen to feedback, investigate suggestions and report back
- To engage in a manner that is collaborative, innovative, adaptive and sustainable
- To ensure that community and stakeholder enquiries about the proposal are managed and resolved effectively
- To ensure that proposal information is distributed in an effective and timely manner.

The proposal has incorporated consultation with directly and indirectly affected landowners including Property NSW, City of Sydney, Bicycle NSW and Department of Education.

A summary of consultation carried out to date is provided in Section 5.2 to Section 5.6. Roads and Maritime would continue to consult with the community and stakeholders throughout development of the proposal. In particular, the REF would be placed on public display and comments invited. Submissions received as a result of the display would be addressed in a formal submissions report and considered when finalising the concept design and during development of the detailed design.

The following sections outline the consultation that has been carried out specifically for the proposal.

### 5.2 Community involvement

Consultation with the community has involved the following activities:

- City of Sydney commenced consultation with the affected stakeholders in 2015 and included a preliminary design presentation meeting with the Fort Street Public School, Observatory Hill Environmental Education Centre and Department of Education
- A Sydney Harbour Bridge community update was released in December 2016 informing the community about the start of the design and REF processes. A similar recent update was released in September 2017 (<http://www.rms.nsw.gov.au/documents/projects/sydney-inner/sydney-harbour-bridge/sbh-across-the-bridge-community-update-2017-09.pdf>)
- Questions about the proposal were answered for cyclists during two cyclist information sessions about safety improvements on the Sydney Harbour Bridge cycleway. These sessions were carried out at the northern end of the cycleway in August 2017.

- Information on the proposal was placed on the Roads and Maritime website (<http://www.rms.nsw.gov.au/projects/sydney-inner/sydney-harbour-bridge/access-projects/cyclist-access/southern-cycleway.html>)

## 5.3 Aboriginal community involvement

Aboriginal heritage impacts were considered in accordance with the Procedure for Aboriginal Heritage Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime, 2011). The PACHCI stage-one concluded that Aboriginal cultural heritage impacts are not expected as a result of the proposal (see Section 6.9) and hence there was no requirement to consult with the Local Aboriginal Land Council.

## 5.4 ISEPP consultation

Clauses 13 – 15 of the ISEPP state that development that may have an impact on council-related infrastructure or services, local heritage items or flood-labile land may require consultation with the relevant council, in this case the City of Sydney.

The proposal is not located within flood-labile land. Council-related infrastructure and services that would be impacted by the proposal include Upper Fort Street, City of Sydney outdoor exercise facilities, and car parking spaces along Upper Fort Street.

Potential impacts to local heritage sites identified in the Sydney LEP 2012 are assessed in Section 6.1, together with proposed safeguards and mitigation measures.

The City of Sydney is working with Roads and Maritime on the design development for the proposal. The concept design developed by the City has been used to progress the design described in this proposal. Appendix C contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered. No comments were received from the City of Sydney as a result of the ISEPP consultation.

Clause 16 of the ISEPP states that a consent authority must not carry out any of the following development without giving written notice to the specified authority and taking their responses into consideration:

- a) development adjacent to land reserved under the National Parks and Wildlife Act 1974 – the Office of Environment and Heritage,*
- b) development adjacent to a marine park declared under the Marine Parks Act 1997 – Marine Parks Authority,*
- c) development adjacent to an aquatic reserve declared under the Fisheries Management Act 1994 – the Office of Environment and Heritage,*
- d) development in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998 – Sydney Harbour Foreshore Authority,*
- e) development comprising a fixed or floating structure in or over navigable waters – Roads and Maritime Services (maritime branch),*
- f) development for the purposes of an education establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act) – NSW Rural Fire Services.*

No part of the proposal would be located on land next to a National Park, declared Marine Park, or declared aquatic reserve. The proposal would not involve development over navigable waters or for the purposes of an educational establishment, health services facility, correction centre, group home or for residential purposes. None of these matters apply to this proposal and no consultation in accordance with Clause 16 is required.

The proposal is not located within the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998 (SHFA Act). As the proposal is within the catchment of Sydney Harbour and potential impacts have been assessed in Chapter 6. Consultation was not required with Government Property NSW who administer the SHFA Act.

## 5.5 Government agency and stakeholder involvement

The City of Sydney consulted with the following key stakeholders during development of the concept design in 2015:

- Roads and Maritime
- Transport for NSW
- Property NSW
- National Trust of Australia
- Fort Street Public School
- Observatory Hill Environmental Education Centre
- Department of Education.

Further consultation was conducted by Roads and Maritime after they took over as the proponent of the proposal including with:

- City of Sydney
- Office of Environment and Heritage
- Transport for NSW:
  - Sydney Coordination Office
  - Active Transport Planning
- Fort Street Public School
- Department of Education
- Sydney Observatory
- Observatory Hill Environmental Education Centre
- National Trust of Australia
- Heritage Council Infrastructure Sub-Committee
- Property NSW
- Australian Government Department of Environment and Energy
- Internal Roads and Maritime stakeholders:
  - Driver Aid Services
  - Critical Infrastructure and Security
  - Asset Management
  - Network and Safety Services - CBD and East Precinct
  - SHB Southern Toll Plaza Precinct Upgrade project team
- Bicycle NSW.

Consultation with the government authorities and agencies listed above has been carried out throughout the proposal's development, including with the Office of Environment and Heritage, City of Sydney, Property NSW, National Trust of Australia, and the Department of Education.

All stakeholders consulted were generally supportive of the changes proposed to improve the cycleway link. Issues raised during consultation are outlined in Table 5-1.



**Table 5-1: Issues raised through stakeholder consultation**

Agency	Issue raised	Response / where addressed in REF
City of Sydney	<ul style="list-style-type: none"> <li>• Loss of car parking spaces adjacent to outdoor exercise area</li> <li>• Potential impacts to outdoor exercise facilities</li> <li>• Relocation of lighting poles</li> <li>• Impact to existing Kent Street footpath and cycleway.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.4 and Section 6.5</li> <li>• Discussed in Section 6.5</li> <li>• Detailed in Table 3-5</li> <li>• Discussed in Section 6.1 to Section 6.10</li> </ul>
National Trust of Australia	<ul style="list-style-type: none"> <li>• View corridor at the frontage of the National Trust Centre/S.H. Ervin Gallery building to be maintained.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.2</li> </ul>
Property NSW	<ul style="list-style-type: none"> <li>• Tree replanting occurs in and around the proposed cycleway</li> <li>• Vehicular and pedestrian access to the rear of the National Trust Centre/S.H. Ervin Gallery site is not impeded during construction or operation of the proposal.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.4</li> </ul>
Department of Education	<ul style="list-style-type: none"> <li>• Redevelopment of Fort Street Public School which may potentially see an increase in student numbers.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.10</li> </ul>
Department of Education	<ul style="list-style-type: none"> <li>• Not in favour of an overpass bridge alignment that is in close proximity to the land occupied by the Environmental Education Centre building.</li> </ul>	<ul style="list-style-type: none"> <li>• Noise and vibration impacts discussed in Section 6.3</li> </ul>
Roads and Maritime	<ul style="list-style-type: none"> <li>• Access between the Incident Response Area and Upper Fort Street must be maintained.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.4</li> </ul>
Sydney Observatory	<ul style="list-style-type: none"> <li>• Limited parking opportunities near Observatory Hill Park need to be considered at the northern end of the proposal, where there are several on-street parking spaces on Upper Fort Street that could be impacted</li> <li>• Concerned about lighting in proximity to the Observatory during operation and construction.</li> </ul>	<ul style="list-style-type: none"> <li>• Discussed in Section 6.5 and Section 6.5</li> <li>• Discussed in Section 6.5</li> </ul>

Initial feedback and comments provided by these authorities and agencies has been considered during the design development of the proposal. Roads and Maritime will continue to consult with government authorities and agencies throughout subsequent project phases and consider any issues raised where reasonable and feasible.

## 5.6 Ongoing or future consultation

This REF will be placed on public display during November and December 2017 and community comments invited. Following the submissions period, Roads and Maritime will collate submissions. After consideration of community comments, Roads and Maritime will determine whether the proposal should proceed as proposed, or if any alterations to the proposal are necessary.

Roads and Maritime will also continue to update the project website (<http://www.rms.nsw.gov.au/projects/sydney-inner/sydney-harbour-bridge/access-projects/cyclist-access/southern-cycleway.html>) and issue community update newsletters during the display of this REF and construction.

A submissions report will be prepared to summarise the submissions received via email, on feedback forms and from government agencies during the REF display consultation period. The submissions report will be published on the project website.

If the proposal is determined, Roads and Maritime would consult with all directly affected stakeholders before the start of construction activities, including:

- Fort Street Public School whose access to drop-off locations could be affected (access to school would be maintained during construction)
- Department of Education/Observatory Hill Environmental Education Centre whose land would be next to proposed construction works
- Property NSW/National Trust of Australia due to construction work near the front access including the new southern approach ramp to the bridge across the Cahill Expressway
- Emergency services that may need to access the boom gate or Incident Response Area within proposed work area
- Stakeholders that may be affected by construction noise impacts (to discuss individual noise mitigation treatments) and night work.

## 6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines *Is an EIS required?* (DUAP 1995/1996) as required under clause 228(1) of the *Environmental Planning and Assessment Regulation 2000* and the *Roads and Related Facilities EIS Guideline* (DUAP 1996). The factors specified in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000* are also considered in Appendix B.

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

### 6.1 Non-Aboriginal heritage

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to non-Aboriginal heritage in the proposal area.

Artefact Heritage has been commissioned by Roads and Maritime to provide a Statement of Heritage Impact for the proposal, which is included as Appendix D and summarised in this section.

#### 6.1.1 Methodology

Statement of Heritage Impact for the proposal was prepared in alignment with the following:

- Statement of Heritage Impact 2002, NSW Heritage Manual 2002 (NSW Heritage Office)
- Roads and Maritime requirements for preparation of Statement of Heritage Impact reports
- Sydney Harbour Bridge Conservation Management Plan 2007
- Assessing Significance for Historical Archaeological Sites and 'Relics' 2009 (NSW Heritage Office, Department of Planning).

The assessment of the magnitude of heritage impact from the proposal used the definitions in Table 6-1.

**Table 6-1: Definitions of magnitude of heritage impact**

Grading	Definition
Major	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.
Moderate	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.
Minor	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.
Negligible	Actions that would result in very minor changes to heritage items.
Neutral	Actions that would have no heritage impact.

## 6.1.2 Existing environment

Searches of relevant databases and other information sources for listed heritage items was undertaken on 17 February 2017 for the study area (Figure 6-1). The databases included:

- National:
  - National Heritage List
- State:
  - NSW State Heritage Register
  - Sydney Regional Environmental Plan (REP) (Sydney Harbour Catchment) 2005
  - Roads and Maritime Section 170 Register
  - RailCorp (Sydney Trains) Section 170 Register
- Local:
  - Sydney Local Environmental Plan 2012
  - Development Control Plans
  - Register of the National Estate
  - Register of the National Trust
  - City of Sydney Register of Significant Trees 2013.

The results for heritage items and heritage conservation areas within the proposal area and wider study area are provided in Table 6-2 and shown on Figures 6-2 to 6-4.





Source: Artefact Heritage, November 2017



**Table 6-2: Listed heritage items within the project area and within or near the study area (50 m buffer)**

Item Name	Address	Location	Significance	Item/Listing Number
Millers Point and Dawes Point Village Precinct	Upper Fort Street, Millers Point	Inside proposal area	State	SHR 01682
Millers Point Heritage Conservation Area	Millers Point	Inside proposal area	Local	LEP C35
National Trust Centre (including buildings and their interiors, retaining walls and ground)	1001 Bradfield Highway, Millers Point	Inside proposal area	Local	LEP I876
Sydney Harbour Bridge, approaches and viaducts	Bradfield Highway and North Shore Railway, Milsons Point/Dawes Point	Within or near the study area	National State Local	NHL 105888 SHR 5045703 RMS Section 170 4301067 Railcorp Section 170 4801059 City of Sydney LEP 2012 I539 RNE 1857 NTA 6088
Sydney Observatory	1003 Upper Fort Street, Millers Point	Within or near the study area	State Local	SHR 01449 LEP I934
Argyle Cut	Argyle Street, The Rocks	Within or near the study area	State	SHR 01523, SHFA Section 170 4500461
Argyle Bridge	Cumberland Street, The Rocks	Within or near the study area	State	SHR 01522, SHFA Section 170 4500475
Garrison Anglican Church Precinct	Argyle Street, Millers Point	Within or near the study area	State	SHR 00644 LEP I609
The Rocks (Argyle Street) Railway Substation and Switchhouse	Trinity Avenue, Dawes Point	Within or near the study area	State	SHR Railcorp Section 170 4800006
Observatory Park (including Boer War Memorial, bandstand, fences and landscaping)	Upper Fort Street, Millers Point	Within or near the study area	Local	LEP I935

Item Name	Address	Location	Significance	Item/Listing Number
Fort Street Primary School Site (including buildings and their interiors, fig trees and grounds)	1005 Upper Fort Street, Millers Point	Within or near the study area	Local	LEP I938
Fort Street Primary School Site (including buildings and their interiors, fig trees and grounds)	9 Upper Fort Street, Millers Point	Within or near the study area	Local	LEP I936
Messenger's Cottage for Sydney Observatory (including interior)	9A Upper Fort Street, Millers Point	Within or near the study area	Local	LEP I937
Lane off Gas Lane (including sandstone walls and wrought iron street light)	Jenkins Street, Millers Point	Within or near the study area	Local	LEP I890
Sydney Opera House (buffer zone)	2 Circular Quay east, Sydney (buffer zone extends to Argyle Street)	Within or near the study area	National World	WHL NHL 105738 SHR 01685 City of Sydney LEP 2012 1064 RNE 2353 NTA 6088

Summary descriptions of the heritage items and conservation areas within the proposal area are provided below. Descriptions of heritage items and heritage conservations areas within the wider study area are provided in Appendix D.

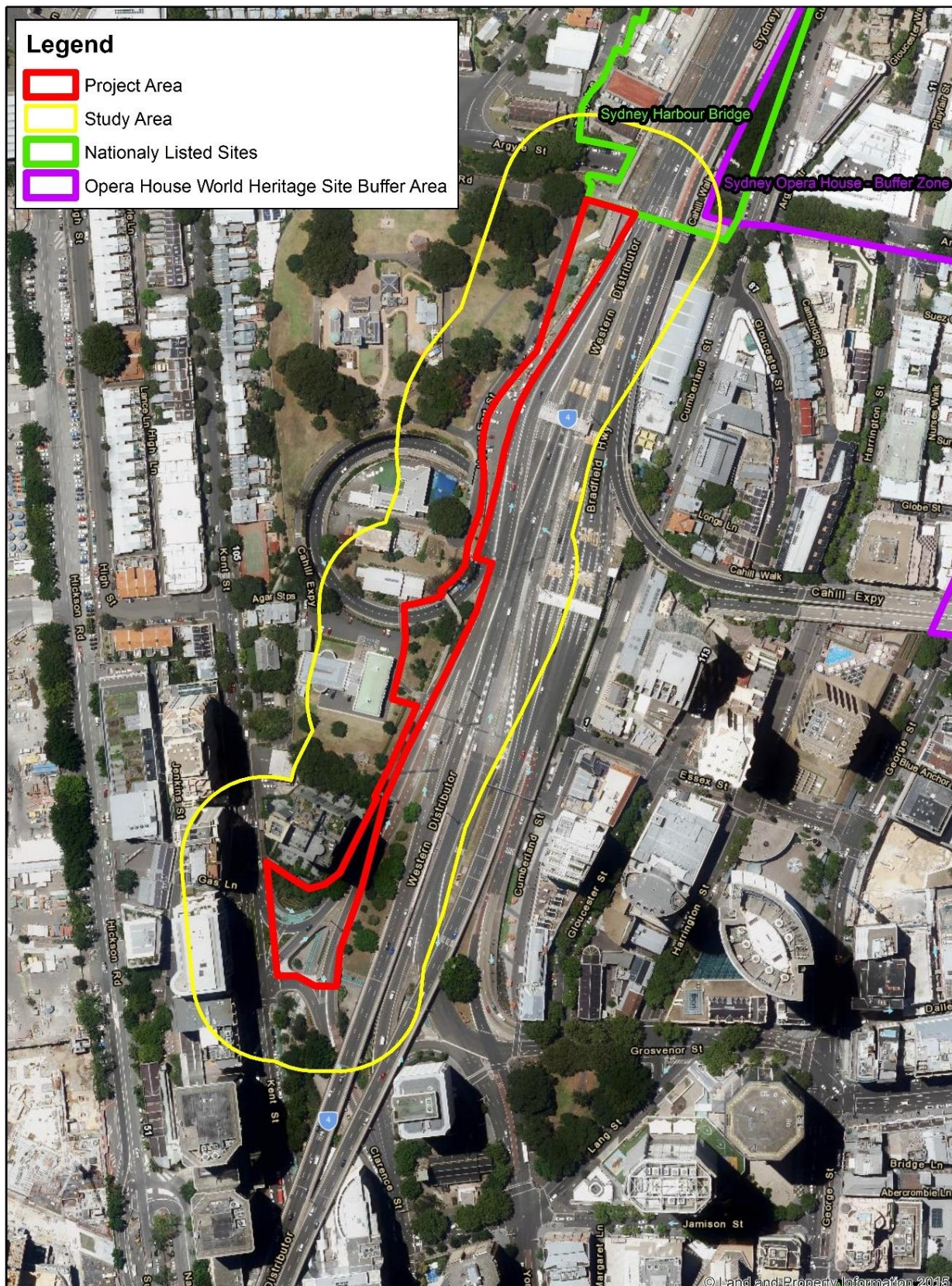
### ***Millers Point and Dawes Point Village Precinct***

The Millers Point and Dawes Point Village Precinct is listed as a state significant heritage item (SHR No. 01682) due to its historical, associative, aesthetic, research potential, rarity and representativeness heritage values. A photograph of the precinct from Observatory Hill Park is provided as Plate 6-1.

### ***Millers Point Heritage Conservation Area***

The Millers Point Heritage Conservation area is listed in the Sydney Local Environment Plan 2012, (Item No. C35). It encompasses a residential and commercial area and is listed as a heritage conservation area due to its historical, associative, aesthetic, social, research potential, rarity and representativeness heritage values. A photograph of a section of the Millers Point Heritage Conservation Area is provided as Plate 6-2.





Source: Artefact Heritage, November 2017









Source: Artefact Heritage, November 2017



**Plate 6-1: Millers Point and Dawes Point Village Precinct from Observatory Hill Park.**



Photo credit: Artefact, 2017

**Plate 6-2: View north to terraces and park within Millers Point Heritage Conservation Area.**



Photo credit: Artefact, 2017

**Plate 6-3: View of the main east elevation of the National Trust Centre.**



Photo credit: Artefact, 2017

### **National Trust Centre (including buildings and their interiors, retaining walls and ground)**

The National Trust Centre is listed in the Sydney Local Environment Plan 2012 (Item No. 1876). The centre was constructed between 1815 and 1849. The National Trust Centre is listed as a local heritage item due to its historical, associative, aesthetic, social, research potential, rarity and representativeness heritage values. A photograph of the National Trust Centre is provided as Plate 6-3.

## **6.1.3 Potential impacts**

This section describes and assesses the magnitude of potential impacts associated with the construction and operation of the proposal. Potential impacts to heritage fall into two categories – physical (or fabric) impacts and visual impacts to heritage views.

### **6.1.3.1 Sydney Harbour Bridge**

Potential impacts on the heritage values of the Sydney Harbour Bridge are summarised in Table 6-3 and detailed below.

**Table 6-3: Summary of potential heritage impact to Sydney Harbour Bridge**

<b>Proposed work</b>	<b>Impact to fabric</b>	<b>Visual impact</b>
Construction of on-grade cycleway	Moderate	Moderate
Construction of elevated cycleway/pedestrian spiral ramp	Negligible	Minor
Construction of cycleway/pedestrian bridge over Cahill Expressway	Negligible	Minor
Widening/resurfacing of shared-use path	Negligible	Negligible - Minor
Relocation of Jelly Palms	Minor	Minor
Overall impact	Minor	Minor

The physical impacts to the Sydney Harbour Bridge from the proposal would arise mainly through the construction and operation of the on-grade cycleway along Upper Fort Street, elevated cycleway/pedestrian ramp accessing the new bridge over the Cahill Expressway, and the widening/resurfacing of existing shared-use paths.

The cycleway alongside Upper Fort Street includes removing a section of parapet and retaining wall west of the Bradfield Highway and construction of a new retaining wall between the cycleway alignment and Incident Response Area. The removal of the parapet and wall would impact on the intactness of the Sydney Harbour Bridge southern approaches. While the wall is not original and outside of the National Heritage Listing and State Heritage Register curtilage of the bridge, they are described as having high significance in a Conservation Management Plan endorsed for the Sydney Harbour Bridge (RTA, 2007) and their removal would interrupt the form and symmetry of the bridge's southern approaches.

This aspect of the proposal would also reconfigure the outdoor exercise area in Observatory Hill, and relocate the significant Jelly Palm plantings associated with the Sydney Harbour Bridge. The cultural landscape setting and visual appearance of this area of parkland would change as a result. The work along Upper Fort Street would be visible from a number of sightlines within the Millers Point and Dawes Point Village Precinct, in particular from Observatory Hill Park and Sydney Observatory. The on-grade cycleway along Upper Fort Street would have a moderate physical



impact to the heritage significant fabric of the Sydney Harbour Bridge southern approaches, and a moderate visual impact to the heritage views and setting of the bridge's southern approaches. The elevated cyclist/pedestrian approach ramp north of the National Trust Centre/S.H. Ervin Gallery and new cyclist/pedestrian bridge over the Cahill Expressway would have a negligible physical impact to the heritage significant fabric of the Sydney Harbour Bridge southern approaches. The ramp and bridge would not directly impact significant end-on views of the Sydney Harbour Bridge from the Bradfield Highway, the Kent Street on-ramp or the existing shared-use pedestrian/cycle route. The ramp and bridge would have a minor visual impact to the heritage views and setting of the Sydney Harbour Bridge southern approaches.

The widening/resurfacing of existing shared-use paths between the Kent Street cycleway and the proposed cyclist/pedestrian elevated ramp in the northeast corner of the National Trust Centre site would remove the grassed nature strip between the shared-use path and Clarence and Kent Street vehicle on-ramp. This aspect of the proposal would have a negligible physical impact to the heritage significant fabric of the Sydney Harbour Bridge southern approaches. While the visual impact of the proposed cycleway in this location would depend on the final material and colour palette used in the design, it is expected to have a negligible to minor visual impact to the heritage views and setting of the Sydney Harbour Bridge southern approaches.

In summary, the proposal would result in an overall minor (physical and visual) impact to the heritage significance of the Sydney Harbour Bridge southern approaches. The proposed work falls outside the National Heritage Listing and State Heritage Register curtilages, and as such would not directly impact the national, state and local heritage values of the Sydney Harbour Bridge. The proposed works would enhance the accessibility and functionality of the existing cycleway on the bridge, including improved connectivity with the Millers Point and Dawes Point precincts, consistent with the current Conservation Management Plan (2007). The proposal also presents an opportunity to strengthen public engagement and understanding of the national and state heritage values of bridge. The overall impact of the proposal on the significance of the Sydney Harbour Bridge would be minor.

#### **6.1.3.2 Other heritage items**

Other heritage items with assessed impacts of negligible or higher are discussed in Table 6-4.

Impacts to other heritage items within the study area (within a 50 m buffer) were assessed as neutral as they have no, or extremely limited, sight lines to and from the proposed works. These items are:

- The Rocks (Argyle Street) Railway Sub-Station and Switchhouse
- Argyle Cut
- Argyle Bridge
- Bureau of Meteorology
- Garrison Anglican Church Precinct
- Lane off Gas Lane including Wrought Iron Street Light.

**Table 6-4: Assessment of impacts to other heritage items**

Item name	Physical impact	Visual impact to heritage views
Millers Point and Dawes Point Village Precinct	<p><b>Minor.</b> The proposal would result in a minor physical impact to the precinct. Identified physical impacts include:</p> <ul style="list-style-type: none"> <li>• Removal of several tree plantings within and also in the vicinity of the item's curtilage</li> <li>• Removal of a 60 m section of existing parapet and retaining wall associated with the Sydney Harbour Bridge southern approaches and construction of a new wall further east.</li> </ul> <p>While the proposal would have a direct localised impact, the affected area would be relatively small (Figure 6-5). The proposal would involve works within a small section of the overall area of the precinct's heritage curtilage. The proposal would not diminish or undermine the state significant values of the Millers Point and Dawes Point Village Precinct.</p>	<p><b>Minor.</b> The proposal would result in a minor visual impact to the precinct. The visual impact of the on-grade cycleway within the conservation area would be restricted to views east from the Observatory Hill Park directly opposite, distant views from Sydney Observatory, and views east from Fort Street Primary School. The sloping nature of the site means that views from Watson Road Steps, Bureau of Meteorology and Messenger's Cottage are not anticipated to be directly affected.</p> <p>While the proposal would have a direct localised impact, the area affected would be relatively small (see Figure 6-5). The proposal would involve works within only a small section of the overall area of the precinct's heritage curtilage. The proposal would not diminish or undermine the state significant values of the Millers Point and Dawes Point Village Precinct.</p>

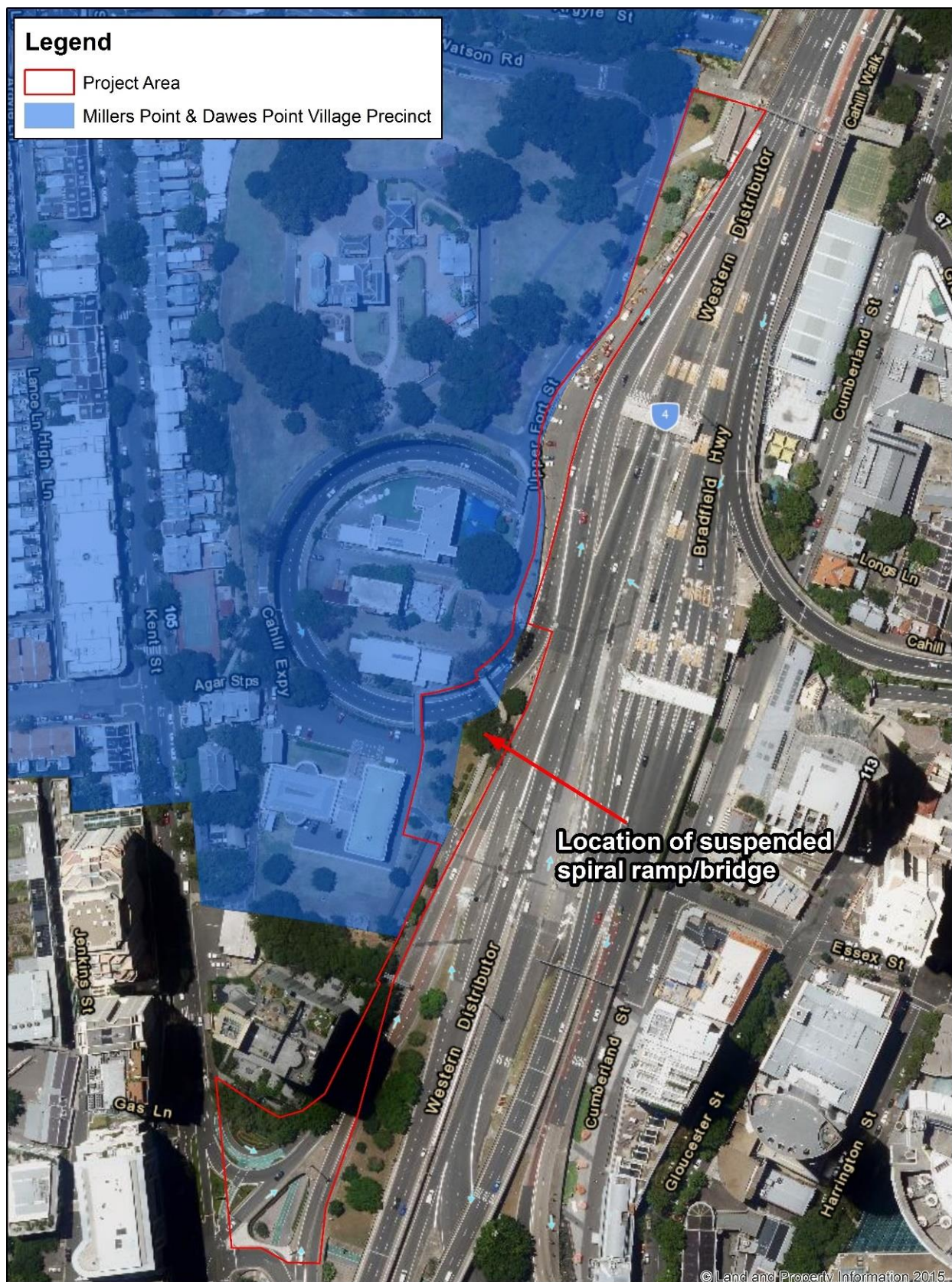
Item name	Physical impact	Visual impact to heritage views
Millers Point Heritage Conservation Area	<p><b>Minor.</b> The proposal would result in a minor physical impact to the Millers Point Heritage Conservation Area.</p> <p>The proposal involves works that would result in direct localised impacts within the area and physical impacts to its components, specially:</p> <ul style="list-style-type: none"> <li>• Construction of new elements within the conservation area including the elevated approach ramp and bridge across the Cahill Expressway, proposed on-grade cycleway alongside Upper Fort Street, reconfiguration of the outdoor exercise area, and the removal of several trees</li> <li>• The proposed on-grade cycleway alongside Upper Fort Street would relocate seven locally listed Jelly Palms, which were identified in the Arboricultural Impact Assessment (Appendix E) as having high landscape significance</li> <li>• Several tree plantings would be removed to make way for the proposed elevated ramp and bridge, impacting the cultural landscape of the immediate area. The significant Moreton Bay fig tree near the front of the National Trust Centre building would be retained.</li> </ul> <p>While the proposal would result in changes within the heritage conservation area, the amount of heritage curtilage to be directly affected is relatively small.</p>	<p><b>Minor.</b> The proposal would result in a minor visual impact to the Millers Point Heritage Conservation Area.</p> <p>The proposal would involve works that would result in visual impacts within and surrounding the Millers Point Heritage Conservation Area, specially:</p> <ul style="list-style-type: none"> <li>• The elevated ramp would not exceed the height of the adjacent National Trust Centre, although would be a dominant visual element and would be visible along the vehicular approaches of the Bradfield Highway. The ramp would also be seen from numerous pedestrian vantage points within the conservation area</li> <li>• The visual impact of the on-grade cycleway within the conservation area would be restricted to views looking east from the Observatory Hill Park directly opposite, distant views from Sydney Observatory, and views east from the Fort Street Primary School site. The sloping nature of the site means that views from Watson Road Steps, the Bureau of Meteorology and Messenger's Cottage, would be directly affected within the conservation area</li> <li>• The removal of several trees within would change the visual setting of the immediate landscape within the conservation area.</li> </ul> <p>The proposal would result in noticeable changes to the cultural landscape of the conservation area and would introduce visually prominent elements in the immediate setting. The overall impact to the broader conservation area as a whole would be relatively minor.</p>



Item name	Physical impact	Visual impact to heritage views
National Trust Centre (including buildings and their interiors, retaining walls and ground)	<p><b>Minor.</b> The proposal would result in a minor physical impact to the National Trust Centre/S.H. Ervin Gallery. Identified impacts include:</p> <ul style="list-style-type: none"> <li>• Several tree plantings would be removed to make way for the proposed elevated ramp and bridge, although the significant Moreton Bay fig near the front of the centre building would be retained</li> <li>• The proposed widening and resurfacing of shared-use paths and associated regrading works would result in minor reconfiguration of the stairs and sandstone retaining wall at the entry point to the centre</li> <li>• Reconfiguration of the main entry stair to the centre would involve several stairs being built over. The stairs are not identified as a significant component of the site, although they are the principal entry point</li> <li>• The ramp would provide a possible step-free pedestrian connection to National Trust Centre/S.H. Ervin Gallery, improving pedestrian connectivity within the Millers Point and Dawes Point Village Precinct.</li> </ul>	<p><b>High.</b> The proposal would result in a high visual impact to the National Trust Centre/S.H. Ervin Gallery. Identified impacts include:</p> <ul style="list-style-type: none"> <li>• The elevated ramp would not exceed the height of the adjacent National Trust Centre but would introduce a prominent visual feature. The ramp would closely border the main heritage view corridor to the centre, and would affect views to and from this heritage item. The spiral ramp would impact on other views towards the site from both the northern and southern approaches (both pedestrian and vehicle), as well as views out towards the Sydney CBD</li> <li>• The construction of the proposed pedestrian and cycle spiral ramp would remove several tree plantings, diminishing the visual setting of the site and cultural landscape of the centre.</li> </ul>
Fort Street Primary School Site including buildings and their interiors, fig trees and grounds	<p><b>Negligible.</b> The proposal would result in a negligible physical impact to the Fort Street Primary School Site. The proposal does not involve any works that directly affect physical fabric of the site.</p>	<p><b>Negligible.</b> The proposal would result in a negligible visual impact to the Fort Street Primary School Site. The proposed separated cycleway would extend along the east side of Upper Fort Street between Bradfield Highway, directly opposite the site. No direct impacts are expected. The proposed on-grade cycleway and elevated ramp and bridge would not impact the setting of this site.</p>

Item name	Physical impact	Visual impact to heritage views
Messenger's Cottage for Sydney Observatory including interiors	<b>Neutral.</b> The proposal would result in a neutral physical impact to the Messenger's Cottage for Sydney Observatory. The proposal does not involve any works that directly affect the physical fabric of the site.	<b>Moderate.</b> The proposal would result in a moderate visual impact to the Messenger's Cottage for Sydney Observatory. The construction of the proposed cycleway/pedestrian bridge over the Cahill Expressway would remove the mature sugar gum ( <i>Eucalyptus cladocalyx</i> ) to the east of the Messenger's Cottage, a prominent landscape feature and local landmark.
Sydney Observatory	<b>Neutral.</b> The proposal would result in a neutral physical impact to Sydney Observatory. No works would directly affect the physical fabric of this site.	<b>Moderate.</b> The proposal would result in a moderate visual impact to the Messenger's Cottage for Sydney Observatory. The proposed cycleway/pedestrian bridge over the Cahill Expressway would result in the removal of the mature Sugar Gum ( <i>Eucalyptus cladocalyx</i> ) to east of the Messenger's Cottage, a prominent landscape feature and local landmark.
Observatory Park including Boer War Memorial, bandstand, fences and landscaping	<b>Neutral.</b> The proposal would result in a neutral physical impact to Observatory Hill Park. No works would directly affect the physical fabric of Observatory Hill Park.	<b>Minor.</b> The proposal would result in a minor visual impact to Sydney Observatory. The construction of the on-grade cycleway between Upper Fort Street and Bradfield Highway would removal the existing retaining wall and parapet and introduce a new retaining wall and associated landscaping. These elements would be discernible from Sydney Observatory, including views from the path around the observatory complex down the slopes of Observatory Hill.
Sydney Opera House buffer zone	<b>Neutral.</b> The proposal would result in a neutral physical impact to the Sydney Opera House World Heritage Buffer Zone as it is located beyond the western extent of the World Heritage buffer zone of the Sydney Opera House, which aims to preserve the significant views and settings of the Opera House.	<b>Neutral.</b> The proposal would result in a neutral visual impact to the Sydney Opera House World Heritage Buffer Zone as the proposal is located beyond the western extent of the World Heritage buffer zone of the Sydney Opera House. No clear sightlines exist between the Sydney Opera House and the proposed elevated ramp, and no impacts are anticipated to the views and setting of the Opera House.





Source: Artefact Heritage, November 2017



## 6.1.4 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on non-Aboriginal heritage are discussed in Table 6-5.

**Table 6-5: Safeguards and management measures relating to non-Aboriginal heritage**

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage. The NAHMP will be prepared in consultation with the Office of Environment and Heritage.	Contractor	Detailed design / pre-construction	Core standard safeguard H1  Section 4.10 of QA G36 <i>Environment Protection</i>
Non-Aboriginal heritage	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (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.	Contractor	Detailed design / pre-construction	Core standard safeguard H2  Section 4.10 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non-Aboriginal heritage	<p>The following measures should be implemented to protect specific heritage items in the proposal area:</p> <ul style="list-style-type: none"> <li>• The concrete parapet and retaining wall on the west side of the Sydney Harbour Bridge southern approaches should be retained wherever possible in the design of the proposal.</li> <li>• The proposed removed section of concrete parapet should be retained and adaptively re-used such as by retention and reuse in landscaping works or furniture.</li> <li>• The provision of an interpretive inlay in the ground surface indicating the location of the demolished section of retaining parapet and wall.</li> <li>• The southwest stairs of the Sydney Harbour Bridge should be protected for the duration of work.</li> <li>• Parts of the sandstone retaining wall at the eastern boundary of the National Trust Centre/S.H. Ervin Gallery near the existing entry stairs should be protected for the duration of the project.</li> </ul>	Roads and Maritime/ Contractor	Detailed design/pre-construction/ /construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Visual impact on heritage items	<p>The proposal should be designed as much as possible to reduce the visual prominence of new elements within the existing cultural landscape and be sympathetic with the surrounding setting and context of nearby heritage items, including through:</p> <ul style="list-style-type: none"> <li>• Use of materials congruent with the aesthetic character of the Sydney Harbour Bridge while sympathetic to the context of surrounding heritage items and heritage conservation areas.</li> <li>• Selection of appropriate modern and lightweight designs and materials that reduce the visual bulk of new structures and are of a consistent material palette with the Sydney Harbour Bridge.</li> </ul>	Roads and Maritime	Detailed design/ /construction	Additional safeguard
Visual impact on heritage items and context	<p>Any trees removed by the proposal should be relocated and retained within the proposal area or a nearby locality, on advice from a suitably qualified arborist, to maintain the existing cultural landscape qualities of the area. Factors to be considered include relative significance, historical appropriateness, condition, public safety risk, amenity value, biological diversity, disease resistance and contribution to landscape character.</p>	Roads and Maritime/ Contractor	Pre-construction	Additional safeguard
Non-Aboriginal heritage	<p>An interpretation strategy should be prepared that considers opportunities to highlight the history, evolution and significance of the Sydney Harbour Bridge and surrounding heritage items and heritage conservation areas.</p>	Roads and Maritime/ Contractor	Pre-construction	Additional safeguard



Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Heritage items	A heritage induction on the Sydney Harbour Bridge should be provided for all workers prior to works commencing.	Contractor	Pre-construction	Additional safeguard

## 6.2 Landscape character and visual impacts

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to urban design, landscape character and visual impact in the proposal area.

Tract Consultants Pty Ltd has been commissioned by Roads and Maritime to provide an Urban Design, Landscape Character and Visual Impact Assessment. The assessment is included as Appendix A.

### 6.2.1 Methodology

The impact of the proposal on landscape character was assessed by identifying four character zones which reflect areas of specific qualities that are distinguishable from the neighbouring zone. The proposal has been assessed in terms of its impacts on these character zones. Impact has been ranked in terms of sensitivity of the zone to change.

The visual impact of the proposal was assessed from key viewpoints and considered the existing land use pattern and development adjoining the proposal area. The assessment included desktop analysis and site surveys to determine the areas from which the proposal would be visible. Specific tasks included:

- Defining the scale of the proposal within the context of the surrounding landscape
- Identifying key visual 'envelopes', viewpoints and groups of viewpoints from which the proposal would be visible
- Assessing the level of impact of the proposal on the proposed viewpoints.

### 6.2.2 Existing environment

The existing environment is described by four character zones and six viewpoints.

Figure 6-6 shows the character zones of the study area and Figure 6-7 shows the viewpoints of the study area. The proposal's visibility is primarily influenced by land use, vegetation and topography. Figure 6-8 shows the proposed design and how it would fit in with the existing environment.

#### **Character zones**

Four character zones were identified in the proposal area and are described below.

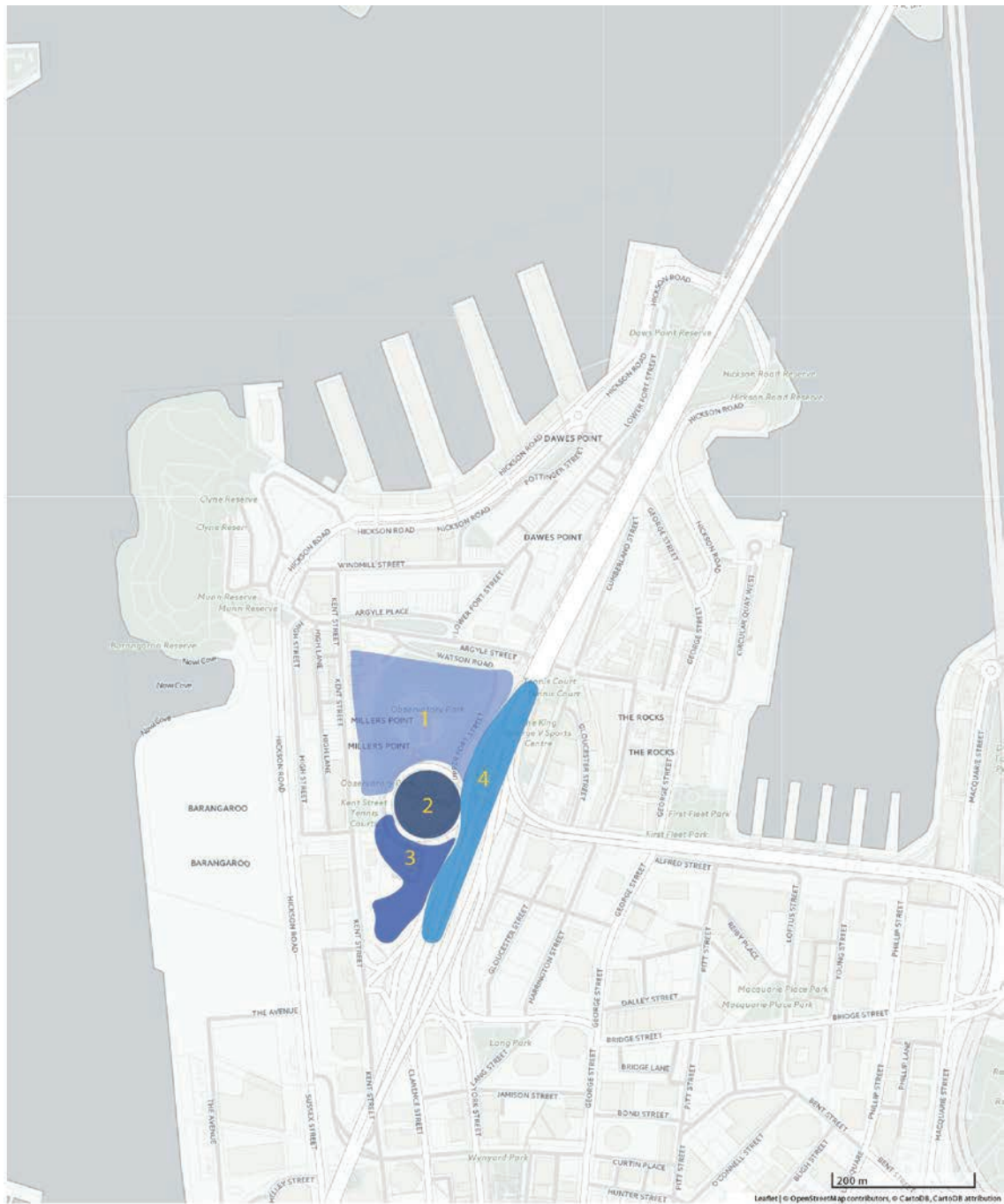
#### **Character Zone 1 – Observatory Hill Park**

Zone 1 extends from the connection to the existing Sydney Harbour Bridge cycleway to the Cahill Expressway at the high point within the proposal area. The zone is defined by the parklands. Key elements of the space are:

- A ground plain predominantly of grass which is delineated by a concrete retaining wall providing a vertical change between the adjoining character zone
- Substantial fig trees forming a strong canopy to the west
- The Observatory compound defined by a wooded and sandstone fence line and the sandstone buildings beyond.

#### **Character Zone 2 – Fort Street Public School**

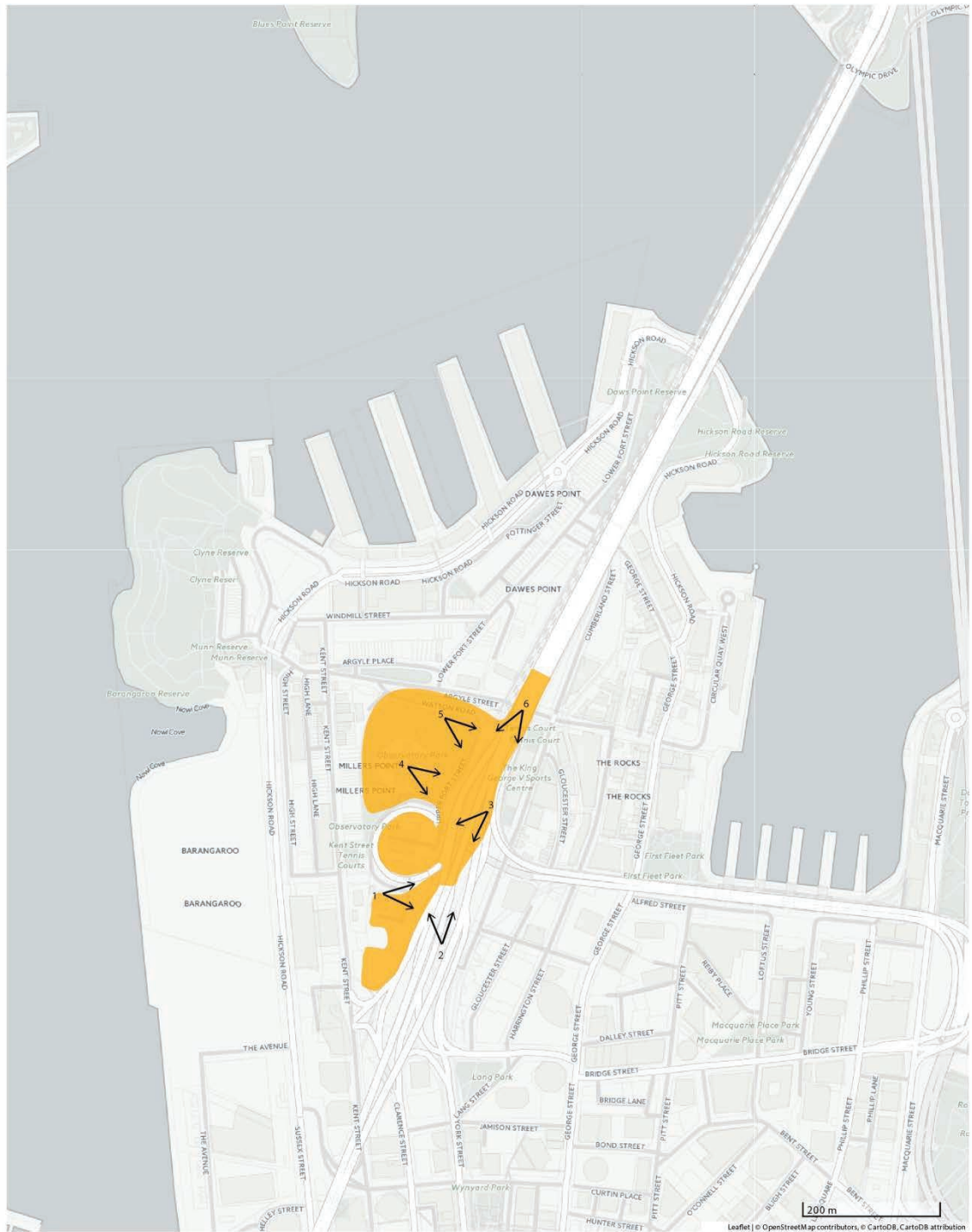
Zone 2 is defined by the sandstone walls of the Cahill Expressway cutting and the cluster of brick buildings associated with the Fort Street Public School compound. The built form is broken by landscape elements including a substantial fig tree and small scale garden beds. To the west, the zone has views over the inner harbour.



#### LEGEND

- |   |   |
|---|---|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #ADD8E6; border: 1px solid black; margin-right: 5px;"></span> CHARACTER ZONE 1 | <span style="display: inline-block; width: 15px; height: 15px; background-color: #4682B4; border: 1px solid black; margin-right: 5px;"></span> CHARACTER ZONE 3 |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #00008B; border: 1px solid black; margin-right: 5px;"></span> CHARACTER ZONE 2 | <span style="display: inline-block; width: 15px; height: 15px; background-color: #87CEFA; border: 1px solid black; margin-right: 5px;"></span> CHARACTER ZONE 4 |

Source: Tract Consults, 2017



#### LEGEND

- |  |                                   |                                 |                  |
|--|-----------------------------------|---------------------------------|------------------|
| 1 ↗ CARPARK - SH ERVIN GALLERY             | 3 ↘ BRADFIELD HIGHWAY SOUTH BOUND | 5 ↗ UPPER FORT STREET TO BRIDGE | VISUAL CATCHMENT |
| 2 ↖ WESTERN DISTRIBUTOR -<br>HEADING NORTH | 4 ↘ OBSERVATORY TO BRIDGE         | 6 ↗ BRIDGE SOUTH BOUND          |                  |

Source: Tract Consultants, 2017





Northbound



Southbound

Source: Tract Consultants, 2017

#### 6.2.2.1.1 Character Zone 3 – National Trust Centre/S.H. Ervin Gallery

Zone 3 is defined by the green space to the forecourt of the National Trust Centre/S.H. Ervin Gallery, a setting composed of individual fig trees, an olive hedge and grassland, with the heritage buildings set beyond to the west. The space provides a green backdrop to the Bradfield Highway and Sydney Harbour Bridge approaches.

#### 6.2.2.1.2 Character Zone 4 – Bradfield Highway and Sydney Harbour Bridge approaches

This zone runs for the full extent of the proposal on its southern boundary and incorporates all elements of the Sydney Harbour Bridge approaches including the Bradfield Highway, Western Distributor, on and off ramps from the adjoining street network, and Incident Response Area. Zone 4 is dominated by road infrastructure and pavement, with edges defined by barriers or cuttings. The northern terminus of the zone is the Sydney Harbour Bridge and its pylons.

#### 6.2.2.2 Viewpoints

Six viewpoints were identified in the proposal area and are described below.

Viewpoint 1 provides views from the carpark of National Trust Centre/S.H. Ervin Gallery to the east. This view establishes the relationship between the National Trust Centre/S.H. Ervin Gallery and the proposal. The view of the existing bridge over the Cahill Expressway and approach ramp is interrupted by the vegetation within the grounds of the Gallery, although the built elements of both the ramp and bridge feature heavily. Some of this vegetation would be cleared as part of construction of the proposal. The heritage value of the National Trust Centre/S.H. Ervin Gallery lends itself to a high level of sensitivity to change, which is moderated by its existing context of high rise buildings and the existing ramp.

Viewpoint 2 provides views northbound from the intersection of the Western Distributor and Bradfield Highway looking northwest across the highway towards National Trust Centre/S.H. Gallery and the proposed elevated approach ramp and bridge over the Cahill Expressway. The view is experienced by the transient motorist ie quickly with limited time to focus on the elements in the view. Visibility of the Gallery is reduced by the fig trees between the highway and the building. As such the sensitivity is low.

Viewpoint 3 provides views southbound from the Bradfield Highway (former toll plaza) looking southwest towards the National Trust Centre/S.H. Ervin Gallery and the proposed elevated ramp and bridge over the Cahill Expressway. This viewpoint is the view of the southbound motorist as they pass through the area formerly occupied by the toll plaza, as such it is one of rapid and short exposure and is of low sensitivity.

Viewpoint 4 provides views from the south-eastern end of Observatory Park looking east towards the Bradfield Highway. The foreground is dominated by the grassland of Observatory Hill Park, with the Bradfield Highway dominating mid-ground view. The presence of the Bradfield Highway takes away from the otherwise relaxing nature of the space. Sensitivity to change is low.

Viewpoint 5 provides views from Watson Road looking east towards the Bradfield Highway and its concrete retaining wall rising out of the Argyle Cut. The setting provides the first view of the Bradfield Highway retaining wall and its relationship to the Observatory Hill Park Precinct. The view is experienced by a range of different users, and the view towards the Bradfield Highway is largely uninterrupted with the exception of planting to the front. The overall character of restful green space with heritage significance has a high sensitivity.

Viewpoint 6 provides views southbound from the Bradfield Highway looking west across the Incident Response Area towards the S.H. Ervin Gallery and proposed elevated ramp and bridge over the Cahill Expressway. This is the view of the southbound motorist as they pass through the

area formerly occupied by the toll plaza opposite the Incident Response Area, similar to the view of pedestrians on the Cahill Expressway pedestrian pathway. The S.H. Ervin Gallery is concealed by vegetation and the existing bridge structure is visible with towers of the Sydney CBD dominant within the view. The sensitivity of the view is low.

## 6.2.3 Potential impacts

### *Landscape character*

Potential impacts on the character zones of the proposal once built are discussed below. Impacts during construction in each of the zones are expected to be temporary and minor and less than those expected during the operation of the cycleway.

Character Zone 1 Observatory Hill Park has a number of heritage buildings and is itself a local heritage item. This, combined with the landscape nature of its setting and accessibility to the public, gives the zone a high sensitivity. The proposal would match or complement the existing retaining structure of the Bradfield Highway and its approaches to the Sydney Harbour Bridge. The magnitude of the proposed changes to this zone is moderate. The impact rating to Character Zone 1 is moderate to high.

Character Zone 2 Fort Street Public School has a number of heritage buildings located in a relatively hard and utilitarian context. The sensitivity to change is low. The proposal largely replicates the existing path with limited changes in alignment and elevation and the magnitude of change is also low. The impact rating to Character Zone 2 is low.

Character Zone 3 National Trust Centre/S.H. Ervin Gallery is largely a green space with a backdrop of heritage buildings. The sensitivity to change is high. The zone already accommodates a cyclist facility, although the proposal encroaches further into the green space dividing it both visually and physically. The view from, and to the National Trust Centre/S.H. Ervin Gallery would be maintained when viewed square on. The magnitude of changes from the proposal in this zone is moderate. The impact rating to Character Zone 3 is moderate to high.

Character Zone 4 Bradfield Highway and Sydney Harbour Bridge approaches has built hard edge and infrastructure focus. The scale of this zone in relation to the proposal gives it a low sensitivity to change. The proposal is largely consistent with the scale of the pathway which already adjoins the precinct, and with the overall character of the Sydney Harbour Bridge. The magnitude of changes from the proposal in this zone is low. The impact rating to Character Zone 4 is low.

### *Visual amenity*

Two viewpoints have been assessed as having moderate to high visual impacts from the proposal, including the frontage of the National Trust Centre/S.H. Ervin Gallery when viewed from the carpark, and the northern sections of the route on approach to the Sydney Harbour Bridge. These two locations are characterised by views that are sensitive to change due to their history or vegetated nature. In both locations planting could be used to further moderate the impact of the proposal on the viewer.

The impacts on all viewpoints are summarised as follows:

- Viewpoint 1 from the carpark of National Trust Centre/S.H. Ervin Gallery to the east has a high level of sensitivity to change, moderated by its existing context of high rise buildings. The magnitude of impact is high as the proposal would introduce a new built element within the foreground of the viewpoint. The impact on visual amenity from viewpoint 1 is rated as moderate to high.
- Viewpoint 2 northbound from the intersection of the Western Distributor and Bradfield Highway looking northwest has a low sensitivity to change. The magnitude of impact to this viewpoint is

low due to the distance from the view and the nature of existing uses. The impact on visual amenity from viewpoint 2 is rated as low.

- Viewpoint 3 southbound from the Bradfield Highway (former toll plaza) looking southwest has a low sensitivity. The viewpoint reveals the largely concealed National Trust Centre/S.H. Ervin Gallery and the prominence that the existing cyclist and pedestrian ramp and structure have in relation to this building. As part of the proposal some of the vegetation in the foreground would be removed. The magnitude of these changes is moderate. The impact on visual amenity from viewpoint 3 is rated as low to moderate.
- Viewpoint 4 from the south-eastern end of Observatory Park looking east has a low sensitivity to change. The proposal introduces a new path which would encroach into the Bradfield Highway, at the same grade as the park. This aspect would provide the sense of additional space being added to the park and removed from the road corridor. The magnitude of the impact is low. The impact on visual amenity from viewpoint 4 is rated as low.
- Viewpoint 5 from Watson Road looking east has a high sensitivity. Vegetation currently provides screening of the Bradfield Highway. The impact is of moderate magnitude. The impact on visual amenity from viewpoint 5 is rated as moderate to high.
- Viewpoint 6 southbound from the Bradfield Highway looking west. The motorist (and to a lesser extent, the pedestrian) are exposed to this view over a rapid and short period. The proposed changes are within the scale of the setting and are relatively minor. The sensitivity of the view and the magnitude of the impact are low. The impact on visual amenity from viewpoint 6 is rated as low.

## 6.2.4 Safeguards and management measures

In addition to the safeguards and management measures described below, a number of mitigation measures have been incorporated into concept design, including:

- Minimising the need for physical alterations and increases in paving area
- Designing 'light and transparent' structures to reduce the overall visual impact
- Retaining the existing landscape setting
- Avoiding the loss of significant existing trees and vegetation
- Retaining important public views.

Other safeguards and management measures proposed to avoid, reduce or manage impacts on landscape and visual values are discussed in Table 6-6.

Other safeguards and management measures that would address landscape character and visual impacts are identified in Section 6.1.



**Table 6-6 Safeguards and management measures relating to landscape and visual impact**

Impact	Environmental safeguards	Responsibility	Timing	Standard/ additional safeguard
Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the final detailed project design and implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> <li>• location and identification of existing vegetation and proposed landscaped areas, including species to be used</li> <li>• built elements including retaining walls, bridges and noise walls</li> <li>• pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings</li> <li>• fixtures such as seating, lighting, fencing and signs</li> <li>• details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage</li> <li>• procedures for monitoring and maintaining landscaped or rehabilitated areas.</li> </ul> <p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> <li>• <i>Beyond the Pavement urban design policy, process and principles</i> (RMS, 2014a)</li> <li>• <i>Landscape Guideline</i> (RTA, 2008a)</li> <li>• <i>Bridge Aesthetics</i> (RMS, 2012)</li> <li>• <i>Noise Wall Design Guidelines</i> (RMS, 2016a)</li> <li>• <i>Shotcrete Design Guideline</i> (RMS, 2016ab).</li> </ul>	Contractor	Detailed design / pre-construction	Core standard safeguard UD1

Impact	Environmental safeguards	Responsibility	Timing	Standard/ additional safeguard
Visual construction impacts	<p>The following mitigation measures will be implemented during construction:</p> <ul style="list-style-type: none"> <li>the extent of all construction activity including temporary works will be limited and defined to minimise the total works area</li> <li>construction facilities will be contained within the work boundary and occupy the minimum area practicable</li> <li>suitable barriers will be provided to screen views from adjacent areas</li> <li>At completion of work, or progressively throughout the work where possible, disturbed areas will be returned to a level equivalent to their pre-work state</li> <li>Pollution and dust emissions will be kept to a minimum and monitored throughout the work</li> <li>Temporary lighting will be screened or diverted to reduce unnecessary light spill.</li> </ul>	Contractor	Pre-construction/ construction	Additional safeguard

## 6.3 Noise and Vibration

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to noise and vibration in the proposal area. The information is drawn from the Construction and Operational Noise and Vibration Impact Assessment carried out by Resonate Acoustics (2017), provided in Appendix F.

### 6.3.1 Methodology

#### *Policy setting*

The noise and vibration assessment was informed by the following guidelines and policies:

- EPA Road Noise Policy (DECCW, 2011)
- Noise Criteria Guideline (RMS, 2015)
- Interim Construction Noise Guideline (DECC, 2009)
- Construction Noise and Vibration Guideline (RMS, 2016b)
- German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures
- British Standard BS 7385 Part 2-1993 Evaluation and Measurement for Vibration in Buildings
- Human comfort: Assessing Vibration – a technical guideline (DEC, 2006).

#### *Noise*

Receivers close to the works were identified to represent areas surrounding the proposal that have the potential to be impacted by construction noise and vibration. Six noise catchment areas (NCAs) were then identified for the purposes of the assessment.

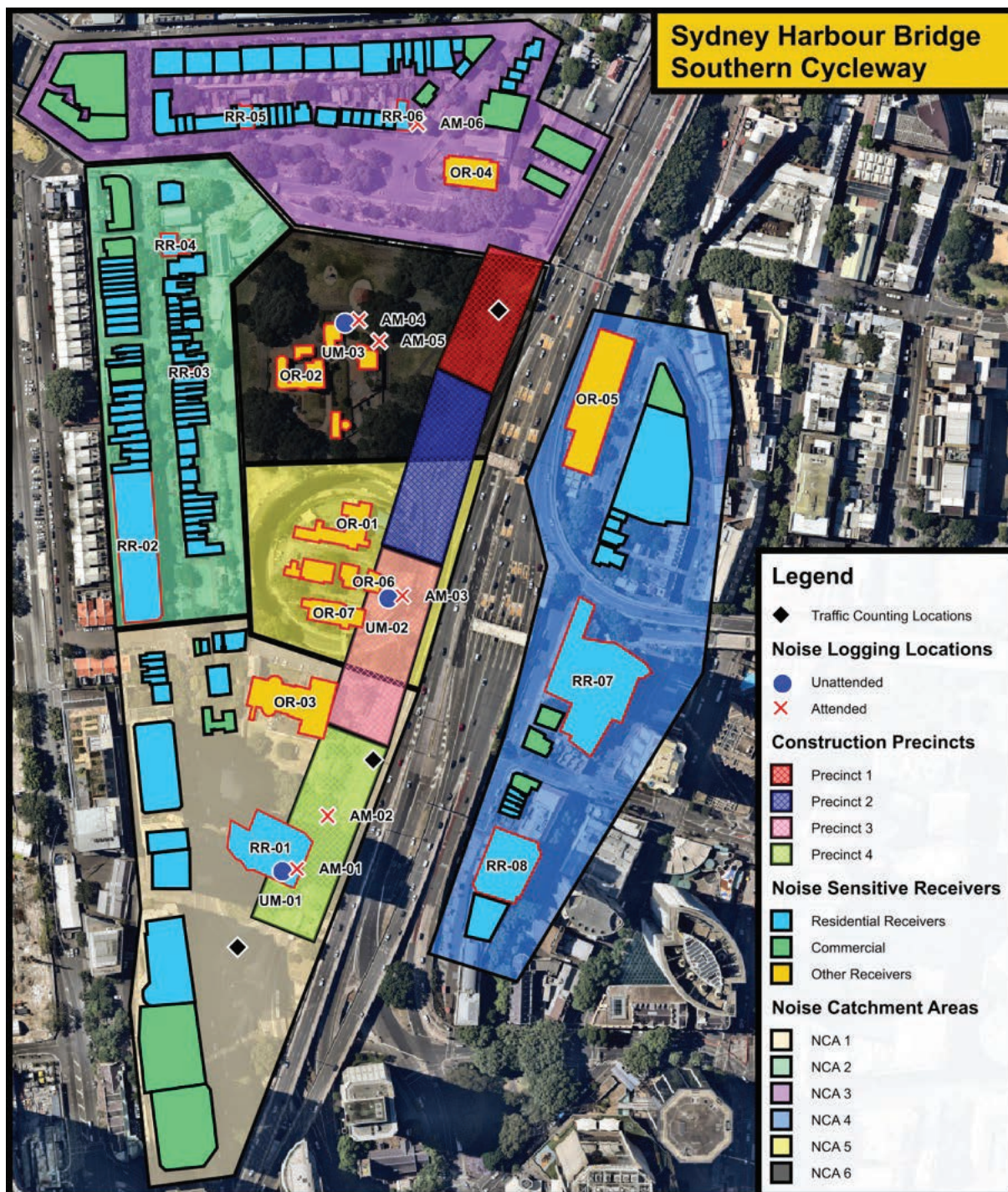
Background noise monitoring and traffic counting were conducted simultaneously to provide a baseline for future comparison (traffic noise is the dominant noise source in the proposal area). Noise monitoring was carried out using loggers to understand existing noise levels in the proposal area and surrounds and to provide inputs to noise modelling. Noise monitoring was conducted in December 2016, and consisted of both unattended noise monitoring and attended noise monitoring as follows:

- Unattended noise monitoring over a one week period at three locations:
  - UM-01 - Observatory Tower
  - UM-02 - Fort Street Primary School
  - UM-03 - Sydney Observatory.
- Attended noise monitoring at the following locations:
  - AM-01 - Observatory Tower (UM-01)
  - AM-02 - Observatory Tower (roadside)
  - AM-03 - Fort Street Primary School (UM-02)
  - AM-04 - Sydney Observatory (UM-03)
  - AM-05 - Sydney Observatory (east)
  - AM-06 - Corner Lower Fort Street and Argyle Place.

The location of the unattended and attended monitoring sites is shown in Figure 6-9.

Data from the noise loggers was separated into representative noise levels for different times of the day - daytime (7am to 6pm), evening (6pm to 10pm) and night-time (10pm to 7am). Measurements of  $LA_{eq}$  and  $LA_{90}$  were taken for each 15-minute window over the logging period.  $LA_{eq}$  is the standard descriptor for traffic noise in NSW and represents a noise level that is equivalent to the level of a constant noise which contains the same energy as the varying noise environment (as would be expected to occur along a road). The rating background level (RBL) ( $LA_{90}$ ) provides an indication of the typical background noise level at a site in each of the three measurement periods (daytime, evening and night-time).





Source: Resonate Acoustics, 2017

ID	NCA	Description
RR-01	1	Observatory Tower
RR-02	2	Private residence
RR-03	2	Private residence
RR-04	2	Private residence
RR-05	3	Private residence
RR-06	3	Private residence
RR-07	4	Shangri-La Hotel
RR-08	4	Private residences
OR-01	5	Fort Street Public School



Potential changes in the noise environment during construction of the proposal were predicted through modelling. The calculations included background (existing) noise levels, the source noise levels of equipment expected that would be used to build the proposal, the location of nearby sensitive receivers, the number of plant items likely to be operating at any given time, and the distance between the equipment and the receivers.

The potential for the proposal to change road traffic noise (once built) was assessed through a desktop review of the distance between the proposal and receivers and traffic flow rates. The only aspect of the works that could influence traffic noise levels is the proposed changes to the merge lane from Kent Street to the Bradfield Highway.

#### **6.3.1.1 Vibration**

The construction vibration assessment determined the likely minimum working distance for vibration-intensive activities from the closest receivers to the work located in each of the four precincts. The minimum distances were then compared against relevant separation criteria. The following vibration-intensive plant and equipment were used in the assessment:

- Excavator with hammer attachment
- Small vibratory roller
- Pile-boring rig.

The Sydney Observatory and the Bureau of Meteorology hold instruments (such as telescopes and meteorological sensors) that may be sensitive to ground-borne vibration. The potential for the work to generate ground-borne vibration within these buildings was predicted for the use of a small vibratory roller and a pile-boring rig.

### **6.3.2 Existing environment**

The proposal area is located in an area of mixed use, adjacent to the Bradfield Highway and Western Distributor. Figure 6-9 shows the location of sensitive receivers, which include a mix of residential, commercial and heritage buildings and structures.

#### **Noise**

Figure 6-9 shows the location of residential, commercial and other sensitive receivers in relation to the proposed works. The closest receiver is located about 10 m away from the southern section of Precinct 4 (Kent Street) and is zoned as 'mixed-use residential'. The receivers that could be affected by construction and operation of the proposed work are listed in Table 6-7.

**Table 6-7: Noise and vibration sensitive receivers and minimum distance to the proposal area**

ID	Description	Address	Land Use	Minimum distance (m)
RR-01	Observatory Tower	168 Kent Street, Millers Point	Mixed-use residential	10
RR-02	Private residence	94 Kent Street, Millers Point	Residential	110
RR-03	Private residence	50 Kent Street, Millers Point	Residential	150
RR-04	Private residence	20 Kent Street, Millers Point	Residential	186
RR-05	Private residence	34 Argyle Place, Millers Point	Residential	188
RR-06	Private residence	64 Argyle Place, Millers Point	Residential	114
RR-07	Shangri-La Hotel	176 Cumberland Street, Sydney	Hotel	95
RR-08	Private residences	194-200 Cumberland Street, Sydney	Residential	91
OR-01	Fort Street Primary School	Upper Fort Street, Millers Point	Educational	20
OR-02	Sydney Observatory	Watson Road, Millers Point	Museum/ observatory	49
OR-03	National Trust Centre/S.H. Ervin Gallery	Upper Fort Street, Millers Point	Museum	20
OR-04	The Garrison Church	60 Lower Fort Street, Millers Point	Place of worship	53
OR-05	King George V Recreation Centre	15 Cumberland Street, Sydney	Sport and recreation	66
OR-06	Observatory Hill <sup>1</sup>	Upper Fort Street	Weather observation station	12
OR-07	Environmental Education Centre	Upper Fort Street	Educational	10

<sup>1</sup> Although not a noise sensitive receiver, weather observation equipment contained in this building may be vibration sensitive and this receiver has been included in the vibration assessment.

Noise levels measured at the unattended monitoring locations are presented in Table 6-8 and a summary of attended noise logging results are shown in Table 6-9.

**Table 6-8: Summary of unattended noise logging results**

ID	Location	Time of day	RBL (LA <sub>90</sub> )	LA <sub>eq</sub>
UM-01	Observatory Tower (Level 5)	Day	69	73
		Evening	68	72
		Night	55	68
UM-02	Fort Street Primary School	Day	64	67
		Evening	63	66
		Night	53	63
UM-03	Sydney Observatory	Day	53	58
		Evening	55	60
		Night	46	56

**Table 6-9: Summary of the attended noise logging results**

ID	Location	Time (min)	Fast Max dB(A)	L <sub>eq</sub> dB(A)	L <sub>10</sub> dB(A)	L <sub>90</sub> dB(A)
AM-01	Observatory Tower (UM-01)	2	81	70	72	68
AM-02	Observatory Tower (roadside)	15	93	73	76	67
AM-03	Fort Street Primary School (UM-02)	15	87	70	72	67
AM-04	Sydney Observatory (UM-03)	15	79	57	58	54
AM-05	Sydney Observatory (east)	15	82	64	66	62
AM-06	Corner Lower Fort Street and Argyle Place	3	94	76	76	60

Table 6-10 summarises the road traffic noise levels from noise logging location UM-01 (Observatory Tower). Table 6-11 summarises the results of the Kent Street traffic count.

**Table 6-10: Road traffic noise**

ID	L <sub>eq</sub> (dBA)		Highest L <sub>max</sub> (dBA)			Percentile (dBA)		
	Day 15 (hr)	Night (9hr)	1st	2nd	3rd	95	50	10
UM-01	73	68	92	85	85	90	80	75

**Table 6-11: Kent Street traffic count summary**

Location	Daytime, 7am – 10pm (15hr)		Night-time, 10pm – 7am (9hr)	
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Kent Street	8,449	332	1,197	45
All other lanes	99,722	7,007	19,772	1,084

### Vibration

The proposed works would be located close to heritage-listed structures, as identified in the *City Plan Heritage Report* (March 2015), including:

- Parts of the SHB
- National Trust Building
- Sydney Observatory
- Observatory Park buildings including:
  - Boer War Memorial
  - Bandstand
- Various fences and landscaping.
- Fort Street Primary School, including
  - Buildings and their interiors
  - Various fig trees and grounds
- Bureau of Meteorology weather station.

The potential impacts of vibration on these buildings from the proposed work was assessed.

### 6.3.3 Criteria

A range of criteria have informed the noise and vibration assessment. These criteria include construction noise criteria, road traffic noise criteria, vibration criteria relating to human exposure and the potential for building damage from vibration, and blasting criteria relating to minimising human annoyance and preventing structural damage. The outputs of the noise model have been compared to these criteria where relevant.

### Noise

#### Construction

The Interim Construction Noise Guideline (ICNG), prepared by the NSW Department of Environment and Climate Change (DECC) in 2009 detail construction noise assessment criteria and call for the application of feasible and reasonable measures to mitigate construction noise and vibration. The ICNG has been used for the assessment of construction noise.



Construction noise management levels (NMLs) at residences, and standard work hours, as specified in the ICNG, are summarised in Table 6-12. The ICNG also prescribes noise management levels depending on the time that construction work is to be carried out. The NMLs apply at the property boundary most exposed to construction noise or, if the residence is more than 30m from the boundary, at the most noise affected position within 30m of the residence. The NMLs should be achieved at noise sensitive locations where it is feasible and reasonable to do so.

**Table 6-12: ICNG construction noise management levels – residences**

Time of Day	$L_{eq}$ (15 min) NML, dB(A)
Recommended standard hours: Monday to Friday 7am to 6pm, Saturday 8am to 1pm, no work on Sundays and public holidays	Noise affected RBL + 10 dB(A)
	Highly noise affected 75 dB(A)
Out of hours work	Noise affected RBL + 5 dB(A)

The Roads and Maritime Construction Noise and Vibration Guideline (CNVG) provides further guidance on the time periods to which some types of construction activity should be limited, where feasible and reasonable to do so. Of relevance to this proposal is construction activities with impulsive and tonal noise emissions which should be restricted to the hours of 8am to 5pm weekdays and 9am to 1pm on Saturdays.

Proposal-specific construction noise management levels have been developed and are summarised in Table 6-13. For the purposes of the assessment, Observatory Hill Park on Upper Fort Street was classified as an active recreation area due to its heavy use as a physical exercise area. The 70 dB(A) NML for commercial land use is applicable during the time of day for which the commercial use of the land is being conducted.

**Table 6-13: Proposal-specific construction noise management levels for sensitive receivers**

Receiver	Land use	Noise management level (dB(A))			
		Day (standard hours)	Day (outside standard hours)	Evening	Night
RR-01	Residential	79	74	73	60
RR-02	Residential	63	58	60	51
RR-03	Residential	63	58	60	51
RR-04	Residential	63	58	60	51
RR-05	Residential	63	58	60	51
RR-06	Residential	63	58	60	51
RR-07	Residential	74	69	68	58
RR-08	Residential	74	69	68	58
OR-01	Educational	65	N/A	N/A	N/A

Receiver	Land use	Noise management level (dB(A))			
		Day (standard hours)	Day (outside standard hours)	Evening	Night
OR-02	Active recreation	70	70	70	N/A
OR-03	Museum	70	70	N/A	N/A
OR-04	Place of worship	65	65	65	N/A
OR-05	Active recreation	70	70	70	N/A
OR-06	Weather observation station	N/A	N/A	N/A	N/A
OR-07	Educational	65	N/A	N/A	N/A

### Sleep disturbance

Night works exceeding 65 dB(A) has been deemed to impact on occupant sleep amenity. This criterion was factored into the analysis of potential airborne noise impacts generated by the proposed works. The criterion is only applicable at night time (10pm to 7am).

### Road noise traffic - operational

The Noise Criteria Guideline (Roads and Maritime, 2015) provides the basis for determining road traffic noise criteria for Roads and Maritime projects. The proposal was defined as 'minor work' in accordance with the guideline. 'Minor work' is defined in the guideline as those that primarily improve safety including minor straightening of curves, intersection widening and minor road work. For minor work, where a proposal's ('build') noise level exceeds the criterion and there is an increase of more than 2.0dBA (ie 2.1dBA) relative to the existing noise levels ('no-build') then the receiver qualifies for consideration of noise mitigation.

### Vibration

Potential human exposure to vibration during the proposed work was assessed through calculations based on the DEC publication *Assessing Vibration: A Technical Guideline provides guidance for assessing human exposure to vibration* (2006). The potential for building damage from vibration to the integrity of heritage structures in the study area was assessed using calculations based on German Standard German DIN 4150 - 3 and British Standard BS 7385 Part 2-1993 Evaluation and Measurement for Vibration in Buildings (in lieu of an Australian standard).

The vibration assessment criteria for human comfort include criteria for continuous, impulsive and intermittent vibration. The criteria represent goals that, where predicted or measured to be exceeded, require all feasible and reasonable mitigation measures to be implemented. The majority of construction works as part of the proposal would be intermittent with the potential for some impulsive activities (eg demolition works). Vibration goals (vibration dose value (VDV)) for human comfort are set out in Table 6-14.

**Table 6-14: Human comfort vibration goals**

Receiver	Day (7am to 10pm)		Night (10pm to 7am)	
	Preferred	Maximum	Preferred	Maximum
<b>Continuous (RMS vibration velocity mm/s)</b>				
Residences	0.2	0.4	0.14	0.28
Offices, schools, places of worship	0.4	0.8	N/A	N/A
<b>Intermittent vibration (VDV m/s<sup>1.75</sup>)</b>				
Residences	0.2	0.4	0.13	0.26
Offices, schools, places of worship	0.4	0.8	N/A	N/A
<b>Impulsive vibration (RMS vibration velocity mm/s)</b>				
Residences	6	12	2	4
Offices, schools, places of worship	13	26	N/A	N/A

Note: Intermittent and impulsive vibration use different metrics for measurement.  
VDV: Vibration dose value accounts for the duration of the source

No Australian standards or guidelines are available for assessing the potential for building damage from vibration. British Standard BS 7385:1993 and German Standard DIN 4150-3 both provide goal levels, below which vibration is considered insufficient to cause building damage. Of these, DIN 4150-3 is the more stringent, and is based upon the goal levels on the highest vibration level in each component (peak component particle velocity - PCPV). DIN 4150-3 is also considered to be suitable for the assessment of both structural and cosmetic damage. The standard considers that the serviceability of the structure has been reduced if:

- Cracks form in plastered surfaces of walls
- Existing cracks in the building are enlarged
- Partitions become detached from loadbearing walls or floors.

Heritage-listed structures are located close to the proposed works and accordingly, potential vibration-induced cosmetic and structural damage were considered in the assessment. The DIN 4150-3 criteria for cosmetic and structural damage are provided in Table 6-15. DIN4150-3 states that exceedances of the guidance values do not necessarily mean that damage would occur, but that more detailed analysis may be required to quantify the site-specific relationship between vibration levels, strain and the potential for damage. BS7385 also states that a building of historical value should not (unless it is structural unsound) be assumed to be more vibration sensitive.

**Table 6-15: DIN 4150-3 vibration cosmetic and structural damage criteria**

Structural type	Peak particle velocity (PPV), mm/s			
	Foundation of structure			Vibration at horizontal plane of highest floor at all frequencies
	<10 Hz	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwelling and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (eg heritage-listed buildings)	3	3 to 8	8 to 10	8

Guidelines for minimum working distances for vibration-intensive activities with respect to the stated standards and guidelines is provided in Table 6-16. The distances are indicative and likely to vary depending on the type of plant or equipment and local geotechnical conditions. The minimum working distances apply to addressing the risk of cosmetic (minor – easily repairable) damage of typical buildings under typical geotechnical conditions.

**Table 6-16: Recommended safe working distances for vibration intensive plant**

Plant item	Rating/description	Minimum working distance – cosmetic damage (BS7385)	Minimum working distance – human response (OH&E guideline)
Vibratory roller	<50 kN (typically 1-2 tonnes (t))	5m	15m to 20m
	<100 kN (typically 2-4 t)	6m	20m
	<200 kN (typically 4-6 t)	12m	40m
	<300 kN (typically 7-13 t)	15m	100m
	>300 kN (typically 13-18 t)	20m	100m
	>300 kN (>18 t)	25m	100m
Small hydraulic hammer	(300 kg – 5 to 12 t excavator)	2m	7m
Medium hydraulic hammer	(900 kg – 12 to 18 t excavator)	7m	23m



Plant item	Rating/description	Minimum working distance – cosmetic damage (BS7385)	Minimum working distance – human response (OH&E guideline)
Large hydraulic hammer	(1600 kg – 18 to 34t excavator)	22m	73m
Vibratory pile driver	Sheet piles	2m to 20m	20m
Pile boring	≤ 800 mm	2m (nominal)	4m
Jackhammer	Hand held	1m (nominal)	2m

*Note: Distances are based on residential structures. A greater safe working distance may apply for a heritage-listed structure.*

The Sydney Observatory and the Bureau of Meteorology hold instruments (such as telescopes and meteorological sensors) that may be sensitive to ground-borne vibration. Information on the sensitivity of these instruments to vibration was not available and the Generic Vibration Criteria for Vibration Sensitive Equipment (VC curves, Gordon 1991) were used as reference criteria for the assessment as follows:

- Maximum RMS velocity level of 0.2mm/s between 1 and 100 Hz, described as barely perceptible vibration and likely adequate for computer equipment, probe test equipment and low power microscopes.

## 6.3.4 Potential impacts

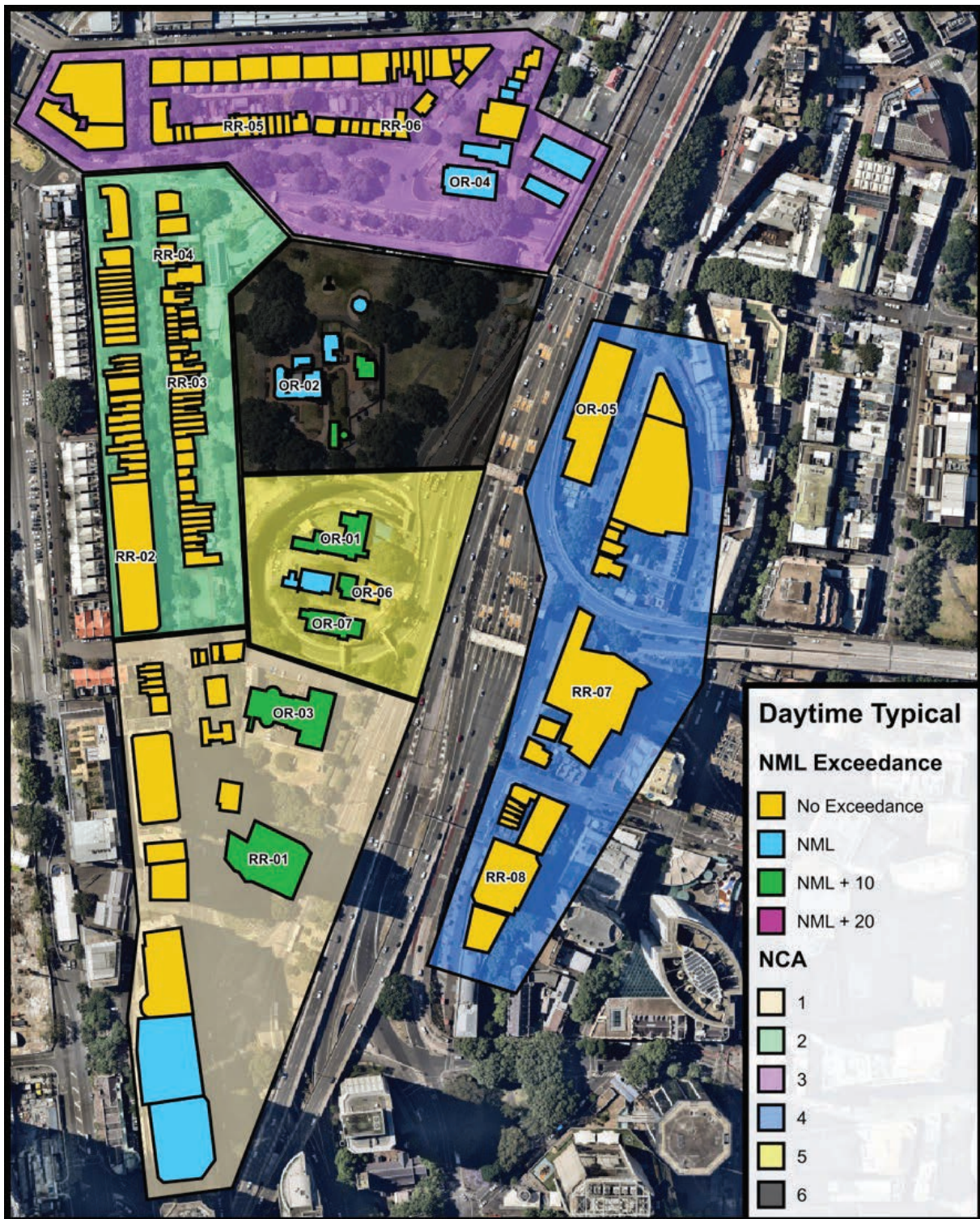
### Construction

#### Noise

The proposal would commence in mid-2019 and be completed by early 2020, taking about 10 months to complete.

Operational requirements of the existing cycleway infrastructure and surrounding roadways means that a significant portion of the work would need to be carried out outside of standard working hours and/or during shutdown periods, including night work. Some 24-hour scheduling of work may be required in some instances. Working up to five nights a week at regular intervals may be required at various stages of the construction period. Where longer closure periods are required, partial closures from Friday night to Monday morning would be the preferred option.

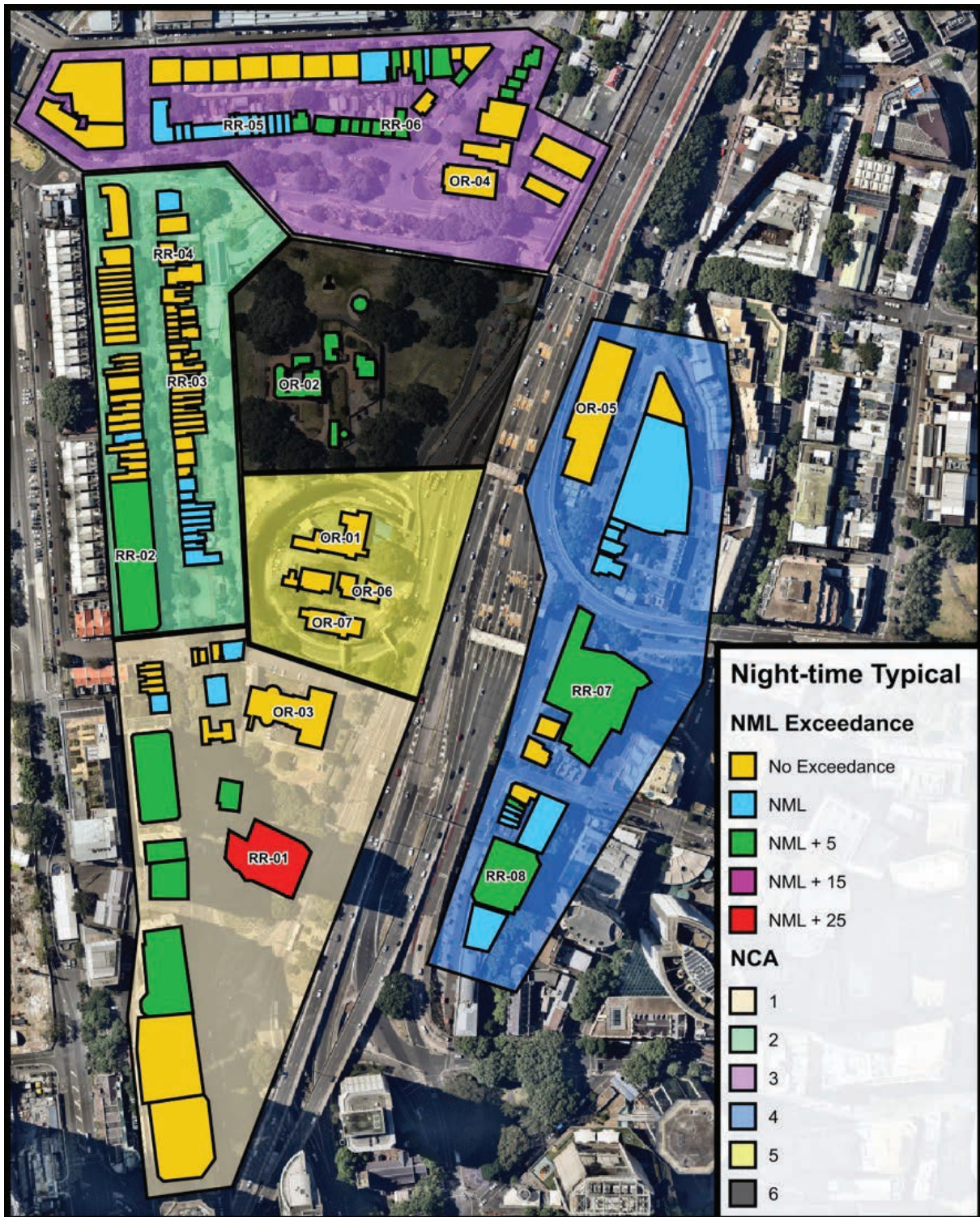
Predicted noise levels relative to the NMLs at sensitive receivers, and for each noise catchment area were calculated for daytime and night-time and are summarised in Table 6-17. Daytime, night-time and maximum (over 75 dB(A) NML exceedances are illustrated in Figures 6-10 to 6-12 for typical noise levels.



Source: Resonate Acoustics, 2017

ID	NCA	Description
RR-01	1	Observatory Tower
RR-02	2	Private residence
RR-03	2	Private residence
RR-04	2	Private residence
RR-05	3	Private residence
RR-06	3	Private residence
RR-07	4	Shangri-La Hotel
RR-08	4	Private residences
OR-01	5	Fort Street Public School

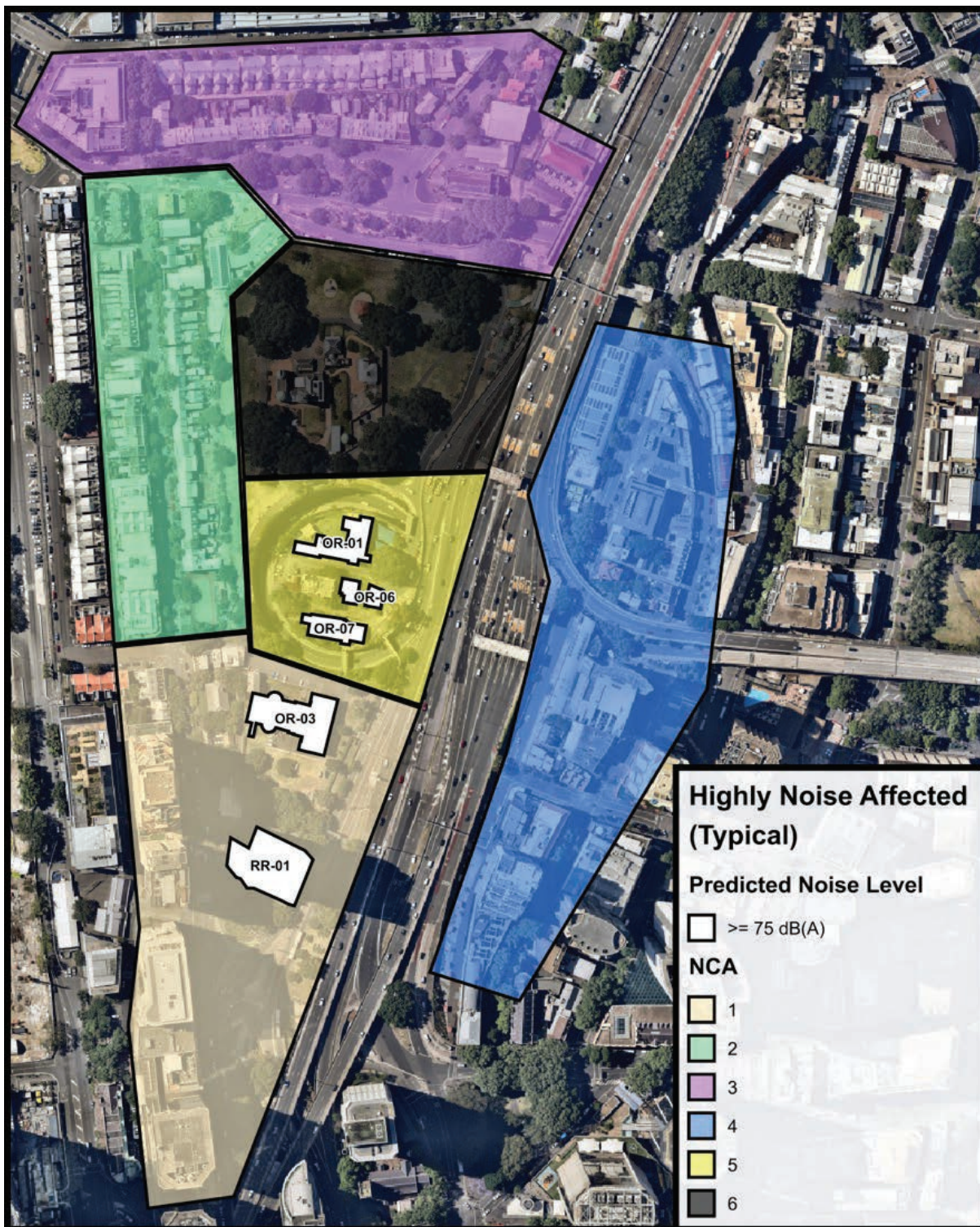




Source: Resonate Acoustics, 2017

ID	NCA	Description
RR-01	1	Observatory Tower
RR-02	2	Private residence
RR-03	2	Private residence
RR-04	2	Private residence
RR-05	3	Private residence
RR-06	3	Private residence
RR-07	4	Shangri-La Hotel
RR-08	4	Private residences
OR-01	5	Fort Street Public School





Source: Resonate Acoustics, 2017

ID	NCA	Description
RR-01	1	Observatory Tower
RR-02	2	Private residence
RR-03	2	Private residence
RR-04	2	Private residence
RR-05	3	Private residence
RR-06	3	Private residence
RR-07	4	Shangri-La Hotel
RR-08	4	Private residences
OR-01	5	Fort Street Public School



**Table 6-17: Summary of predicted noise levels at sensitive receivers within noise catchment areas**

Noise catchment area	Range (dB(A))	NML exceedences		Exceedence locations and activities
		Daytime	Nighttime	
1	66 - 98	0 - 19	6 - 38	<ul style="list-style-type: none"> <li>Demolition of existing bridge span in Precinct 3</li> <li>Median and kerb works along Kent Street merge taper in Precinct 4.</li> </ul>
2	40 - 66	0-3	0-15	<ul style="list-style-type: none"> <li>Demolition of existing bridge span within Precinct 3</li> <li>Kerb and retaining wall works in Precinct 1 and Precinct 2.</li> </ul>
3	50 - 71	0-8	0-20	<ul style="list-style-type: none"> <li>Kerb and retaining wall works in Precinct 1 and Precinct 2.</li> </ul>
4	62 - 74	<1	4-16	<ul style="list-style-type: none"> <li>Demolition of existing bridge span in Precinct 3</li> <li>Median and kerb works along Kent Street merge taper in Precinct 4.</li> <li>Kerb and retaining wall works in Precinct 1 and Precinct 2.</li> </ul>
5	73 - 90	8 - 25	Nil	<ul style="list-style-type: none"> <li>Demolition of existing bridge span within Precinct 3</li> <li>Kerb and retaining wall works in Precinct 1 and Precinct 2.</li> </ul>
6	61 - 76	6 - 21	6 - 21	<ul style="list-style-type: none"> <li>Kerb and retaining wall works in Precinct 1 and Precinct 2.</li> </ul>

The highest affected noise sensitive receivers include those properties located close to the work and those with direct line of sight to the proposal area. These receivers include high-rise commercial and/or residential towers to the south, residential townhouses and some commercial and religious land uses to the west and north, the Sydney Observatory, the Environmental Education Centre, Fort Street Public School and the National Trust Centre/S.H. Ervin Gallery directly adjacent to the works as well as commercial and residential structures to the east.

Construction NMLs would be exceeded during standard hours at several residential receivers. The exceedences are generally minor (less than 10dB) with the exception of the Observatory Towers and a private residence at 20 Kent Street, Millers Point (NCA 2). The daytime exceedences for commercial/educational receivers are predicted to be minor except at the Observatory Hill weather station, and the Environmental Education Centre, where exceedences would be moderate (over 20 dB in NCA 5).

For night works, exceedences of the NMLs for residential receivers are generally moderate (less than 25dB) with the exception of the Observatory Tower (NCA 1) where exceedences over 25dB are predicted. Moderate exceedences (over 15dB) are predicted for the Shangri-La Hotel and several private residences (NCA 4). The night-time NML exceedences for commercial receivers are not applicable as these properties would not be in use during the night-time period.

The sleep disturbance screening criterion of 65 dB(A) is predicted to be exceeded at the Observatory Tower and Shangri-La Hotel. Sleeping areas of these residential receivers are unlikely to have opening windows and the internal noise levels experienced by their occupants are expected to be lower than would otherwise be inferred from the screening criterion.

The maximum construction noise levels in all cases are likely to arise through the use of high sound power level plant items such as excavators with hammer attachments and concrete saws. Construction noise levels on a representative night would vary depending on the location and operation of such equipment, and would typically be less than the maximum predicted level.

The proposal area is subject to relatively high daytime noise from existing road traffic. The relatively small number of construction vehicles used for the proposed works during standard daytime hours is predicted to have a negligible effect on existing road traffic noise levels. Further consideration of noise impacts due to construction traffic is not required.

#### **6.3.4.1 Vibration**

The vibration assessment found that there is a minimal risk that vibration levels would exceed human comfort criteria for exposure to vibration from the works for the majority of receivers. Similarly, the separation distance from the nearest receivers is generally sufficient to mitigate the potential for structural or cosmetic damage to buildings from vibration intensive works. Works in Precinct 2 and 3 would be located within the safe working distances for the Bureau of Meteorology weather station, and in Precinct 3, also for the Environmental Education Centre. In Precinct 4, works would be within the minimum separation distance for Observatory Tower (refer Appendix F – Table 21).

BS7385 states that a building of historical value should not (unless it is structural unsound) be assumed to be more vibration sensitive. Accordingly, compliance with the minimum distances provided in Table 6-16, is likely to result in a low risk of cosmetic damage to the heritage-listed structures near the proposal area. Most heritage structures are predicted to be exposed to vibration that would exceed the most stringent DIN4150 criterion of 3 mm/s. The exception is where works are on sections of the Sydney Harbour Bridge.

The vibration sensitivity of each structure with regard to structural condition would be reviewed during detailed design of the proposal to confirm the appropriateness of the minimum working distances. Any additional management protocols required to protect these structures during the works would be identified at this stage in consultation with the property owners.

The vibration levels predicted to occur at the Sydney Observatory indicate that compliance with the nominated trigger level of 0.2 mm/s<sub>V<sub>rms</sub></sub> is likely for the pile-boring rig. Exceedance of the trigger levels may occur if a vibratory roller is used. Detailed information on how vibration may affect these instruments is not currently available and further consultation would be carried out to confirm the specific measures and safeguards required.

#### **Operation**

The distance separating the proposed new alignment of the Kent Street merge lane and nearby sensitive receivers would increase marginally. The proposed works would not result in an increase of road traffic volumes, and road traffic noise levels are unlikely to change. Lane taper length would remain unchanged and the proposed acceleration lane length would increase from 110 to 118 m. Any potential increase in road traffic noise would be less than 2dB. No further consideration of reasonable and feasible mitigation for operational noise is required.

### **6.3.5 Safeguards and management measures**

Safeguards and management measures proposed to avoid, reduce or manage noise and vibration impacts are discussed in Table 6-18.

**Table 6-18: Safeguards and management measures relating to noise and vibration impacts**

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will be in accordance with the RMS Construction Noise and Vibration Guideline and generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> <li>• all potential significant noise and vibration generating activities associated with the activity</li> <li>• feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (RMS, 2014a)</li> <li>• a monitoring program to assess performance against relevant noise and vibration criteria</li> <li>• arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</li> <li>• contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</li> </ul>	Contractor	Detailed design / Pre-construction	<p>Core standard safeguard NV1</p> <p>Section 4.6 of QA G36 <i>Environment Protection</i></p>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>All sensitive receivers (eg local residents) likely to be affected will be notified at least five days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will include details of the project:</p> <ul style="list-style-type: none"> <li>• construction period</li> <li>• construction hours</li> <li>• contact information for project Management staff</li> <li>• complaint and incident reporting</li> <li>• how to obtain further information.</li> </ul>	Contractor	Pre-construction/ Construction	Core standard safeguard NV2
Noise and vibration	All personnel working on site will receive training to ensure awareness of requirements of the Noise and Vibration Management Plan. Site-specific training will be given to personnel when working in the vicinity of sensitive receivers.	Contractor	Pre-construction	Standard safeguard
Noise and vibration	Any variations to the standard construction hours will follow the approach in Roads and Maritime Services Construction Noise and Vibration Guideline, including consultation with the affected local community.	Contractor	Construction	Standard safeguard



Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>Implement all standard mitigations measures identified in the Roads and Maritime Services Construction Noise and Vibration Guideline including, but not be limited to:</p> <ul style="list-style-type: none"> <li>• preparation of work specific construction noise and vibration management plans</li> <li>• validation noise and vibration measurements</li> <li>• selection of the quietest available plant and equipment</li> <li>• scheduling of noise and vibration intensive work</li> <li>• use of temporary noise barrier/enclosure and/or planning work to use natural topographical shielding</li> <li>• dilapidation surveys and vibration monitoring.</li> </ul>	Contractor	Construction	Standard safeguard
Noise and vibration	<p>Conduct work during the daytime where feasible and reasonable to do so. Where possible, schedule noise intensive work outside of the night-time period (or before midnight) to minimise the risk of sleep disturbance.</p>	Contractor	Detailed design / Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>The duration of exposure to construction noise at individual receivers will be minimised on a night-by-night basis through implementation of the following measures:</p> <ul style="list-style-type: none"> <li>• work with a high noise intensity will be planned to cease (where practical) prior to midnight</li> <li>• high noise generating activities will commence adjacent to the most potentially affected receiver and then move further way from the receiver as the night progresses</li> <li>• alternate construction methods and/or engineering controls will be used (such as temporary noise barriers) to reduce noise levels</li> <li>• the affected community will be consulted to seek support for any extended work duration.</li> </ul>	Contractor	Construction	Additional safeguard
Noise and vibration	<p>Construction noise in the out-of-hours night-time period exceeding the noise management level by more than 5 dB(A) will be limited to two consecutive nights per week except where there is a duration respite as per Roads and Maritime's Construction Noise and Vibration Guideline.</p>	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>Implement project-specific safeguards identified in the noise and vibration specialist report (Appendix F) including, but not be limited to:</p> <ul style="list-style-type: none"> <li>widespread community consultation via letterbox drops, phone calls and one-on-one briefings</li> <li>respite offers which involve scheduling of work to provide specific receivers with a break from continuous construction work</li> <li>alternative accommodation for highly intrusive night-time work.</li> </ul>	Contractor	Construction	Additional safeguard
Vibration	<p>Safe working distances should be maintained, with distances between work areas and sensitive receivers maximised wherever possible. Where vibration intensive works are required to be undertaken within the specified minimum working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied. As exceedances are predicted at several identified sensitive receivers for various construction activities, all feasible and reasonable mitigation measures should be implemented to minimise the impacts of construction vibration.</p>	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Vibration	<p>The vibration sensitivity of nearby heritage structures and sensitive equipment should be reviewed with respect to structural integrity and/or vibration monitoring be conducted at commencement of construction. These structures include:</p> <ul style="list-style-type: none"> <li>• Parts of the Sydney Harbour Bridge</li> <li>• National Trust Centre/S.H. Ervin Gallery</li> <li>• Sydney Observatory</li> <li>• Observatory Park buildings</li> <li>• Fort Street Public School</li> <li>• Bureau of Meteorology weather station.</li> </ul>	Roads and Maritime	Pre-construction	Additional safeguard
Vibration	Areas of heritage significance should be demarcated to reduce the risk of accidental damage from vibration.	Contractor	Pre-construction / Construction	Additional safeguard



## 6.4 Traffic and transport

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to traffic and transport in the proposal area.

Bitzios Consulting has prepared a Traffic and Transport Impact Assessment to inform this section, included as Appendix G.

### 6.4.1 Methodology

The Traffic and Transport Impact Assessment included the following tasks:

- Review of the existing conditions for all road users including vehicle drivers, public transport users, cyclists and pedestrians
- Assessment of the potential construction impact during all stages of work
- Assessment of the potential operational impact
- Recommendations and management measures.

The review of the existing conditions included analysis of traffic count survey data provided by Roads and Maritime.

### 6.4.2 Existing environment

There are two existing cycleways in the study area including the Sydney Harbour Bridge cycleway and the Kent Street cycleway. Kent Street also has an underpass which is an underground connection of the Kent Street cycleway to the Clarence Street cycleway. Figure 6-13 shows the existing cycleways and roads in the study area.

The Bradfield Highway is an eight lane state highway with two permanent northbound lanes, one southbound lane and four interchangeable lanes which change direction according to the necessities of the peak hour. The Bradfield Highway connects the Sydney CBD with North Sydney, across the Sydney Harbour Bridge. The Bradfield Highway is accessed by the Bradfield Highway on-ramp which merges from Clarence Street and Kent Street.

The Cahill Expressway serves as a connection between the Eastern Distributor, Macquarie Street, the Sydney CBD and the Bradfield Highway. Other roads in the study area include Argyle Street, Kent Street, Watson Road, Upper Fort Street and the National Trust Centre/S.H. Ervin Gallery carpark driveway (Figure 6-13).

No bus stops are located within the study area although a number of bus routes travel through it. Argyle Street and Kent Street both have high pedestrian activity, and an official walking route, 'A Harbour Circle Walk 2011' passes through the study area.

Three types of traffic survey data were provided by Roads and Maritime to quantify the movement of vehicles, cyclists and pedestrians:

- An intersection survey at the merge of Kent Street and Clarence Street before the Bradfield Highway on-ramp
- A shared path survey of pedestrians and cyclists between Upper Fort Street to the Kent Street Cycleway
- Sydney Harbour Bridge Cycleway survey data at the Upper Fort Street portal.

The traffic counts recorded from the Kent Street and Clarence Street merge were conducted on 28 March 2017 for a week. The results are summarised in Table 6-19. Traffic survey locations are shown in Figure 6-14.

**Table 6-19: Summary of intersection survey**

Average	Peak period	Total vehicles
Weekday daily average	-	4,333 per day
Weekday peak average	AM peak	247 per hour
	PM peak	351 per hour
7 day daily average	-	4,112 per day
7 day peak average	AM peak	228 per hour
	PM peak	314 per hour

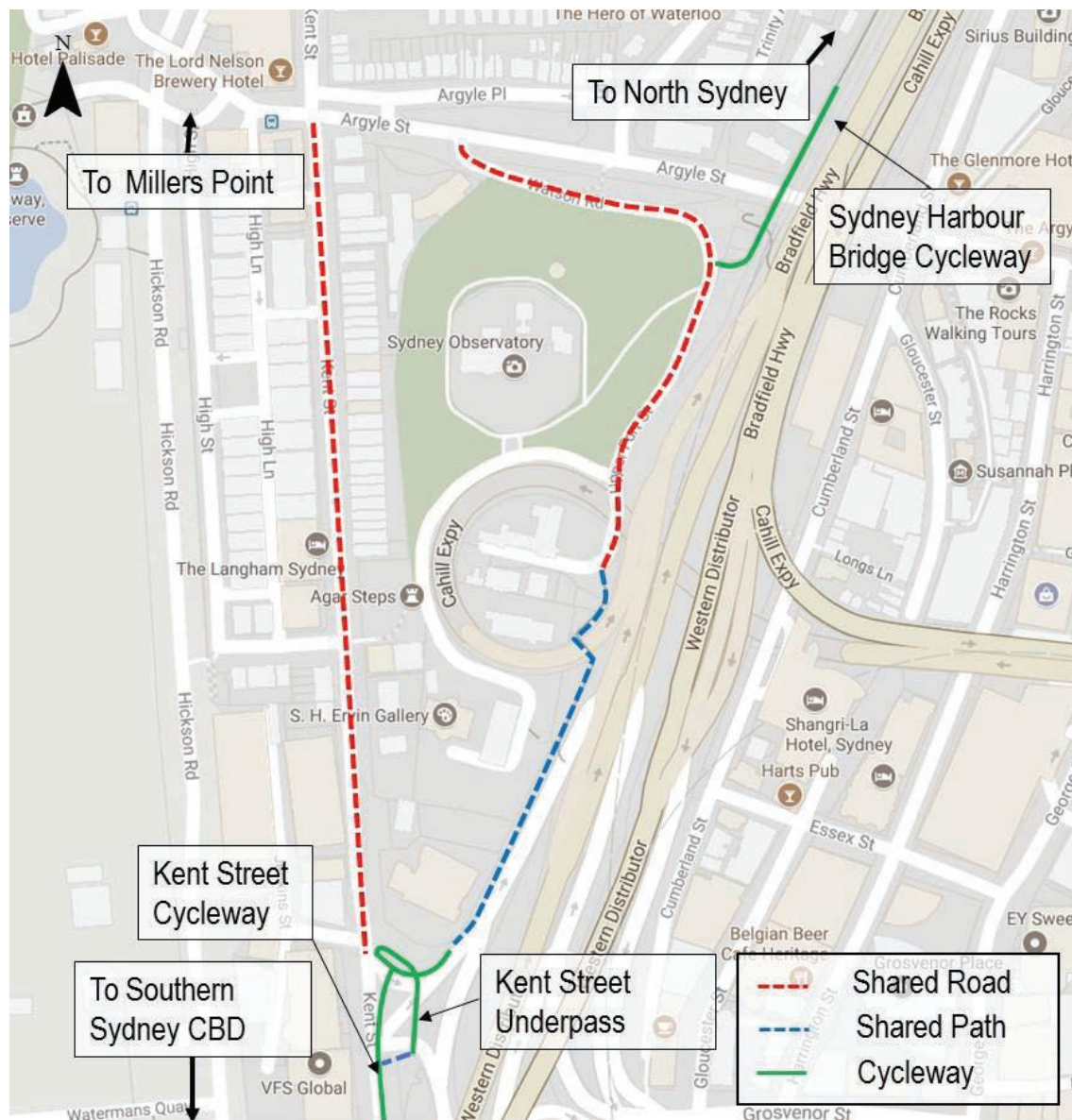
Pedestrian and cyclist counts were conducted on the shared path next to the Bradfield Highway on-ramp on Wednesday 30 March 2016 from 6am to 7pm and recorded in 15 minute intervals. The counts monitored pedestrian and cyclist movements in the northbound and southbound direction as well as cyclist movements travelling on-road from Clarence Street. The results are summarised in Table 6-20.

**Table 6-20: Summary of shared path pedestrian and cyclist daily survey data**

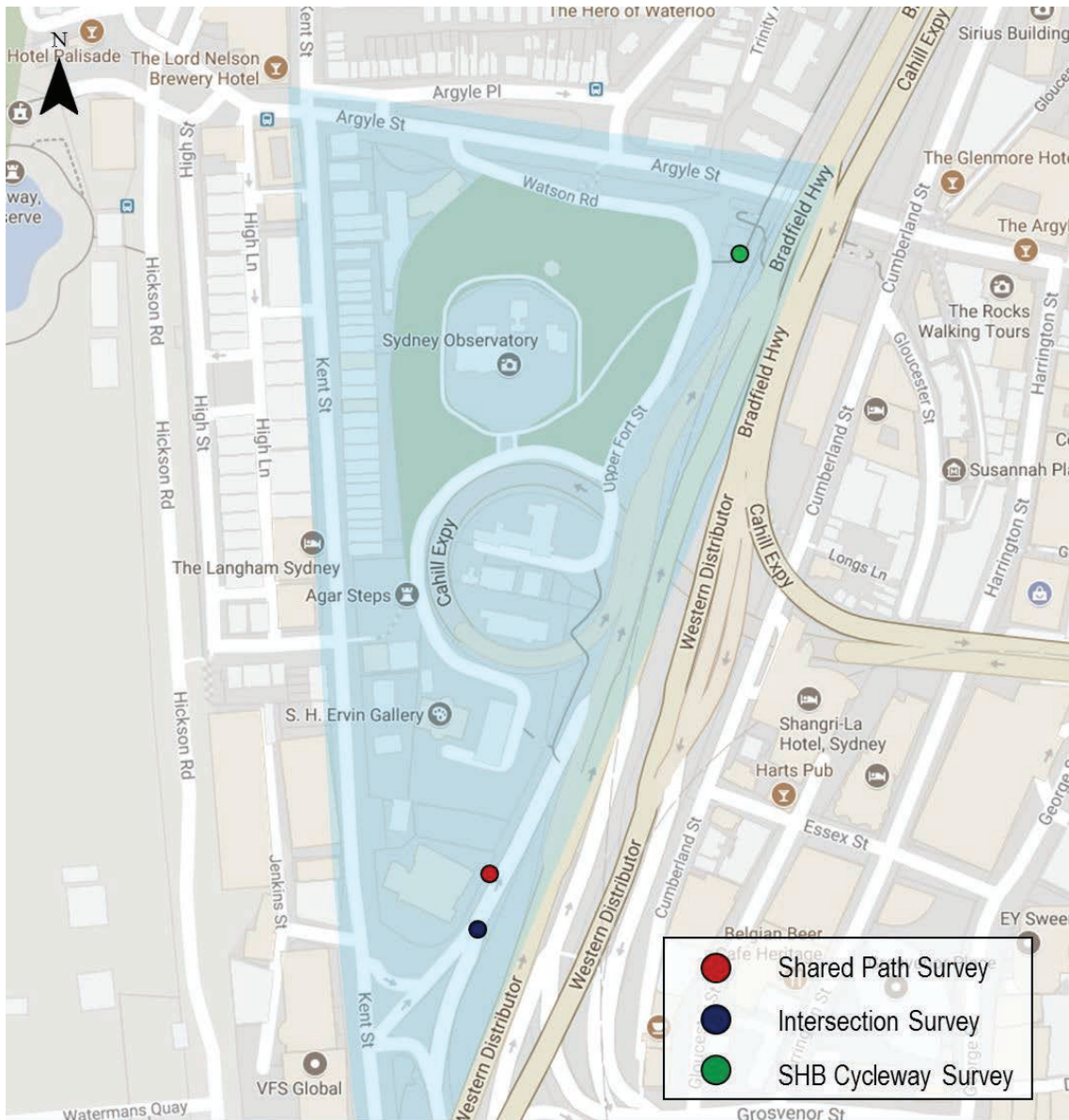
Peak	Direction	Pedestrian counts	Cyclist count	
			Shared path	Clarence Street
AM count 6am – 12pm	Northbound	183	208	58
	Southbound	104	473	-
	<b>Total</b>	<b>287</b>	<b>681</b>	<b>58</b>
PM count 12pm – 7pm	Northbound	171	359	128
	Southbound	301	285	-
	<b>Total</b>	<b>472</b>	<b>644</b>	<b>128</b>

Site observations indicated that pedestrians in this area make short trips, for example, between Kent Street and Fort Street Public School, whereas cyclists are travelling longer distances such as between the Sydney CBD and Lower North Shore.

Data was obtained from the past 10 years to evaluate the trend of cyclists travelling along the Sydney Harbour Bridge cycleway from the Roads and Maritime permanent bicycle counter (#90902) near Upper Fort Street, Millers Point. A data summary of cyclist trends is provided in Table 6-21. The data show a steady increase in cyclists using the cycleway throughout the 10 year period, and relatively balanced numbers of cyclists travelling northbound and southbound.



Source: Bitzios Consulting, 2017



Source: Bitzios Consulting, 2017

AI Reference: 3119AF1\_01\_GRA025.ai.v1



**Table 6-21: Summary of Sydney Harbour Bridge cycleway survey data from 2007-2016**

Year	Northbound average		Southbound average		Both directions (average)	
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
2007	403	234	397	233	801	467
2008	628	278	637	285	1,264	562
2009	808	313	826	327	1,634	640
2010	825	326	842	336	1,667	662
2011	919	420	969	415	1,888	835
2012	978	519	1036	517	2,014	1,037
2013	1,111	484	1,194	483	2,305	966
2014	1068	475	1,144	479	2,212	953
2015	946	464	1,027	461	1,973	925
2016*	-	-	-	-	2,098	955

\*Data to mid-2016 only.

### 6.4.3 Potential impacts

#### **Construction**

Construction work through the four precincts is programmed to occur simultaneously and require nine months to complete. Impact to traffic conditions includes footpath, road and cycleway closures and the associated effects on road users.

The existing cyclist provision from Kent Street cycleway to Sydney Harbour Bridge cycleway would be closed during work. A cycle detour is proposed around the site via the temporary ramp on the Sydney Harbour Bridge stairs and would continue onto Watson Road, Argyle Street and Kent Street, connecting to the Kent Street cycleway. The temporary cycle detour would remain until the completion of work in all precincts. This detour would add about 250m to the existing cyclist route from the Upper Fort Street portal towards the Kent Street cycleway via the shared path. The detour would mix cyclists with vehicles and require cyclists to manage their speeds travelling downhill on Watson Road.

The west footpath on Upper Fort Street would remain available for pedestrians throughout construction and access would be maintained to the Fort Street Public School. Access may need to be closed for short periods for deliveries and work. Pedestrian access to the National Trust Centre/S.H. Ervin Gallery would be maintained from the Bradfield Highway on-ramp where pedestrians would be guided through the work and detoured through the gallery carpark.

Two alternative detour routes would be available for pedestrians to travel between Upper Fort Street and the surrounding road network during the construction work in Precinct 3 (see Figure 3-9). One route is accessible from Kent Street via the Agar Steps to the footpath adjacent to the S.H. Ervin Gallery carpark driveway. This route has steps and is not suitable for pedestrians with prams or trolleys and for Persons with a Disability. From the southern end of the Bradfield Highway on-ramp shared path to Fort Street Public School, this route would be approximately 220m longer than the current pedestrian route adjacent to the Bradfield Highway on-ramp.

An alternative detour route would be available from Kent Street through Argyle Street to Upper Fort Street via Watson Road. From the southern end of the Bradfield Highway on-ramp shared path to Fort Street Public School, this route would be approximately 720m longer than the current pedestrian route adjacent to the Bradfield Highway on-ramp. This route is longer but is free of steps and is accessible by pedestrians with prams or trolleys and by Persons with a Disability.

The Department of Education has stated that the existing western pedestrian bridge linking the National Trust Centre/S.H. Ervin carpark and the grounds of the Environmental Education Centre cannot be used as a pedestrian detour route. This route would cut through existing play space for students and create significant safety and security concerns for the school.

Traffic management measures would be required to allow the safe construction of the proposal adjacent to the road corridor. Some sections of the proposal adjacent to the Bradfield Highway require the timed closure of one lane during construction. The adjacent bus lane and vehicle travel lane would be used to share traffic movement. Some disruptions to traffic may occur as a result of these lane closures. Those worst-affected by traffic disruptions would be residents of Barangaroo and Millers Point to the north-west of the proposal area who frequently use the Kent Street to Cahill Expressway connection. Work would be carried out at night and/or on weekends, although disruption to traffic resulting from the work is not expected to be significant.

The demolition of the existing cycleway bridge which spans the Cahill Expressway and the construction of the new bridge would require the closure of sections of the expressway. Traffic would be diverted via an alternate route. The closure of the Cahill Expressway and resultant traffic diversions are proposed to occur at night. The closures would have short-term impacts on congestion on the road network in the Sydney CBD and may result in increased travel times for some road users. Local residents who use this section of road frequently would be most affected by the diversions and congestion caused by the proposal.

The City Centre Transport Taskforce has been established to ensure the smooth operation of Sydney CBD transport on a 24-hour basis and would provide a single point of reference for transport incident responses. The Taskforce would coordinate the transport operations within the CBD and develop, ahead of time, plans to handle special events and major construction periods. Travel demand management practices (similar to those used during the Sydney Olympics) would be applied to manage demand in critical locations at critical times. The Taskforce would have access to the tools required to manage transport within the CBD, including control of traffic lights, variable message signage and the ability to propose changes to the street network. Some sections of road may be closed for construction and certain deliveries. Where possible, large deliveries and work would be coordinated and would occur at night or during off peak hours to mitigate the impact to traffic. In particular deliveries would avoid peak school drop off and pick up times to minimise the impact on school traffic and minimise the need for full road closures.

Full closures of the Cahill Expressway would be required during work in Precincts 3 and 4, in particular to demolish the existing overbridge and to build the new cyclist/pedestrian bridge. The Bradfield Highway on-ramp at Clarence and Kent Street may also need to be closed during work in this area. Traffic would be diverted to alternative routes during closures.

## **Operation**

A number of changes to existing traffic conditions are expected from the proposal.

The proposal includes increasing the width of the shared path adjacent to the Clarence Street and Kent Street on-ramp which would reduce the road width on the ramp, altering the approach and merge taper lengths. The on-ramp would be modified from a lane change to a 'zip merge'. This change would promote equal priority to vehicles on Kent Street and Clarence Street and decrease the risk of traffic build up, particularly during the evening peak hour.

Part of the cycleway would be constructed within the existing Incident Response Area used by emergency vehicles that park in the area to attend to emergencies on the Sydney Harbour Bridge. A relatively small section of the Incident Response Area would be used to build the proposal. The length of the area would be maintained and the overall impact would be minor.

Once the proposal is built, cyclists travelling northbound from Clarence Street would be required to use the Kent Street underpass. This route is about 120m longer than travelling via the Clarence Street on-ramp, but would reduce the risk of collisions.

Operation of the Upper Fort Street boom gate would intersect the proposed cycleway. Vehicles using the boom gate would be required to give way to cyclists on the cycleway. The intersection would be marked as a conflict zone.

The gradient of the proposed elevated ramp sections of the cycleway, means that cyclists would travel at a slower speed going uphill and a faster speed going downhill. Due to the curvature of the bridge, cyclists travelling around the ramp may slow down and cause a build-up of cyclists on the bridge, particularly during peak periods.

The proposed separated pedestrian footpath and cycleway from the Kent Street on-ramp to Upper Fort Street would reduce the likelihood of collisions between pedestrians and cyclists.

A portion of the cycleway conflicts with the rail tunnel emergency exit door and would be designed to provide adequate distance from the door and the cycleway, in accordance with Australian Standards. Warning signs would alert cyclists of the door opening on both sides of the exit, and the pavement would be painted green to highlight the conflict point.

The separated pedestrian footpath and cycleway on Upper Fort Street would not affect the road geometry or on-street parking. The cycleway and pedestrian footpath would conflict at the access onto Upper Fort Street, increasing the risk of collisions. Appropriate signage would warn cyclists of pedestrians including prohibiting pedestrian use the cycleway.

#### 6.4.4 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on traffic are discussed in Table 6-22.

Table 6-22: Safeguards and management measures relating to traffic and transport

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the <i>Roads and Maritime Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2008). The TMP will include:</p> <ul style="list-style-type: none"> <li>• confirmation of haulage routes</li> <li>• measures to maintain access to local roads and properties</li> <li>• site specific traffic control measures (including signage) to manage and regulate traffic movement</li> <li>• measures to maintain pedestrian and cyclist access</li> <li>• requirements and methods to consult and inform the local community of impacts on the local road network</li> <li>• access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads</li> <li>• a response plan for any construction traffic incident</li> <li>• 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</li> <li>• monitoring, review and amendment mechanisms.</li> </ul>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard TT1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>
Access	Pedestrian, cyclist and vehicular access will be maintained to the National Trust Centre/S.H. Ervin Gallery and Fort Street Public School.	Roads and Maritime/ Contractor	Pre-construction / construction	Additional safeguard



Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Access	Cyclists will be redirected to the Kent Street underpass from Clarence Street when travelling northbound towards the Sydney Harbour Bridge cycleway	Roads and Maritime/ Contractor	Pre-construction / construction	Additional safeguard
Traffic management around special events	Transport for NSW Transport Management Centre will be consulted on the timing of construction activities in relation to major events planned for the Sydney CBD.	Roads and Maritime	Pre-construction / construction	Additional safeguard
Cyclists movements	<p>The following measures will be implemented to manage potential impacts on cyclists during construction:</p> <ul style="list-style-type: none"> <li>• a cyclist communication strategy will be implemented including providing information signs and maps to inform cyclists of changes to cycle route and the detour provided</li> <li>• Information signs and material will be located along major cyclist travel routes to clearly communicate proposed and ongoing changes.</li> <li>• Erection of signs to warn cyclists of vehicles entering the cycleway in accordance with Roads and Maritime practice.</li> </ul>	Roads and Maritime	Pre-construction / construction / operation	Additional safeguard
Communication with stakeholders	Relevant stakeholders will be notified of the timing and program of work prior to the start of work, including employees, visitors, students and parents of The National Trust Centre/S.H. Ervin Gallery, Sydney Observatory and Fort Street Public School, as well as vehicle drivers along the Cahill Expressway and Bradfield Highway via Kent Street and Clarence Street.	Roads and Maritime	Pre-construction and construction	Additional safeguard
Communication with stakeholders	Information about road closures and detours will be posted on the City of Sydney and Roads and Maritime websites.	Roads and Maritime	Pre-construction and construction	Additional safeguard

## 6.5 Socio-economic and land use

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to the socio-economic values and land use of the proposal area.

EMM was commissioned to carry out a socio-economic assessment on the impacts of the proposed works during both its construction and operational phases (Appendix H).

### 6.5.1 Methodology

The study area for the socio-economic assessment considers the Rocks-Millers Point-Dawes Point area defined by EMM and includes Goat Island as shown in Figure 6-15. The study area was chosen to provide a representation of the individuals, groups and businesses that would be most likely to be affected by the proposal. Goat Island has been excluded from the assessment as the population is unlikely to be materially affected by the proposal.

The socio-economic assessment involved a combination of desktop review of Australian Bureau of Statistics (ABS) Census 2011 data, relevant strategies and policies, previous consultation carried out by Roads and Maritime and surrounding stakeholders and inspection (14 November 2016) of the proposal area. The assessment was undertaken in accordance with *Environmental Impact Assessment Practice Note: Socioeconomic Assessment* (EIA-N05) (RMS, 2011).

From the desktop review, potential socio-economic impacts of the proposal on individuals and the community were identified in accordance with a moderate level of assessment as described in EIA-N05. The assessment considers the economic costs and benefits of the proposal, potential impacts on social infrastructure, potential impacts on community values including local amenity, the displacement of homeless people, and access and connectivity.

### 6.5.2 Existing environment

The socioeconomic characteristics of the study area relevant to the potential impacts of the proposal include population and demographics, transport and access arrangements for the city centre, land uses immediately surrounding the proposal, community values and homelessness.

#### **Population and demographics**

The proposal is located within the Rocks-Millers Point-Dawes Point study area. The study area covers around 82ha with an estimated population of around 4,000 people. The average age of residents is 42, which is high compared to the average age of the whole Sydney LGA, which is 36. The population of the study area consists of predominately working age and older people. A lower proportion of people in the under 17 age bracket live in the study area than in the Sydney LGA. A high proportion of empty nesters, retirees and pre-retirees are resident, with the over 50 age bracket representing a significantly larger portion of the population than the same age bracket in the Sydney LGA. A lower proportion of people aged 17 to 49 years old live within the study area than within the Sydney LGA.

A number of public transport options are available within the Sydney LGA and to surrounding areas including buses, trains, ferries and light rail. A high number of residents from the study area walk or travel to work in a private vehicle. Levels of public transport use as a method of travel to work are much lower in the study area than in the Sydney LGA. At the 2011 census, the number of residents cycling to work was also lower in the study area than for the Sydney LGA.



#### LEGEND

- Project area
- Main road
- Study area
- - Rail line



### **Property and surrounding land use**

The land on which the proposal is located is owned by four separate entities:

- Roads and Maritime
- City of Sydney
- Property NSW
- Department of Education.

The properties surrounding the proposal area are shown in Figure 3-9. The balance of the study area consists of residential and metropolitan centre uses including a mix of residential dwellings (multi-unit flat buildings), public infrastructure such as roads, and commercial and office uses.

The area in the immediate vicinity of the proposal is used for a range of public and private uses. Key land uses in the area immediately adjoining the proposal area are shown in Table 6-23. The surrounding land uses close to the proposed work are shown in Figure 6-16.

**Table 6-23: Existing surrounding land use**

Land Use	Description
Observatory Hill Park	Public park used by locals, workers and visitors in the area
Sydney Observatory	Public observatory and museum Open 10am – 5pm (Monday-Sunday). Night visits are available and the timing of these is variable (Monday-Sunday) and by booking only
Observatory Hill Environmental Education Centre	Education centre which provides teaching and learning programs for students Kindergarten to year 12
Fort Street Public School	Primary school
The National Trust Centre	Headquarters of the NSW branch of the National Trust Open 9am-5pm (Monday-Friday)
The Bradfield Highway	Provides vehicular access across the Sydney Harbour Bridge
S.H. Ervin Gallery	Public art gallery Open 11am-5pm (Tuesday-Sunday).

A small number of paid City of Sydney Council car parking spaces located on the eastern side of Upper Fort Street provide parking opportunities for visitors to the Sydney Observatory and a source of revenue for the council. Visitors to the study area can also park in Watson Road or Argyle Street, both of which are metered.





## LEGEND

Land use

- 1 - Road
- 2 - Sydney Observatory
- 3 - Observatory Hill Environmental Education Centre
- 4 - Observatory Hill Park
- 5 - Fort Street Public School
- 6 - Bureau of Meteorology
- 7 - National Trust and S.H. Ervin Gallery
- 8 - Residential with bottom floor commercial uses
- 9 - Outdoor exercise area
- 10 - Cycleway



## Social infrastructure

Key social infrastructure in the immediate vicinity of the proposal includes Observatory Hill Park, Sydney Observatory, Fort Street Public School, Observatory Hill Environmental Education Centre, the National Trust Centre/S.H. Ervin Gallery (see Table 6-23).

Observatory Hill Park is a tourist destination and close to major tourist landmarks including The Rocks and Sydney Harbour Bridge. The park is visited by a large number of international tourists, many of which may not speak English as their first language (Destination NSW, 2016).

An outdoor exercise area containing public fitness equipment is located near the north-eastern corner of Observatory Hill Park, near the southern extent of the Sydney Harbour Bridge cycleway. A site inspection on 14 November 2016 noted a number of people using the area, including a personal trainer and clients. The area is identified in the City of Sydney's Park Fitness Equipment Plan as one of eight existing outdoor exercise areas in the Sydney LGA. The nearest alternate public outdoor exercise areas are located in the Domain and Bourke Street Park, about 1.5km to the south-east of the Observatory Hill facility. The shade and weather protection provided by trees adjoining the park is mentioned as one of the parks qualities. The area is identified in the plan for upgrade, with improvements needed to the park to increase the use of existing the fitness equipment facilities at the outdoor exercise area to better meet the needs of the community.

## Travel and access

### Access to the central business district (CBD)

Public access trends over the past 10 years have shown that the number of people driving to the Sydney CBD during the morning peak has reduced dramatically. The number of people arriving by public transport has grown significantly.

The number of trips to the Sydney CBD by walking or cycling has more than doubled over the past 10 years (Transport for NSW, 2013a). The Sydney City Centre Access Strategy explains that *"the number of people travelling to the city centre each day will grow to 775,000 by 2031 – an extra 145,000 trips"* (NSW Government, 2013).

Major developments at Barangaroo and Darling Harbour are expected to create significant additional demand for travel to the Sydney CBD. The Barangaroo development alone is expected to create an additional 23,000 jobs.

### Bus access

Buses servicing Fort Street Public School access the school via Upper Fort Street. During an inspection of the site, a bus accessing Fort Street Public School was observed to be having difficulty navigating the pinch point.

The bus lane located on the Sydney Harbour Bridge approach between Kent Street and the Bradfield Highway towards the south of the study area services a high number of bus routes travelling north across the Sydney Harbour Bridge (Transport for NSW, 2015).

There are no bus stops close to the proposal area.

### Cycling to the city centre

The number of cyclists accessing the Sydney CBD through key gateways has increased significantly over recent years. Between 2009 and 2013, the number of cyclists using the Sydney Harbour Bridge has grown by 70 per cent. This growth in cyclist usage is expected to continue and new cycleways and improvements to the existing cycleway networks are required to accommodate this increase (NSW Government, 2013).

Around 2,000 to 3,000 cyclist trips are taken on the Sydney Harbour Bridge Cycleway each day, making it the busiest cycleway in Sydney. The Sydney Harbour Bridge provides the only cyclist access between the Lower North Shore and Sydney CBD. Existing cycle routes into and surrounding the Sydney CBD including the key gateways into the city are shown in Figure 6-17.

### **Congestion**

A significant portion (around 30 per cent) of daily trips (made by all modes of transport) into the Sydney CBD are made during the morning peak. The Sydney Harbour Bridge corridor accommodates a large portion of these trips (NSW Government, 2013). The number of trips to the Sydney CBD during the morning peak is expected to grow significantly. Increasing access for cyclists through key corridors including the Sydney Harbour Bridge corridor is critical to meeting this future demand and effectively managing congestion (NSW Government, 2013).

Congestion has a significant financial cost. Across the Sydney metropolitan area, congestion is estimated to cost around \$5 billion per year (Department of Infrastructure and Regional Development, 2015). This cost is forecast to increase to around \$8 billion per year by 2020. A number non-financial social costs are also associated with congestion, including increased travel time, travel time variability and reduced air. The cost of traffic congestion is spread across society.

Walking and cycling plays an important role in relieving road and public transport congestion and maintaining the efficient functioning of the transport system by reducing trips made by road or public transport. Increasing the share of walking and cycling trips into the Sydney CBD will play an important role in relieving congestion and achieving an efficient transport network within the CBD and surrounds (NSW Government, 2013).

### **Community values**

Sustainable Sydney 2030 (Community Strategic Plan, 2014) is a long-term program and commitment to achieving the vision and targets set out for a green, global, connected city. The plan was developed in consultation with residents, visitors, workers and business and reflects the community's values.

The process of developing the plan revealed that a key focus for the community was creating a city with environmental leadership and where riding a bike is safe and enjoyable. The proposal would help to achieve safe bike riding through improved safety of the cycleway.

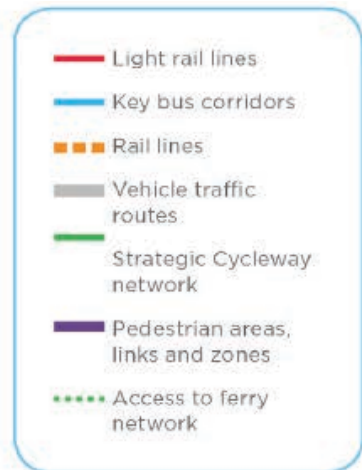
### **Homelessness**

People were observed to be residing under the existing cycle/pedestrian bridge over the Cahill Expressway. The City of Sydney aims to ensure that public spaces can be accessed and enjoyed by everyone including people who are homeless. The city encourages responsible behaviour by all people in public spaces whilst acting to ensure that disadvantaged people are not discriminated against and are treated with compassion and respect.

The City of Sydney employs four public space liaison officers who have the role of working with city business units, service providers and other external stakeholders to manage the impacts of homelessness, while ensuring that vulnerable people have access to the support they need.

## **6.5.3 Relevant policy**

The following policies and City of Sydney Council direction are related to the proposal:



**Note:** A new CBD rail line and rail crossing under the harbour will also exist on an as yet undefined alignment.

Source: Sydney City Centre Access Strategy (tN SW, 2013)



## **Sydney City Access Strategy**

The Sydney City Access Strategy specifically identifies that some existing cycleways will be extended and additional cycleways will connect the whole city centre cycleway network (also see Section 2.1.1). Connecting the cycleway network within the Sydney CBD would encourage growth in cycling, alleviate road congestion and reduce pressure on the public transport system. The proposal would contribute to achieving many of the outcomes of the Sydney City Centre Access Strategy by improving the amenity and safety of pedestrian and cycling links, completing safe and direct cycleways to the north of Sydney's CBD and increase the number of people who are choosing to cycle into the city.

One of the actions to deliver improved cycleway connections contained within the strategy is to improve the safety at key locations on existing cycleway links such as access to the Sydney Harbour Bridge at the northern end of the Sydney CBD.

The proposal would deliver this outcome.

## **Sustainable Sydney 2030 (Community Strategic Plan 2014)**

The Strategic Plan recognises that residents walk or cycle for nearly half of their average weekday trips, residents are less likely to own a car, have a driving licence and use a car for short trips. The relatively high residential density surrounding the city centre suggests that within a 10 km radius of the city a significant potential pool of people could cycle to work and other activities. The Strategic Direction 4 of the Plan is for *"a city for walking and cycling, with a safe and attractive walking and cycling network linking the city's street, parks and open spaces"*.

The proposal would contribute to achieving the objectives of the plan by helping to develop a network of safe, linked pedestrian and cycling paths integrated with green spaces throughout central Sydney, giving priority to cycle and pedestrian movements in the city centre and promoting sustainable travel to major workplaces and venues in the local area.

### **6.5.4 Consultation**

The key values of the community which could be affected by the proposal include:

- Safety of cycling and pedestrian facilities
- Amenity of cycling and pedestrian facilities
- Connectivity of the city's villages, the CBD and inner Sydney
- Reduced vehicular usage and increases in walking and cycling as a mode of travel
- Heritage values of the study area, in particular the National Trust Centre/S.H. Ervin Gallery.

Consultation has been carried out with all major stakeholders likely to be affected by the proposal, including:

- Roads and Maritime internal stakeholders
- City of Sydney Council
- Office of Environment and Heritage
- Australian Government Department of Environment and Energy
- Transport for New South Wales
- Property NSW
- National Trust Centre/S.H. Ervin Gallery
- Fort Street Public School
- Sydney Observatory
- Environmental Education Centre
- NSW Department of Education.

All stakeholders were generally supportive of the proposal. Conservation of the heritage values of the study area, particularly the National Trust Centre/S.H. Ervin Gallery, was raised by some community members and groups. Specific issues and concerns raised during stakeholder consultation include:

- The National Trust noted that the current 'viewshed' to/from the building should be maintained
- The Environmental Education Centre, Department of Education and Fort Street Public School were not in favour of an overpass bridge option that is close to the Department of Education buildings
- The Sydney Observatory noted that there are limited parking opportunities near Observatory Park and that several on-street parking spaces on Upper Fort Street could be impacted if a dedicated cycleway were to be provided at this location
- The Department of Education indicated that there are plans to redevelop Fort Street Public School to accommodate additional students.

The matters raised during the consultation have been considered in the design of the proposal, including the timing and staging of construction works. Those issues impacting on the socio-economic environment are discussed in Section 6.5.

## 6.5.5 Potential impacts

### **Construction**

#### Property

A number of public facilities are located in the immediate vicinity of the proposal area including Observatory Hill, Sydney Observatory, Fort Street Public School, Observatory Hill Environmental Education Centre and the National Trust Centre/S.H. Ervin Gallery.

During the works, including demolition of the existing shared use bridge over the Cahill Expressway, traffic management measures would be required which may result in minor traffic delays and diversions. Properties in the study area may be slightly more difficult to access. Access would be maintained at all times, although some inconvenience could be expected (delays, alternative routes) to users, including employees. Access to all properties in the study area would be maintained during construction. The works are expected to occur predominantly at night and would include appropriate traffic and pedestrian management measures. Impacts would be minor.

#### Social infrastructure

Social infrastructure in the immediate vicinity of the proposal includes Observatory Hill Park, public outdoor exercise area, Sydney Observatory, Fort Street Public School, Observatory Hill Environmental Education Centre and the National Trust Centre/S.H. Ervin Gallery.

Minor travel delays, traffic management and localised diversions may occur during construction and would reduce the ease of access to these facilities. Detours may be required to access facilities, resulting in reduced patronage. The works are expected to occur predominately at night and access to social infrastructure in the area would be maintained during the day. Impacts are expected to be minor.

The Sydney Observatory conducts nightly tours and would be most adversely affected by night works. Reduced patronage could occur, resulting in some short term, temporary loss in revenue for the Sydney Observatory. This impact is expected to be minor.

Access to the Sydney Observatory would be maintained at all times. The facility is accessible via a number of routes though Observatory Hill Park from Watson Road and Kent Street. Impacts associated with reduced accessibility to the Observatory would be minor. When booking night tours at the Observatory, patrons would be advised of the potential for traffic disruption and any alternative access arrangements.

Street parking on the eastern side of Upper Fort Street from Watson Road to the boom gate for construction staff and/or construction vehicles may reduce visitor parking on surrounding streets, although at least three parking spaces would remain available for public use.

Overall, traffic and access impacts are likely to be minor during the daytime and largely mitigated by traffic management and restricting parking for construction staff and vehicles to the compounds, when possible. Temporary impacts associated with social infrastructure during this time would vary during construction and would be influenced by the separation of the facilities from construction activities and the management of construction. Impacts may be highest close to the site of the new cycleway bridge and approach next to the Cahill Expressway, due to the extent of demolition and construction activities.

The installation of the at-grade approach to Sydney Harbour Bridge would result in the temporary closure of the public outdoor exercise area near the north-eastern corner of Observatory Hill Park. The equipment is reported to be well used, and temporary closure would have a moderate impact until proposed upgrades to the outdoor exercise area are undertaken. Installation of a temporary public outdoor exercise area would help mitigate the impact.

Localised environmental impacts during the works, including increased noise, reduced air quality (through dust) and visual disruption may impact on the amenity of social infrastructure facilities located close to the proposal area. Potential impacts on amenity are not expected to be significant as the majority of the works would occur outside of the operational hours of surrounding facilities, except for the Sydney Observatory which conducts nightly tours.

The proposal may require the removal of trees on the eastern side of the public outdoor exercise area near the north-eastern corner of Observatory Hill Park. The shade and weather protection provided by the trees adjoining the park is identified in the City of Sydney's Park Fitness Equipment Plan as one of the park's qualities. The removal of these trees would have a minor impact on the amenity of the exercise area for users and this impact would be short-term until the proposed upgrades to the outdoor exercise area are undertaken.

### Business and industry

Some of the businesses close to the proposal which offer recreational activities to the community may experience short-term losses in patronage as a result of small changes in amenity and access arrangements. These businesses include Sydney Observatory, Observatory Hill Environmental Education Centre and the National Trust Centre/S.H. Ervin Gallery. Other businesses in the study area located further away from the cycleway are unlikely to be materially impacted.

### Travel and access

Pedestrian and cyclist accessibility would be maintained and managed through a series of shared pedestrian and cyclist zones and diversions. The existing bridge which crosses the Cahill Expressway cutting would be closed during demolition and works to build a new bridge. An alternative temporary route would be provided.

While pedestrian and cyclist access would be maintained throughout the works, the level of service along the cycleway would be temporarily reduced and cyclists and pedestrians travelling in the area would experience delays and longer travel distances due to the diversion. A large number of people would be impacted by this reduced level of service. The impacts would be limited to the period of the works. Some cyclists and pedestrians may use an alternate mode of travel such as car or public transport or adjust their daily routine during this time.

Additional discussion on travel and access is provided in Section 6.4.

## Community values

The proposal would temporarily affect the amenity of the study area during construction as a result of visual impacts associated with the work sites, noise and vibration, lighting during night works and temporary impacts to access and disruption to road, cycleway and pedestrian traffic.

Amenity is a key value of the community within the study area. The impact on amenity would be received mostly by study area residents and those who frequently use the area for recreational activities. Impacts would vary between individuals and groups and depend on the exposure of individuals to the environmental impacts and the degree to which the works affect their use or enjoyment of land surrounding the proposal area. With the exception of the temporary closure of the public outdoor exercise area, amenity impacts would be short-term and limited to construction which would occur mainly at night.

The site compounds would result in a minor increase in heavy vehicle movements associated with delivery of materials which could have a minor impacts on the amenity of residents as a result of increases in traffic noise and impacts to air quality. Given the proximity of the proposal area to major roads, the overall effect would be minor.

Another key value of the community within the study area is the preservation of heritage values within the area, including the National Trust Centre/S.H. Ervin Gallery. The proposal interacts with and is located close to a number of heritage items (see Section 6.2.2). The works may impact on the public enjoyment of these heritage items as a result of visual, noise and vibration and dust impacts. Most works would occur at night and the impact would be minor. The impact of the proposal on the heritage items in the vicinity of the area and the associated noise and vibration impacts are discussed in detail in sections 6.1 and 6.3 respectively.

## Economic

Construction would create a number of short-term labour, engineering, site management and worker employment positions. Workers to fill these positions are likely to be sourced from the local labour market with expected economic benefits mostly captured within the local economy. Economic benefits associated with the creation of employment during construction would be short term and of a minor scale when compared to the Sydney economy.

The Sydney Harbour Bridge is a key transport route and provides access between the Sydney CBD and Lower North Shore for people commuting to work and for commercial vehicles. Minor traffic delays, detours and congestion are likely to be experienced near the proposal area during construction. Some economic costs would result from congestion and traffic delays during the work. The majority of the work is proposed to occur during the night and/or on weekends and most construction related traffic disruptions would occur outside of standard work hours, and would be limited to the duration of construction. The significance of this impact is minor.

Some businesses in the immediate vicinity of the proposal area may experience a minor reduction in patronage during construction. Impacts are expected to be low as construction work would take place predominately at night. The Sydney Observatory runs night tours and would likely be most adversely impacted by reduced patronage at night. The impact is expected to be minor.

## Homelessness

The presence of makeshift shelters below the southern ramp to the existing cyclist and pedestrian bridge over the Cahill Expressway indicates that homeless people are likely to be permanently or temporarily residing in this area. The proposal would result in the displacement of these people. While the number of people residing below the overpass is unknown, those affected represent the most disadvantaged members of the community. The impact of their displacement is high.

The City of Sydney's Homeless Unit provides outreach in partnership with several government and non-government organisations and services. Consultation with, and utilisation of, the Homeless



Unit before construction would help mitigate impacts associated with the demolition of the overpass.

## Operation

### Social infrastructure

The cycleway would benefit the social infrastructure facilities in the immediate vicinity of the proposal area by improving safety and ease of access to the facilities. The benefits arise largely through removing the existing conflict between cyclists/pedestrians and vehicles on Upper Fort Street by providing a separated facility.

The operation of the proposal would not result in adverse impacts to any of the surrounding social infrastructure facilities. The public outdoor exercise area would be redesigned and reinstated with new equipment and landscaping.

The proposal would remove the existing conflict between cyclists/pedestrians and vehicles on Upper Fort Street by providing a separated facility. The operation of the proposal would provide significant benefits to the social infrastructure facilities in the immediate vicinity of the proposal area by providing improvements to the overall safety and ease of access.

### Business and industry

The operation of the proposal may result in some minor increase to the patronage of businesses in the area through potential increases in cyclist and pedestrian through trips.

### Travel and access

The operation of the proposal would provide long-term and broad ranging benefits. Users of the Sydney Harbour Bridge cycleway would benefit from an improved level of service. The proposal would offer improved grades, alignments and track widths which allow improved ease of use and safety to users. The proposal provides full separation of cyclists and pedestrians from the road corridor along its entire length. By separating cyclists and pedestrians from vehicles, the proposal would improve the ease of use of cycleway and reduce travel times through the study area for both cyclists and pedestrians.

The proposal would encourage cycling as an alternative form of transport to driving or using public transport. By increasing the mode share for walking and cycling, the proposal would assist in relieving congestion on roads and improving the level of service of roads and public transport in the area. This is an important impact of the proposal and would assist in achieving the strategic directions outlined in the Sydney City Centre Access Strategy and Sustainable Sydney 2030.

### Community values

The National Trust noted during consultation that the viewshed to and from the National Trust Centre/S.H. Ervin Gallery should be maintained. The alignment of the cycleway connection and particularly the spiral ramp has been designed to avoid conflict with views to and from this building. Views to and from the National Trust Centre/S.H. Ervin Gallery would likely be intermittently obscured only from viewpoints to the north-east by the new elevated ramp associated with the proposal. As views from these viewpoints are currently largely obscured by vegetation, and predominately viewed from the north-east by vehicles travelling on the Sydney Harbour Bridge at 70 km/h, any long-term visual amenity impacts would be minor.

Accessibility, and the safety and amenity of pedestrian and cyclist facilities, are valued highly by the community in the study area. Through improved grades, alignments and path widths, the proposal would provide a more pleasant experience for its users. The upgrades would also provide users of the pedestrian footpath and cycleway with greater confidence to walk or cycle to their destination and allow them to feel safe when using the cycleway. Reduced travel times would also be expected, with a timely connection between existing cycleway facilities in the CBD and on the

Sydney Harbour Bridge. Cycling and walking would also be encouraged as a mode of transport, allowing the health benefits associated with this to be realised.

### Economic impacts

A study of the economic benefits of the proposed Inner Sydney Regional Bike Network covering the Sydney CBD and its surrounds (AECOM, 2010) found that cycleways provide economic benefits to the community through a number of cost savings resulting from:

- Travel time savings and reduced congestion
- Reduced travel and vehicle operating cost savings
- Reduced pressure on government infrastructure and services
- Health benefits
- Environmental benefits associated with reduced air pollution and greenhouse gases.

The study also found that the Inner Sydney Regional Bike Network would be economically beneficial for individuals, government and the economy through cost savings and benefits. The report estimated that the network would provide \$3.88 in economic benefits for every dollar spent. These findings provide an indication of the economic benefits which cycleway upgrades are likely to have in the Sydney area. The proposal does not form part of the Inner Sydney Regional Bike Network, although is likely to provide economic benefits to the Sydney area, similar to the Inner Sydney Regional Bike Network.

Economic benefits would be observed through cost savings from travel time and congestion reductions, reduced travel and vehicle operating costs and health benefits resulting from an increase in cycling and walking which the proposal is expected to facilitate. The scale of the economic benefits provided by the proposal upgrade is likely to be small in comparison to the Sydney economy.

### Homelessness

The impact of the proposal in displacing homeless people would be long-term, extending into operation of the proposal. The infrastructure associated with the proposal does not provide the same opportunity for shelter or privacy as the existing cycleway and homeless people are unlikely to return to reside in the area following construction. The social impact of the long-term displacement of homeless people resulting from the proposal has the potential to be high, depending on the availability of and willingness of homeless residents to utilise other housing options.

## 6.5.6 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on socioeconomic and land-use values are discussed below in Table 6-24.

Other safeguards and management measures that would address traffic and transport impacts are identified in Section 6.4.

**Table 6-24: Safeguards and management measures relating to socio-economic values**

Impact	Environmental safeguards	Responsibility	Timing	Standard/ additional safeguard
Communication	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> <li>mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions</li> <li>contact name and number for complaints.</li> </ul> <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008b).</p>	Contractor	Detailed design/pre-construction	Core standard safeguard SE1
Emergency vehicle access	Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contractor	Detailed design/pre-construction	Core standard safeguard SE2
Social infrastructure	The users of the outdoor gym will be notified about the proposal and upcoming changes via notices in the local media, and by predominantly placed advisory notices on the site.	Roads and Maritime / Contractor	Pre-construction/ construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard/ additional safeguard
	Consultation and notification of works would be undertaken with the community and adjacent facilities (Sydney Observatory, Fort Street Public School, Observatory Hill Environmental Education Centre and the National Trust Centre/S.H. Ervin Gallery) in accordance with the Roads and Maritime's <i>Community Involvement Practice Notes and Resource Manual</i> and <i>RMS Noise and Vibration Guideline</i> .	Roads and Maritime/ contractor	Pre- construction/ construction	Additional safeguard
	Complaints received will be recorded and attended to promptly in accordance with the Roads and Maritime Community Involvement Practice Notes and Resource Manual.	Contractor	Construction	Additional safeguard
Homeless people	Consultation and notification of the works will be undertaken with the City of Sydney's public space liaison officers.	Roads and Maritime/ contractor	Pre- construction/ construction	Additional safeguard
Access	The community will be notified about the construction activities and upcoming changes via notices in the local media, and by prominently placed advisory notices such as variable message signs (VMS) or similar, in accordance with Roads and Maritime Community Involvement Practice Notes and Resource.	Roads and Maritime/ contractor	Pre- construction/ construction	Additional safeguard



Impact	Environmental safeguards	Responsibility	Timing	Standard/ additional safeguard
	Where temporary access restrictions are required, owners and tenants of affected properties will be consulted regarding alternate access arrangements.	RMS	Pre-construction/ During construction	Additional safeguard

## 6.6 Biodiversity

This section describes the existing environment, potential impacts and proposed safeguards and management measures in relation to biodiversity values in the proposal area.

Biosis Pty Ltd carried out a terrestrial biodiversity survey of the proposal area and biodiversity assessment for the proposal which is included as Appendix I.

### 6.6.1 Methodology

The study area for the assessment includes the proposal area as well as adjacent areas, about 50m either side of the centre of the proposed upgrade works as shown in Figure 6-18.

Desktop database reviews included records contained in the OEH Atlas of NSW Wildlife, Department of the Environment (DoE) Protected Matters Search tool, critical habitat register (OEH), OEH Vegetation Information System, NSW OEH Vegetation Types Database, Federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems, DoE Interactive Flying-Fox Web Viewer, Mitchell Landscapes (NPWS, 2003) and aerial imagery.

From the desktop review, a preliminary likelihood of occurrence assessment was made to guide field survey effort and methods. Field surveys of the study area were carried out by an ecologist on 14 November 2016. The aim of the field survey was to ground-truth the results of the background research and habitat assessment and to determine whether targeted flora and fauna surveys were required. The types and qualities of habitat(s) present in the study area were assessed. The investigation focussed on locations containing stands of vegetation, waterbodies and locations of potential connective links. Particular attention was given to searching for threatened biodiversity and suitable habitat for these species, with a focus on species or communities listed under the *Threatened Species Act (1996)*<sup>1</sup> and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Full details of the methods employed when carrying out the biodiversity assessment are provided in Appendix I.

### 6.6.2 Existing environment

The study area is located in the Pittwater subregion of the Sydney Basin Bioregion, in the Port Jackson Basin Mitchell Landscape and is shown in Figure 6-18. The area is located entirely within the urban landscape of the Sydney CBD and is bounded by established buildings, landscaped parks and gardens to the west, and the Bradfield Highway and Cahill Expressway to the east.

Biodiversity values of the study area are limited to those associated with heavily urbanised landscapes, and are illustrated in Figure 6-18.

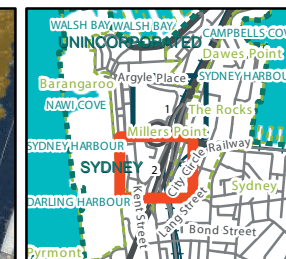
#### **Existing vegetation**

The study area does not support any native vegetation communities and is comprised of a mixture of landscaped planted native (both indigenous and non-indigenous) and exotic trees, shrubs and grasses. The Arboricultural Impact Assessment Report (Tree IQ 2016) provides comprehensive details and mapping of all landscape trees occurring within the study area (Appendix E).














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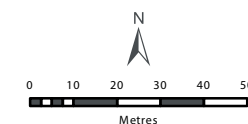
<sup>1</sup> Since the survey was undertaken, the Threatened Species Act has been repealed and replaced by the Biodiversity Conservation Act 2016. The assessment of biodiversity impacts has been undertaken in accordance with the current act.



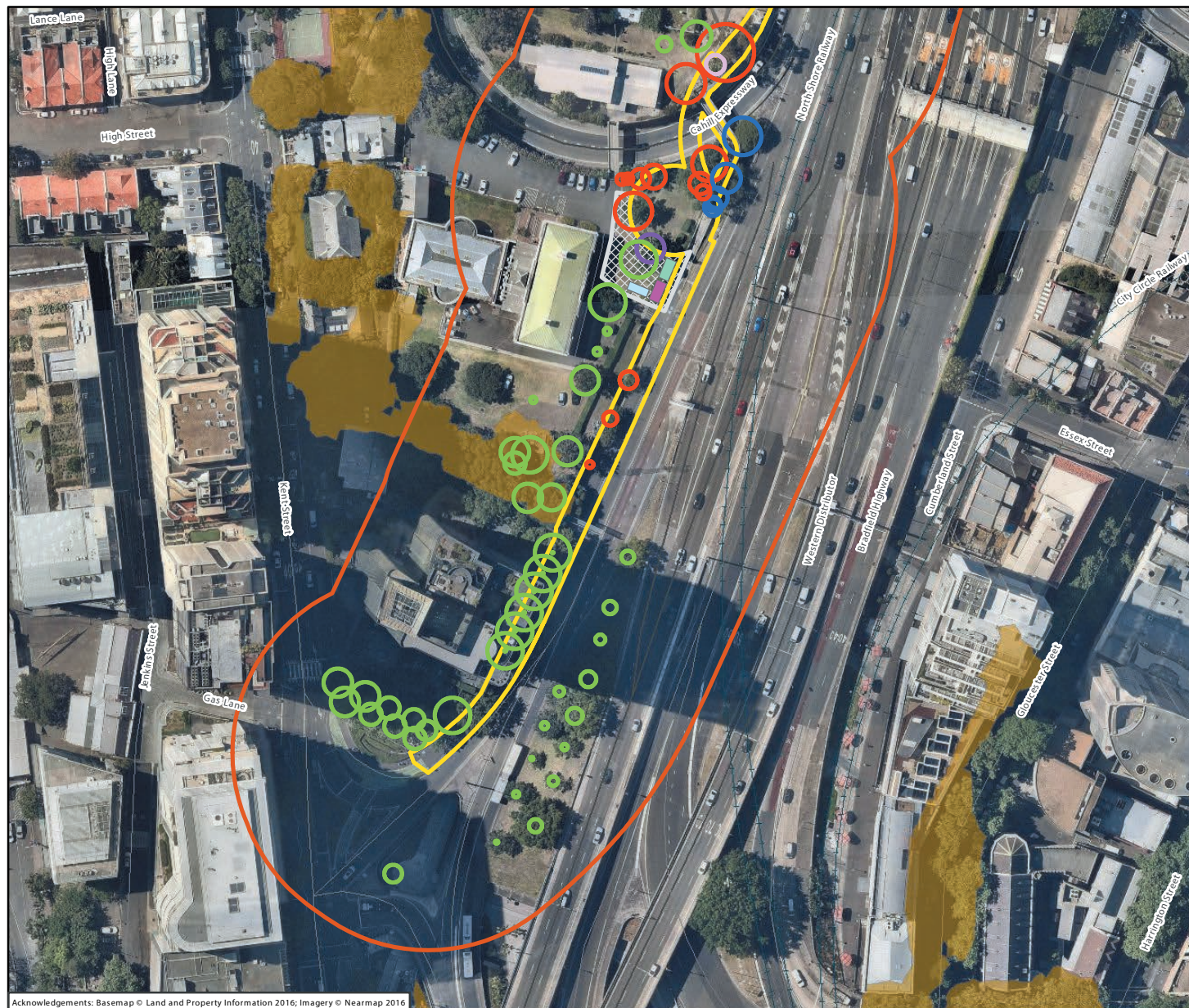


### Legend

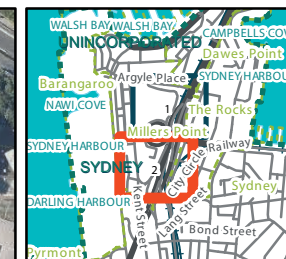
-  Study area
-  Proposed construction and operational footprint
- Compound
-  Amenities
-  Container
-  Extent of hardstand/construction compound
-  Site office
- Tree data
-  Tree to be retained
-  Tree to be removed
-  Tree to be transplanted
-  Tree to be transplanted if possible otherwise remove
-  Tree removed (entity unknown)
-  Tree removed (Sydney Harbour Bridge Southern Toll Plaza Precinct Upgrade project)
- The native vegetation of the Sydney metropolitan area
-  Urban E/N: Urban Exotic/Native





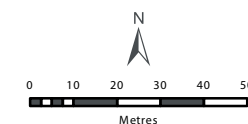


Acknowledgements: Basemap © Land and Property Information 2016, Imagery © Nearthmap 2016



#### Legend

- Study area
- Proposed construction and operational footprint
- Compound
  - Amenities
  - Container
  - ▨ Extent of hardstand/construction compound
  - Site office
- Tree data
  - Tree to be retained
  - Tree to be removed
  - Tree to be transplanted
  - Tree to be transplanted if possible otherwise remove
  - Tree removed (entity unknown)
  - Tree removed (Sydney Harbour Bridge Southern Toll Plaza Precinct Upgrade project)
- The native vegetation of the Sydney metropolitan area
  - Urban\_E/N: Urban Exotic/Native



Source: Biosis (November 2017)



Date:  
14.11.2017  
Project:  
ENAU RHOD03119AF1  
File Name:  
3119AF1\_01\_F06-18B\_GRA

NSW Roads and Maritime Services  
SHB Southern Cycleway REF



Transport  
Roads & Maritime  
Services

Ecological features of  
the proposal area (Biosis 2017)

Figure No:  
6-18B



The Urban Exotic/Native vegetation of the study area would not meet the criteria specified in listing advice or scientific determinations for any of the threatened ecological communities known to occur in the wider locality shown in Figure 6-18. The Urban Exotic/Native vegetation of the study area provides only very limited habitat resources for highly mobile species such as birds and bats. The study area does not support any habitat features such as hollow-bearing trees, dense understorey vegetation, leaf litter and fallen debris.

The study area supports two specimens of Chinese Hackberry (*Celtis sinensis*). This species is declared as a class 4 noxious weed within the City of Sydney LGA (DPI 2016).

### **Threatened species and populations**

No *Biodiversity Conservation Act 2016* (BC Act) or EPBC Act listed threatened flora, fauna or ecological communities were recorded during the field survey.

The field survey and desktop results that informed the habitat assessment determined that three threatened fauna known from the locality were considered to have a 'Moderate' or higher potential to occur within the study area. Table 6-25 summarises the threatened species (and their status) that have a moderate potential to occur within the study area.

**Table 6-25: Habitat assessment and survey results**

Scientific name	Common name	Status		Potential occurrence
		TSC Act	EPBC Act	
<i>Ninox strenua</i>	Powerful owl	V	-	<p><b>Moderate:</b> The study area does not provide any suitable roosting (ie tall dense vegetation) or breeding (ie large hollow-bearing trees within tall dense forest) habitat for the powerful owl.</p> <p>Given the proximity of recent records for this species, the study area is likely to lie within the large home range of the powerful owl and may provide occasional forage habitat only.</p>
<i>Miniopterus schreibersii oceanensis</i>	Eastern bentwing-bat	V	-	<p><b>Moderate:</b> The study area does not provide any suitable roosting, breeding or winter torpor habitat for the Eastern Bentwing-bat.</p> <p>Given the proximity of recent records for this species, the study area is likely to provide occasional forage habitat for Eastern Bentwing-bats roosting in the wider locality.</p>

Scientific name	Common name	Status		Potential occurrence
		TSC Act	EPBC Act	
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	V	Vu	<p><b>Moderate:</b> No flying-fox camps were recorded within the study area during the field survey. The nearest known camp for this species is located at Royal Botanic Garden Sydney s about 1.2 km from the study area (DEE, 2017).</p> <p>Given the proximity of recent records for this species, and the presence of suitable forage tree species, grey-headed flying-fox is highly likely to forage within the study area when suitable blossom or fruits are present.</p>

The likelihood of the other threatened flora and fauna species or populations known from the locality to occur within the study area was considered to be 'Low' or 'None' given the study area does not provide suitable habitat for these species (see Appendix I).

A number of migratory fauna are listed under the EPBC Act. The study area does not provide suitable habitat for any migratory species, although they may overfly the area.

Two artificial nest boxes were recorded during the field survey. One nest box was in disrepair and highly unlikely to provide shelter or breeding habitat for any native fauna. The second nest box was intact and, although no signs of occupation were recorded during the field survey, this nest box would provide suitable breeding habitat for common birds such as the rainbow lorikeet (*Trichoglossus moluccanus*).

No areas of critical habitat for flora or fauna have been declared within the study area. No mapped groundwater-dependent ecosystems are present, and none were recorded during the site investigation. No aquatic features (such as ponds or drainage lines) were recorded within the study area. The site does not provide suitable habitat for any aquatic flora or fauna.

The study area does not lie within any mapped potential habitat linkages (City of Sydney, 2014). Mature trees within the study area would provide only 'stepping stone' connectivity for highly mobile species such as birds and bats.

No State Environmental Planning Policies (SEPPs) are applicable to the biodiversity assessment for the proposal.

### **Matters of National Environmental Significance**

The grey-headed flying-fox is listed as Vulnerable under the EPBC Act and as such, any impacts to this species would be considered a Matter of National Environmental Significance. The study area does not support any active camps of the grey-headed flying-fox, and is not located next to any camps. The proposal would not directly or indirectly impact on roosting or breeding habitat for this species.

The study area provides suitable forage resources for the grey-headed flying-fox, a commonly recorded species in the locality. The proposal would require the potential removal of a small number of trees, and no large fig trees would be removed. Similar forage habitat for the grey-headed flying-fox is abundant in the locality, and the overall impact of the proposal on forage habitat for this species would not be significant.

Given the urban setting of the proposal, the limited habitat resources present within the study area and the scale of proposed impacts, the proposal is highly unlikely to trigger any biodiversity-related M NES and would therefore not require referral to the minister for impacts on biodiversity.

### 6.6.3 Potential impacts

The proposal has the potential to impact on the biodiversity values of the proposed study area in construction and operation. Given the urban setting of the proposal, the small scale of the proposed works, and the results of the biodiversity assessment, the following potential biodiversity impacts are considered relevant to the proposal:

- Removal of native vegetation and threatened flora
- Removal of threatened fauna species habitat and habitat features
- Injury and mortality of fauna
- Wildlife connectivity and habitat fragmentation
- Invasion and spread of weeds
- Noise, light and vibration.

#### **Construction**

##### **Removal of native vegetation and threatened flora**

The study area does not support any native vegetation communities. Construction for the proposal would not result in impacts to any native vegetation or to any threatened or non-threatened ecological communities.

No threatened flora species were recorded within the study area during the field survey. The biodiversity assessment has determined that none of the threatened flora species known from the locality would occur within the study area. The proposal would not result in any impacts to threatened flora species.

##### **Removal of threatened fauna habitat**

The study area does not support any shelter, roosting or breeding habitat for any of the threatened fauna species considered likely to occur. The study area provides forage resources only for these species, and suitable forage habitat for all species also occurs throughout the locality.

A total of 44 trees were identified within the study area for the Arboricultural Impact Assessment Report (Tree IQ 2016). Six of these trees have since been removed, five as part of the Sydney Harbour Bridge Southern Toll Plaza Precinct Upgrade project and one by an unidentified entity. The proposal would remove 19 trees, and transplant seven trees. An additional two trees (Moreton Bay figs) may be removed if they cannot be transplanted.

Nine of the trees to be removed could provide potential forage resources (blossoms or fruit) for the grey-headed flying-fox and include:

- Two Moreton Bay fig (*Ficus macrophylla*)
- Three old man banksia (*Banksia serrata*)
- One sugar gum (*Eucalyptus cladocalyx*)
- One gum tree (*Eucalyptus* sp.)
- Two Port Jackson fig (*Ficus rubiginosa*)

The trees to be removed represent only a small portion of forage resources available for the grey-headed flying-fox. No very large fig trees would be removed and no significant reduction is predicted in available forage resources for the grey-headed flying-fox or other listed species (powerful owl and eastern bentwing-bat).

### Injury and mortality

The study area provides limited habitat for a number of common native and introduced fauna species. Construction for the proposal has the potential to result in injury and/or mortality of these species. The scale and location of the proposed works means that such impacts are highly unlikely to occur.

The key responsibility of Roads and Maritime is to undertake works in a manner that would not result in any fauna injury or mortality during the work required to build the proposal.

### Operation

#### Wildlife connectivity and habitat fragmentation

The study area does not lie within any mapped potential habitat linkages (City of Sydney, 2014). Mature trees within the study area would provide only 'stepping stone' connectivity for highly mobile species such as birds and bats. Removal a small number of trees within the study area would not result in any significant reduction in wildlife connectivity in the locality.

The Urban Native/Exotic vegetation within the study area provides only limited habitat for highly mobile fauna. Removal of trees for construction would not contribute to habitat fragmentation in the locality.

#### Invasion and spread of weeds

The study area supports two specimens of Chinese Hackberry (*Celtis sinensis*). These trees are identified as trees 24 and 27 in the Arboricultural Impact Assessment Report (Tree IQ, 2016). Chinese Hackberry is declared as a class 4 noxious weed within the City of Sydney LGA (DPI, 2016). The management of class 4 noxious weeds requires 'the growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed'.

The key responsibility of Roads and Maritime is to undertake works in a manner that would prevent noxious weeds spreading from the work areas.

#### Noise, light and vibration

The study area supports only limited biodiversity values, primarily as forage habitat for highly mobile species adapted to urban environments. Noise, light and vibration impacts are already present within the study area due to existing infrastructure (eg major roads) and development. The proposal is unlikely to exacerbate any potential impacts on biodiversity due to noise, light or vibration.

## 6.6.4 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on terrestrial or aquatic biodiversity are discussed below in Table 6-26.



Table 6-26: Safeguards and management measures relating to biodiversity

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> <li>plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas</li> <li>requirements set out in the <i>Landscape Guideline</i> (RTA, 2008a)</li> <li>pre-clearing survey requirements</li> <li>procedures for unexpected threatened species finds and fauna handling</li> <li>procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013)</li> <li>protocols to manage weeds and pathogens.</li> </ul>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>
Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contractor	Detailed design / pre-construction	Core standard safeguard B2
Removal of threatened species, forage trees and nest boxes	Removal of potential grey-headed flying-fox forage trees will be minimised through detailed design, where practicable and feasible.	Contractor	Detailed design	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Removal of threatened species, forage trees and nest boxes	Existing nest boxes will be translocated and repaired in accordance with <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011a) prior to removal of the host tree, and re-installed outside of the proposed work area.	Contractor	Construction	Additional safeguard
Injury and mortality of fauna	A suitably qualified ecologist should undertake a pre-construction survey to ensure that no wildlife has taken up occupancy within trees on and adjacent to the site.	Contractor	Pre-construction	Additional safeguard
Injury and mortality of fauna	If encountered, fauna should be managed in accordance with <i>Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011b).	Contractor	Construction	Additional safeguard
Injury and mortality of fauna	If unexpected threatened fauna or flora species are discovered, work should be stopped immediately and the Unexpected threatened species find procedure in <i>Roads and Maritime's Biodiversity Guidelines – Guide 1 (Pre-clearing process)</i> (RTA 2011c) should be followed.	Contractor	Construction	Additional safeguard
Invasion and spread of weeds	The two specimens of Chinese Hackberry within the study area should be removed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011d).	Contractor	Construction	Additional safeguard
Invasion and spread of weeds	The transport of topsoil within, into or out of the study area should be minimised to reduce the spread of weeds.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Tree protection	Disturbance to trees, particularly fig trees, eucalypts and banksias, within and/or next to the study area should be minimised to the fullest extent practicable.	Contractor	Construction	Additional safeguard
Tree protection	Appropriate measures should be implemented to protect trees to be retained during construction as per recommendations of the Arboricultural Impact Assessment Report (Tree IQ, 2016).	Contractor	Construction	Additional safeguard

## 6.7 Hydrology and flooding

This section describes the existing environment, potential impacts of the proposal on hydrology and flooding, and proposed safeguards and management measures in the proposal area.

Information presented in this section has been drawn from a desktop review of hydrology in the proposal area. The desktop review included a search of topographical mapping, aerial imagery and investigation of flood hazard mapping within the City Area Catchment Floodplain Risk Management Plan (City of Sydney, 2016).

### 6.7.1 Existing environment

The elevation of the proposal area rises from 27 m AHD (Australian Height Datum) at the southern end (adjacent Kent Street) and reaches a peak of 43 m AHD just south of the Fort Street Public School. The elevation then begins to fall from Upper Fort Street to 25 m AHD at the northern end of the proposal area, adjacent the Sydney Harbour Bridge cycleway entrance. Most rainfall would be expected to run-off the hard paved surfaces and discharge into the municipal stormwater system.

The proposal is located with the Sydney City catchment which includes the suburbs of Millers Point, Barangaroo, Dawes Point, the Rocks and parts of Sydney. The catchment area covers an area of about 199 ha and is fully urbanised, with runoff in the catchment draining to Circular Quay and Darling Harbour via the area's pit and pipe stormwater system. Stormwater runoff from the Bradfield Highway, Cahill Expressway and Upper Fort Street enters the harbour via stormwater drains in the road kerb and channel.

The proposal area is not located on high flood hazard land as defined within City Area Catchment Floodplain Risk Management Plan (City of Sydney, 2016). A number of locations within the catchment are flood liable, and flooding is known to occur in some areas. Urbanisation occurred prior to the installation of road drainage systems in the 1900s and many buildings were constructed on overland flow paths or in unrelieved sags. Topographic depressions can cause localised flooding as excess flows have no opportunity to escape via overland flow paths where sub-surface systems are running at capacity. This creates a significant drainage/flooding problem in many areas throughout the catchment, with roads and pedestrian areas forming major flow paths, with associated high velocities and flood depths (City of Sydney, 2016).

### 6.7.2 Potential impacts

The proposal would involve the relocation of stormwater pits to the new kerb alignment along the Bradfield Highway on-ramp where lanes and kerbs would be adjusted.

Given the scope and extent of the work, the main potential impact on hydrology and flooding is expected to be limited to:

- Sediment-laden runoff from disturbed areas entering waterways and discharging into Sydney Harbour during the removal of the existing infrastructure and pavement. Run-off has the potential to cause sedimentation and affect flow regimes. Surface run-off would be diverted around the work to minimise the potential for erosion and sedimentation.
- Partial blocking of waterways, drainage lines or stormwater pits that receive road surface runoff leading to localised flooding upstream, or restricted flow downstream. These impacts would be minor and temporary, for the period of construction. The stormwater pits would be relocated near their existing location and would drain stormwater flows from the proposal area into Sydney Harbour. No permanent change to drainage pathways would occur as a result of the proposal.



### 6.7.3 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on hydrology and flooding are discussed in Table 6-27.

Table 6-27: Safeguards and management measures relating to hydrology and flooding

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Minimise future flooding and hydrology risks	Prior to construction commencing, final hydrology and drainage assessments will be undertaken to inform detailed design measures to minimise flood risks to the environment, properties and the project.	Roads and Maritime/ Contractor	Detailed design / pre-construction	Additional safeguard

Other safeguards and management measures that would address hydrology and flooding impacts, including sedimentation, are identified in Table 6-28.

## 6.8 Surface water

This section describes the existing environment, potential impacts on surface water of the proposal and proposed safeguards and management measures in the proposal area. Information presented in this section has been drawn from a desktop review of information relevant to the study area, mapping of the catchment area and aerial imagery.

### 6.8.1 Existing environment

The proposal is located in the Sydney City catchment. This region lies within the City of Sydney Local Government Area (LGA) and has been fully developed for urban and commercial usage, which provides little opportunity for water to infiltrate due to the high degree of impervious surfaces. The hydrology of the proposal area is discussed in Section 6.7.

The catchment drains into Sydney Harbour at various locations, with the majority of the catchment discharging to Sydney Cove via Sydney Water's main trunk drainage system. Sydney Harbour is located approximately 290m to the north, 370m to the east and 365m to the west of the proposal area.

Stormwater runoff from the urban catchment that drains into Sydney Harbour is generally not treated (except for gross pollutants) and is of relatively poor quality. Common urban stormwater pollutants include gross pollutants and litter, sediment and suspended solids, nutrients, toxic organics, heavy metals and hydrocarbons.

### 6.8.2 Potential impacts

The proposal activities would include clearing of vegetation to allow for construction of the proposal. Earthworks would be needed to create suitable gradients to construct the cycleway and possible piling works for the bridge access across the Cahill Expressway.

Given the scale and extent of the work, the potential impacts on surface water quality are expected to be limited to:

- Sediment in runoff from disturbed areas entering waterways and causing sedimentation, affecting water quality (eg increased turbidity)

- Pollution of surface water from accidental spills of contaminants such as fuels used in vehicles and machinery

No changes to traffic flow are expected with the proposal. The proposal is not anticipated to have a significant impact on the average annual weight of pollutants discharging from the road corridor to the receiving drainage lines when compared to present day conditions.

Most surface water impacts would be temporary and minor and limited to the period of construction. Although the work is planned for about 10 months, not all areas would be disturbed at the same time. The impact on surface water quality is expected to be minor and would be able to be managed effectively through the implementation of standard erosion and sediment controls.

### 6.8.3 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts on surface water are discussed in Table 6-28.

Other safeguards and management measures that would address surface water impacts are identified in Table 6-27.

**Table 6-28: Safeguards and management measures relating to surface water**

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Soil and water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Detailed design/ pre-construction	Core standard safeguard SW1  Section 2.1 of QA G38 <i>Soil and Water Management</i>
Soil and water	A site specific Erosion and Sediment Control Plan/s 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.	Contractor	Detailed design / Pre-construction	Core standard safeguard SW2  Section 2.2 of QA G38 <i>Soil and Water Management</i>
Sedimentation/ decreased water quality	During construction, divert surface run-off around work zones to minimise erosion and sedimentation.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Sedimentation/ decreased water quality	The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, and in accordance with: Landcom's Managing Urban Stormwater: Soils and Construction series Roads and Maritime Guideline for Batter Stabilisation Using Vegetation (RMS, 2015a)	Contractor	Construction	Additional safeguard
Contamination of surface waters and groundwater related to accidental spills	Spill management measures and procedures will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. The measures and procedures will address, but not necessarily be limited to: management and storage of chemicals and potentially polluting materials; any bunding requirements; refuelling requirements; maintenance of plant and equipment; and emergency management, including notification in accordance with Roads and Maritime guidelines, response and clean-up procedures.	Contractor	Pre-construction/ construction	Additional safeguard
Disturbance of contaminated soil/ contamination of environment	Emergency spill kits will be kept at areas identified as having spill risk.	Contractor	Construction	Additional safeguard
Contamination of surface waters and groundwater	Refuelling will not take place within 50 m of waterways, and will occur in a suitably located and bunded area.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Minimise risks to water quality and soil impacts	Concreting activities will not occur during actual or forecasted rain events. Any concrete slurries generated during construction will be collected and stored in an impermeable bunded area, until they are removed and disposed of at an appropriately licenced facility.	Contractor	Construction	Additional safeguard
Contamination of surface water	Wash-down of plant, equipment and vehicles will occur in a designated bunded area away from waterways and drainage lines.	Contractor	Construction	Additional safeguard



## 6.9 Other impacts

This section describes the existing environment, potential impacts of the proposal and proposed safeguards and management measures in relation to the following environmental factors:

- Soils and contamination
- Aboriginal heritage
- Groundwater
- Air quality
- Waste
- Climate change and greenhouse gas emissions.

Information presented in this section has been drawn from desktop reviews of information relevant to the study area. A site inspection was also carried out in relation to soils and contamination.

### 6.9.1 Existing environment and potential impacts

The existing environment and potential impacts of the proposal on soils and contamination, Aboriginal heritage, groundwater, air quality, waste and climate change and greenhouse gas emissions is provided in Table 6-29.

**Table 6-29: Other impacts - existing environment and potential impacts**

Existing environment	Potential impacts
<b>Soils and contamination</b>	
<p>The proposal area is paved, except for a small landscaped area next to the outdoor exercise area. There is no evidence of significant filling - small quantities of engineered fill may be present on the proposed cycleway route.</p> <p>The proposal area is not located within an area of known acid sulfate soils. No visual evidence of wastes being located on the site, with the exception of small quantities of fly-tipped waste landscaped verge, just south of Fort Street Public School (Coffey, 2017; Appendix J).</p> <p>No evidence observed of chemical storage or spills or evidence of chemical wastes. NSW EPA contaminated land record indicates that the proposal area and surrounding properties have not been reported or notified as a contaminated site under the <i>Contaminated Land Management Act 1997</i>.</p> <p>Based on available historical information for the proposal area and site observations, potential for contamination of the proposal area is considered low.</p>	<p>Potential for impacts of the proposal associated with contamination soils or water is negligible to low and summarised as follows:</p> <ul style="list-style-type: none"> <li>• Ground disturbance through removal of vegetation, excavation and earthworks, stripping of topsoil and stockpiling and movement of machinery is minimal.</li> <li>• During construction, exposed loose soils could become mobilised with increased potential for soil erosion. Soil and erosion impacts would be low, with limited earthworks and progressive rehabilitation.</li> <li>• The work is not expected to encounter or disturb acid sulfate soils.</li> <li>• Disturbance of potentially contaminated materials may expose workers or the public to these contaminants if controls are not put in place. Work activities could also release contaminants to the environment.</li> </ul> <p>During operations, impacts would be negligible as exposed areas would be paved or rehabilitated, greatly reducing erosion and the potential for contamination.</p>

Existing environment	Potential impacts
<b>Aboriginal heritage</b>	
<p>The proposal is located within the boundaries of the Metropolitan Local Aboriginal Land Council.</p> <p>A search of the AHIMS database (Appendix K) did not identify any Aboriginal places or Aboriginal sites that have been declared or recorded in the proposal area. The closest AHIMS recorded site is about 70 m to the east of the northern extent of the proposal area near Argyle Street.</p> <p>The proposal area has low potential to contain Aboriginal heritage sites. Areas of artificial slopes and embankments have reduced the potential for intact archaeological sites to be found.</p>	<p>The proposal would not impact on any known Aboriginal heritage sites.</p> <p>No major changes to the landscape are proposed and the majority of work would be within or next to the existing road and cycleway corridor.</p> <p>Roads and Maritime has sought advice from the Roads and Maritime Aboriginal Heritage Officer on the proposal. The significance of any impacts on Aboriginal heritage sites through an unexpected find is low, as the potential for a find is assessed to be low, and the nature of sites potentially present is limited by the geology and landscape of the site.</p> <p>The proposal area has been assessed as having low potential to contain Aboriginal sites, and no further input on Aboriginal heritage is recommended. Measures to address chance finds and worker awareness are described in Table 6-30.</p>
<b>Groundwater</b>	
<p>The occurrence of groundwater in the proposal area is expected to occur as discontinuous lenses of water at the soil/rock interface, and within the underlying sandstone at depth (Coffey, 2017; Appendix J).</p> <p>Groundwater is likely to flow in a general south to south-western direction for the southern half of the proposal area and in the northern half of the proposal area in a north to north-easterly direction and discharge into Sydney Harbour.</p> <p>Groundwater from the southern portion of the site is expected to discharge to Darling Harbour.</p> <p>Various groundwater bores are located within a 500m radius of the proposal area, and are all used for monitoring. The closest groundwater monitoring bore is 141m south-west of the proposal area.</p>	<p>The work would be superficial and is not expected to intercept groundwater, with the exception of piling works for the proposed bridge access to Upper Fort Street.</p> <p>No potential impacts to groundwater are anticipated during construction or operation of the proposal.</p>

Existing environment	Potential impacts
<b>Air quality</b>	
<p>Air quality overall in NSW is good by international standards (EPA, 2016) and locally depends on nearby sources of pollutants. Existing air quality in the study area is likely to be heavily influenced by emissions from vehicles. Other influences are the prevailing weather and climatic conditions, and any emissions from surrounding industrial and commercial land uses.</p> <p>The nearest NSW OEH/EPA air quality monitoring sites for the NSW Air Quality Index are located in Rozelle and Lindfield. Historical data from 2012-2017 for these sites shows (OEH, 2015):</p> <ul style="list-style-type: none"> <li>• 94% of days in the very good to good range</li> <li>• 4% of days in the fair category</li> <li>• 2% of days per cent in the poor, very poor and hazardous range.</li> </ul> <p>The closest Bureau of Meteorology monitoring station is at Observatory Hill. Weather statistics from this site include (BoM, 2012):</p> <ul style="list-style-type: none"> <li>• Average annual rainfall of 1,216mm</li> <li>• Wettest month June (average 133mm)</li> <li>• Driest month September (average 68mm)</li> <li>• Average annual wind speed ranges between 10 km per hour to 16 km per hour.</li> </ul>	<p><b>Construction:</b> Dust may cause nuisance impacts when construction activities are located close to sensitive receivers. The extent of impact associated with dust would be short-term and minor and influenced by soil types, amount and duration of ground disturbance, local weather conditions (eg wind speed and direction), vehicle speeds and frequency of water spraying. Progressive rehabilitation of disturbed areas would help to reduce the extent of exposed soils. Impacts on sensitive receivers as a result of dust are expected to be confined within the area of the immediate works and would be short-term and minor.</p> <p>Vehicle (exhaust) emissions include those from petrol and diesel-fuelled vehicles and operation of on-site plant and machinery. Contractors would be expected to operate and maintain vehicles and equipment to required standards. Emissions from these sources are unlikely to result in local decreases in air quality during the work.</p> <p><b>Operation:</b> The proposal would not result in an increase in vehicle traffic. By creating a safer cycleway, the proposal aims to reduce the pressure on roads, indirectly contributing to an improvement in ambient air quality.</p>
<b>Waste</b>	
<p>The existing road and cycleway and its use generates little waste. Waste may be generated from pruning or cutting of vegetation to maintain a clear cycleway, and from any maintenance activities on the road and cycleway. Litter may also be generated from passing motorists, cyclists and pedestrians. Waste bin facilities are located at Observatory Hill.</p>	<p>Various waste streams would be generated during construction including cleared vegetation, spoil and general construction waste, domestic solid and liquid waste from site compounds, packaging and scrap metal.</p> <p>Potential impacts from waste relate to contamination of the surrounding environment through improper waste handling, storage and transport practices. The significance of these impacts is predicted to be low, as proposed safeguards and management measures would manage potential impact pathways into the surrounding environment.</p> <p>Waste generated during operation would be similar to existing wastes that currently occur along the road and cycleway. No long-term waste-related impacts are anticipated.</p>

Existing environment	Potential impacts
<b>Climate change and greenhouse gases emissions</b>	
<p>Climate change projections for the Metropolitan Sydney region for the years 2020-2039 and 2060-2079 from NSW and ACT Regional Climate Modelling (NARClIM) Project are as follows:</p> <ul style="list-style-type: none"> <li>• Maximum temperatures projected to rise by 0.7°C by 2030 and 1.9°C by 2070, with the greatest temperature increases during spring and summer</li> <li>• An extra 5-10 days per annum above 35°C by 2030, and an extra 10-20 days per annum by 2070, mainly in summer</li> <li>• Number of cold nights (below 2°C) expected to decrease, with the greatest decrease of up to 20 fewer nights by 2030 and more than 40 fewer nights in 2070</li> <li>• Severe fire weather increase in the north-west and south-west during spring and summer</li> <li>• Rainfall increase in autumn and decrease in spring.</li> </ul> <p>The projected changes to future climatic conditions would have an effect on existing and proposed projects and infrastructure. Climate change is expected to exacerbate natural variability in the region. Climate change adaption strategies may be required for the design, construction and operation of projects, such as this proposal.</p>	<p>Emissions from the combustion of fossil fuels from construction vehicles, machinery and equipment in the form of greenhouse gases may affect climate. While the proposal is not expected to significantly add to these emissions, safeguards would be implemented to minimise these impacts. Impacts would be negligible in the context of overall NSW and Australian emissions.</p> <p>By creating a safer cycleway, the proposal aims to reduce the pressure on roads and encourage clean transport. As such, the proposal would not exacerbate current greenhouse gas emissions for the Sydney region.</p>



## 6.9.2 Safeguards and management measures

Proposed safeguards and management measures relating to soils and contamination, Aboriginal heritage, groundwater, air quality, waste, and climate change and greenhouse gas emissions are provided in Table 6-30.

**Table 6-30: Safeguards and management measures relating to other environmental aspects**

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Soils and contamination	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C1  Section 4.2 of QA G36 <i>Environment Protection</i>
Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (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	Detailed design / Pre-construction	Core standard safeguard C2  Section 4.3 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Disturbance of contaminated soil/ contamination of environment	<p>All fuels, chemicals and other hazardous materials will be stored in a roofed, fire-protected and impervious bunded area at least 50m from waterways, drainage lines, basins, flood affected areas or slopes above 10%. Bunding design will comply with relevant Australian Standards, and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual.</p> <p>Appropriate on-site signage will be provided to identify the materials stored.</p>	Contractor	Construction	Core safeguard C3
Soil erosion	Activities will be planned and sequenced to minimise the length of time disturbed soil remains exposed, and limit the time of soil stockpile storage before the material is reused or removed from the site.	Contractor	Construction	Additional safeguard
Aboriginal heritage	<p>The <i>Standard Management Procedure - Unexpected Heritage Items</i> (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.</p> <p>Work will only re-commence once the requirements of that procedure have been satisfied.</p>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard AH2</p> <p>Section 4.9 of QA G36 <i>Environment Protection</i></p>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Groundwater quality and quantity	In addition to the implementation of general erosion, sediment and water quality control safeguards, any stockpiles, wash downs, refuelling and chemical storage sites will be lined and/or bunded.	Contractor	Detailed design / Pre-construction	Additional safeguard
Air quality	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> <li>• potential sources of air pollution</li> <li>• air quality management objectives consistent with any relevant published EPA and/or OEH guidelines</li> <li>• mitigation and suppression measures to be implemented</li> <li>• methods to manage work during strong winds or other adverse weather conditions</li> <li>• a progressive rehabilitation strategy for exposed surfaces.</li> </ul>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard AQ1</p> <p>Section 4.4 of QA G36 <i>Environment Protection</i></p>
Air quality	<p>Dust control measures, including wetting and (if required) engineering control methods would be applied in excavation areas to minimise dust emissions.</p> <p>Construction activities that emit dust or volatile chemicals would be undertaken in the shortest time possible taking work quality and worker safety precautions into account.</p>	Project manager	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Generation of waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> <li>• measures to avoid and minimise waste associated with the project</li> <li>• classification of wastes and management options (re-use, recycle, stockpile, disposal)</li> <li>• statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</li> <li>• procedures for storage, transport and disposal</li> <li>• monitoring, record keeping and reporting.</li> </ul> <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (RMS, 2014b) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contactor	Detailed design / pre-construction	<p>Core standard safeguard W1</p> <p>Section 4.2 of QA G36 <i>Environment Protection</i></p>
Construction waste	<p>Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a pre-construction land assessment will be undertaken to identify the presence of any pre-existing wastes. The assessment will be prepared in accordance with the <i>Roads and Maritime Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i>. Where the land is privately owned, a copy of the assessment will be provided to the landowner.</p>	Road and Maritime/ Contractor	Pre-construction	Additional \ safeguard



Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Construction waste	Waste materials (such as soils and aggregates) obtained from the project and to be exported to a non-road construction site or project will be sampled and managed in accordance with relevant Roads and Maritime <i>Waste Fact Sheets</i> .	Contractor	Construction	Additional safeguard
Construction waste	No burning of timber or other materials will occur in or around the proposal area. Such material will be removed from work sites and disposed of to an appropriately licenced facility.	Contractor	Construction	Additional safeguard
Construction waste	Any trees to be removed will be reused as millable timber wherever practicable. Other vegetated material from native species can be mulched and re-used on-site for landscaping or rehabilitation purposes. Weed species, or vegetation not considered appropriate for re-use on-site, will be removed and disposed of to an appropriately licenced facility.	Contractor	Construction	Additional safeguard
Construction waste	If encountered, asbestos waste will be removed from the site and disposed of to an appropriately licenced facility and in accordance with the WMP.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Construction waste	<p>A post-construction land assessment will be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking) to determine the suitability for hand-back to the landowner.</p> <p>The assessment will be prepared in accordance with the Roads and Maritime <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i>. Where the land is privately owned, a copy of the assessment will be provided to the landowner.</p>	Contractor	Construction	Additional safeguard
Construction waste	Appropriate housekeeping will be undertaken at the construction site and project sites will be maintained free of litter at all times.	Contractor	Construction	Additional safeguard

## 6.10 Cumulative impacts

In accordance with Clause 82 of the EP&A Regulation, any cumulative environmental effects of the proposal associated with other existing and likely future activities must be taken into account in determining the potential impact of the proposal.

A cumulative environmental impact is a combination of the direct impacts discussed in sections that would occur as a result of the construction and operation of the proposal, along with any direct impacts from other known or reasonably foreseeable projects within the general area.

### 6.10.1 Existing environment

Several other planned or reasonable foreseeable projects are located close to the proposal area. Each of these projects would be assessed separately for their potential impacts and would be expected to implement appropriate safeguards manage these impacts.

Construction of step-free pedestrian lifts on the southern side of the Sydney Harbour Bridge is currently planned for 2018 and would not overlap with the program for the proposal. Roads and Maritime also proposes to upgrade the cycleway at the northern end of the Sydney Harbour Bridge. Construction of this upgrade is unlikely to overlap substantially with the proposal.

Other known or upcoming projects which may result in cumulative impacts with the proposal are the redevelopment of Fort Street Public School and ongoing routine maintenance on the Sydney Harbour Bridge. Of these projects, the Fort Street Public School project is most likely to lead to cumulative impacts when considered alongside the proposal. This project is expected to commence in 2019 and extend into 2020.

These proposals in combination could expose the surrounding communities, road users and other stakeholders to construction activities for approximately three years (ie from early 2018 to late 2020) (Table 6-31). The potential for construction and consultation fatigue should be considered and managed for these receivers.

**Table 6-31: Planned or reasonable foreseeable projects**

Proposal	Time period											
	2018				2019				2020			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sydney Harbour Bridge Southern Cycleway (the proposal)												
Sydney Harbour Bridge Step-Free Pedestrian Lifts (southern site)												
Fort Street Public School redevelopment												

Source: Appendix F

## 6.10.2 Potential impacts

Potential cumulative impacts could arise as a result of the simultaneous construction of the proposal with other routine works on the Sydney Harbour Bridge and within the proposal area, and the redevelopment of Fort Street Public School. Maintenance activities are unlikely to impact on the values of the proposal area and surrounds. Roads and Maritime would coordinate with the City of Sydney and other stakeholders in the area to identify any potentially significant overlap of activities ie at the same time and location as the proposal.

The potential cumulative impacts of the proposal together with the Fort Street Public School redevelopment, the Sydney Harbour Bridge Step Free Access project and Sydney Harbour Bridge Northern Cycle Ramp project (where relevant) are discussed below. Environmental factors common to all proposals where potential cumulative impacts may occur include non-Aboriginal heritage, traffic and transport, noise and vibration, landscape and visual, and socio-economic.

### ***Non-Aboriginal heritage***

The proposal, the Sydney Harbour Bridge Step Free Access project and the Sydney Harbour Bridge Northern Cycle Ramp project would all impact the on the fabric of the bridge. The Step Free Access project is currently underway and aims to provide step free access to the bridge walkway from the southern and northern approaches through the provision of passenger lifts. This project would remove two sections of parapet wall along the walkway on the northern and southern approaches. These sections are expected to be re-used into the street-level design of the lift shaft entrances and pavement areas.

The Sydney Harbour Bridge Northern Cycle Ramp project is in early stages of development and aims to improve cyclist access at the northern approach in Milsons Point. This project would have similar aims to the proposal and would also include removal of a section of parapet of the Sydney Harbour Bridge and installation of a new structural element along the northern retaining wall.

Numerous interventions to the retaining walls and concrete parapets of the northern and southern approaches could undermine the integrity and intactness of these significant elements of the Sydney Harbour Bridge. The cumulative impact of these works would be reduced through minimising the extent of work undertaken in these areas.

These projects would also collectively introduce new visual elements to the Sydney Harbour Bridge, potentially obscuring views to the bridge. Potential visual impacts could be reduced through use of lightweight design, and unobtrusive materials including steel and glass consistent with the existing material palette and character of the bridge. Any design elements that reduce visual bulk and prominence of new elements would also reduce potential visual impacts. The visual clarity and character of the Sydney Harbour Bridge and its southern and northern approaches could also be diminished by projects adopting conflicting or contrasting designs. All projects would comply with the Sydney Harbour Bridge Conservation Management Plan.

### ***Traffic and transport***

Multiple construction projects occurring in the area could increase travel times for road users as a result of lane closures and traffic management. These impacts would be effectively managed through coordination of the construction timetable, and for example, phasing of construction activities to avoid peak hours where possible. Traffic impacts are likely to be short-term and minor.

Cyclists not wanting to use the cycleway during construction may experience congestion if they use an alternate mode of travel.

The Department of Education is planning to redevelop Fort Street Public School which may increase the number of construction vehicle movements on Upper Fort Street at the same time as construction of the proposal. Consultation with the Department of Education and Fort Street Public School would be undertaken to stagger timing of work activities wherever possible, and to manage traffic on Upper Fort Street.



The proposal would facilitate improved access to Fort Street Public School for both redevelopment activities and access for the proposed increase in student numbers.

### ***Noise and vibration***

Where work for the proposal and the Fort Street Primary School redevelopment occur concurrently, in particular for work in Precinct 2 and Precinct 3, cumulative noise impacts may occur at several sensitive receivers. These receivers include Observatory Tower, the National Trust Centre/S.H. Ervin Gallery, residential receivers on Kent Street, the Environmental Education Centre and Sydney Observatory.

Furthermore sensitive receivers may be exposed to noisy construction activities (including night works) for a total duration of approximately three years if all proposals proceed.

### ***Landscape and visual***

Cumulative visual impacts would need to be considered for any future project in the proposal area. Further refinement of the proposal design would seek to reduce the visual impact of the proposal, such as providing structures that are light and transparent, and minimising overall visual intrusion through sympathetic design. The existing landscape setting would be retained.

### ***Socio-economic***

Although minor there would be the potential for some degree of cumulative impacts to occur during construction. Potential cumulative impacts include traffic delays and congestion (resulting from temporary road closures and detours) and temporary changes to amenity resulting from environmental impacts. Potential impacts also include the confusion and nuisance effect of having to keep up with changes relating to access and consultation / notifications from multiple contractors relating to multiple projects for a prolonged period (ie three years). The presence of a number of construction sites in the area may result in a general feeling of congestion in the area. Those not wanting to use the cycleway during construction may also experience congestion if they use an alternate mode of travel as a result of these cumulative works. A coordinated approach to the management and construction of the proposal and nearby concurrent projects would ensure that cumulative impacts are minimised.

The Department of Education is planning to redevelop Fort Street Public School which includes increasing the number of students at the school. If the construction of the school redevelopment and the proposal occur at the same time it is likely that cumulative traffic impacts would occur. However, consultation with the Department of Education and Fort Street Public School to arrange the staggered timing of construction activities would ensure the effective management of traffic along Upper Fort Street. The proposal would facilitate improved access to Fort Street Public for both construction of redevelopment activities and access for the proposed increase in student numbers.

During operation of the proposal, negative cumulative impacts would be negligible. The implemented cycleway upgrade as part of the broader program of cycleway upgrades would have positive cumulative effects in terms of improved cyclist, pedestrian and motorist safety.

The upgrade program would reduce incident numbers, improve access for visitors, overall traffic conditions, reduce travel times and generate increased employment during the work. Overall access to services and facilities would also be improved.

### 6.10.3 Safeguards and management measures

The contribution of the proposal to cumulative impacts would be reduced through implementation of the safeguards and management measures identified in this chapter. The additional safeguards and management measures relating to cumulative impacts are identified in Table 6-32.

**Table 6-32: Safeguards and management measures relating to cumulative impacts**

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration, Traffic	The Construction Noise and Vibration Management Plan prepared for the proposal should include a procedure for managing potential cumulative impacts of concurrent projects, such as the Fort Street Public School redevelopment.	Roads and Maritime/ Contractor	Construction	Additional safeguard
Noise and vibration	For periods where cumulative construction noise and vibration may occur all feasible and reasonable mitigation measures should be implemented including scheduling of work across construction sites, such as night works, and consultation with affected sensitive receivers.	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard
Socio-economic	Develop a Community and Stakeholder Engagement Plan that considers cumulative impacts in the timing and content of information and notifications to the community that aims to minimise consultation fatigue and ensure consistency across other Roads and Maritime projects being constructed at the same time.	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Heritage and visual	<p>Measures to avoid and/or reduce the potential cumulative impact of the proposal together with other projects on or close to Sydney Harbour Bridge should be implemented and may include:</p> <ul style="list-style-type: none"> <li>• minimising the physical impact to significant fabric of Sydney Harbour Bridge</li> <li>• adopting consistent design, style, aesthetic character and material palette</li> <li>• providing a coordinated approach to design and interpretation.</li> </ul>	Roads and Maritime	Design/ pre-construction	Additional safeguard

## 7 Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards, as well as the licence and/or approval requirements required before construction, are provided below.

### 7.1 Environmental management plans

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

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

The CEMP would be prepared before construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Sydney Region, before the start of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

The CEMP would be developed in accordance with the specifications set out in the following: QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing, and QA Specification G10 - Traffic Management.

### 7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.



**Table 7-1: Summary of safeguards and management measures**

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
GEN1	General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> <li>• any requirements associated with statutory approvals</li> <li>• details of how the project will implement the identified safeguards outlined in the REF</li> <li>• issue-specific environmental management plans</li> <li>• roles and responsibilities</li> <li>• communication requirements</li> <li>• induction and training requirements</li> <li>• procedures for monitoring and evaluating environmental performance, and for corrective action</li> <li>• reporting requirements and record-keeping</li> <li>• procedures for emergency and incident management</li> <li>• procedures for audit and review.</li> </ul> <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN1
GEN2	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	Core standard safeguard GEN2
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.	Contractor / Roads and Maritime	Pre-construction / detailed design	Core standard safeguard GEN3

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		<p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• areas of heritage sensitivity</li> <li>• threatened species habitat</li> <li>• adjoining residential areas requiring particular noise management measures</li> </ul>	project manager		
<b>Non-Aboriginal heritage</b>					
NAH-1	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage. The NAHMP will be prepared in consultation with the Office of Environment and Heritage.	Contactor	Detailed design / pre-construction	<p>Core standard safeguard H1</p> <p>Section 4.10 of QA G36 <i>Environment Protection</i></p>
NAH-2	Non-Aboriginal heritage	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (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.	Contactor	Detailed design / pre-construction	<p>Core standard safeguard H2</p> <p>Section 4.10 of QA G36 <i>Environment Protection</i></p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
NAH-3	Non-Aboriginal heritage	<p>The following measures should be implemented to protect specific heritage items in the proposal area:</p> <ul style="list-style-type: none"> <li>• The concrete parapet and retaining wall on the west side of the Sydney Harbour Bridge southern approaches should be retained wherever possible in the design of the proposal.</li> <li>• The proposed removed section of concrete parapet should be retained and adaptively re-used such as by retention and reuse in landscaping works or furniture.</li> <li>• The provision of an interpretive inlay in the ground surface indicating the location of the demolished section of retaining parapet and wall.</li> <li>• The southwest stairs of the Sydney Harbour Bridge should be protected for the duration of work.</li> <li>• Parts of the sandstone retaining wall at the eastern boundary of the National Trust Centre/S.H. Ervin Gallery near the existing entry stairs should be protected for the duration of the project.</li> </ul>	Roads and Maritime/ Contractor	Detailed design/pre-construction/ /construction	Additional safeguard
NAH-4	Visual impact on heritage items	<p>The proposal should be designed as much as possible to reduce the visual prominence of new elements within the existing cultural landscape and be sympathetic with the surrounding setting and context of nearby heritage items, including through:</p> <ul style="list-style-type: none"> <li>• Use of materials congruent with the aesthetic character of the Sydney Harbour Bridge while sympathetic to the context of surrounding heritage items and heritage conservation areas.</li> <li>• Selection of appropriate modern and lightweight designs and materials that reduce the visual bulk of new structures and are of a consistent material palette with the Sydney Harbour Bridge.</li> </ul>	Roads and Maritime	Detailed design /construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
NAH-5	Visual impact on heritage items and context	Any trees removed by the proposal should be relocated and retained within the proposal area or a nearby locality, on advice from a suitably qualified arborist, to maintain the existing cultural landscape qualities of the area. Factors to be considered include relative significance, historical appropriateness, condition, public safety risk, amenity value, biological diversity, disease resistance and contribution to landscape character.	Roads and Maritime/ Contractor	Pre-construction	Additional safeguard
NAH-6	Non-Aboriginal heritage	An interpretation strategy should be prepared that considers opportunities to highlight the history, evolution and significance of the Sydney Harbour Bridge and surrounding heritage items and heritage conservation areas.	Roads and Maritime/ Contractor	Pre-construction	Additional safeguard
NAH-7	Heritage items	A heritage induction on the Sydney Harbour Bridge should be provided for all workers prior to works commencing.	Contractor	Pre-construction	Additional safeguard
<b>Landscape character and visual impacts</b>					
LCV-1	Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the final detailed project design and implemented as part of the CEMP.</p> <p>The Urban Design Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> <li>• location and identification of existing vegetation and proposed landscaped areas, including species to be used</li> <li>• built elements including retaining walls, bridges and noise walls</li> <li>• pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings</li> <li>• fixtures such as seating, lighting, fencing and signs</li> </ul>	Contractor	Detailed design / pre-construction	Core standard safeguard UD1



No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		<ul style="list-style-type: none"> <li>details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage</li> <li>procedures for monitoring and maintaining landscaped or rehabilitated areas.</li> </ul> <p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> <li><i>Beyond the Pavement urban design policy, process and principles</i> (RMS, 2014a)</li> <li><i>Landscape Guideline</i> (RTA, 2008a)</li> <li><i>Bridge Aesthetics</i> (RMS, 2012)</li> <li><i>Noise Wall Design Guidelines</i> (RTA, 2006)</li> <li><i>Shotcrete Design Guideline</i> (RTA, 2005).</li> </ul>			
LCV-2	Visual construction impacts	<p>The following mitigation measures will be implemented during construction:</p> <ul style="list-style-type: none"> <li>the extent of all construction activity including temporary works will be limited and defined to minimise the total works area</li> <li>construction facilities will be contained within the work boundary and occupy the minimum area practicable</li> <li>suitable barriers will be provided to screen views from adjacent areas</li> <li>at completion of work, or progressively throughout the work where possible, disturbed areas will be returned to a level equivalent to their pre-work state</li> <li>pollution and dust emissions will be kept to a minimum and monitored throughout the work</li> <li>temporary lighting will be screened or diverted to reduce unnecessary light spill.</li> </ul>	Contractor	Pre-construction / construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
<b>Noise and vibration</b>					
NV-1	Noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will be in accordance with the RMS Construction Noise and Vibration Guideline and generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> <li>• all potential significant noise and vibration generating activities associated with the activity</li> <li>• feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (RMS, 2014a)</li> <li>• a monitoring program to assess performance against relevant noise and vibration criteria</li> <li>• arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures</li> <li>• contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.</li> </ul>	Contractor	Detailed design / Pre-construction	<p>Core standard safeguard NV1</p> <p>Section 4.6 of QA G36 <i>Environment Protection</i></p>
NV-2	Noise and vibration	<p>All sensitive receivers (eg local residents) likely to be affected will be notified at least five days prior to commencement of any work associated with the activity that may have an adverse noise or vibration impact. The notification will include:</p> <ul style="list-style-type: none"> <li>• details of the project:</li> <li>• construction period</li> <li>• construction hours</li> <li>• contact information for project Management staff</li> <li>• complaint and incident reporting</li> <li>• how to obtain further information.</li> </ul>	Contractor	Pre-construction/ Construction	Core standard safeguard NV2

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
NV-3	Noise and vibration	All personnel working on site will receive training to ensure awareness of requirements of the Noise and Vibration Management Plan. Site-specific training will be given to personnel when working in the vicinity of sensitive receivers.	Contractor	Pre-construction	Standard safeguard
NV-4	Noise and vibration	Any variations to the standard construction hours will follow the approach in Roads and Maritime Services Construction Noise and Vibration Guideline, including consultation with the affected local community.	Contractor	Construction	Standard safeguard
NV-5	Noise and vibration	Implement all standard mitigations measures identified in the Roads and Maritime Services Construction Noise and Vibration Guideline including, but not be limited to: <ul style="list-style-type: none"> <li>• Preparation of work specific construction noise and vibration management plans</li> <li>• Validation noise and vibration measurements</li> <li>• Selection of the quietest available plant and equipment</li> <li>• Scheduling of noise and vibration intensive work</li> <li>• Use of temporary noise barrier / enclosure and/or planning work to use natural topographical shielding</li> <li>• Dilapidation surveys and vibration monitoring.</li> </ul>	Contractor	Construction	Standard safeguard
NV-6	Noise and vibration	Conduct work during the daytime where feasible and reasonable to do so. Where possible, schedule noise intensive work outside of the night-time period (or before midnight) to minimise the risk of sleep disturbance.	Contractor	Detailed design / Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
NV-7	Noise and vibration	<p>The duration of exposure to construction noise at individual receivers will be minimised on a night-by-night basis through implementation of the following measures:</p> <ul style="list-style-type: none"> <li>• work with a high noise intensity will be planned to cease (where practical) prior to midnight</li> <li>• high noise generating activities will commence adjacent to the most potentially affected receiver and then move further way from the receiver as the night progresses</li> <li>• alternate construction methods and/or engineering controls will be used (such as temporary noise barriers) to reduce noise levels</li> <li>• the affected community will be consulted to seek support for any extended work duration.</li> </ul>	Contractor	Construction	Additional safeguard
NV-8	Noise and vibration	<p>Construction noise in the out-of-hours night-time period exceeding the noise management level by more than 5 dB(A) will be limited to two consecutive nights per week except where there is a duration respite as per Roads and Maritime's Construction Noise and Vibration Guideline.</p>	Contractor	Construction	Additional safeguard
NV-9	Noise and vibration	<p>Implement project-specific safeguards identified in the noise and vibration specialist report (Appendix F) including, but not be limited to:</p> <ul style="list-style-type: none"> <li>• widespread community consultation via letterbox drops, phone calls and one-on-one briefings</li> <li>• respite offers which involve scheduling of work to provide specific receivers with a break from continuous construction work</li> <li>• alternative accommodation for highly intrusive night-time work.</li> </ul>	Contractor	Construction	Additional safeguard



No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
NV-10	Vibration	<p>Safe working distances should be maintained, with distances between work areas and sensitive receivers maximised wherever possible.</p> <p>Where vibration intensive works are required to be undertaken within the specified minimum working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied. As exceedances are predicted at several identified sensitive receivers for various construction activities, all feasible and reasonable mitigation measures should be implemented to minimise the impacts of construction vibration.</p>	Contractor	Construction	Additional safeguard
NV-11	Vibration	<p>The vibration sensitivity of nearby heritage structures and sensitive equipment should be reviewed with respect to structural integrity and/or vibration monitoring be conducted at commencement of construction. These structures include:</p> <ul style="list-style-type: none"> <li>• Parts of the Sydney Harbour Bridge</li> <li>• National Trust Centre/S.H. Ervin Gallery</li> <li>• Sydney Observatory</li> <li>• Observatory Park buildings</li> <li>• Fort Street Public School</li> <li>• Bureau of Meteorology weather station</li> </ul>	Roads and Maritime	Pre-construction	Additional safeguard
NV-12	Vibration	<p>Areas of heritage significance should be demarcated to reduce the risk of accidental damage from vibration.</p>	Contractor	Pre-construction / Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
<b>Traffic and transport</b>					
TT-1	Traffic and transport	<p>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 <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2008). The TMP will include:</p> <ul style="list-style-type: none"> <li>• confirmation of haulage routes</li> <li>• measures to maintain access to local roads and properties</li> <li>• site specific traffic control measures (including signage) to manage and regulate traffic movement</li> <li>• measures to maintain pedestrian and cyclist access</li> <li>• requirements and methods to consult and inform the local community of impacts on the local road network</li> <li>• access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads</li> <li>• a response plan for any construction traffic incident</li> <li>• 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</li> <li>• monitoring, review and amendment mechanisms.</li> </ul>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard TT1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>
TT-2	Access	Pedestrian, cyclist and vehicular access will be maintained to the National Trust Centre/S.H. Ervin Gallery and Fort Street Public School.	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard
TT-3	Access	Cyclists will be redirected to the Kent Street underpass from Clarence Street when travelling northbound towards the Sydney Harbour Bridge cycleway.	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
TT-4	Traffic management around special events	Transport for NSW Transport Management Centre will be consulted on the timing of construction activities in relation to major events planned for the Sydney CBD.	Roads and Maritime	Pre-construction /construction	Additional safeguard
TT-5	Cyclists movements	<p>The following measures will be implemented to manage potential impacts on cyclists during construction:</p> <ul style="list-style-type: none"> <li>• a cyclist communication strategy will be implemented including providing information signs and maps to inform cyclists of changes to cycle route and the detour provided</li> <li>• Information signs and material will be located along major cyclist travel routes to clearly communicate proposed and ongoing changes.</li> <li>• Erection of signs to warn cyclists of vehicles entering the cycleway in accordance with Roads and Maritime practice.</li> </ul>	Roads and Maritime	Pre-construction/ construction/ operation	Additional safeguard
TT-6	Communication with stakeholders	Relevant stakeholders will be notified of the timing and program of work prior to the start of work, including employees, visitors, students and parents of The National Trust Centre/S.H. Ervin Gallery, Sydney Observatory and Fort Street Public School, as well as vehicle drivers along the Cahill Expressway and Bradfield Highway via Kent Street and Clarence Street.	Roads and Maritime	Pre-construction /construction	Additional safeguard
TT-7	Communication with stakeholders	Information about road closures and detours will be posted on the City of Sydney and Roads and Maritime websites.	Roads and Maritime	Pre-construction /construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
<b>Socio-economic and land use</b>					
SEL-1	Communication	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> <li>mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions</li> <li>contact name and number for complaints.</li> </ul> <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008b).</p>	Contactor	Detailed design / pre-construction	Core standard safeguard SE1
SEL-2	Emergency vehicle access	Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Contactor	Detailed design / pre-construction	Core standard safeguard SE2
SEL-3	Social infrastructure	The users of the outdoor gym will be notified about the proposal and upcoming changes via notices in the local media, and by predominantly placed advisory notices on the site.	Roads and Maritime	Pre-construction/ construction	Additional safeguard
SEL-4	Social infrastructure	Consultation and notification of works would be undertaken with the community and adjacent facilities (Sydney Observatory, Fort Street Public School, Observatory Hill Environmental Education Centre and the National Trust Centre/S.H. Ervin Gallery) in accordance with the Roads and Maritime's <i>Community Involvement Practice Notes and Resource Manual</i> and <i>RMS Noise and Vibration Guideline</i> .	Roads and Maritime/ contractor	Pre-construction/ construction	Additional safeguard



No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
SEL-5	Social infrastructure	Complaints received will be recorded and attended to promptly in accordance with the Roads and Maritime Community Involvement Practice Notes and Resource Manual.	Contractor	Construction	Additional safeguard
SEL-6	Homeless people	Consultation and notification of the works will be undertaken with the City of Sydney's public space liaison officers.	Roads and Maritime/City of Sydney / contractor	Pre-construction/ construction	Additional safeguard
SEL-7	Access and connectivity	The community will be notified about the construction activities and upcoming changes via notices in the local media, and by prominently placed advisory notices such as variable message signs (VMS) or similar, in accordance with Roads and Maritime Community Involvement Practice Notes and Resource.	Roads and Maritime/ contractor	Pre-construction/ construction	Additional safeguard
SEL-8	Access and connectivity	Where temporary access restrictions are necessary, owners and tenants of affected properties will be consulted regarding alternate access arrangements.	RMS	Pre-construction/ construction	Additional safeguard
<b>Biodiversity</b>					
BI-1	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> <li>plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas</li> <li>requirements set out in the <i>Landscape Guideline</i> (RTA, 2008a)</li> <li>pre-clearing survey requirements</li> </ul>	Contractor	Detailed design / pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		<ul style="list-style-type: none"> <li>procedures for unexpected threatened species finds and fauna handling</li> <li>procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013)</li> <li>protocols to manage weeds and pathogens.</li> </ul>			
BI-2	Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Contactor	Detailed design / pre-construction	Core standard safeguard B2
BI-3	Removal of threatened forage trees and nest boxes	Removal of potential grey-headed flying-fox forage trees will be minimised through detailed design, where practicable and feasible.	Contractor	Detailed design	Additional safeguard
BI-4	Removal of threatened forage trees and nest boxes	Existing nest boxes will be translocated and repaired in accordance with <i>Guide 8: Nest boxes</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011e) prior to removal of the host tree, and re-installed outside of the proposed work area.	Contactor	Construction	Additional safeguard
BI-5	Injury and mortality of fauna	A suitably qualified ecologist should undertake a pre-construction survey to ensure that no wildlife has taken up occupancy within trees on and adjacent to the site.	Contractor	Pre-construction	Additional safeguard
BI-6	Injury and mortality of fauna	If encountered, fauna should be managed in accordance with <i>Guide 9: Fauna handling</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011b).	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
BI-7	Injury and mortality of fauna	If unexpected threatened fauna or flora species are discovered, work should be stopped immediately and the Unexpected threatened species find procedure in <i>Roads and Maritime's Biodiversity Guidelines – Guide 1 (Pre-clearing process)</i> (RTA, 2011c) should be followed.	Contractor	Construction	Additional safeguard
BI-8	Invasion and spread of weeds	The two specimens of Chinese Hackberry within the study area should be removed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011d).	Contractor	Construction	Additional safeguard
BI-9	Invasion and spread of weeds	The transport of topsoil within, into or out of the study area should be minimised to reduce the spread of weeds.	Contractor	Construction	Additional safeguard
BI-10	Tree protection	Disturbance to trees, particularly fig trees, eucalypts and banksias, within and/or next to the study area should be minimised to the fullest extent practicable.	Contractor	Construction	Additional safeguard
BI-11	Tree protection	Appropriate measures should be implemented to protect trees to be retained during construction as per recommendations of the Arboricultural Impact Assessment Report (Tree IQ, 2016).	Contractor	Construction	Additional safeguard
<b>Hydrology and flooding</b>					
HY-1	Minimise future flooding and hydrology risks	Prior to construction commencing, final hydrology and drainage assessments will be undertaken to inform detailed design measures to minimise flood risks to the environment, properties and the project.	Roads and Maritime/ Contractor	Detailed design / pre-construction	Additional standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
<b>Surface water</b>					
SW-1	Minimise environmental risks during construction	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Detailed design / pre-construction	Core standard safeguard SW1  Section 2.1 of QA G38 <i>Soil and Water Management</i>
SW-2	Sedimentation/ decreased water quality	A site specific Erosion and Sediment Control Plan/s 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.	Contractor	Detailed design / Pre-construction	Core standard safeguard SW2  Section 2.2 of QA G38 <i>Soil and Water Management</i>
SW-3	Sedimentation/ decreased water quality	During construction, divert surface run-off around work zones to minimise erosion and sedimentation.	Contractor	Construction	Additional safeguard
SW-4	Sedimentation/ decreased water quality	The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, and in accordance with: Landcom's Managing Urban Stormwater: Soils and Construction series Roads and Maritime Guideline for Batter Stabilisation Using Vegetation (RMS, 2015a)	Contractor	Construction	Additional standard safeguard



No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
SW-5	Contamination of surface waters and groundwater related to accidental spills	Spill management measures and procedures will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. The measures and procedures will address, but not necessarily be limited to: management and storage of chemicals and potentially polluting materials; any bunding requirements; refuelling requirements; maintenance of plant and equipment; and emergency management, including notification in accordance with Roads and Maritime guidelines, response and clean-up procedures.	Contractor	Pre-construction/ construction	Additional standard safeguard
SW-6	Disturbance of contaminated soil/ contamination of environment	Emergency spill kits will be kept at areas identified as having spill risk.	Contractor	Construction	Additional safeguard
SW-7	Contamination of surface waters and groundwater	Refuelling will not take place within 50m of waterways, and will occur in a suitably located and bunded area.	Contractor	Construction	Additional safeguard
SW-8	Minimise risks to water quality and soil impacts	Concreting activities will not occur during actual or forecasted rain events. Any concrete slurries generated during construction will be collected and stored in an impermeable bunded area, until they are removed and disposed of at an appropriately licenced facility.	Contractor	Construction	Additional safeguard
SW-9	Contamination of surface water	Wash-down of plant, equipment and vehicles will occur in a designated bunded area away from waterways and drainage lines.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
<b>Other impacts</b>					
SC-1	Contamination identified during construction activities	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C1  Section 4.2 of QA G36 <i>Environment Protection</i>
SC-2	Accidental spill	A site specific emergency spill plan will be developed, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (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	Detailed design / Pre-construction	Core standard safeguard C2  Section 4.3 of QA G36 <i>Environment Protection</i>
SC-3	Disturbance of contaminated soil/ contamination of environment	All fuels, chemicals and other hazardous materials will be stored in a roofed, fire-protected and impervious bunded area at least 50m from waterways, drainage lines, basins, flood affected areas or slopes above 10%. Bunding design will comply with relevant Australian Standards, and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual.  Appropriate on-site signage will be provided to identify the materials stored.	Contractor	Construction	Core safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
SC-4	Soil erosion	Activities will be planned and sequenced to minimise the length of time disturbed soil remains exposed, and limit the time of soil stockpile storage before the material is reused or removed from the site.	Contractor	Construction	Additional safeguard
AB-1	Unexpected find of Aboriginal heritage artefact or site	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (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.	Contractor	Detailed design / pre-construction	Core standard safeguard AH2  Section 4.9 of QA G36 <i>Environment Protection</i>
GW-1	Minimise risks to groundwater	In addition to the implementation of general erosion, sediment and water quality control safeguards, any sediment basins, stockpiles, washdowns, refuelling and chemical storage sites will be lined and/or bunded.	Contractor	Detailed design / pre-construction	Additional standard safeguard
AQ-1	Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: <ul style="list-style-type: none"> <li>• potential sources of air pollution</li> <li>• air quality management objectives consistent with any relevant published EPA and/or OEH guidelines</li> <li>• mitigation and suppression measures to be implemented</li> <li>• methods to manage work during strong winds or other adverse weather conditions</li> <li>• a progressive rehabilitation strategy for exposed surfaces.</li> </ul>	Contractor	Detailed design / pre-construction	Core standard safeguard AQ1  Section 4.4 of QA G36 <i>Environment Protection</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
AQ-2	Air quality	<p>Dust control measures, including wetting and (if required) engineering control methods would be applied in excavation areas to minimise dust emissions.</p> <p>Construction activities that may emit dust or volatile chemicals would be undertaken in the shortest time possible taking work quality and worker safety precautions into account.</p>	Project manager	Construction	Additional safeguard AQ2
WA-1	Generation of construction waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> <li>• measures to avoid and minimise waste associated with the project</li> <li>• classification of wastes and management options (re-use, recycle, stockpile, disposal)</li> <li>• statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions</li> <li>• procedures for storage, transport and disposal</li> <li>• monitoring, record keeping and reporting.</li> </ul> <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (RMS, 2014b) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contactor	Detailed design / pre-construction	<p>Core standard safeguard W1</p> <p>Section 4.2 of QA G36 <i>Environment Protection</i></p>
WA-2	Generation of construction waste	<p>Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a pre-construction land assessment will be undertaken to identify the presence of any pre-existing wastes. The assessment will be prepared in accordance with the <i>Roads and Maritime Environmental Procedure - Management of Wastes on Roads and Maritime</i></p>	Road and Maritime/ Contractor	Pre-construction	Additional standard safeguard



No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		<i>Services Land.</i> Where the land is privately owned, a copy of the assessment will be provided to the landowner.			
WA-3	Construction waste	Waste materials (such as soils and aggregates) obtained from the project and to be exported to a non-road construction site or project will be sampled and managed in accordance with relevant Roads and Maritime <i>Waste Fact Sheets</i> .	Contractor	Construction	Additional standard safeguard
WA-4	Construction waste	No burning of timber or other materials will occur in or around the proposal area. Such material will be removed from work sites and disposed of to an appropriately licenced facility.	Contractor	Construction	Additional standard safeguard
WA-5	Construction waste	Any trees to be removed will be reused as millable timber wherever practicable. Other vegetated material from native species can be mulched and re-used on-site for landscaping or rehabilitation purposes if consistent with the approved Flora and Fauna Management Plan for the project. Weed species, or vegetation not considered appropriate for re-use on-site, will be removed and disposed of to an appropriately licenced facility.	Contractor	Construction	Additional standard safeguard
WA-6	Construction waste	Waste materials (such as soils and aggregates) obtained from the project and to be exported to a non-road construction site or project will be sampled and managed in accordance with relevant Roads and Maritime <i>Waste Fact Sheets</i> .	Contractor	Construction	Additional standard safeguard
WA-7	Construction waste	If encountered, asbestos waste will be removed from the site and disposed of to an appropriately licenced facility and in accordance with the WMP.	Contractor	Construction	Additional standard safeguard
WA-8	Construction waste	A post-construction land assessment will be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking) to determine the suitability for hand-back to the landowner.	Contractor	Construction	Additional standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		The assessment will be prepared in accordance with the Roads and Maritime <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> . Where the land is privately owned, a copy of the assessment will be provided to the landowner.			
WA-9	Construction waste	Appropriate housekeeping will be undertaken at the construction site and project sites will be maintained free of litter at all times.	Contractor	Construction	Additional standard safeguard
<b>Cumulative impacts</b>					
CI-1	Noise and vibration, Traffic	The Construction Noise and Vibration Management Plan prepared for the proposal should include a procedure for managing potential cumulative impacts of concurrent projects, such as the Fort Street Public School redevelopment.	Roads and Maritime/ Contractor	Construction	Additional safeguard
CI-2	Noise and vibration	For periods where cumulative construction noise and vibration may occur all feasible and reasonable mitigation measures should be implemented including scheduling of work across construction sites, such as night works, and consultation with affected sensitive receivers.	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard
CI-3	Socio-economic	Develop a Community and Stakeholder Engagement Plan that considers cumulative impacts in the timing and content of information and notifications to the community that aims to minimise consultation fatigue and ensure consistency across	Roads and Maritime/ Contractor	Pre-construction/ construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional
		other Roads and Maritime Services' projects being constructed at the same time.			
CI-4	Heritage and visual	<p>Measures to avoid and/or reduce the potential cumulative impact of the proposal together with other projects on or close to Sydney Harbour Bridge should be implemented and may include:</p> <ul style="list-style-type: none"> <li>• minimising the physical impact to significant fabric of Sydney Harbour Bridge</li> <li>• adopting consistent design, style, aesthetic character and material palette</li> <li>• providing a coordinated approach to design and interpretation.</li> </ul>	Roads and Maritime	Design/ Pre-construction	Additional safeguard

## 7.3 Licensing and approvals

The licences required for the proposal include those listed in Table 7-2.

**Table 7-2: Summary of licensing and approvals required**

Instrument	Requirement	Timing
<i>Roads Act 1993</i> <i>Roads Regulation 2008</i>	Road occupancy licence will be obtained from Transport for NSW Transport Management Centre for all construction activities. Major CBD and city wide events will be considered when applying for road occupancy licences and when scheduling construction activities.	Prior to the start of the activity
<i>Heritage Act 1977</i> <i>(s57(2))</i>	<p>As the proposal has been assessed as resulting in a minor physical impact and minor visual impact to the SHR listed Millers Point and Dawes Point Village Precinct, the proposal would be exempt from the requirement to obtain approval under Section 60 of the Heritage Act. Under Section 57(2) of the Heritage Act, the proposed work falls within the definition of Standard Exemption No.7.</p> <p>A Section 57(2) notification under Standard Exemption No. 2 and Exemption No. 7 requires a statement to be provided to the Heritage Division demonstrating that the activity is of a minor nature. The statement of heritage impact included in Appendix D can be used to demonstrate the minor impact of the proposal.</p>	Prior to the start of activity



## 8 Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the proposal area and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

### 8.1 Justification

The Sydney Harbour Bridge southern cycleway is a critical link connecting the cycleway over the bridge, Millers Point precinct and the Kent Street cycleway which links into the Sydney CBD. Around 2,000-3,000 cyclist trips are taken on the Sydney Harbour Bridge Cycleway each day, making it the busiest cycleway in Sydney.

The proposal seeks to implement improvements to the Sydney Harbour Bridge southern cycleway to:

- Improve safety for cyclists, pedestrians and motorists
- Improve access for cyclists and pedestrians
- Support future growth in cyclists travelling between the Sydney CBD and Lower North Shore
- Integrate the proposed cycle facility within the existing heritage precinct.

In addition, the proposal aims to minimise impacts to the community and the natural and built environments while providing a cost-effective solution.

The proposed improvements assessed in this REF include the construction of a dedicated bi-directional cycleway from the Kent Street cycleway to the Sydney Harbour Bridge cycleway, upgrade of the existing pedestrian footpath from Kent Street to Fort Street Public School, demolition of the existing shared use bridge over the Cahill Expressway and provision of a new pedestrian and cyclist bridge with improved width and sight lines, removal of the existing pedestrian and cyclist ramp on the southern approach to the Cahill Expressway footbridge and replacement with a new spiral ramp for cyclists and pedestrians. A 60m section of retaining wall adjacent to the Incident Response Area will be removed and replaced with a new concrete wall and a new merge arrangement would be implemented between Kent Street and Clarence Street on-ramps.

The concept design process has been instrumental in avoiding or reducing the severity of a number of potential environmental impacts including soil and water. Some negative environmental impacts would occur including:

- Heritage: Minor overall impact to the heritage significance and setting of the Sydney Harbour Bridge southern approaches
- Traffic and access: Minor travel delays, traffic management and localised diversions may limit access to local social infrastructure in the immediate vicinity of the proposal during construction. Once completed, the proposal would result in a number of minor changes to existing traffic patterns
- Landscape and visual: Moderate to high visual impacts in several locations. Management of the scale of change and refinement of the design to integrate it with the surrounding context would further reduce such impacts
- Socio-economic: Displacement of homeless people residing under the existing Cahill Expressway shared use bridge and the nuisance impacts of traffic/access and noise/vibration during construction
- Biodiversity: Minor impacts through clearance of nine potential forage trees for grey-headed flying-fox and no significant impact on any listed threatened communities or species

- Noise and vibration: Increased levels of noise and vibration during the work mostly occurring at night, which could cause sleep disturbance. All practical and reasonable safeguards and management measures would be implemented to reduce construction noise.

The majority of these impacts would occur during work required to build the proposal, would be temporary, and restricted in spatial extent. Environmental safeguards are proposed to minimise these impacts. With effective implementation of the measures, most impacts would be minor or negligible.

Some cumulative impacts are predicted as a result of other road and infrastructure projects in the region. These impacts can be effectively managed through coordination of the construction timetable, sensitive design and community notifications. Most of the work would be occurring at the same time as redevelopment of Fort Street Public School and other scheduled maintenance activities on the Sydney Harbour Bridge.

The proposal would have several substantial benefits, principally improved safety and access for cyclists and pedestrians and better integration of the cycleway within the existing heritage precinct. The proposal is consistent with the NSW and Australian governments' strategic priorities of supporting the predicted future growth in cyclists travelling between the Sydney CBD and the Lower North Shore. These benefits would not be realised if the proposal did not proceed, with subsequent implications for cyclist and pedestrian safety.

These benefits outweigh the potential negative environmental impacts from the proposal, both temporary and permanent impacts, which can be managed effectively with implementation of the safeguards proposed.

## 8.2 Objects of the EP&A Act

Table 8-1 identified the objects of the EP&A Act and their relevance to the proposal.

**Table 8-1: Objects of the EP&A Act**

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	<p>The proposal would contribute to supporting future growth of cyclists travelling between the Sydney CBD and the Lower North Shore.</p> <p>The proposal would promote the social and economic welfare of the community by improved safety and access for cyclists and pedestrians using the Sydney Harbour Bridge southern cycleway.</p>
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal would improve access for cyclists and pedestrians using the Sydney Harbour Bridge southern cycleway to access the Sydney CBD from the Lower North Shore, or vice versa.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Some utility services would require relocation. Roads and Maritime has consulted with utility providers and liaison would continue before commencement of work.

Object	Comment
5(a)(iv) To encourage the provision of land for public purposes.	The existing infrastructure provides transport for cyclists and pedestrians which would be enhanced.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would improve access to social infrastructure for cyclists and pedestrians. The community is expected to benefit from improved safety, access and along the Sydney Harbour Bridge southern cycleway.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	<p>The proposal would not impact any threatened species or ecological communities. The proposal has sought to minimise impacts on the environment, particularly to trees that may provide forage resources for threatened fauna species. Several trees that provide potential forage resources for the grey-headed flying-fox are to be removed. These trees are only a small portion of resources available in the wider locality.</p> <p>Management measures and safeguards are proposed to manage impacts during construction and operation.</p>
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.3 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Roads and Maritime has partnered with City of Sydney during the planning and development of this proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	<p>The proposal has incorporated consultation with directly and indirectly affected stakeholders as well as the wider community.</p> <p>Consultation has also included involvement of City of Sydney, National Trust Centre/S.H. Ervin Gallery, Fort Street Public School, Sydney Observatory, Sydney Trains, and the Bureau of Meteorology (see Section 5).</p> <p>This REF will be placed on public display for comment. Following the submissions period, Roads and Maritime will collate submissions. After consideration of community comments, Roads and Maritime would determine whether the proposal should proceed as proposed, or whether any alterations to the proposal are necessary. Roads and Maritime would also continue to update the project website and issue community update newsletters during the display of this REF and during construction.</p>

## 8.3 Ecologically sustainable development

The principles of ecologically sustainable development (ESD) described below have been an integral consideration during the development of this proposal.

Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision making processes. The principles of ESD, set out in Schedule 2 of the EP&A Regulation are:

- Precautionary principle
- Inter-generational equity
- Conservation of biological diversity and ecological integrity
- Improved valuation and pricing of environmental resources.

Roads and Maritime is committed to conducting business in an environmentally sustainable manner. Details of how the principles of ESD have been incorporated into this proposal are described below.

### 8.3.1 The precautionary principle

The assessment of impacts in this REF is consistent with the precautionary principle.

Environmental and social investigations have been consistent with accepted methodologies and, when considering the potential impacts associated with the proposal, have assumed that the impact may occur.

This REF has shown that most of the environmental impacts of the proposal are expected to be minimal, and do not pose a risk of serious or irreversible environmental damage. Management measures and safeguards to reduce impacts have been identified in this REF, and outlined in Chapter 7. The concept design process has been instrumental in avoiding and/or reducing the severity of several potential environmental impacts. Where possible, avoidance has been the first measure adopted. The management measures proposed have been applied on similar projects and found to be successful in managing the identified impact. They are feasible from both an economic and engineering perspective.

### 8.3.2 Intergenerational equity

The proposal would contribute towards regional strategic benefits for future generations, including improved safety and access for pedestrians and cyclists.

Minor impacts are predicted during construction including noise and vibration and traffic delays. These impacts would be short term in nature and managed through project staging and safeguards.

### 8.3.3 Conservation of biological diversity and ecological integrity

An assessment of the Clause 228 factors in this REF note the proposal is not likely to result in any significant loss of biodiversity or ecological integrity.

The proposal would not impact any threatened species or threatened ecological communities. The proposal has sought to minimise impacts on the environment, particularly to trees that may provide forage resources for threatened fauna species. Several trees that are considered to provide potential forage resources for the grey-headed flying-fox are to be removed. These trees are only a small portion of resources available in the wider locality.

Management measures and safeguards are proposed to manage impacts during construction and operation.



### 8.3.4 Improved valuation, pricing and incentive mechanisms

Roads and Maritime recognises the value of environmental resources and aims to minimise the impacts of its activities by ensuring that appropriate safeguards and management measures are implemented for all aspects of the proposal. Economic and social issues were considered in the rationale for the proposal and consideration of design options.

## 8.4 Conclusion

The proposed upgrade of the existing cycleway facility between the Kent Street cycleway and the Sydney Harbour Bridge cycleway is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The assessment has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the Biodiversity Conservation Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

The concept design process and options assessment has been instrumental in avoiding and/or reducing the severity of several potential environmental impacts to non-Aboriginal heritage, traffic and transport, landscape and visual, socio-economic, noise and vibration and biodiversity values.

The proposal as described in the REF best meets the project objectives but would still result in some impacts to terrestrial biodiversity, visual amenity, noise and vibration, traffic and access and non-Aboriginal heritage. The proposal would also contribute to the cumulative socio-economic impacts with other proposed developments. Safeguards and management measures as detailed in this REF would reduce the significance of the expected impacts. The proposal would improve safety and access for cyclists and pedestrians and achieve better integration of the cycleway within the existing heritage precinct. The proposal would also support the predicted future growth in cyclists travelling between the Sydney CBD and the Lower North Shore. The benefits of the proposal would outweigh the potential negative environmental impacts, which can be managed effectively with implementation of the safeguards proposed. On balance, the proposal is considered justified and the following conclusions are made:

- 1. Significance of impact to the environment**

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act.

- 2. Significance of impact to NSW listed biodiversity matters**

The proposal is not likely to significantly affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required.

- 3. Significance of impact to nationally listed biodiversity matters**

The proposal is not likely to significantly affect threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

**4. Commonwealth land and other matters of national environmental significance**

The proposal does not significantly affect Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 2016* and a referral to the Federal Department of the Environment is not required.

The proposal is not likely to significantly affect other matters of national environmental significance, within the meaning of the *Environment Protection and Biodiversity Conservation Act 2016* and a referral to the Federal Department of the Environment is not required.

## 9 Certification

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



Emma Waterhouse  
Principal Environment and Social Consultant  
Coffey Services Australia  
Date: 20 November 2017

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.



Lily Wu  
Project Development Manager  
Greater Sydney Project Office | Technical and Project Services  
Roads and Maritime Services  
Date: 20 November 2017

# 10 References

AECOM Australia Pty Ltd (AECOM) 2010, *Inner Sydney Regional Bicycle Network Demand Assessment and Economic Appraisal*, prepared by AECOM for the City of Sydney

Australian Bureau of Statistics, 2011, *Census 2011 data*.

Austroads 2017. *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths*.

Austroads 2009. *Guide to Road Design- Part 4A and Part 6A: Pedestrian and Cyclist Paths*.

British Standard BS 7385 Part 2-1993, *Evaluation and Measurement for Vibration in Buildings*.

Bureau of Meteorology, 2012, *Rainfall data*.

City of Sydney Council 2014, *Urban Ecology Strategic Action Plan*.

City of Sydney, 2015, *Harbour Village North Cycleway: Feasibility and concept design report*. Prepared by Group GSA.

City of Sydney, 2016, *City Area Catchment Floodplain Risk Management Plan*.

DEC 2006, *Assessing Vibration: A Technical Guideline provides guidance for assessing human exposure to vibration*. Department of Environment and Conservation, Sydney.

DEC 2011, *NSW Road Noise Policy*. Department of Environment and Conservation, Sydney.

DECC 2009, *Interim Construction Noise Guideline*. Prepared by Department of Environment and Climate Change.

DEE 2017, *Monitoring Flying-fox Populations. Interactive Flying-fox Web Viewer*. Accessed at <http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>.

DPI Fisheries 2013, *Policy and guidelines for fish habitat conservation and management*.

DPI 2016, *Weeds Declared in the Local Control Authority Area of Council of the City of Sydney*. Accessed on 31/01/2017 from URL:<http://weeds.dpi.nsw.gov.au/WeedDeclarations?RegionId=103>.

Department of Infrastructure and Regional Development 2015, *Traffic congestion cost and trends for Australian capital cities*, Australian Government.

Destination NSW, 2016, *The Rocks visitor profile*, NSW Government.

DUAP, 1995/1996, *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979*

German Standard DIN 4150-3, 1999, *DIN 4150 Part 3: Structural Vibration in Buildings: Effects on Structures*.

Government Architect's Office 2012, *Sydney Harbour Bridge Southern Approach- Landscape character and visual impact assessment*, Sydney.

Landcom, 2004, *Managing Urban Stormwater: Soils and Construction series*.

NPWS 2003, *Descriptions for NSW (Mitchell) Landscapes Version 2*. Prepared for Department of Environment and Climate Change.



NSW EPA 2014, *Waste Classification Guidelines*.

NSW Government 2014, *Waste Avoidance and Resource Recovery Strategy 2014 – 2021*.

OEH 2017, *Air quality monitoring service*. Accessed on 10 November 2017 from URL: <http://www.environment.nsw.gov.au/AQMS/search.htm>.

OEH 2016a, *BioNet the website for the Atlas of NSW Wildlife*. Accessed on 31/01/2017 from URL: <http://www.bionet.nsw.gov.au/>.

RMS undated, *Roads and Maritime Bridge Technical Directions - 2000 to current*.

RMS 2006, *Noise wall design guideline: Design guideline to improve the appearance of noise walls in NSW*.

RMS 2011, *Roads and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation*.

RMS 2012, *Bridge Aesthetics: Design Guidelines to improve the appearance of bridges in NSW*.

RMS 2014a, *Beyond the Pavement: Urban Design Policy, Procedures, and Design Principles*.

RMS, 2014b, *Environmental Procedure - Management of Wastes on Roads and Maritime Services Land*.

RMS 2015, *Noise Criteria Guideline*.

RMS 2016a, *Roads and Maritime Supplement to Australian Standard 1742 Manual of Uniform Traffic Control Devices parts 1-15 Version 2.4*.

RMS 2016b, *Construction Noise and Vibration Guideline*.

RMS 2016c, *Noise Wall Design Guidelines*. Design guideline to improve the appearance of noise walls in NSW.

RMS 2016d, *Shotcrete Design Guideline: Design guideline to improve the appearance of shotcrete in NSW*.

RTA 2005, *NSW Bicycle Guidelines*.

RTA 2007, *Sydney Harbour Bridge Conservation Management Plan*. Prepared by Godden Mackay Heritage Consultants.

RTA 2008a, *Landscape guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding*.

RTA 2008b, *Community Involvement and Communications Resource Manual*.

RTA 2011a, *Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*.

RTA 2011b, *Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*.

RTA 2011c, *Roads and Maritime's Biodiversity Guidelines – Guide 1 (Pre-clearing process)*.

RTA 2011d, *Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects.*

RTA 2011e, *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects.*

Standards Australia 2007, *AS 5100 Bridge Design*

Transport for NSW 2012, *NSW Long Term Transport Master Plan.*

Transport for NSW 2013a, *Sydney City Centre Access Strategy.*

Transport for NSW 2013b, *Sydney Cycling Future.*

Transport for NSW 2014, *A Plan for Growing Sydney.*

Transport for NSW, 2015, *A new CBD bus network*, NSW Government.

Tree IQ 2016. *Arboricultural Impact Assessment – Harbour Village North Cycleway (Revision A).*  
Prepared for City of Sydney, 28 June 2016.

# Terms and acronyms used in this REF

Term / Acronym	Description
BC Act	<b>Biodiversity Conservation Act 2016 (NSW)</b>
CEMP	Construction environmental management plan
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SHR	State Heritage Register
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.