Transport
for NSW

Sydney Harbour Bridge Cycleway Northern Access proposal

Review of Environmental Factors

November 2022

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges Cammeraygal people of the Eora Nation the traditional custodians of the land on which the Sydney Harbour Bridge Cycleway Northern Access proposal is proposed. Further, the proposal facilitates movement for the Gadigal, the Wangal and the Cammeraygal people from Country to Country to share resources, knowledge and cultural practice.

We pay our respects to their Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our Nation's First Peoples followed for tens of thousands of years.

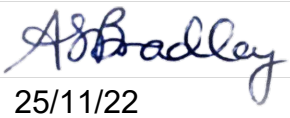
Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Connecting with Country Statement

Transport for NSW has taken into consideration the elements of Designing with Country, nature and people. Extensive Aboriginal community consultation has been undertaken alongside consideration of the existing environment. This consultation and research will ensure a design for the project that is conscious of all elements of Designing with Country.

Transport for NSW will ensure that Designing with Country remains a priority during all of the design phases through continued consultation with Aboriginal community members and elders. This has been achieved through meetings with Aboriginal elders from Cammeraygal and Gadigal lands, facilitated by Transport for NSW, WSP Australia and Yerrabingin. This engagement will continue throughout the project.

Approval and authorisation

Title	Sydney Harbour Bridge Cycleway Northern Access proposal – Review of Environmental Factors
Accepted on behalf of Transport for NSW by:	Anna Bradley
Signed	
Date:	25/11/22

Document review tracking

Draft No.	Date	Comments
Draft 1	26/04/2022	Submitted to Transport for review
Draft 2	24/10/2022	Submitted to Transport for review
Draft 3	02/11/2022	Submitted to Transport for Review
Final draft	9/11/2022	Submitted to Transport for Review
Final	11/11/2022	Submitted to Transport for Executive Review
Final for publication	24/11/2022	Submitted for exhibition

Executive summary

The proposal

Transport for NSW (Transport) proposes to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South (the proposal).

The proposal is located on Cammeraygal land and is in Milsons Point, within the North Sydney Local Government Area (LGA). The proposal is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west.

The proposal would consist of a three-metre-wide elevated linear bike ramp that extends 200 metres from Bradfield Park North, near Burton Street, interfacing with the Sydney Harbour Bridge Cycleway south of the existing stair access. The ramp would connect to a new cycle path which would extend along the east side of Alfred Street South, between Middlemiss Street and Burton Street, and include a new street crossing on Alfred Street South. The two-way cycle path would be 2.5 metres wide and connect to the existing bike network in Milsons Point.

Key features of the proposal include:

- A design-led approach to the integration of new cycling infrastructure with its existing important open space and heritage setting
- A new elevated linear bike ramp, with deck about three metres wide and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
  - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
  - Precast columns carefully sited within Bradfield Park North and Central
  - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
  - A gathering space, lighting, seating and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
  - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new street crossing at 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
  - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located near 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street
  - Low speed shared path and verge widening on the north side of Lavender Street
  - Adjustments to the Lavender Street roundabout
  - New street tree planting, shrub planting and footpath paving
  - Relocation of the existing bus stop on Alfred Street South near Lavender Street about 60 metres to the south of its current location
  - Permanent removal of up to 15 parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage

- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

Construction of the proposal would be carried out in three construction zones and would include the establishment of a temporary ancillary facility at the boules piste and bowling greens on Alfred Street South. Construction of the proposal would take around 18 months and, subject to planning approval, is expected to start mid-2023.

Need for the proposal

The Sydney Harbour Bridge Cycleway route is a critical link in the metropolitan Sydney regional bike network connecting the proposed North Shore cycleway on the Pacific Highway with the existing Kent Street cycleway in the Sydney central business district (CBD). Over the last decade, a rolling average of just under 2,000 bike rider trips have been completed each weekday on the Sydney Harbour Bridge Cycleway making it one of the busiest links in the Metro Sydney Bike Network. However, the current step access to the heavily used Sydney Harbour Bridge Cycleway is not easily accessible and prevents many customer groups from using the facility, including younger and older bike riders and cargo bike users.

Currently, access at the northern end of the Sydney Harbour Bridge is via 55 steps that connect with Bradfield Park, at Milsons Point. The steps create a bottleneck, present a safety hazard and deter people from cycling. Bike riders must dismount at Burton Street and carry their bikes up and down the existing cycleway steps to continue on the cycleway, which creates a bottleneck to traffic flow. There is also limited separation for bike riders, pedestrians and motorists on Alfred Street South.

As such, the proposal is required to improve safety and accessibility for bike riders and pedestrians as well as support the future growth in the number of bike riders travelling between the lower north shore, North Sydney CBD and Sydney's CBD.

The NSW Government is committed to cycling as a key mode of city-serving, sustainable infrastructure. Active Transport infrastructure provides positive community health, amenity and environmental outcomes. The proposal would connect customers and communities, and promote a safe, reliable, sustainable and integrated transport system, while creating vibrant places and improving a healthier and more sustainable lifestyle. The proposal is also consistent with and would help fulfil the goals and objectives of numerous strategic planning instruments, such as the Future Transport Strategy – Our Vision for NSW (Transport, 2022a), Connecting to the future: Our 10 Year Blueprint (Transport, 2018), NSW Infrastructure Strategy 2022-2042 (Infrastructure NSW, 2022) and Transport Sustainability Plan 2021 (Transport, 2020a).

Proposal objectives

The proposal focuses on clear aims to increase transport mode shift, reduce crashes and falls, protect heritage and open space, provide equitable access, and deliver design excellence.

The objectives of the proposal are to:

- Improve access to the Sydney Harbour Bridge Cycleway
- Achieve a high-quality urban design and heritage outcome
- Release latent capacity on the Sydney Harbour Bridge Cycleway
- Improve safety for bike riders, pedestrians and motorists
- Support future growth in bike riders travelling between the Sydney CBD and the lower north shore
- Provide a cycleway facility that sensitively fits in with the:
  - Context of the location including the potential visibility of the structure
  - Heritage values of the area
  - Architectural qualities of the Sydney Harbour Bridge.

To support these objectives, the proposal also aims to:

- Minimise impacts to the natural and built environment
- Minimise impacts to the community
- Deliver a cost-effective solution.

Design excellence approach

At proposal inception, Transport recognised the importance of the proposal and the subject site to the community and stakeholders as well as the significance of the site's Aboriginal and non-Aboriginal heritage and open space setting. To ensure the highest quality design outcomes, Transport determined that a proposal specific Design Excellence Strategy should be developed with input from the NSW Government Architect. This strategy required a design-led approach where:

- Urban design, architecture, Designing with Country and heritage specialists would drive the design development process, supported by engineers and other technical experts
- Expert design reviews led by the NSW Government Architect would occur at regular intervals during design development to inform and guide the design, and help achieve the best possible outcomes
- The expert design review process would be adapted to suit the proposal phase including review by the Transport Design Review Panel early in the scoping design phase, review by a Design Jury during the competition phase and review by a Design Integrity Panel post-competition, based on the NSW State Design Review Panel model
- Discussion and engagement with Aboriginal elders and knowledge holders early in the design process and throughout design development would inform and guide the proposal requirements and design
- Close engagement with user groups and the community would inform the development of the design
- Regular and close engagement with Heritage NSW and the Heritage Council Approvals Committee would guide the design process
- Ongoing engagement with North Sydney Council would be undertaken to inform the design, particularly the design of the public domain, park and streets
- An open design competition process, with input on the brief by Heritage NSW and the NSW Government Architect and involvement by these organisations and North Sydney Council, to attract the best designers in the industry and elevate the importance of a sensitive and high-quality design in a remarkable and much-loved urban setting.

The adoption of a design excellence strategy and a design-led approach has promoted a transparent and collaborative design process with close and regular engagement with a wide range of proposal stakeholders, experts and the local community. Transport remains committed to achieving a world-class urban design and heritage outcome for the proposal that responds to the site's important open space and heritage values, including recognition of Aboriginal voices and occupation of the site.

Options considered

The development processes for the Sydney Harbour Bridge Cycleway Northern Access proposal considered options for the northern Sydney Harbour Bridge connection and upgrades to Alfred Street South separately.

Northern Sydney Harbour Bridge connection

Investigations to improve the connectivity, safety and access between the Sydney Harbour Bridge Cycleway and Milsons Point have been ongoing since 1999, with about 30 ramp options considered. In late 2020, Transport began assessing feasible options to meet existing and future demands.

Options considered included mechanical options, such as travelators and elevators, linear ramps and looped compact ramps. Of 14 options shortlisted, four ramp options were considered to satisfy the minimum rideability requirements and met future capacity requirements.

These four options were assessed against the proposal objectives and resulted in the selection of two options. The two options were then refined to reflect past feedback received from Heritage NSW, Heritage Council, North Sydney Council, community groups and bicycle groups.

The refined linear and refined loop ramp options were put on public display in 2021 for three weeks to seek feedback and input from a wide range of community members and key stakeholder groups. Following community and stakeholder feedback, the linear ramp was considered the preferred option as it would manage bike rider and pedestrian conflict better by minimising cycle interactions on Burton Street and around Milsons Point Station, and is a smaller, less bulky structure than the loop option. Transport presented the preferred option and the proposal's Design Excellence Strategy to the Heritage Council Approvals Committee who also voiced support for the linear ramp and the design competition process.

As part of the proposal's Design Excellence Strategy, a design competition process was held, including public engagement and a Design Jury assessment process, to select a best linear ramp design. Based on the Design Jury and public feedback, a preferred design was selected (Aspect design). The Aspect design has been further developed to fit into the heritage precinct as sensitively as possible and minimise impacts to open space and tree loss.

Alfred Street South cycle path

The methodology for selection of a preferred option for a cycle path along Alfred Street South involved consideration of a preliminary options assessment and consultation by North Sydney Council which was further developed by Transport.

In 2017, North Sydney Council developed three concept designs for the Alfred Street South section of the cycleway (optimal, basic and intermediate). The intermediate design, which proposed a new two-way cycleway along Alfred Street South on the eastern side of the road, was identified as the preferred option as it would lead to improved amenity for pedestrians and bike riders, a more attractive urban environment and negligible impact to existing road traffic.

Transport also carried out an assessment of seven potential options to facilitate bicycle movement, which built upon the work developed by the North Sydney Council in 2017 and 2018. The options considered including a one-way cycle path on each side of Alfred Street South, a two-way cycle path on the west side of Alfred Street South and shared paths. The one-way options were discounted as they would require additional tree removal and footpath loss. The two-way cycle path on the west side of Alfred Street South was also discounted due to potential conflict of bike riders entering and exiting side streets and driveways along the street. The assessment identified that the shared path options would be sufficient for some time but would need to be upgraded in the future to a separated arrangement to accommodate longer term growth in cycling. As a result, Transport focussed on a two-way cycle path on the eastern side of Alfred Street South as a preferred option to be taken forward for further assessment and design refinement, and in 2021, invited community and stakeholder feedback on the updated plans for a two-way separated cycle path along Alfred Street South.

Feedback results indicated support for separating bikes and pedestrians along Alfred Street South. Stakeholders and the community expressed concerns about a range of issues including loss of on-street parking and potential conflicts on a proposed shared path on the west of Alfred Street South, near the Lavender Street roundabout.

Transport considered the concerns raised and progressed the separated cycle option (2.5-metre-wide two-way cycle path on Alfred Street South) by reallocating road space. Up to 15 parking spaces would be permanently lost as a result of the proposal, which has been deemed necessary to provide substantial improvements to active transport users and contribute to encouraging people to use active transport and the Sydney Harbour Bridge Cycleway.

Statutory and planning framework

The proposal is categorised as development for the purpose of road infrastructure facilities and is to be carried out by or on behalf of a public authority. Under Section 2.109 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP) the proposal is permissible without consent. The proposal can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from North Sydney Council is not required.

Transport is the determining authority for the proposal. This Review of Environmental Factors satisfies Transport's obligations under section 5.5 of the EP&A Act including 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.

The proposal is not expected to impact on world heritage values. The proposed actions on the historical heritage values of the place were not considered to be significant as defined by the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and do not require a referral to the Federal Environment Minister. Transport has determined a referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required, however Transport would consider referring the proposal to ensure all Commonwealth assessment requirements have been met.

Community and stakeholder consultation

Extensive consultation has been carried out with directly and indirectly affected residents, businesses, landowners and cycleway users. Stakeholder consultation has been ongoing throughout the development phase and involved agencies and groups including North Sydney Council, Heritage NSW, Bike North, Bicycle NSW, heritage interest groups, local community groups and impacted stakeholders, and Aboriginal Elder representatives.

Two phases of public engagement were held for the proposal:

- In June 2021, Transport sought feedback on two options for a ramp (linear and loop ramp options). A total of 2,578 responses were received and 461 submissions were received. **82.9 per cent supported the concepts put forward and 68.3 per cent preferred the linear option**. Key concerns raised involved heritage impacts, visual impacts, temporary impact to the Kirribilli Markets and construction cost and timing
- In August 2021, in response to community feedback, Transport released a registration of interest seeking leading architectural firms to take part in a design competition for an elevated linear bike ramp. Key stakeholders were given the opportunity to attend briefings with the design team and Transport exhibited three shortlisted designs between December 2021 and January 2022. The public consultation extended across a period of six weeks and more than 1,000 submissions were received. **Just over half of all respondents said they preferred the winning design**.

Activities to support this engagement included stakeholder briefings and update meetings, letters, media announcements, online portal updates, overview fact sheets, presentation, paid social media ads, updated web page, online engagement platform and online briefings.

The June 2021 'Have your Say' engagement campaign on the linear and loop options was conducted via emails, a community update sent to 8,900 residences in Milsons Point, Kirribilli, Lavender Bay and Neutral Bay, posters at Kirribilli, Milsons Point and McMahon's Point Wharves, a paid Facebook advertising, a briefing to the Sydney Morning Herald, mainstream media coverage, and provided information on the proposal on Transport's website (https://nswroads.work/cycleway).

Since the April 2022 announcement of Aspect's design as the winner of the ramp design competition Transport continued to consult key stakeholders and community groups to understand and reduce potential impacts of the proposal, which included workshops with an expert Design Integrity Panel, establishment of the Community and Bike User Group, regular meetings with North Sydney Council, local precinct community groups and local businesses, such as Milsons Point Community Group, Lavender Bay Precinct Committee, Bicycle NSW, Bike North, Kirribilli Neighbourhood Centre, Billi Boules Club, St Aloysius School, Loreto College, St George Community Housing, La Capannina restaurant and GoGet car share operators.

Transport has embraced a Designing with Country approach throughout the design development of the proposal and would continue this consultation throughout concept and detailed design. Local Aboriginal Elders and community have been involved in the proposal development. Yarns have been undertaken with significant elders from both the Cammeraygal and Gadigal, who were briefed on the proposal and given the opportunity to provide feedback on the scoping and initial designs. A Connecting with Country 'Design Jam' was facilitated by Yerrabingin in 2022, which brought together the local Indigenous community, the design team, and Transport to explore design ideas, merge different styles of thinking, start conversations and refine insights.

Transport would continue to work closely with the community and relevant stakeholders through all stages of the proposal. Transport would also ensure that Designing with Country remains a priority during future design development of the proposal.

The REF would be placed on public display from Monday 28 November to Monday 19 December 2022 for community input and feedback. The REF would be placed on an interactive online engagement platform with a feedback form and information on how to make a written or email submission about the proposal. At the conclusion of the public display period, Transport would acknowledge receipt of feedback from each respondent and issues raised would be considered by Transport before determining whether to proceed with the proposal.

Environmental impacts

The REF identifies comprehensive environmental management measures to avoid, manage, mitigate and offset impacts during construction and operation of the proposal. These include best practice environmental planning, management techniques and urban design. A summary of the main issues identified in the REF is outlined below. The majority of these impacts would occur during construction of the proposal and would be temporary. With effective implementation of the environmental management measures, most impacts would be minor or negligible.

Key environmental management measures include the preparation of a comprehensive construction environmental management plan (CEMP) to manage environmental impacts during pre-construction and construction and design development to assess and mitigate impacts to heritage items and traffic flows.

The main environmental impacts of the proposal are:

Non-Aboriginal heritage

Construction of the proposal would result in a minor to moderate impact to the heritage fabric of the locally, state and nationally heritage listed Sydney Harbour Bridge as well as a moderate impact to the locally listed Bradfield Park. Other direct

impacts to heritage listed items would be minor to negligible. The potential for construction works to impact on significant archaeological resources would be moderate given that earthworks would be limited to relatively shallow excavation.

The impact to the heritage listings would be mitigated through good contemporary design, by locating the proposed elevated linear bike ramp close to the concrete bridge approach, and by graduating the proposed elevated linear bike ramp from its connection to the Sydney Harbour Bridge and Bradfield Park. Further design development would seek to further reduce potential design impacts, in accordance with the mitigation measures and safeguards identified for the proposal.

The technical achievement of the Sydney Harbour Bridge's design and its status as an iconic cultural landmark would be respected and not diminished by the proposal. The proposal would improve accessibility and amenity for commuters and visitors to the Sydney Harbour Bridge and would enhance and strengthen the core function of the Sydney Harbour Bridge as an iconic and critical transport link, as well as have a positive impact on its National Heritage values

A Non-Aboriginal Heritage Management Plan would be prepared and implemented as part of the CEMP. It would provide specific drafting guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage. An Archaeological Research Design would also be prepared for the proposal.

Landscape character and visual impacts

Visual impacts during construction would be mostly associated with the temporary introduction of construction sites, fencing and hoarding. Views of Bradfield Park and the Sydney Harbour Bridge would largely remain visible.

The Sydney Harbour Bridge and Milsons Point Station landscape character areas would be impacted as a result of the construction of the new bike ramp, which would remove a small part of Sydney Harbour Bridge parapet and the bike ramp installed above the station entrance. These impacts were assessed as moderate to high. Visual impacts to Bradfield Park were assessed as moderate to adverse during construction. The main landscape features of the park would be maintained and the park would be partially open for public use, which would minimise visual impacts. However, where would be visual impacts associated with the removal of five poplar trees and one small ornamental pear tree, installation of columns along the eastern edge of the park (to support the cycleway) and a temporary closure of the parks' eastern most pathway. Trees removed for the proposal would be replaced at a minimum replacement ratio of 4:1 in accordance with Transport's *Tree and hollow replacement guidelines* (2022). Replanting would be undertaken in consultation with North Sydney Council. If tree replacement is not possible within the proposal boundary, or on land in the proximity by agreement with North Sydney Council, a payment would be made to the Transport for NSW Conservation Fund.

The proposal would have contemporary character, design excellence and considerably improve the functioning of the Sydney Harbour Bridge Cycleway, once operational. The original features of views would be maintained and there would be an upgraded streetscape incorporating the new Alfred Street South cycle path. Visual impacts during operation were mostly assessed as low-moderate as the new bike ramp would incorporate design features that minimise the visual bulk and scale of the structure, reducing its prominence.

An Urban Design Plan would be prepared to support the final detailed proposal design and implemented as part of the CEMP. It would provide practical detail on the application of design principles and objectives to mitigate impacts on landscape character and visual impacts and include tree replacement requirements in accordance with Transport's *Tree and hollow replacement guidelines* (2022).

Noise and vibration

The majority of work would be carried out during standard construction hours. During standard construction hours, noise management levels (NML) exceedances would typically range between zero and 27 decibels and zero to five decibels in the residential areas to the east and west of the proposal boundary, respectively. Exceedances are predicted when using the concrete saw during groundworks occurring directly next to receivers located on Alfred Street South. To the west of the proposal boundary the highest noise level is predicted for when cycleway works occur at the northern extent of the proposal boundary that have direct line of sight to sensitive receivers on the eastern side of the Warringah Freeway. Under the worst-case scenario during standard construction hours, the proposal construction is predicted to exceed the highly noise affected level of the NML + 20 decibels at up to five residential receivers and two commercial receivers.

Out of hours construction work would be required for certain activities because of operational road and rail user safety requirements. When out of hours works are carried out, typical construction noise levels are expected to range between 32 A-weighted decibel (dB(A)) and 76 dB(A) for receivers to the west of the proposal, and 32 dB(A) and 52 dB(A) for receivers to the east of the proposal. NML exceedances for work would typically range between zero and 31 decibels. The highest predicted noise level would be up to 92 dB(A) for ramp works and 105 dB(A) for cycleway works for receivers to the west of the proposal and up to 71 dB(A) for cycleway works for receivers to the east of the proposal. Operation of the concrete saw

and jackhammer during construction of the cycle path on Alfred Street South are expected to cause the maximum recorded noise levels.

Nightwork is currently proposed to occur periodically across the 18 months construction program. These works would be carried out for short times only and would be limited to three consecutive evenings in any one week.

During construction there is potential for vibration impacts as a result of the use of plant and equipment, as the assumed construction staging indicated that pile boring and jack hammering would be required for some construction activities. Minimum working distances based on the nominated three millimetres per second criterion for heritage structures would be respected to avoid any risk of cosmetic or structural damage to the Sydney Harbour Bridge approach spans and the Milsons Point Station Railway Station. Where identified as required, pre-construction building surveys for structures would be carried out prior to commencement of activities and vibration monitoring would be carried out at high-risk receptors during construction.

Operational road traffic and bike rider related noise levels are not expected to change as a result of the proposal.

A Noise and Vibration Management Plan (NVMP) would be prepared and implemented as part of the CEMP, and would include management measures to avoid, reduce or manage noise and vibration impacts.

Traffic and transport

Impacts to traffic and transport during construction would be temporary and would comprise temporary road closures, diversions to footpaths, and the temporary loss of up to 15 parking spaces at any one time. Works on Alfred Street South would be staged and be carried out on one side of the street at a time, to minimise impacts to parking. As construction would be limited to the eastern side of Alfred Street South, it is expected loading and delivery for the restaurants and food retail storefronts located along the western side of the street would not be impacted during the construction. Access to La Capannina (located at 41 Alfred Street South) would be maintained during construction. Changes to loading and delivery for La Capannina would be made in consultation with the restaurant.

Operation of the proposal would improve accessibility and release capacity on the Sydney Harbour Bridge, as well as improve safety for bike riders, pedestrians and motorists. The proposal would improve safety for bike riders and pedestrians by providing separation between motorists, pedestrians and bike riders, and encourage motorists exiting the Bradfield Highway to reduce speed when approaching the intersection of Alfred Street South, Lavender Street and Middlemiss Street.

A high-level SIDRA analysis for the future year 2036 identified that, while some queuing of vehicles exiting Bradfield Highway could be expected as a result of the relocated pedestrian and cyclist crossing on Alfred Street South, no adverse operational impacts on the connecting traffic network were predicted under any of the assessed scenarios. Further modeling would be carried out during design development to identify and mitigate potential impacts to the local road network associated with the proposal.

The proposal would also result in the permanent loss of up to 15 parking spaces along Alfred Street and the relocation of one bus stop on Alfred Street South (relocated about 60 metres). The availability of alternate parking spaces suggests that any impact is likely to be minor.

A Traffic Management Plan (TMP) would be prepared and implemented as part of the CEMP. It would provide measures and controls to be implemented to avoid and mitigate impacts to traffic and transport. Further traffic modelling would be carried out during design development to confirm and identify appropriate mitigation for impacts to queueing on the local road network.

Socio-economic and land use

During construction, potential impacts on communities, businesses, visitors and road users in the study area would mainly be associated with temporary changes to local amenity, noise and vibration, lighting during night works, loss of parking and disruption to road, cycleway and pedestrian traffic. The Kirribilli Markets would be relocated for the duration of construction. The south bowling green would remain open for use by school children during the week and there is an ongoing engagement with Loreto Kirribilli and St Aloysius School to ensure impact on school use would be minimised as much as possible. Negotiations with Billi Boules Club are ongoing to identify alternative locations for the boules pistes, which would be impacted during construction.

Construction activities would also generate demand for goods and services, potentially creating opportunities for local businesses. Due to the temporary nature of the construction work, it is expected the proposal would result in minor economic benefits associated with the creation of employment.

Operation of the proposal would promote a positive impact given that mobility of bike riders and pedestrians would be improved. The proposal would improve amenity and accessibility of the Sydney Harbour Bridge and potentially attract more users and tourists to Milsons Point and Kirribilli. This may result in some minor increase in patronage of businesses in the area. The implementation of the proposal would also allow greater accessibility for a wider range of customers to use the cycleway, such as less skilled riders, families, bike riders with disabilities and commuters using e-bikes.

The proposal would provide the community with greater confidence to walk or cycle to their destination and feel safe while riding their bike, in particular, given that the community surrounding the proposal highly value accessibility, safety, amenity and the preservation of open spaces (North Sydney Council, *North Sydney Vision 2040: Community Strategic Plan)*. Considerable effort has been made through the options identification and proposal design to ensure a high quality urban design outcome which would enhance the amenity of the area and result in a minimal loss of usable open space.

Operation of the proposal would also benefit motorists, cyclists and pedestrians, nearby social infrastructure and businesses by improving safety, reducing congestion and ease of access in the area.

A Community Liaison Plan will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction.

Biodiversity

The proposal boundary is a highly urbanised area with no remnant native vegetation present. The vegetation within the proposal boundary has been extensively modified by urban development over the past 100 years or so.

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the Biodiversity Conservation Act 2016 or EPBC Act.

The proposal design development has avoided tree removal as much as possible. The proposal would require the removal of five non-native poplar trees and one ornamental pear in Bradfield Park north and a Canary Island date palm from the centre of the roundabout at the intersection of Alfred Street South, Lavender Street and Middlemiss Street. A Tree and Hollow Replacement Plan would be prepared for the proposal in accordance with Transport's Tree and Hollow Replacement Guideline (2022) and would specify the number of trees to be provided as offsets for the proposal. Trees would be replaced at a minimum ratio of 2:1.

Cumulative impacts

Projects with the potential to contribute to cumulative impacts in combination with the proposal include the Sydney Harbour Bridge Deck Upgrade, Sydney Harbour Bridge Arch Maintenance Units, North Sydney Olympic Pool Aquatic Centre and the Warringah Freeway Upgrade. Potential cumulative impacts during construction of the proposal include the potential for cumulative heritage impacts to the heritage values of the Sydney Harbour Bridge resulting from concurrent construction of the proposal with the Sydney Harbour Bridge Arch Maintenance Units project. There would be potential cumulative construction noise impacts from the proposal occurring concurrently with the Sydney Harbour Bridge deck upgrade and the Warringah Freeway Upgrade. As these projects are all managed by Transport, ongoing planning would ensure noise impacts are adequately managed. Cumulative socio-economic impacts during construction would be minor and associated with traffic delays, temporary changes to amenity, decrease in patronage to local businesses and temporary loss of public open space. Potential, minor, cumulative traffic and visual impacts may occur as a result of the overlap with the North Sydney Olympic Pool redevelopment project.

During operation of the proposal there would be a minor cumulative heritage impact to the heritage values of the Sydney Harbour Bridge, due to overlap of the proposal with the Sydney Harbour Bridge Arch Maintenance Units projects. However, the combined projects would positively allow better access to the Sydney Harbour Bridge for the public and support ongoing use of the bridge. The arch maintenance project would also potentially cause a cumulative visual impact due to the introduction of permanent new elements to the Sydney Harbour Bridge. Operation of the proposal would promote positive cumulative traffic impacts, given that it would improve active transport accessibility and safety and decrease motorists on the road, reducing road traffic.

Justification and conclusion

The proposal would improve access and connectivity for a broader range of customer groups. It would also improve safety for bike riders, pedestrians and motorists, increase health and wellbeing and improve the integration of the cycleway with the Alfred Street South cycle path and existing bike network.

The proposal's approach to Design Excellence, with significant input and review by design experts and stakeholders as well as adoption of a design-led approach, has ensured the highest standards of design quality, and this level of review and engagement would continue during the design development process.

A number of potential environmental impacts from the proposal have been avoided or reduced during the options assessment and subsequent concept design development. The proposal, as described in this REF, best meets the proposal objectives but would still result in some impacts on heritage, noise and vibration, landscape and visual amenity, traffic and access, and socio-economic factors. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts.

The benefits of the proposal are considered to outweigh the expected impacts on the environment. The environmental impacts for the proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval from the Minister for Planning under Division 5.2 of the EP&A Act are not required. Transport has determined a referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required, however Transport would consider referring the proposal to ensure all Commonwealth assessment requirements have been met.

Display of the review of environmental factors

This REF is on display for comment between 28 November and 19 December 2022. You can access the documents in the following ways:

Internet

The documents are available as pdf files on the Transport for NSW website at https://roads-waterways.transport.nsw.gov.au/projects/sydney-harbour-bridge/access-projects/cycleway-access-proposals.html.

Copies by request

Printed and electronic copies are available by contacting **1800 581 595** (toll free), noting that there may be a charge for hard copies or USB.

Staffed displays

Sunday 4 December 2022

8.30am to 3pm
Kirribilli Markets

Tuesday 6 December 2022

7am to 9am | 4pm to 6pm
At the bottom of the northern stairs of the Sydney Harbour Bridge Cycleway, near Milsons Point Station.

Wednesday 7 December 2022

7am to 9am | 4pm to 6pm
At the bottom of the northern stairs of the Sydney Harbour Bridge Cycleway, near Milsons Point Station.

Sunday 11 December 2022

8.30am to 3pm
Kirribilli Markets.

How can I make a submission?

To make a submission about this proposal, please send your written comments to:

- Completing a submission form at nswroads.work/cycleway
- Emailing: sydneyharbourbridgeprojects@transport.nsw.gov.au
- By mail: PO Box K659,Haymarket NSW 1240.

Submissions must be received by midnight Monday, 19 December 2022. Submissions will be managed in accordance with the *Transport for NSW Privacy Statement*. A copy can be made available upon request.

What happens next?

Transport will collate and consider the submissions received during public display of the REF.

After this consideration, Transport will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the proposal is determined to proceed, Transport will continue to consult with the community and stakeholders prior to and during construction.

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1. Introduction

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

1.1 Proposal identification

Transport for New South Wales (Transport) is proposing to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South (the proposal).

The Sydney Harbour Bridge Cycleway provides the only cycling link between Sydney central business district (CBD) and North Sydney CBD, which are the largest and third largest commercial centres respectively in NSW. It provides a vital connection between the existing Kent Street cycleway in Sydney CBD and the lower north shore. Access at the northern end of the Sydney Harbour Bridge Cycleway is currently via 55 steps that connect with Bradfield Park at Milsons Point. The steps create a bottleneck, present a safety hazard and deter people from cycling. Currently there is also limited separation of bike riders, pedestrians and motorists on Alfred Street South. The proposal focuses on clear aims to increase mode shift, reduce crashes and falls, protect heritage and open space, provide equitable access, and deliver design excellence.

The proposal aims to:

- Improve access to the Sydney Harbour Bridge Cycleway
- Achieve a high-quality urban design and heritage outcome
- Release latent capacity on the Sydney Harbour Bridge Cycleway
- Improve safety for bike riders, pedestrians and motorists
- Support future growth in bike riders travelling between the Sydney CBD and the lower north shore
- Provide a cycleway facility that sensitively fits in with the:
  - Context of the location including the potential visibility of the structure
  - Heritage values of the area
  - Architectural qualities of the Sydney Harbour Bridge.

Operation of the proposal would encourage a wider range of customers to pursue active transport as an effective mode of transportation. This would lead to potential opportunities for decreased congestion on surrounding road networks, improved community health and improvements in connectivity between North Sydney CBD and Sydney CBD.

This proposal has been developed in accordance with Transport's Environment and Sustainability Plan and the Environment and Sustainability Policy. Avoiding and minimising impact is a key objective of this proposal. The proposal design has been refined to minimise, where possible, the impacts on the environment especially on open space, biodiversity, and heritage values.

The proposal is located on Cammeraygal land and is in Milsons Point, within the North Sydney Local Government Area (LGA). The proposal area is bounded by Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west. Figure 1-1 shows the proposal and its location in a regional context. A more detailed location description is provided in Chapter 6.

The proposal would consist of an approximately three-metre-wide elevated linear bike ramp that extends approximately 200 metres from Bradfield Park North, near Burton Street, interfacing with the Sydney Harbour Bridge Cycleway south of the existing stair access. The ramp would connect to a new cycle path which would extend along the east side of Alfred Street South, between Middlemiss Street and Burton Street, and include a new street crossing on Alfred Street South. The two-way cycle path would be 2.5 metres wide and connect to the existing bike network in Milsons Point. An overview of the proposal is provided in Figure 1-2. Key features of the proposal are outlined below and Chapter 3 describes the proposal in more detail.

Key features of the proposal would include:

- A design-led approach to the integration of new cycling infrastructure with its existing significant open space and heritage setting
- A new elevated linear bike ramp, with deck mostly about three metres wide, and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North including:
  - Steel ramp structure with deck incorporating Designing with Country motifs, and balustrade with integrated lighting
  - Precast columns carefully sited within Bradfield Park North and Central
  - Provision of a bike riders rest area next to the Sydney Harbour Bridge Cycleway connection
  - A gathering space, lighting, seating and cycle path within Bradfield Park North connecting the elevated linear bike ramp and the proposed Alfred Street South cycle path
- Alfred Street South pedestrian and cycle path upgrade including:
  - New 2.5-metre-wide two-way cycle path on Alfred Street South from the ramp landing, linking to the existing bike network in Middlemiss Street. The cycle path would be located on the east side of Alfred Street South between the ramp landing and the new crossing near 110 Alfred Street South. On the west side of Alfred Street South the cycle path would be located between the new crossing and Lavender Street
  - Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located at 110 Alfred Street South and an upgrade to the pedestrian crossing at Lavender Street
  - Low speed shared path and verge widening on the north side of Lavender Street
  - Adjustments to the Lavender Street roundabout
  - New street tree planting, shrub planting and footpath paving
  - Relocation of an existing bus stop on Alfred Street South near Lavender Street about 60 metres to the south of its current location
  - Permanent removal of up to 15 metered parking spaces along Alfred Street South.

The proposal, would also include, but not be limited to:

- Kerb and pavement work, and line marking
- Drainage and utility adjustments
- Street furniture adjustments
- Changes to street parking, parking meter locations and regulatory signage.
- Minor lighting upgrades to Bradfield Park North and in other locations where required to meet safe lighting standards.

Construction of the proposal would take around 18 months and, subject to planning approval, is expected to commence mid-2023. It would comprise several key phases and activities outlined in Table 1-1. The construction footprint for the proposal is shown in Figure 1-3.

Table 1-1 Proposed construction phase timing

Construction Phase	Duration (months)																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Site establishment																		
2. Ramp construction																		
3. Groundwork, cycleway, roadworks and utilities																		
4. Demobilisation and landscaping																		

Figure 1-1: Location of the proposal

Figure 1-2: The proposal

Figure 1-3: Construction footprint

1.2 Background to the proposal

The proposal is a part of the broader Sydney Harbour Bridge Cycleway Access program of works. The program proposes to include the following key features:

- Sydney Harbour Bridge southern access - upgrading the existing cycleway facility between the Kent Street cycleway and the Sydney Harbour Bridge Cycleway – in preliminary development stages
- Sydney Harbour Bridge northern access (this proposal) - provision of a new elevated linear bike ramp about three metres wide and about 200 metres in length between the Sydney Harbour Bridge Cycleway and Bradfield Park North, and upgrades to the Alfred Street South cycle path.

Investigations into options for improving the connectivity, safety and access between the Sydney Harbour Bridge Cycleway and Milsons Point date back as far as 1999. Many attempts to develop an alternative to the existing steps have been made over the years and 30 ramp options have been explored. The use of lifts, travelators and putting bikes back on the main deck of the Sydney Harbour Bridge have also been put forward as an alternative to a ramp solution.

In 2020, Transport restarted the project and undertook a fresh examination of the strategic need, demand, project alternatives and all the ramp options developed in the past 20 years. The process has involved extensive investigations and engagement with stakeholders and the community to complete this work, including a design excellence process. As a result, the elevated linear bike ramp design for the proposal was progressed.

1.2.1 Related development

A separate proposal for the southern access to the Sydney Harbour Bridge Cycleway was developed in 2017, with a Review of Environmental Factors (REF) placed on public display in November of 2017. The REF for the southern access attracted a range of feedback and has not been determined pending further stakeholder engagement and design development.

A pedestrian access lift on the northern and southern sides of the Sydney Harbour Bridge pedestrian pathway was developed in 2017 with a REF placed on public display in October/November of 2017. The project was approved and constructed in 2018.

1.3 Purpose of the report

This REF has been prepared by Arcadis on behalf of Transport Infrastructure and Place. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of Section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in Guidelines for Division 5.1 assessments (DPE 2022), Roads and Related Facilities EIS Guideline (Department of Urban Affairs and Planning 1996), the *Biodiversity Conservation Act, 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

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

- Section 5.5 of the EP&A Act including that Transport 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 sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report

- The significance of any impact on nationally-listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if 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 Department of Climate Change, Energy, the Environment and Water 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 in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

The NSW Government is committed to cycling as a key mode of city-serving, sustainable infrastructure. Active Transport infrastructure provides positive community health, amenity and environmental outcomes. Active transport involves walking, cycling and other physical modes of travel. The NSW Government is looking to address continued access and safety constraints and find ways to encourage more people to cycle, to develop active, healthy and carbon neutral ways to move across the city.

The Sydney Harbour Bridge Cycleway route is a critical link in the metropolitan Sydney regional bike network connecting the proposed North Shore cycleway on the Pacific Highway with the existing Kent Street cycleway in the Sydney CBD. Over the last decade, a rolling average of just under 2,000 bike rider trips have been completed each weekday on the Sydney Harbour Bridge Cycleway, making it one of the busiest links in the Metro Sydney Bike Network. However, the current 55 step makes access difficult and prevents many customer groups from using the facility, including younger and older bike riders and cargo bike users. In 2019, one third of incidents reported on the Sydney Harbour Bridge Cycleway were caused by the bridge stairs (Security & Critical Infrastructure Resilience). Usage has decreased over time despite a significant growth in bike purchases and uptake in the recent years. The step access and associated safety barriers create a bottleneck that would prevent the cycleway from meeting projected demand.

The proposal aims to:

- Improve safety for bike riders, pedestrians and motorists
- Improve access for bike riders and pedestrians
- Support the future growth in the number of bike riders travelling between the lower north shore, North Sydney CBD and Sydney's CBD.

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 Sydney Harbour Bridge's southern cycleway access and the recently completed (2018) pedestrian access lift on the northern and southern sides of the Sydney Harbour Bridge pedestrian pathway.

2.2 Strategic planning and policy framework

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

- Future Transport Strategy – Our vision for NSW (Transport for NSW, 2022a)
- Strategic Cycleway Corridors for Eastern Harbour City Overview (Transport for NSW, 2022b)
- Connecting to the future: Our 10 Year Blueprint (Transport for NSW, 2018)
- NSW Infrastructure Strategy 2022-2042 (Infrastructure NSW, 2022)
- Transport Sustainability Plan 2021 (Transport for NSW, 2020a)
- Premier's Priorities (NSW Government, 2020)
- Directions for a Greater Sydney 2017-2056 (Greater Sydney Commission, 2017)
- Greater Sydney Region Plan – A Metropolis of Three Cities (Greater Sydney Commission, 2018)
- Sydney City Centre Access Strategy (Transport for NSW, 2013a)
- Transport for NSW Customer Value Propositions for Walking and Cycling (Transport for NSW, 2013)
- Road User Space Allocation Policy (Transport for NSW, 2021a)
- Sydney Harbour Bridge Conservation Management Plan (GML Heritage, 2021)

- Infrastructure Priority List (Infrastructure Australia, 2020)
- North District Plan (Greater Sydney Commission, 2018)
- North Sydney Environmental Sustainability Strategy 2030 (North Sydney Council, 2021)
- North Sydney Integrated Cycling Strategy (North Sydney Council, 2013)
- North Sydney Transport Strategy (North Sydney Council, 2017)
- North Sydney Vision 2040 Community Strategic Plan 2020 (North Sydney Council, 2020a).
- North Sydney Local Strategic Planning Statement (North Sydney Council, 2020b)

These documents and their relevance to the proposal are discussed below.

2.2.1 Future Transport Strategy – Our vision for transport in NSW

The Future Transport Strategy – Our vision for NSW replaced the Future Transport 2056: Shaping the Future, which was published in 2018. The new strategy sets out principles to guide transport investment over the longer term and aims to connect customers and communities and promote a safe, reliable, sustainable and integrated transport system across NSW, while taking into account population growth and focusing on people and places.

The Strategy's high-level proposed outcomes are to connect customer's whole lives, create successful places and enable economic activity.

The strategy outlines the importance of optimising the existing infrastructure and promoting behaviour change, for instance, by making public transport, walking, cycling and micro-mobility safer and easier with better pathways, cycleways and connections. As such, the strategy supports stronger investment in walking and cycling networks in order to offer the customers convenient alternatives to driving and build a sustainable transport system, including small to medium interventions to optimise the transport network.

The strategy focuses on reallocating road space to more efficient modes of transport like buses, walking, cycling and micro-mobility devices. It proposes to improve transport solutions for customers, such as planning strategic cycleway corridors, prioritising walking and cycling and provide more attractive neighbourhoods that enable healthier lifestyles.

The primary objectives of the proposal are aligned with the strategy as it would:

- Optimise the existing cycling link between Sydney CBD and North Sydney CBD and connect these key centres and regional communities
- Promote cycling as an alternative and sustainable mode of transport and encourage a wider range of customers to pursue active transport as an effective mode of transportation, which could lead to potential opportunities for decreased congestion on surrounding road networks
- Promote a healthier lifestyle by encouraging people to adopt cycling as a form of transportation
- Improve safety for bike riders of all ages and abilities by providing greater accessibility to the Sydney Harbour Bridge Cycleway, by eliminating the bottleneck created by the existing stairway access, which poses a potential safety risk and a barrier to a wide range of customers.

2.2.2 Strategic Cycleway Corridors – Eastern Harbour City Overview

The Minister for Cities and Active Transport announced the Strategic Cycleway Corridors for Eastern Harbour City Overview in April 2022, which seeks to provide a safe and connected cycleway network within the Eastern Harbour City, including in the North Sydney to the Sydney CBD corridor.

Notably, the NSW Government vision is to provide a safer and more connected cycleway network that enables more people to safely ride their bicycle as a daily routine, but also better connect centres, precincts, and places.

From this perspective, the proposal would align with five of the program's building blocks:

- 'Make riding an attractive choice': the proposal would remove the need to dismount and push or carry a bike up and down stairs, as well as provide a cycle path on Alfred Street South, providing a more approachable cycling route for riders of all abilities
- 'Progressively expand and fill gaps to create a connected network': the proposal would remove a significant existing pinch point in the network, making the route more attractive to a broader group of bike riders, and improve

connectivity between the Sydney CBD, Milsons Point and North Sydney. Access at the northern end of the Sydney Harbour Bridge Cycleway is currently via 55 steps that connect with Bradfield Park at Milsons Point. The steps create a bottleneck and may deter people from cycling

- 'Connect key centres and places across council and project boundaries': the proposal would improve connectivity between North Sydney and Sydney CBD, which are the largest and third largest commercial centres respectively in NSW
- 'Improve safety for all ages and abilities': the proposal would improve safety for bike riders of all ages and abilities by providing greater accessibility to the Sydney Harbour Bridge Cycleway. The current 55 steps at the northern end of the Sydney Harbour Bridge Cycleway present a safety hazard for users
- 'Offer integration with local bike networks': the proposal would provide greater integration with the Sydney Harbour Bridge Cycleway, and the cycleway network in Milsons Point, North Sydney, and beyond, in line with NSW Strategic Cycling Corridors - Eastern Harbour City Overview.

2.2.3 Connecting to the future: Our 10 Year Blueprint

Connecting to the Future – Our 10-year Blueprint (Transport for NSW, 2018) lays out desired outcomes, ambitions and strategic priorities for Transport to deliver on the NSW Government's focus area of 'well-connected communities with quality local environments'. The strategic priorities identified in the Blueprint include:

- Connecting customers' whole lives via creating new mobility options and experiences, and safe, seamless journeys for people and goods
- Promoting successful places by protecting and enhancing communities and their environment, and integrated, resilient and accessible transport networks and places
- Promoting a strong economy and quality of life via transport investments and solutions that serve the people of NSW, quality assets and efficient networks, managed at the right price.

The proposal aligns with the key strategic priorities of the Blueprint including working in partnership with impacted communities in a more meaningful way, and place-based integrated service design. The cycleway would contribute towards a more sustainable and better quality of life for the community. It would also assist with integrating access between active transport links that can be used by a wider range of customers, previously deterred by the stairway access. By improving the connectivity between Sydney CBD and North Sydney CBD, the cycleway would make Milsons Point a great place to work, live and visit.

Transport closely engaged with Heritage NSW regarding potential impacts of the proposal to the Sydney Harbour Bridge and will continue to seek their feedback during further design development. Transport has also carried out extensive engagement with impacted community members and other key stakeholders to understand their concerns about the proposal. As a result of Transport's engagement activities, the proposal design has been refined to reflect the values of the community and remains sensitive to, and respectful of, the heritage values and architecture of the Sydney Harbour Bridge.

2.2.4 NSW State Infrastructure Strategy 2022 - 2042

The NSW State Infrastructure Strategy 2022 – 2042 presents an infrastructure investment program for different areas, including transport and lays out the NSW Government's infrastructure vision over the next 20 years.

The strategy recommends the development of off-road cycling networks and walkways connecting public transport and popular destinations and linking major strategic centres across the three cities. The strategy recommends that green open spaces and quality civic places should be part of the core plan for all precincts and neighbourhoods. The strategy also supports the idea of '15-minute neighbourhood' approach, which represents ensuring residents can access most services and facilities by walking or cycling for 15 minutes.

To implement this strategy, it proposes investments on local high streets, open spaces, and safe and enjoyable walking and cycling infrastructure. The strategy is based on the importance of infrastructure that supports active transport, such as walking and cycling, given that it improves physical and mental health. The proposal is aligned with relevant objectives of the NSW State Infrastructure Strategy 2022 – 2042 as it would:

- Enhance the existing active transport infrastructure, while connecting Northern Sydney CBD and Sydney CBD and promoting a healthier lifestyle
- Improve the Sydney Harbour Bridge Cycleway, providing a designated cycleway along Alfred Street South and enhancing the connections with the surrounding bike network.

2.2.5 Transport Sustainability Plan 2021

Transport's Transport Sustainability Plan 2021 aims to address the most important sustainability aspects associated with various modes of transport, to ensure a resilient and sustainable transport system. The report documents Transport's sustainability vision and goals, guided by eight focus areas. The focus areas include:

- Respond to climate change
- Protect and enhance biodiversity
- Improve environmental outcomes
- Procure responsibly
- Partner with communities
- Respect culture and heritage
- Align spend and impact
- Empower customers to make sustainable choices.

The proposal would align with focus area eight, empower customers to make sustainable choices, by improving safety and accessibility of the cycleway connection between North Sydney CBD and Sydney CBD. In accordance with the plan, encouraging people to reduce their private car use by choosing alternative transport options would drive greater sustainability outcomes as well as improving safety outcomes on the roads, and promoting a healthier community.

The proposal would improve access to the Sydney Harbour Bridge Cycleway for a greater number of customer groups, such as less skilled riders, families and bike riders living with disabilities. This would encourage the community to make sustainable transportation choices, for example cycling and walking.

2.2.6 Premier's Priorities

The Premier's Priorities represent the NSW Government's commitment to making a significant difference to enhance the quality of life of the people of NSW and accompany outcomes that track the NSW Government's achievements, including connecting communities with quality local environments. Specific priorities related to this proposal include well connected communities with quality local environments, building infrastructure and improving road travel reliability.

The proposal would contribute to the accessible transport and successful places outcomes. It would improve accessibility for a broader range of customer groups including less skilled riders, families and people living with a disability. The proposal would also improve connectivity between the Sydney CBD and the lower north shore by replacing the bottleneck created by the current stairs at the northern access to the Sydney Harbour Bridge with a safe, more accessible linear bike ramp. The provision of the ramp as well as upgrades to the Alfred Street cycle path would also result in a better functioning Bradfield Park precinct by removing conflict points for bike riders, pedestrians, and cars.

2.2.7 Directions for a Greater Sydney 2017 - 2056

Directions for a Greater Sydney 2017-2056 sets the 40-year vision for Greater Sydney and outlines the guiding principles that would help navigate Sydney into three productive, liveable and sustainable cities – the Western Parkland City, the Central River City and the Eastern Harbour City.

The proposal would support making Sydney a well-connected city by improving connectivity to local centres. Removing the bottleneck and queues created by the current stairs at the northern access to the Sydney Harbour Bridge Cycleway would reduce travel time between North Sydney and the Sydney CBD. The bike ramp would also allow greater accessibility for a wider range of customers to use the cycleway. Promoting active transport would also increase the proportion of sustainable, more energy efficient modes of travel, and improve liveability.

2.2.8 Greater Sydney Region Plan – A Metropolis of Three Cities

The Greater Sydney Region Plan: A Metropolis of Three Cities sets the 40-year vision and 20-year implementation plan for Sydney to develop as three unique and connected cities – the Western Parkland City, the Central River City and the Eastern Harbour City. The principles of the Plan are mirrored in the Directions for a Greater Sydney 2017-2056 and have been addressed above.

2.2.9 Sydney City Centre Access Strategy

The Sydney City Centre Access Strategy is NSW's first detailed plan showing how people would 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 bike riders would interact in the heart of Sydney and how different transport modes would 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 bike riders travelling to and from the CBD. The strategy highlights an 'integrated cycleway network' as one of the key features of a future integrated transport network.

One of the actions of the strategy is to complete safe and direct cycleway connections in all directions of the CBD. The strategy outlines the importance of an extended bike network to support continued growth in cycling within the city centre and provide the infrastructure needed for the increasing number of people who are choosing to ride between the city and its surrounding suburbs.

The proposal would provide an accessible, safe and connected cycle link between the Sydney Harbour Bridge Cycleway and the lower north shore.

The Sydney City Centre Access 2018 update provides a five-year report since 2013 and identifies upcoming initiatives including the Sydney Harbour Village North cycleway and Sydney Harbour Bridge north ramp.

2.2.10 Transport for NSW Customer Value Propositions for Walking and Cycling Reports, 2013

The Walking and Cycling Customer Value Proposition reports, (investigates how we can encourage customers in NSW to cycle or walk more often. The reports identify four key areas:

1. Connectivity and flow of footpaths to public transport and centres
2. Pedestrian safety and personal security
3. Health and wellbeing benefits
4. Supporting facilities including complete shade or rain coverage on key routes and at interchanges.

These reports provide a detailed analysis of why the research was conducted, what influences cycling or walking in NSW, what is important to the NSW population, and how do needs differ across the NSW population. The proposal would support the 45 per cent of the population, as identified in the Customer Value Proposition, who are less confident riding a bike but would consider riding a bike more and/or further if they felt increased safety and confidence from safe separation from cars, and direct, connected routes to get to their destination.

2.2.11 Road User Space Allocation Policy

The Road User Space Allocation Policy aims for the allocation of road user space safely and equitably to support the movement of people and goods and place objectives. Planning consideration is given to establish primary road function, and the following order of road user space:

- Walking, including equitable access for all abilities
- Cycling, including larger legal micro-mobility devices
- Public transport
- Freight and deliveries
- Point to point transport
- General traffic and on-street parking for private motorised vehicles.

The proposal supports this hierarchy.

2.2.12 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 Sydney Harbour Bridge.

The plan outlines access opportunities that should be investigated for the Sydney Harbour Bridge Northern cycleway such as inclusion of a ramp at the northern end of the cycleway and resolving the inherent dangers associated with a wide range of riders (and possibly their carers) sharing the cycleway. The plan also recognises opportunities to link with existing cycle paths and footpaths within the North Sydney Council area. 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.

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. The Conservation Management Plan was considered in the design development of the proposal in regard to minimising heritage impacts and ensuring the design would be sensitive to and respectful of the heritage values and architectural qualities of the Sydney Harbour Bridge.

2.2.13 Infrastructure Priority List

The Infrastructure Priority List is Infrastructure Australia's guide to the priority infrastructure investments Australia requires to ensure a sustainable and prosperous future. The list drives national investment and is a key reference point for government at all levels.

Active transport access to Sydney CBD is identified as a priority for the near future (0-5 years) by Infrastructure Australia.

The proposal would support the initiative for an improved and dedicated cycleway and shared path network within a 10-kilometre radius of the CBD.

2.2.14 North District Plan

The Greater Sydney Region Plan divides the Sydney Region into five separate regions, including the North District in which North Sydney, and the proposal, is situated. The North District Plan is a district specific plan that breaks down the objectives of Greater Sydney Region plan into region specific goals and actions that can be carried out by local councils situated in the district and the NSW government on a manageable scale.

The proposal aligns with the plan in the following ways:

- Planning Priority N1: The proposal would maximise the use of existing infrastructure through the provision of a safe, modern and efficient connection to the Sydney Harbour Bridge Cycleway and safety upgrades to the existing Alfred Street South cycle path
- Planning Priority N3: The proposal provides greater accessibility to the Sydney Harbour Bridge Cycleway for a wider range of customers and improving liveability
- Planning Priority N4: The increased accessibility created by the Alfred Street South cycle path upgrades and the elevated linear ramp would promote active transport and support healthy lifestyles
- Planning Priority N6: The proposal would support renewing streets as great places through the improvements for safety for pedestrians, bike riders and other road users by removing conflict points, creating a 2.5-meter-wide separated shared use path along Alfred Street South with low-speed areas, as well as upgrading pedestrian crossings
- Planning Priority N12: Improving Sydney's connectivity to local centres by removing bottlenecks and queues created by the current stairs at the northern access to the Sydney Harbour Bridge Cycleway. The proposal would improve walking and cycling by creating a direct, safe and accessible connection from North Sydney and the Sydney Harbour Bridge Cycleway. The improvements to walking and cycling in the area would also support sustainability transport by encouraging and increasing walking and cycling. Increase the proportion of cycling trips and provide greater accessibility for a wider range of customers
- Planning Priority N21: The improvements to walking and cycling in the area would reduce carbon emissions by encouraging and increasing walking and cycling.

2.2.15 North Sydney Environmental Sustainability Strategy 2030

The North Sydney Environmental Sustainability Strategy 2030 sets targets to help North Sydney Council and the community to achieve their environmental goals and reduce the Council's environmental footprint. The strategy's themes and targets are aligned with the United Nations 2030 Sustainable Development Goals.

The proposal supports Goal 7 – Sustainable Transport which focuses on a shift to travel modes that produce less greenhouse gas emissions. Council adopted a Transport Strategy that aims to reduce private vehicle use by optimising walking, cycling, public transport and local deliveries.

2.2.16 North Sydney Integrated Cycling Strategy 2013 - 2023

North Sydney Council has created an Integrated Cycling Strategy to increase cycling as a sustainable mode of transport in the LGA, with the following goals:

- Delivers an accessible, safe and connected cycle network by 2020
- Make cycling an attractive choice for short trips within the LGA.
- Increase and diversify participation in cycling (people of all ages and abilities would view cycling as a safe, everyday transport option)

The Sydney Harbour Bridge to Cammeray route (Route 1) is identified as the most important route in North Sydney. It experiences high traffic volume, with Transport identifying a north-south connection through North Sydney as a high priority route of regional significance. The Integrated Cycling Strategy acknowledges that the step access to the Sydney Harbour Bridge is a barrier to cycling and notes that North Sydney Council will advocate for improved access to the Sydney Harbour Bridge Cycleway.

The proposal supports the attractiveness and effectiveness of the Sydney Harbour Bridge to Cammeray route and of cycling in the area more generally.

2.2.17 North Sydney Transport Strategy

The North Sydney Transport Strategy (North Sydney Council, 2017) builds on the directions, outcomes and strategies detailed in North Sydney's Community Strategic Plan and bridges the gap between the plan objectives and practical, everyday transport planning and management decision making.

The community feedback provides the foundation of the transport vision and implementation framework of the strategy which identifies walking and cycling as the top two transport priorities for North Sydney. The strategy has developed best practice principles for transport planning which includes Council's commitment to identifying and prioritizing improvements to walking and cycling infrastructure.

The proposal delivers North Sydney Council's stated aim of addressing the problem of the existing barriers to movement such as the 55-step access to the existing Sydney Harbour Bridge Cycleway that undermine the amenity, live-ability, walkability, lifestyle and travel choices of the North Sydney community.

2.2.18 North Sydney Vision 2040 Community Strategic Plan

The North Sydney Vision 2040 Community Strategic Plan sets the future direction for North Sydney's community. The plan outlines the community's future priorities and aspirations, and details strategies for achieving them.

Outcome 2.3 of the strategy encourages sustainable transport by improving road safety and prioritising walking and cycling. The proposal would contribute to this plan by improving walking and cycling infrastructure in Milsons Point by creating a more accessible and safer connection between the existing Alfred Street cycle path and the Sydney Harbour Bridge Cycleway.

2.2.19 North Sydney Local Strategic Planning Statement 2020

The North Sydney Local Strategic Planning Statement builds upon the values and aspirations for the future as detailed in the North Sydney Community Strategic Plan 2018-2028. It provides a 20 year vision for land use and planning within the North Sydney LGA. The Planning Statement is also guided by the North Sydney Integrated Cycling Strategy 2013, which supports the development of cycling projects that assist in improving safety, enjoyability and convenience of cycling as a sustainable transportation option for residents, workers and visitors.

The operation of the proposal would satisfy these goals as the elevated linear bike ramp and Alfred Street South cycle path would improve safety and accessibility and reduce existing bottlenecks.

2.3 Limitations of existing infrastructure

The existing cycleway from the northern end of the Sydney Harbour Bridge connects to the existing Milsons Point shared path and local bike network. The rolling average of weekday cycle trips over a ten-year period is just below 2,000. This figure is derived from publicly available data taken between 2009-2019 from counters on the Sydney Harbour Bridge Cycleway.

Around 25 per cent of bike trips take place in peak periods, with about 380 bike riders recorded in both the morning and evening peak.

Bike riders must dismount at Burton Street and carry their bikes up and down the existing 55 cycleway steps to continue on the cycleway, which creates a bottleneck to traffic flow

Burton Street is used primarily as a vehicle parking area, with allowances made for cycleway access through to Kirribilli. Burton Street is also used as a fortnightly weekend market space. This results in potential safety interactions between pedestrians, bike riders and vehicles.

Key limitations of the existing infrastructure include:

- Step access: The existing 55 steps to access the northern entry of the Sydney Harbour Bridge Cycleway are a barrier to safe and equitable access for riders. The steps are particularly a deterrent for less experienced bike riders and e-bike riders who may avoid the cycleway as it can be difficult to navigate with a heavier bike. The stairs are not easily accessible for all skill levels of bike riders and could be an obstacle for families and people living with a disability, as shown in Figure 2-1.
- Noncompliance with technical and safety standards: Existing infrastructure on Alfred Street South is outdated and does not comply with technical standards or the Transport modal hierarchy for walkers and riders. The existing pedestrian refuge crossing on Alfred Street South near Lavender Street requires an upgrade to meet current road safety standards
- Capacity limitations: The safety barrier located above the stairs only allows a single user at a time, creating a bottleneck where two-way flow is not possible to enter/exit the Sydney Harbour Bridge Cycleway.

Other considerations for safety and access on Alfred Street South include:

- Parked cars are on both sides of the street
- Buses travel in both directions
- A local shopping strip and restaurants on the western side of the street with outdoor dining
- Apartment entries and driveways
- Access to and from Burton Street carpark
- Car share spaces
- Timed on street parking on both sides with parking meters
- The existing shared path next to Bradfield Park north allows pedestrians and bike riders to mix
- No formal crossing for bike riders on Alfred Street South or Lavender Street.

Implementation of the proposal would:

- Eliminate the existing bottleneck and queues created by the current stairs and cater to increased cycling demand projected for the future
- Allow greater accessibility for a wider range of customers to use the existing cycleway by improving access for a greater number of customer groups, such as less skilled riders, families and people living with disabilities, which would be encouraged to use a more sustainable mode of transportation
- Improve connectivity between the Sydney CBD and the lower north shore by reducing the travel time between these places.

Figure 2-1: Existing step access to Sydney Harbour Bridge Cycleway (source: Consultation outcomes report, Sydney Harbour Bridge Cycleway Northern Access, Transport for NSW)

2.4 Proposal objectives and development criteria

The proposal is part of the broader Sydney Harbour Bridge Cycleway Access Program, through which Transport seeks to improve accessibility and capacity to the Sydney Harbour Bridge Cycleway.

The proposal focuses on clear aims to increase mode shift, reduce crashes and falls, protect heritage and open space, provide equitable access, and deliver design excellence.

2.4.1 Proposal objectives

The objectives of the proposal are to:

- Improve access to the Sydney Harbour Bridge Cycleway
- Achieve a high-quality urban design and heritage outcome
- Release latent capacity on the Sydney Harbour Bridge Cycleway
- Improve safety for bike riders, pedestrians and motorists
- Support future growth in bike riders travelling between the Sydney CBD and the lower north shore
- Provide a cycleway facility that sensitively fits in with the:
  - Context of the location including the potential visibility of the structure
  - Heritage values of the area
  - Architectural qualities of the Sydney Harbour Bridge.

To support these objectives, the proposal also aims to:

- Minimise impacts to the natural and built environment
- Minimise impacts to the community
- Deliver a cost-effective solution.

2.4.2 Development criteria

The development criteria for the proposal are to:

- Allow for convenient access to/from Sydney Harbour Bridge without the need for bike riders to dismount
- Create a safe, direct cycleway connection to the bike network and utilise latent capacity on the Sydney Harbour Bridge Cycleway
- Avoid conflict and obstruction to path of travel and provide safe separation between bike riders and other transport modes to allow bike riders to feel safe and confident using the cycleway
- Ensure all rider types and abilities can experience riding over the Sydney Harbour Bridge with a high level of customer satisfaction and comfort
- Maintain the function of events such as weekend markets and consider potential for new uses
- Enhance the public domain and minimise visual and physical clutter
- Enhance views and open space, and increase tree canopy
- Protect cultural heritage by protecting significant views, retaining cultural significance of Milsons Point Railway Station, avoid/minimise changes to fabric of precinct, avoid cumulative impacts on the Sydney Harbour Bridge
- Design with Country to acknowledge and respectfully incorporate Aboriginal cultural connections
- Design excellence to ensure a high quality design and process for the proposal's integration with the surrounding precinct
- Provide a solution that is compliant, constructable, maintainable, appropriately lit, allows Crime Prevention Through Environmental Design (CPTED), is sustainable, adequately meets capacity demands, allows access for emergency services and considers materiality.

2.4.3 Urban design objectives

Urban design objectives for the proposal include:

- Provide a safe and continuous cycle connection suitable for all riding abilities
- Maintain and respect the heritage significance
- Enhance the built and natural environment
- Deliver a high-quality, universally accessible public domain
- So far as practicable protect and enhance key spaces, places, views, vistas, civic and community destinations
- Improve the customer experience
- Preserve and enhance activity along adjacent streetscapes
- Develop a place-based design language and approach
- Deliver a multi-purpose, year-round, transit-oriented, activity precinct
- Ensure high design quality, constructability and value for money.

2.5 Alternatives and options considered

The proposal development processes for the Sydney Harbour Bridge Cycleway Northern Access proposal considered options for the northern Sydney Harbour Bridge connection and upgrades to Alfred Street South separately.

Investigation into options for improving the connectivity, safety and access between the Sydney Harbour Bridge Cycleway and Milsons Point date back as far as 1999. Many attempts to develop an alternative to the existing steps have been made over the years and 30 ramp options have been explored. The use of lifts, travelators and putting bikes back on the main deck of the Sydney Harbour Bridge have also been put forward as an alternative to a ramp solution.

The precinct integration works including the Alfred Street South cycle path was subject to a separate options assessment process. The cycle path builds on North Sydney Council's 2017 plans for a cycle route along Alfred Street South. Feedback was sought on both the Northern Sydney Harbour Bridge connection as well as the Alfred Street South cycle path in June 2021.

A timeline of the options development for the Northern Sydney Harbour Bridge connection is shown in Figure 2-2.

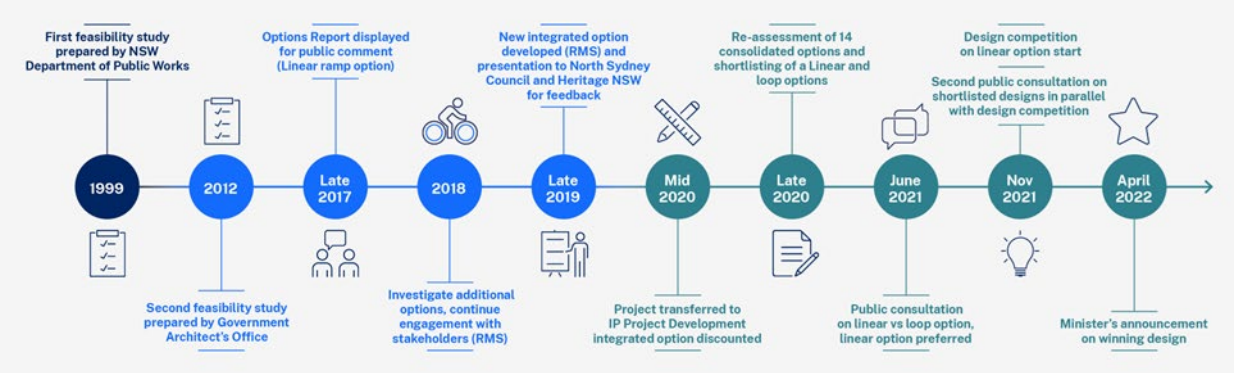


Figure 2-2: Northern Sydney Harbour Bridge connection - history of option development

2.5.1 Northern Sydney Harbour Bridge connection

Methodology for selection of the preferred option

In late 2020, Transport began a refresh of the proposal starting with an assessment of the need for intervention and alternative solutions. The end-to-end assessment process has several steps and used a series of workshops, informed by previously completed work, stakeholder feedback and further technical analysis. This assessment is depicted in Figure 2-3 and summarised in Table 2-1.

Table 2-1: Options assessment process

Stages of options assessment	Description
Strategic identification of proposal	High level review of proposal alternatives
Options identification	Long list of stairway alternative options identified
Multi-criteria assessment	Analysis against place, movement and heritage criteria was used to shortlist design options
Analysis of shortlisted options	Incorporation of stakeholder feedback and identification of opportunities for design refinement
Refinement and assessment	Assessment of two final shortlisted options (a linear and a loop option) including stakeholder workshops to identify the preferred option through community consultation
Design competition (preferred alignment selection)	Independent design review based on agreed framework and assessment criteria.

The assessment process was supported by evidence-based examination of the following matters:

- Modelling the current and projected capacity of the existing Sydney Harbour Bridge Cycleway assuming a growth in cycling to determine if it had the capacity to meet future demand
- Exploring the merits of moving the cycleway to the eastern side of the bridge

- Conducting high level investigations into whether it would be feasible to convert either Lane 1 or lane 8 of the bridge into a cycleway in the future
- Examining whether lifts and travellators would be a suitable replacement for the steps.

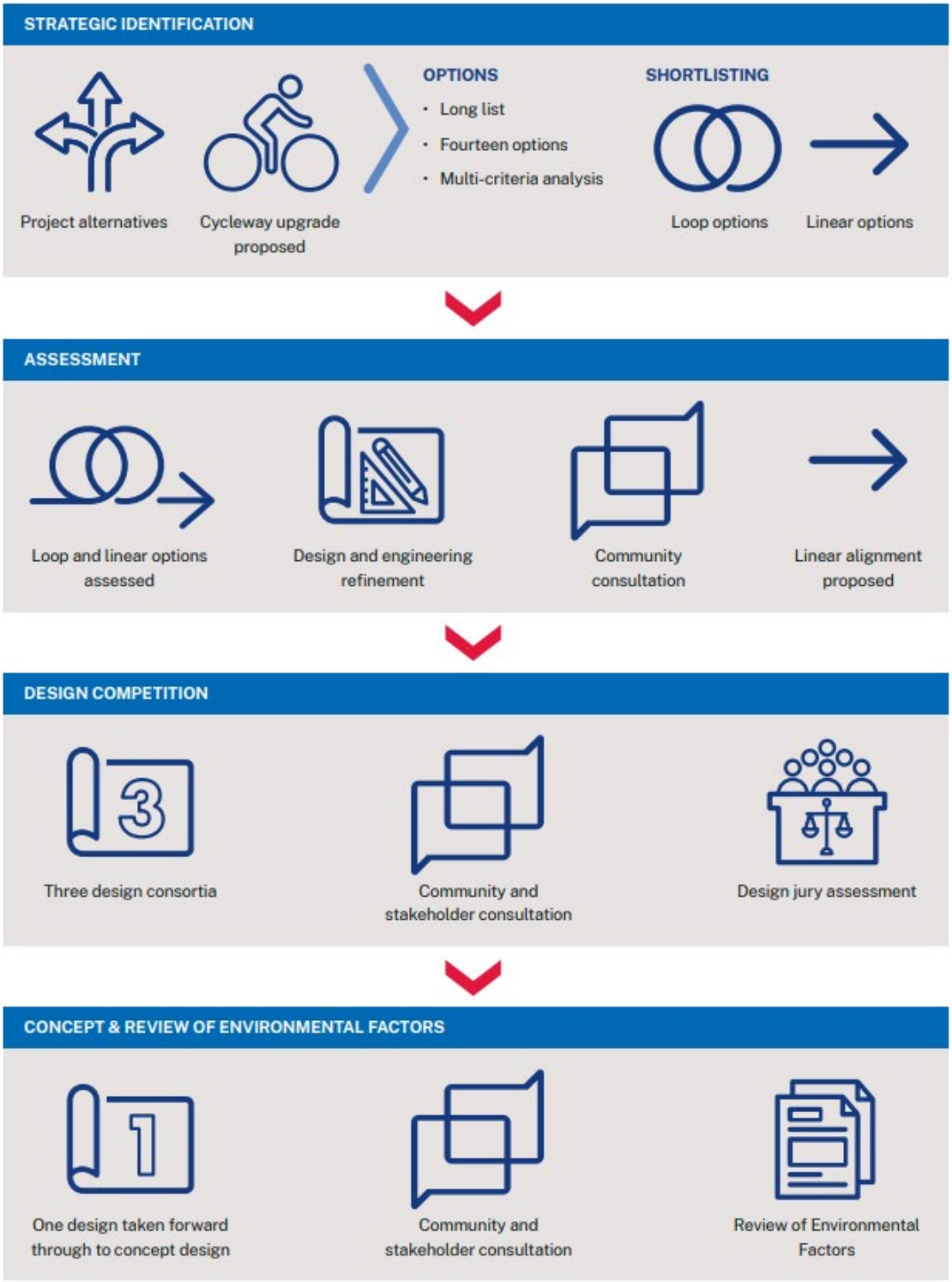


Figure 2-3: Options assessment process/history

Due to the interface with the Sydney Harbour Bridge, a strong commitment to design excellence has been incorporated into the development of the proposal and embedded into the options assessment process. Identification and development of options for assessment adopted an urban design-led approach that involved collaboration across a multi-disciplinary team and consultation with:

- The internal Transport's Design Review Panel
- Urban designers
- Road, bridge and structural engineers
- Architects
- Active transport specialists
- Heritage and adaptive reuse specialists
- Customer and user experience specialists
- Designing with Country specialists.

Strategic identification

A strategic identification of the need for the proposal, and an assessment of alternatives was carried out in the early 2000s with respect to connectivity, safety, capacity and infrastructure requirements associated with the following options:

- Upgrade the existing cycleway – north and south approaches
- Reallocation of traffic lane 1 of the Sydney Harbour Bridge for cycle use
- Reallocation of traffic lane 8 (eastern most lane) of the Sydney Harbour Bridge for cycle use
- Do nothing

The strategic assessment is summarised in Table 2-2. The outcome of the assessment identified that upgrading the existing cycleway approaches would be the best proposal alternative as summarised in Table 2-2 below.

Table 2-2: Strategic alignment options assessment summary

Option	Assessment
Upgrading existing cycleway – North and south approaches	This option would address immediate safety risks and inequality of access and meet the capacity requirements for at least 30 years
Conversion of lane 1 to cycleway	Discounted as lane 1 could only be used in tandem with the existing cycleway as the lane is not wide enough to allow for two-way flow of bike riders once appropriate safety measures are in place
Conversion of lane 8 to cycleway	Discounted as lane 8 is significantly higher than the adjacent Cumberland Street, making it more difficult to connect a cycleway on the eastern side of the Bridge to the street below. Also, there is poor connectivity from Cumberland Street to both Circular Quay and the western side of the city due to lack of east-west connecting streets

Options identification

An examination of previous studies and recent investigations identified a range of thirty ramp options for the northern connection. This pool of options was consolidated and refined to create a long list of 14 consolidated feasible options. The 14 consolidated options were grouped into four groups:

- Long north-south ramps: predominantly linear, aligning with the existing bridge wall with minor variations to options in both landing location and interface with the parapet of the Sydney Harbour Bridge Cycleway
- Looped compact ramps: ramps' geometry exhibiting multiple and varied radii to land south of Burton Street and located entirely within Bradfield Park Central
- Partly within the rail viaduct: using the airspace within the Burton Street and Fitzroy Street rail viaducts, ramp options provided step-free access via switchback geometry and tight radii
- Mechanical options: a set of travelators linking from the Sydney Harbour Bridge Cycleway, and landing south of Burton Street and an elevator option located immediately adjacent to the existing stairs.

The options assessed are shown in Figure 2-4.

Figure 2-4: Northern connection option assessed

A multi-criteria assessment was carried out to shortlist the 14 ramp options. The options were firstly assessed for minimum rideability requirements and/or their ability to meet capacity requirements based on the forecast demand and likely modes of operation to determine which options would be feasible bike ramps. Opportunities to modify the options to achieve compliance were also assessed and each option assigned a pass or fail. The feasible options were subsequently assessed against criteria to complete the assessment.

Most options were identified as too steep and/or having too tight curves, and failed the proposal's safety, capacity and equity of access objectives.

Of the 14 options, four ramp options were considered to satisfy the minimum rideability criteria, being two linear ramps that run north from the stairs (Options B & C in Figure 2-4) and two loop ramps that run south from the stairs (Options H & I in Figure 2-4).

The two mechanical options were also considered to provide access for heavy bikes, and older or less able bike riders. They would however, create a bottleneck which would increase queueing, slowing down the journey and presenting a significant long-term capacity constraint. The installation of three lifts with a capacity of six riders each would not be able to achieve 1000 bike riders in peak hour (the current upper capacity limit of the cycleway). The installation of three travelators could achieve the 1000 bike riders in peak hours but would still create compounding delays with bike riders having to dismount and stand still whilst on the travelator. Both options also still create substantial heritage and visual impacts to the Sydney Harbour Bridge and Bradfield Park. These options were discounted as they were unable to meet the capacity requirements and would negatively impact on the overall cycleway capacity.

Analysis of shortlisted options

A more detailed assessment of the four short listed options against the movement, heritage and place proposal objectives was undertaken. This assessment identified that Option C had an unacceptable heritage impact on the viaduct structure which cannot be resolved, and Option I had an unacceptable place impact, in that it would occupy most of the bowling greens. An assessment of the four options and the 'Do nothing' scenario against the proposal objectives is provided in Table 2-3.

Table 2-3: Analysis of shortlisted options against proposal objectives

Proposal objectives	Option B	Option C	Option H	Option I	Do nothing
Improve access to the Sydney Harbour Bridge Cycleway	✓	✓	✓	✓	X
Improve efficiency on the Sydney Harbour Bridge Cycleway	✓	✓	✓	✓	X
Improve safety for bike riders, pedestrians and motorists	✓	✓	O	O	X
Support future growth in bike riders travelling between the Sydney CBD and the lower north shore	✓	✓	✓	✓	X
Provide a cycleway facility that sensitively fits in with the:					
Context of the location including the potential visibility of the structure	O	X	✓	✓	✓
Heritage values of the area	O	X	O	O	✓
Architectural qualities of the Sydney Harbour Bridge	O	X	O	O	✓
To support these objectives, the proposal also aims to:					
Minimise impacts to the natural and built environment	O	X	O	X	✓
Minimise impacts to the community	O	X	O	X	✓
Deliver a cost-effective solution	✓	✓	O	O	X

Key: Alignment with proposal objectives

✓	Superior	O	Some	X	Limited / not feasible

The result of the detailed assessment was selection of two shortlisted options for further exploration and refinement:

- A north-south linear ramp offset from the Sydney Harbour Bridge approach wall (Option B)
- A looped ramp south of Burton Street (Option H).

These two shortlisted options were then refined to reflect past feedback received from Heritage NSW, Heritage Council, North Sydney Council, community groups and bicycle groups. Through this process the following aims were considered:

- Minimise loss of open space and tree removal
- Minimise impacts to the fabric of the Sydney Harbour Bridge values and fabric
- Reduce impacts to key views
- Meet the proposal's customer and rideability objectives.

As a result, a refined linear option and a refined loop were developed for further stakeholder engagement.

Refinement and assessment of options

The two refined options identified and placed on public display for community feedback and consultation were:

- Refined linear option: A linear ramp extending north above Milsons Point Station plaza (Figure 2-5)
- Refined loop option: A loop extending over the southern bowling green at Bradfield Park Central (see Figure 2-6).

Parallel option through Bradfield Park Central (linear)

The refined linear option presented a ramp with the alignment further from the Sydney Harbour Bridge viaduct and Milsons Point station entry than the design assessed in the multi-criteria analysis. The refined alignment avoided interface between the ramp piers and the viaduct footings, minimised the need for tree removal and retained passive recreation space in Bradfield Park.

Figure 2-5: Option 1: Linear ramp

Spiral option south of Burton Street (loop)

The refined loop option presented a double loop that required less impact to the existing open space and sought to minimise obstructing views of the Sydney Harbour Bridge approach. A full concrete structure with six cantilevered columns was selected as it presented better value than alternative solutions. The refined option reduced the overall footprint of the structure and steepness of the ramp by offering landings and flatter sections for recovery. Radii for ease of rideability and compliance with best practice were proposed to maximise safety compared to the design assessed in the multi-criteria analysis. Impacts to public space were minimised by placing the minimum number of structural columns inside of the loops, which also reduced visual impacts and maximised views through and from the structure. Heritage impacts were minimised by setting the ramp back from the Sydney Harbour Bridge.

Figure 2-6: Option 2: Looped ramp

Community and stakeholder consultation

Transport met regularly with key stakeholders between July 2020 and May 2021, in the period leading up to public consultation on two shortlisted options. Key stakeholders included Heritage NSW, North Sydney Council, community groups and bicycle groups.

The above two ramp options were on public display commencing in June 2021 for three weeks. Community consultation was aimed at encouraging participants to either complete an online survey or provide a submission via other methods. Transport also undertook one on one consultation with impacted stakeholders. Refer to Chapter 5 for further discussion on community consultation.

The community and stakeholder feedback revealed a preference for the linear ramp as it would manage bike rider and pedestrian conflict better, by minimising cycle interactions on Burton Street and around Milsons Point Station and is a smaller, less bulky structure than the loop ramp. Transport presented the preferred option to the Heritage Council Approvals Committee who voiced support for the linear ramp and the design competition process.

Design competition (preferred alignment selection)

In response to the consultation and assessment process, Transport decided to proceed with the linear ramp option and a competitive design competition. Three linear options were developed through the competition process. Through the design competition, three design teams were appointed to explore solutions that:

- Are capable of achieving design excellence
- Explore architectural solutions to realise a 'light' and elegant sculptural design that complements the open space and heritage setting
- Achieves a connection to Country using site specific totems and themes
- Retains key views of the Bridge and minimises impacts to public open space and movement impact on the public domain.

The design excellence approach was developed to optimise the preferred option and ensure the highest standard of architectural, urban and landscape design for the proposal in a highly sensitive heritage setting. The process included:

- The setting of design excellence expectations
- A competitive design selection process
- Ongoing expert design review.

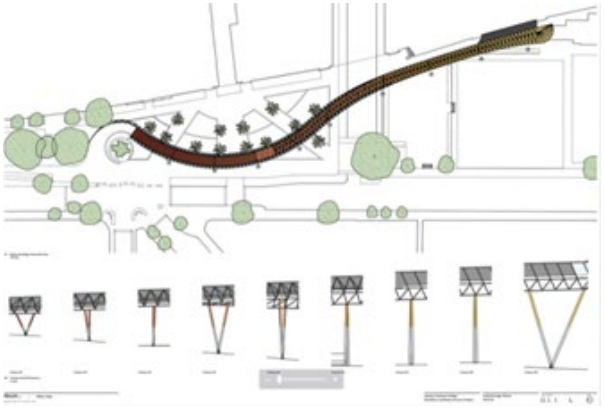
The design excellence approach adopted for the proposal includes the following requirements:

- Sensitively respond to the heritage values articulated in the Statements of Significance for the National Heritage Listing and the State Heritage Listing of the Sydney Harbour Bridge, and the State Heritage Listing of the Milsons Point Railway Station Group
- Embed Aboriginal design and cultural expression, revealing and celebrating the deep, rich history of Aboriginal people and stories relevant to this Country in all aspects of the proposal
- Be consistent with the Sydney Harbour Bridge Conservation Management Plan and other relevant heritage management documents (such as The Burra Charter, Design in Context, Better Design for Heritage etc.) applicable policies and proposal documents
- Assess what collateral benefits may be possible through integration and/ or complementary forms
- Be capable of achieving design excellence in every aspect and be consistent with the Project Design Excellence Strategy
- Be innovative, creative, site-responsive, refined, elegant, slender and beautiful
- Minimise physical and visual impacts
- Embed measurable sustainability initiatives and benefits
- Minimise impacts on Milsons Point station forecourt and Bradfield Park public open spaces, trees and pedestrian movement, and 'touch lightly' on the landscape
- Integrate seamlessly with the public domain, proposed Alfred Street cycleway and desired landscape character including the Bradfield Park Masterplan
- Achieve the proposal objectives (as referred to in Section 2.4.1), to:
  - Improve cycling mode share
  - Reduce the number of safety incidents on the Sydney Harbour Bridge Cycleway
  - Respect heritage and open space amenities
  - Provide equity of access.

Competitive design process

Transport carried out a competitive design process to find a leading design team of the highest calibre to refine the linear concept and create a ramp that can be truly valued and celebrated. Three design teams were selected to prepare initial design plans for the Northern Sydney Harbour Bridge connection ramp in accordance with the Design Excellence Strategy. A brief description of each design is provided in Table 2-4.

Table 2-4: Three design options

Design team	Design plan	Description
Aspect Studios		• A 210-metre ramp with an alignment which closely mirrors the sweep of the bridge and approach viaduct • From the landing at Bradfield Park the cycleway would be a raised steel deck, supported by columns that are strategically placed within Bradfield Park to avoid pedestrian desire-lines • A lookout is included at the southern connection of the cycleway with the Sydney Harbour Bridge.
REALM Studios		• A 150-metre ramp that swings further towards Alfred Street South, opening up a larger space between the Sydney Harbour Bridge and the cycleway • The cycleway within Bradfield Park is a formed sandstone spiral wall that meets the ramp as it comes to ground, widening out and becoming part of the larger shared space • The suspended cycleway structure is supported primarily on steel columns and made up of three inter-related structural sections, each with a distinct structural system, being: balustrade truss, hybrid transition structure and deck truss.

Design team	Design plan	Description
Civille		• A 150-metre ramp that maintains a three-metre separation between the cycleway and the Sydney Harbour Bridge for the majority of the alignment. • The ramp commences with a horizontal loop away from Alfred Street before looping back towards Alfred Street in front of Milsons Point station and looping back to connect with the Sydney Harbour Bridge. • The landing of the cycleway ramp is at the juncture of Bradfield Park North and Bradfield Plaza and incorporates a water feature under the ramp landing and a shady seating area next to the water feature.

The design selection process comprised three steps including community feedback, Design Jury assessment and tender assessment committee consideration.

Community feedback

Community feedback was sought on the three initial designs between December 2021 and January 2022. Respondents were able to leave comment and rate the designs against the following criteria:

1. Acknowledgement of Country
2. Respect for the Sydney Harbour Bridge
3. Respect for Milsons Point Railway Station
4. Integration with Bradfield Park
5. Quality of design
6. Rideability.

Feedback was received via the on-line survey and map as well as via emails. The feedback showed a strong community preference for the Aspect design. The design was considered the least visually intrusive response to the heritage location and open space, and the most rideable of the three designs.

Further details of consultation are addressed in Section 5.

Design jury assessment

The three initial designs were also subject to expert reviews by Transport technical experts and external technical advisors and comparative assessment reports were produced for each design with regard to:

- Connecting with Country
- Active transport and open space
- Technical performance (Engineering, operation and maintenance)
- High-level costing.

A jury comprising a panel of five design experts and chaired by the NSW Government Architect reviewed the initial designs. Several observers were invited to attend the jury deliberations, including a representative from North Sydney Council and representatives from Heritage Council NSW. The jury received all design material from each team, comparative assessment

reports by subject matter experts on each design, and qualitative feedback from the community consultation. Heritage Council NSW and North Sydney Council also presented their views on the designs to the jury. The jury attended a guided site tour and heard from each design team on their proposal.

Following the submission of the final competitive design schemes, a technical assessment and compliance review of the competitors' submissions were undertaken by the technical advisors.

Each competitor presented their scheme to the Jury explaining their approach to the site, design concept, compliance with planning controls and the design, heritage, planning and Connecting with Country objectives of the competition brief, as well as the benefits of their respective schemes.

The design schemes presented by the three competitors were analysed and evaluated by the jury with a focus on design quality and the planning, design and objectives of the brief. An assessment of the design merits and areas for further development were also identified and discussed during the evaluation process. The jury evaluation was extended to a second session the following week, which included another site visit, to conclude deliberations.

An issue common to all schemes was the question of future use of the existing cycle-only stairway connecting to the Sydney Harbour Bridge Cycleway. The jury recommended these stairs be retained for cycling only to cater for the 20 per cent of bike riders travelling eastwards from this junction point in the network, and as a purposeful use of retained heritage. The evaluation comments for each scheme assumed this as the end-state condition.

The jury determined the Aspect and Civille designs responded the most successfully to the design, planning and heritage objectives and, with further development, would be the most capable of achieving design excellence. Therefore, the jury recommended the two shortlisted designs for further consideration by Transport.

Transport's Tender assessment committee consideration

In determining the winning design the Transport tender assessment committee took into consideration the advice from the jury, as well as the community responses to the competition proposals. In addition, the tender assessment committee based their determination on the evaluation criteria including design quality and deliverability. The tender assessment committee's evaluation was reviewed by the Transport's Tender Review Panel, which confirmed that the designs had been appropriately assessed in accordance with Transport policy and confirmed the winning design as the preferred option.

The preferred option would satisfy the proposal's objectives. The new ramp would improve access to the Sydney Harbour Bridge Cycleway and safety for bike riders, pedestrians and motorists. The removal of the bottleneck created by the existing stair access would also release latent capacity on the Sydney Harbour Bridge Cycleway. Future growth in bike riders travelling between the Sydney CBD and the lower north shore would be supported through a design that clearly caters for bike riders of all skill levels and provides good connections to other parts of the North Sydney bike network. Finally, the design has been developed to fit into the heritage precinct as sensitively as possible, through the use of sympathetic materials and sensitive design.

2.5.2 Alfred Street South cycle path

Methodology for selection of preferred option

The methodology for selection of the preferred option for the Alfred Street South cycle path, involved preliminary work by North Sydney Council that was further developed by Transport.

North Sydney Council

North Sydney Council commissioned a report in 2017/2018 to document the findings of the concept design phase for the North Shore Cycleway – Pacific Highway section, which included consideration of a cycleway along Alfred Street South, between the intersection with Lavender Street and Milsons Point station.

As part of the concept design development, North Sydney Council held a Public Design Workshop to identify opportunities and constraints regarding transport and public domain in the assessment area. The workshop identified that 80 per cent of participants favoured a separated cycling facility along Alfred Street South, of which 60 per cent favoured a two-way separated cycleway (to ensure safety of pedestrians and bike riders and efficient use of space). Key concerns raised were:

- The construction of a cycleway may require removal of parking spaces
- The cycleway may impact Bradfield Park
- Bike riders on the cycleway may conflict with pedestrians in the busy areas of Bradfield Park and Milsons Point station.

Several concept designs were developed to address the safety concerns and conflicts between pedestrians and bike riders along Alfred Street South. A multi-criteria analysis was undertaken by North Sydney Council to assess the design.

Transport

Building on the work undertaken by North Sydney Council, in 2021 Transport developed seven potential options for the Alfred Street South cycle path, and carried out an assessment of the options. The assessment of the cycleway options took into consideration:

- Safe movement by all road users, speeds, lane and path widths
- Existing and forecast road user and transport customer numbers
- Safe access and egress to residences, businesses and infrastructure
- User desire lines
- Open space and adjacent uses
- Kerbside parking demand (accessible spaces, loading zones, ride share, car share and private vehicle)
- Wayfinding
- Amenity (canopy cover for walkers, materials, surfaces, lighting etc.).

Identified options – Alfred Street South

In 2017/2018, North Sydney Council developed three concept designs for the Alfred Street South section of the cycleway which are summarised in Table 2-5.

Table 2-5: Alfred Street South identified options

Design option	Concept design	Description
Optimal		The roundabout at the intersection of Alfred Street South and Lavender Street would be passed on the eastern side with a two-way cycleway. A new pedestrian and cycleway crossing would be located on the south side of the roundabout. To optimise the design and alignment of the cycleway, the roundabout would be relocated to the east and to ensure road safety, the slip lane from the Warringah Freeway would be removed. A new two-way cycle path would be constructed along Alfred Street South on the eastern side of the road
Basic		The roundabout at the intersection of Alfred Street South and Lavender Street would be passed on the eastern side via the existing pedestrian crossing on Lavender Street. A new pedestrian and cycleway crossing would be located on the south side of the roundabout, tying into new shared paths along Lavender Street. The shared path along Alfred Street South would be widened
Intermediate		The roundabout at the intersection of Alfred Street South and Lavender Street would be passed on the eastern side with a two-way cycleway. To optimise the design and alignment of the cycleway, the roundabout would be relocated to the east. A new pedestrian and cycleway crossing would be located 50m south of the roundabout, to increase safe crossing facilities while maintaining the slip lane from the Warringah Freeway. A new two-way cycleway would be constructed along Alfred Street South on the eastern side of the road

Note – Figures have been sourced from North Shore Cycleway, North Sydney Council, December 2018

The intermediate design was identified as the preferred option as it would lead to improved amenity for pedestrians and bike riders, a more attractive urban environment and negligible impact to existing road traffic operation.

In 2021, Transport carried out an assessment of seven potential options for a cycle path on Alfred Street South that separates bike riders from pedestrians and traffic. The options built upon the work carried out by North Sydney Council in 2017 /2018. The outcomes of the assessment are summarised in Table 2-6.

Table 2-6: Assessment of options for cycle path on Alfred Street South

Option	Description	Pros	Cons
Option 1: Two-way - eastern side - next to parking	A two-way cycle path located on the eastern side of Alfred Street South, between the parking lane and the footpath, from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The path would then continue on the western side of Alfred Street, turning left before crossing Lavender Street. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle	• Western footpath retained • Western trees retained • Safe east to west crossing for pedestrian and bike riders south of the roundabout • Continuous two-way cycle path from Burton Street to Middlemiss • Bradfield Park remain as is • No loss of trees or green open space in Bradfield Park • Existing shared path converted to pedestrians only footpath • Opportunity for additional street tree planting near round about and outside Station, in new planted median • Kerb side parking on both sides of streets retained in most part • Loading zones, car share zones and accessible parking zones retained	• Bus stop relocations on Burton Street • Vehicle passengers might use cycle path for loading/unloading • Removal of some on street parking • Greater potential for conflicts with pedestrians in Alfred Street crossing the cycleway to/ from the train station
Option 2: Two-way - eastern side - next to open space	A two-way cycle path located on the eastern side of Alfred Street South, between the footpath and Bradfield Park, from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The path would then continue on the western side of Alfred Street, turning left before crossing Lavender Street. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	• Western footpath retained • Western trees retained • Safe east to west crossing for pedestrian and bike riders south of the roundabout • Reduced potential for conflicts as most pedestrians in Alfred Street do not need to cross the cycleway to/ from the train station • Continuous two-way cycle path from Burton Street to Middlemiss • Bradfield Park remain as is	• Reduced eastern footpath width • Bus stop relocations on Burton Street • Footpath disconnected from the park/open space • Removal of some on street parking spaces

Option	Description	Pros	Cons
		• No loss of trees or green open space in Bradfield Park • Existing shared path converted to pedestrians only footpath • Opportunity for additional street tree planting near round about and outside Station, in new planted median • Vehicle passengers to use footpath for loading/unloading	
Option 3: One way - next to parking	A single direction cycle path located on each side of Alfred Street South, located between the footpath and parking lanes. The western footpath would be modified to be consistently 1.8 metres wide. The single direction cycle path would extend from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The path would then continue as a two-way cycle path on the western side of Alfred Street, turning left before crossing Lavender Street. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	• Safe east to west crossing for pedestrian and bike riders south of the roundabout • Continuous cycle path from Burton Street to Middlemiss • Bradfield Park remain as is • No loss of trees or green open space in Bradfield Park • Existing shared path converted to pedestrians only footpath • Opportunity for additional street tree planting near round about and outside Station, in new planted median	• Western footpath to be adjusted • Western trees to be removed • Reduced eastern footpath width • Potential decrease of western footpath width • Bus stop relocations on Burton Street • Cycle path to intersect with relocated bus stop • Users traveling north from proposed ramp to backtrack to use signalised crossing • Vehicle passengers might use cycle path for loading/unloading • Removal of some on street parking spaces
Option 4: One way - next to open space (eastern side)	A single direction cycle path located on each side of Alfred Street South. On the eastern side the cycle path would be located between the footpath and Bradfield Park and on the western side the cycle path would be located between the footpath and parking lane. The western footpath would be modified to be consistently 1.8 metres wide. The single direction cycle path would extend from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The path would then continue as a two-way cycle path on the western side of Alfred Street, turning left before crossing Lavender Street.	• Safe east to west crossing for pedestrian and bike riders south of the roundabout • Continuous cycle path from Burton Street to Middlemiss • Bradfield Park remain as is • No loss of trees or green open space in Bradfield Park • Existing shared path converted to pedestrians only footpath • Opportunity for additional street tree planting near round about and outside	• Western footpath to be adjusted • Western trees to be removed • Reduced eastern footpath width • Potential decrease of western footpath width • Bus stop relocations on Burton Street • Cycle path to intersect with relocated bus stop • Footpath disconnected from the park/open space

Option	Description	Pros	Cons
	A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	Station, in new planted median • Vehicle passengers to use footpath for loading/unloading	• Users traveling north from proposed ramp to backtrack to use signalised crossing • Removal of some on street parking spaces
Option 5: One way - next to open space (and western kerb as is)	A single direction cycle path located on each side of Alfred Street South. On the eastern side the cycle path would be located between the footpath and Bradfield Park and the footpath adjusted to be consistently 1.8 metres in width. On the western side the cycle path would be located between the footpath and parking lane. The western footpath would remain unmodified. The single direction cycle path would extend from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The path would then continue as a two-way cycle path on the western side of Alfred Street, turning left before crossing Lavender Street. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	• Western footpath retained • Western trees retained • Safe east to west crossing for pedestrian and bike riders south of the roundabout • Continuous cycle path from Burton Street to Middlemiss • Opportunity for additional street tree planting near round about and outside Station, in new planted median • Vehicle passengers to use footpath for loading/unloading • Existing shared path converted to pedestrians only footpath	• Reduction to Bradfield Park green open space • Reduced eastern footpath width • Bus stop relocations on Burton Street • Cycle path to intersect with relocated bus stop • Footpath disconnected from the park/open space • Users traveling north from proposed ramp to backtrack to use signalised crossing • Removal of some on street parking spaces
Option 6: Shared path - eastern side	A shared path on the eastern side of Alfred Street South, located between Bradfield Park and the parking lane. The shared path would extend from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street. The shared path would then continue on the western side of Alfred Street, turning left before crossing Lavender Street. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	• Western footpath retained • Western trees retained • Safe east to west crossing for pedestrian and bike riders south of the roundabout • Bradfield Park remain as is • No loss of trees or green open space in Bradfield Park • Vehicle passengers to use shared path for loading/ unloading	• Long term requirement for separation of cyclists and pedestrians (by about 2036) based on forecast demand) • Removal of some on street parking spaces
Option 7: Two-way - western side	A two-way cycle path located on the western side of Alfred Street South, between the parking lane and the footpath, from adjacent to the front of Milsons Point station, turning left onto Lavender Street before crossing	• Western footpath retained • Western trees retained • Bradfield Park to retain as is	• Decrease of eastern footpath width • Bus stop relocations on Burton Street

Option	Description	Pros	Cons
	Lavender Street. A section of two-way cycle path would also be constructed on the eastern side of Alfred Street South, in front of Milsons Point station and connecting to the new bike ramp. A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.	• Vehicle passengers to use shared path for loading/ unloading	• Cycle path to intersect with relocated bus stop • Users traveling north from proposed ramp to backtrack to use signalised crossing • Increased conflicts between shoppers, apartment residents, loading zones, accessible parking users, side streets and driveways.

As a result of the assessment the following options were discounted:

- One-way cycle paths (Options 3, 4 and 5): these options were discounted as they would require the removal of trees and the reduction of the footpath width on the west side of Alfred Street South.
- Two-way cycle path on the west side of Alfred Street South (Option 7): this option was discounted due to the potential conflicts of bike riders with traffic entering and exiting side streets and driveways along Alfred Street South.
- Shared paths (Option 6): These options would be sufficient for the short term but would need to be upgraded in the future to a separated arrangement to accommodate longer term growth in cycling, and Transport' focused on developing an optimum long term solution.

  The two-way cycle path on the eastern side of Alfred Street South (Options 1 and 2) were identified as the preferred options, to be taken forward for further assessment and design refinement.

In June 2021, community feedback was sought on early plans for a separated two-way cycle path along Alfred Street South, proposed for either ramp design option, and a shared zone for bikes and pedestrians at Burton Street, which would be delivered if the loop were to go ahead (see Figure 2-7). The preferred option would run along the eastern side of Alfred Street South from Burton Street, past the Milsons Point station and base of the new bike ramp, to a new crossing on Alfred Street South. The path would then continue on the western side of Alfred Street, turning left before crossing Lavender Street.

A shared path on the north side of Lavender Street would join the existing cycle path on Middlemiss Street. On-road riders would still be able to cross the Lavender Street roundabout to reach the Middlemiss Street cycle path.

The cycle path extended to Burton Street for the benefit of the 20 per cent of bike riders who travel east towards Kirribilli.

Figure 2-7: Alfred Street South cycle path

Preferred option

In December 2021, Transport invited community and stakeholder feedback on the updated plans for a two-way, separated cycle path along Alfred Street South. Feedback results indicated support for separating bikes and pedestrians along Alfred Street South. However, there were concerns about the loss of on-street parking and the safety of a proposed shared path on the west of Alfred Street South near the Lavender Street roundabout. There were also suggestions for the cycle path to be one-way in the line of traffic flow and for a proposed zebra crossing to be brought further south along Alfred Street South.

Reallocating road space to encourage a much-needed mode shift from cars to bikes often means making a trade-off with car parking. About 15 parking spaces would be permanently lost as a result of the proposal, which has been deemed necessary to facilitate the safe separation of bikes and pedestrians.

Continuing the cycle path all the way to Lavender Street on the east side of Alfred Street South would bring it into direct conflict with the Sydney Harbour Bridge slip road. This slip road cannot be closed as it is a primary northbound connection to Milsons Point from the Sydney Harbour Bridge.

The Alfred Street South crossing needs to avoid the slip road that merges from Lane 1 of the Harbour Bridge to Alfred Street South. Bringing the crossing further south would have the effect of extending the cycle path on the western side of the road. This would create additional conflict points with driveways and result in more parking spots being removed. Transport have tried to keep the cycle path on the eastern side as much as possible for these reasons.

2.6 Alignment with sustainability objectives

Transport is committed to delivering transport services, projects, operations and programs in a manner that balances economic, environmental and social issues to ensure a sustainable transport system in NSW.

Through Future Transport Strategy– Our vision for NSW and the Transport's Environment and Sustainability Policy 2020, Transport is committed to ensuring a coordinated approach to delivering the NSW Government's environmental and sustainability agenda across the transport cluster.

The Transport Sustainability Plan 2021 brings together all aspects of sustainability and provides an implementation framework to deliver on eight sustainability focus areas in order to meet the vision of "A NSW where every journey is people and planet positive". Transport projects and activities should seek to align with the eight focus areas from this Plan:

- Respond to climate change
- Protect and enhance biodiversity
- Improve environmental outcomes
- Procure responsibly
- Partner with communities
- Respect culture and heritage
- Align spend and impact
- Empower customers to make sustainable choices.

The Sydney Harbour Bridge Cycleway Northern Access Sustainability Strategic Management Plan (SSMP) (Transport for NSW, 2021b) has been prepared to provide a framework for identifying and managing sustainability risks, impacts and opportunities associated with the proposal. It aligns with Transport's sustainability policies and provides the management approach in accordance with legislative and approval requirements.

Table 2-7 outlines the sustainability objectives, as per the SSMP and the anticipated performance of the proposal against these based on the current level of design development.

Table 2-7: Proposal alignment with sustainability objectives

Sustainability objective	Anticipated proposal performance
Environmental protection	The proposal has been refined to minimise the impacts on the environment especially on open space, biodiversity and heritage values. The proposal has been designed to include best practice sustainability measures including material selection, potential water management and potential energy generation.
Energy and carbon	Careful consideration has been given to the choice of materials and their durability over the life span of the proposal. Low carbon materials would be selected, where possible. The use of precast columns and foundations

Sustainability objective	Anticipated proposal performance
	would also reduce the embodied carbon associated with construction.
Resilience	The proposal has taken into consideration the potential effects of climate change to ensure the exposure to climate change risks is minimised.
Sustainable procurement	Sustainable procurement requirements including efficient and cost-effective transport options and responsible supply chains would be included in supply chain assessments.
Whole of life	The proposal has considered future costs across the asset lifecycle including design life, durability and low maintenance.
Social	The proposal ensures the cultural heritage values of the Sydney Harbour Bridge, Milsons Point Station and forecourt are preserved and enhanced. The proposal would also enhance the accessibility and safety of the existing cycleway thereby strengthen its social value.
Leadership, awareness and communication	Transport has endeavoured to communicate openly, responsively and empathically with members of the community and key stakeholders through the duration of the proposal. The proposal has taken into consideration community feedback.

2.7 Design refinements

The primary aim in refining the design is to have minimal intrusion on views to the Sydney Harbour Bridge for park users, residents, commuters and visitors, while maintaining safety. Key changes to the design are discussed Table 2-8 with key features outlined in Section 3.

Table 2-8: Summary of design refinement

Design element	Design refinement
Bike ramp – viaduct offset	The bike ramp's alignment has been generally matched to that of the Sydney Harbour Bridge viaduct, such that infrastructure and movement are combined in a more simple, complementary and intuitive manner. This leaves the park open and uncluttered. The ramp's offset from the viaduct varies slightly along its length in response to varying design and site constraints across the proposal site. South of the Milsons Point station entry, the ramp generally adopts a three-metre offset from the viaduct in order to prevent the need for throw screens to the adjacent railway corridor. North of the station entry, this offset gradually tapers from three metres to 1.5 metres in order to reduce impacts and encroachment on Bradfield Park while maintaining required offsets for viaduct maintenance.
Bike ramp – balustrade	High quality balustrading along the length of the ramp has been incorporated in the concept design. The design of the balustrade would aim to minimise visual impact. The balustrade would incorporate lighting.
Bridge connection	The proposal includes the removal of approximately 8.4 metres of viaduct parapet to allow for the new cycleway ramp to connect to the existing Sydney Harbour Bridge Cycleway. The steel balustrade would now run all the way to the parapet. An 'island' would be provided in the middle of the connection (over the joint) to separate cyclists heading up and down the ramp and accessing the rest area. This dimension allows for safe passage of cyclists with due consideration for sight lines and turning movements, while reducing impacts to the heritage structure as much as practical.
Station entry arc	The bike ramp geometry adjusts with deference to the heritage of Milsons Point Station entry. The extent of the curve carefully traces the powerful park geometry on the ground plane. In doing so, the cycleway frames the access to Milsons Point Station and its forecourt, and subtly slows cyclists as they descend towards Bradfield Park North. The cycleway flattens out over the heritage awning to create an address which when viewed from Alfred Street South respects the established datums of the approach viaduct. This flat and curved section of ramp would facilitate both an easier journey for cyclists riding up the ramp in the southbound direction, as well as reducing speeds of cyclists travelling down the ramp in the northbound direction.

Design element	Design refinement
Bradfield Park North Landing	The proposal seeks to reduce impacts on the heritage park setting as much as practical, while providing a safe pedestrian and cyclist environment and embracing Country-led design opportunities. The proposal meets this objective by landing the cycleway close to the existing viaduct, set away from the eastern edge of Alfred Street South. A gathering space has been retained to provide space for pedestrians and park users to meet and congregate. Cyclists and Station Forecourt pedestrians are clearly separated wherever possible to reduce conflicts. The bike ramp landing in Bradfield Park North has been shortened by approximately 50 metres and would avoid impacts on all significant trees. This change would result in a very minor increase in travel time of approximately 20 seconds for the 20 per cent of cyclists traveling back south towards Burton Street (travelling at a comfortable cycling speed of 10 kilometres per hour).
Station Forecourt arc	A minor reconfiguration of the forecourt's pathways and garden beds next to the Sydney Harbour Bridge viaduct is proposed. The existing planting next to the viaduct would be removed, increasing the width of pavement to provide a footpath next to the base of the viaduct. This would return the alignment of the paths to their original location and also ensure the pathway is open to the sky, which would provide a pleasant pedestrian experience. The existing trees and plaza geometry would be retained. New pavement features, such as light and dark pavement zones and heritage stone inlays, would be incorporated with respect to the existing geometry to provide a seamless extension of existing elements.
Alfred Street South	South of the cycleway ramp's landing in Bradfield Park North, the existing shared path to Burton Street would be retained. Widths to adjacent travel and parking lanes would be reduced and the kerb realigned to allow the shared path to be widened to provide more space for cyclists and pedestrians without losing any green space. Between the bike ramp's landing in Bradfield Park North and the new pedestrian and bicycle crossing of Alfred Street South, the existing parking and travel lanes on Alfred Street South would be narrowed. This facilitates the relocation of the kerb on the eastern side of Alfred Street South, moving its alignment slightly west to create space for construction of the new footpath and cycleway. Between the new crossing and Lavender Street roundabout, north of the new pedestrian and bicycle crossing of Alfred Street South, a new separated two-way cycle path is proposed on the western side of Alfred Street South, generally constructed to the east of the existing kerb alignment so as to minimise encroachment.
Lavender Street roundabout	The existing pedestrian crossing on the western leg of the roundabout, crossing north-south across Lavender Street, would include provision for a cycle crossing of the street. The crossing would be located as close as possible to the roundabout to best address pedestrian and cyclist desire lines. Due to space constraints on the northern side of Lavender Street, the separated walking and cycling facility reverts to a shared path on the northern side of the roundabout. Minor adjustments to the design and location of the roundabout have been implemented to maximise available space in this location. A new continuous footpath treatment would be included on Middlemiss Street at its intersection with the Lavender Street roundabout. This would prioritise east-west pedestrian movement and a more intuitive connection for cyclists between the Lavender Street shared path and Middlemiss Street.

3. Description of the proposal

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

3.1 The proposal

Transport proposes to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection would interface with a new cycle path along Alfred Street South. The proposal would be located to the west of the Sydney Harbour Bridge northern approach, in Milsons Point as shown in Figure 1-2.

The elevated linear bike ramp would be three metres wide and extend 200 metres from Bradfield Park North, near Burton Street, and interface with the Sydney Harbour Bridge Cycleway. The landing would be located within Bradfield Park North, interfacing with the Alfred Street South cycle path and pedestrian upgrade. The ramp would be supported by eight pre-cast columns, ranging from 600 millimetres to 900 millimetres in diameter. The columns have been sited to minimise disruption to the existing sight lines, pathways and planted areas of Bradfield Park. The locations of the columns are shown in Figure 3-2.

From the landing, the ramp would extend south, passing over the Milsons Point Station entry plaza and Burton Street, following the alignment of the Sydney Harbour Bridge northern approach. The ramp would connect with the Sydney Harbour Bridge Cycleway above Bradfield Park Central, south of the existing step access.

The Alfred Street South cycle path and pedestrian upgrade would consist of a 2.5-metre-wide two-way path on the east side of Alfred Street South between Burton Street and the new street crossing around 110 Alfred Street South. The cycle path would then cross to the west side of the Alfred Street South and continue north to the upgraded pedestrian crossing on Lavender Street and a low speed shared path on the north side of Lavender Street. The cycle path would then interface with the existing bike network.

A summary of the key features of the proposal is provided in Table 3-1. More detailed design and construction methodology descriptions is provided in Section 3.3. The key features are shown on Figure 3-1.

Table 3-1: Proposal summary table

Proposal element	Summary	Figure/Table reference
Operations		
Description	The proposal includes upgrading the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the bike network in Milsons Point. The cycleway connection includes an elevated linear bike ramp connection to the Sydney Harbour Bridge and a new cycle path along Alfred Street South.	Figure 1-2
Operational footprint	The elevated linear bike ramp would be located within Bradfield Park North and Central. The cycle path would be located on Alfred Street South, between Burton Street and Lavender Street. It would then join the existing bike network at Middlemiss Street.	Figure 3-1
Linear bike ramp	The linear bike ramp includes these key design features: • Country-inspired ramp deck • Columns • Balustrading • Connection to the Sydney Harbour Bridge • Rest area • Gathering place at the ramp landing informed by Design with Country principles.	Figure 3-2
Alfred Street South cycle path	The Alfred Street South cycle path would include these key design features:	Figure 3-3

Proposal element	Summary	Figure/Table reference
	• Separated cycle path • Pedestrian and cyclist crossings	
Local road network	The proposal would modify the following local roads: • Alfred Street South • Lavender Street. The proposal would result in the permanent loss of up to 15 parking spaces.	Figure 3-1
Public transport	The proposal would involve the permanent relocation of the Lavender Street bus stop (Stop ID 206128) about 60 metres south of its current location on Alfred Street South. No access changes would be made to Milsons Point Station.	Figure 3-1
Active transport	The operation of the proposal would facilitate the increased use of active transport infrastructure by achieving the proposal objectives identified in Section 2.4. Additionally, the proposal would include: • New pedestrian paving, shared path, pedestrian path and cycleway ground treatment along Alfred Street South • Widening the corner of Lavender Street and Middlemiss Street • New pedestrian and bike rider crossing at Alfred Street South • Upgrading the pedestrian crossing at Lavender Street.	Figure 3-1
Open space and green infrastructure	Impacts to open space and green infrastructure, including Bradfield Park, would be minimised by: • Retaining existing park character, pedestrian desire lines and functions • Minimal loss of grass and retention of significant trees • Planting and streetscaping to include indigenous and existing plant species • Construction of a Country-inspired gathering space.	Figure 3-1
Operational ancillary facilities and infrastructure	The operation of the proposal would involve the upgrade of lighting in Bradfield Park North and in other locations where required to meet safe lighting standards, that would provide lighting for pedestrians, bike riders and road users and closed circuit television (CCTV) surveillance. Additionally, street signage and wayfinding development and modification and street furniture adjustments may be required.	Figure 3-1
Utilities	Utilities in the vicinity of the proposal include: • Axicom • Jemena • AARNet • NBN Co • Nextgen Networks • Optus • Primus Telecom • Telstra • Verizon • Vocus • Ausgrid	Table 3-3

Proposal element	Summary	Figure/Table reference
	• North Sydney Council • Sydney Trains • Transport • Sydney Water	
Construction		
Construction footprint	Construction of the elevated linear bike ramp would be undertaken in three main construction zones. The southern construction zone, established during phase 1, would be located at Bradfield Park Central between Burton Street and Fitzroy Street. A temporary ancillary facility would be located at the boules piste and the northern bowling green on Alfred Street South. The central and north construction zones would be located in Bradfield Park North between Burton Street and Middlemiss Street.	Figure 1-3
Timeframe	Construction for the proposal is expected to commence in mid-2023 and take about 18 months, subject to planning approval, technical requirements and weather.	Section 3.3.3
Workforce	The peak construction workforce is expected to be up to 40 workers per day with an average of 15 to 20 workers per day.	N/A
Earthworks	The proposal would generate minimal fill, about 1,000 metres cubed, as a result of excavation activities.	N/A
Construction ancillary facilities	A temporary ancillary facility would be located at the boules piste and the northern bowling green, Alfred Street South. The site would be used for material lay down, temporary stockpiling, storage area for plant and machinery, a site office with meeting room, change room(s), amenities, lunchroom(s) and drinking water station.	Figure 1-3: Construction footprint
Temporary work	Temporary works would include: • Construction site establishment and fencing • Loss of up to 15 parking spaces along Alfred Street South and Burton Street, at any one time • Scaffolding/propping whilst installing the bike ramp sections.	Figure 1-3
Key construction phases	Key construction phases include: • Site establishment and enabling works • Ramp construction • Groundwork, cycleway and utility adjustments • Landscaping and demobilisation.	Section 3.3.1
Vegetation clearing	A site inspection and review of the Native Vegetation of Sydney Metropolitan Area map (OEH, 2016) confirmed that vegetation within Bradfield Park did not conform to any mapped plant community type. Construction of the elevated linear bike ramp would require the removal of five non-native Poplar trees and an ornamental pear, located in Bradfield Park North.	Figure 6-16
Property	The proposal would be constructed largely on land owned by North Sydney Council. A temporary ground lease would be obtained for construction, followed by a permanent land acquisition parcel upon completion and survey of the finished works.	Section 6.6

Figure 3-1: Key features of the proposal

3.1.1 Linear bike ramp

The linear bike ramp has been designed to minimise impacts on surrounding landscape character and visual amenity as well as to nearby heritage items. The design has sought to achieve the lightest touch, whilst leaving the Bradfield Park largely untouched.

The key design features associated with the elevated linear bike ramp are detailed below and shown in Figure 3-2.

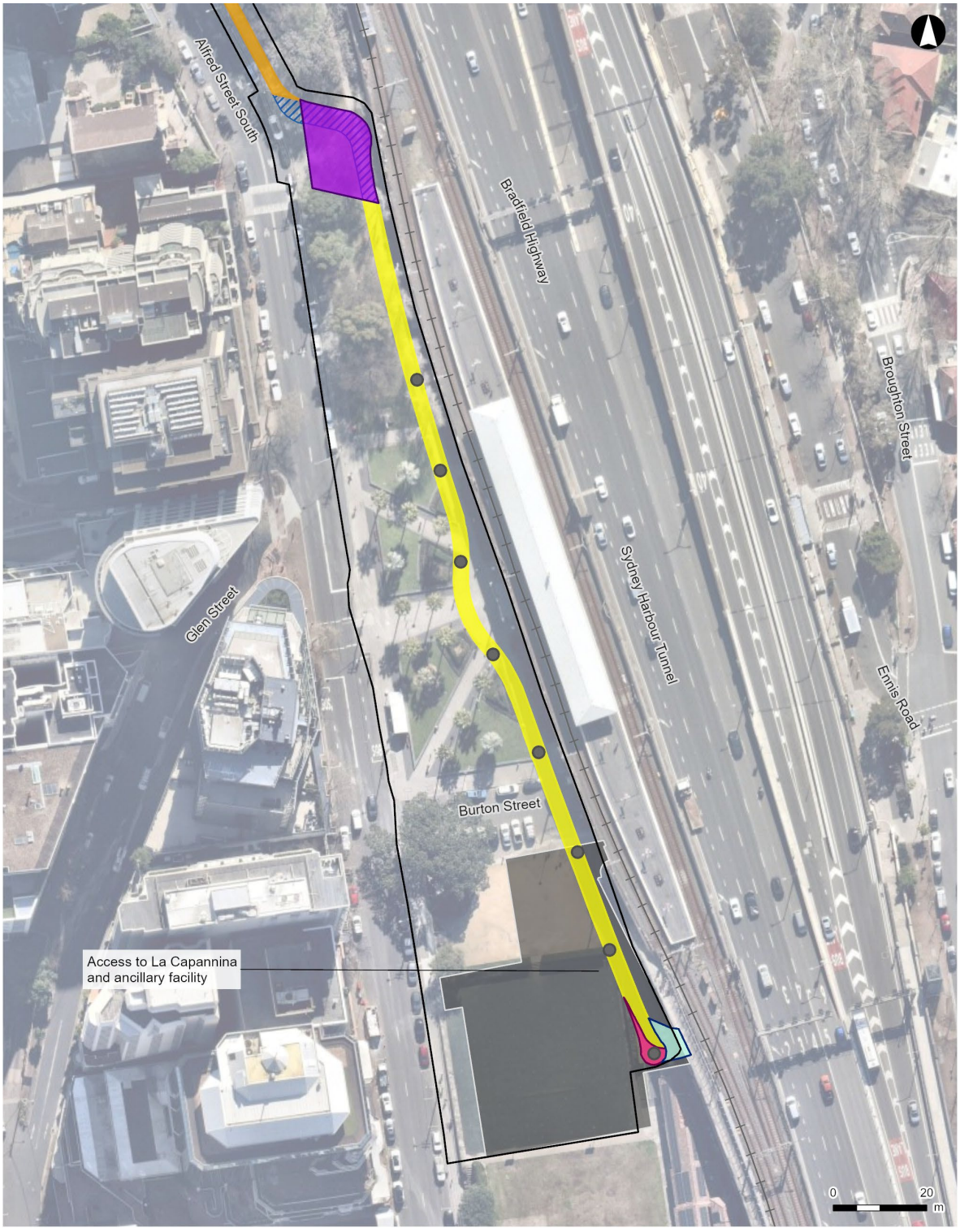


Figure 3-2: Key features of the proposal – linear bike ramp

Alignment

The horizontal alignment of the elevated linear bike ramp closely mirrors the sweep of the Sydney Harbour Bridge and approach viaduct. The ramp south of Milsons Point Station entry is offset from the Sydney Harbour Bridge viaduct by three metres, gradually tapering to 1.5 metres north of the station. The offset from the viaduct has been incorporated to reduce impacts and encroachment on Bradfield Park while maintaining the required offsets for viaduct maintenance. In front of Milsons Point Station entry, the ramp follows a curve which matches geometry of Bradfield Park on the ground plane.

The vertical alignment of the northern portion of the ramp, between the landing in Bradfield Park North and the ramps arc around the station entrance is about a five per cent gradient for a duration of 70 metres. The vertical alignment is level along the station entry arc as it passes the heritage awning, allowing mostly unobstructed views of the station entrance. The ramp then increases to a two per cent gradient to the ramp connection with the Sydney Harbour Bridge Cycleway. The average ramp gradient is around 2.5 per cent. The flat and slightly curved section of the ramp would facilitate an easier journey for southbound bike riders whilst reducing speeds of northbound bike riders.

Form and detail

The form of the elevated linear bike ramp has been developed via a design excellence approach and following input from Aboriginal designers and Aboriginal knowledge holders. The ramp has a serpentine form, with a series of complimentary curves that are organic in geometry. The design aims to reduce the impact on and shadowing of Bradfield Park. The form of the elevated linear bike ramp has sought to balance lightness, fluidity and transparency in design with robustness, constructability, sustainability and long-term maintenance requirements.

Country-inspired ramp deck

The ramp deck would consist of a continuous curving box section beam, with steel outriggers to support the decking at approximately 1.5 metre intervals.

The deck surface would be about three-metres-wide and 200 metres in length, consisting of decorative tiles over a concrete subbase on steel plates, which span between outrigger beams. A damping system would likely be included in the deck sections which would reduce user induced vibrations. Linear drainage grating would be incorporated into the ramp deck, channelling captured stormwater to downpipes integrated within the ramp columns.

The decorative tiles on the deck would include expression of Country with site specific totems, celebrating Aboriginal stories and culture.

Columns

The ramp would be supported by eight columns, the location of which has been chosen to provide minimum disruption to the existing sight lines, pathways and planted areas of Bradfield Park North and Central. The columns would be formed with a tapered ellipse profile with the smallest dimension of the column aligned to the axis of the Sydney Harbour Bridge.

The column dimensions would be around 700 millimetes by 550 millimtres ellipse at the top, tapering to around 900 millimtres by 700 millimetres ellipse at the base, with a maximum height of around eight metres. They would be precast constructed to reduce onsite formwork and build times and to achieve a high quality finish. Drainage downpipes would be integrated into the columns with a recessed bronze toned cover plate.

Column foundations would be bored reinforced concrete piles of 600 to 900 millimetres diameter.

Balustrade

The balustrade would be about 1.4 metres high, with an outward angle to create a feeling of openness for cyclists. The design of the balustrade allows the minimum volume of material required while maintaining architectural aesthetic and performance requirements. Deflection rails would be incorporated within the balustrade, mirroring the angle of the balustrade screen and providing visual balance. Lighting would be integrated within the deflection rail and/or balustrade.

Connection to the Sydney Harbour Bridge

The proposed design would remove about 8.4 metres of viaduct parapet, allowing a safe passage for bike riders. The design has considered sight lines and turning movements, incorporating low height medians to separate north and south moving cyclists. The design has aimed to reduce impacts to the heritage structure as much as possible. This would be achieved through a design that is contemporary, lightweight, with a high degree of visual transparency. This would create a high degree of legibility between the old and new structures. At the ramp's connection with the Sydney Harbour Bridge Cycleway, a rest area would be incorporated on the west side of the ramp.

The final extent of parapet removal would be confirmed in detailed design and is subject to user safety review, heritage assessment and structural design development.

Bradfield Park North landing and Country-inspired gathering place

The ramp landing within Bradfield Park North is the structure's primary public domain interface, with design seeking to reduce impacts on the locally listed heritage item as much as practical whilst providing a safe pedestrian and bike rider environment. Additionally, the ramp landing aims to embrace Country-led design opportunities.

The design also acknowledges the ramp landings function as a gathering place for bike riders to discuss their next movements. As such, it is important that a generous amount of space is provided at the ramp landing to allow for social interactions while avoiding conflicts with other users of Bradfield Park North.

The ramp landing would be located close to the existing viaduct, set away from the east edge of Alfred Street South. The gathering place would provide seating and space for meeting, gathering and pedestrian movement. Bike riders and pedestrians would be separated wherever possible to reduce conflicts. Country design narratives would also be incorporated into the ramp landing, with a constellation of circular paving inlays proposed based on inputs from Aboriginal elders and knowledge holders.

Minor reconfiguration of Milson Point Station forecourt

Minor reconfiguration of Milsons Point Station forecourt would be required as a result of the proposal, focused on the pathways and garden beds next to the Sydney Harbour Bridge viaduct. The existing planting next to the viaduct would be removed to increase the path next to the viaduct. This would allow the pathway to return to its original location and ensure that it remains open to the sky, providing a pleasant pedestrian experience.

The existing trees and plaza geometry would be retained, with new pavement features incorporated into the existing geometry, providing a seamless extension of existing elements. This would include the incorporation of light and dark pavement zones and heritage stone inlays.

3.1.2 Alfred Street South cycle path and pedestrian upgrade

The Alfred Street South cycle path and pedestrian upgrade would involve a new cycle path from the ramp landing to the existing bike network on Middlemiss Street. The cycle path would consist of a two-way separated path about 2.5 metres wide, as seen in Figure 3-3. South of the ramp landing in Bradfield Park North, the existing shared cycle path to Burton Street would be retained.

North of the ramp landing to the new pedestrian and bike rider crossing on Alfred Street South, the parking and travel lanes would be narrowed, allowing construction of a new footpath and cycle path. On the eastern side of the street the footpath would be located next to Bradfield Park North, allowing a safe and accessible space for motorists, including motorists with a disability, to enter/exit parked vehicles. The path would be level with Bradfield Park North, which would visually enlarge the park.

North of the new pedestrian and bike rider crossing on Alfred Street South, a new two-way cycle path would be located on the west side of Alfred Street South. The cycle path would be located to the east of the existing kerb alignment until meeting the new pedestrian and cyclist crossing at Lavender Street. A low speed shared path would be constructed on the north side of Lavender Street with a new pedestrian crossing at Middlemiss Street. From this point the cycle path would integrate with the existing cycleway.

Figure 3-3: Key features of the proposal – Alfred Street South cycle path and pedestrian upgrade

Pedestrian crossing and refuges

Several updates would be made to pedestrian crossings and refuges as part of the proposal, being:

- A new pedestrian and cycleway crossing would be provided on Alfred Street South, located near 110 Alfred Street South as seen Figure 3-4
- A new pedestrian crossing would be provided on Middlemiss Street
- Updates would be made to the pedestrian crossing located on Lavender Street, allowing bike riders to travel safely and efficiently from the existing bike network at Middlemiss Street to the Sydney Harbour Bridge Cycleway.

Figure 3-4: Alfred Street South indicative pedestrian and bike rider crossing

3.1.3 Operational ancillary infrastructure

Lighting would be installed in Bradfield Park North around the landing area and in other locations where required to meet safe lighting standards. Wayfinding and signage would be designed to provide intuitive and clear wayfinding guidance while minimising clutter and visual intrusiveness on the sensitive heritage setting of the proposal. The following signage and wayfinding inclusions and adjustments are included in the proposal:

- On-ground pavement markings and signage for bike riders at key bike rider decision points
- Retainment of existing Council interpretation signage were possible, or relocated where impacts are unavoidable
- Country interpretation opportunities would be incorporated into the proposed gathering space at the ramp landing in Bradfield Park North
- Additional regulatory signage would be developed during detailed design, including relevant road signage.

3.2 Design

The detailed proposal description in this chapter is based on the proposal's concept design and has been developed with consideration of:

- Findings from Aboriginal engagement activities and co-design process detailed in Section 5.3
- Placemaking and urban design principles and objectives detailed in Section 2.4
- Stakeholder and community feedback as detailed in Chapter 5
- Avoiding and minimising environmental and social impacts.

The concept design and construction methodology would continue to be refined during further design development and construction planning. Sufficient flexibility has been provided in the concept design to:

- Allow for refinement in response to submissions received following the exhibition of this REF
- Allow for refinement during detailed design and further construction planning to consider design innovation and/or alternative construction techniques

- Respond to improved technologies or materials
- Improve value for money.

3.2.1 Design excellence approach

At proposal inception Transport recognised the importance of the proposal and the subject site to the community and stakeholders as well as the significance of the site's Aboriginal and non-Aboriginal heritage and open space setting. To ensure the highest quality design outcomes Transport determined that a proposal specific Design Excellence Strategy should be developed with input from the NSW Government Architect. This strategy required a design-led approach where:

- Urban design, architecture, Designing with Country and heritage specialists would drive the design development process, supported by engineers and other technical experts
- Expert design reviews led by the NSW Government Architect would occur at regular intervals during design development to inform and guide the design and help achieve the best possible outcomes
- The expert design review process would be adapted to suit the proposal phase including review by the Transport Design Review Panel early in the scoping design phase, review by a Design Jury during the competition phase and review by a Design Integrity Panel (DIP) post-competition, based on the NSW State Design Review Panel (SDRP) model
- Discussion and engagement with Aboriginal elders and knowledge holders early in the design process and throughout design development would inform and guide the proposal requirements and design
- Close engagement with user groups and the community would inform the development of the design
- Regular and close engagement with Heritage NSW and the Heritage Council Approvals Committee would guide the design process
- Ongoing engagement with North Sydney Council would be undertaken to inform the design, particularly the design of the public domain, park and streets
- An open design competition process, with input on the brief by Heritage NSW and the NSW Government Architect and involvement by these organisations and North Sydney Council, would attract the best designers in the industry and elevate the importance of a sensitive and high-quality design in a remarkable and much-loved urban setting.

The adoption of a Design Excellence Strategy and a design-led approach has promoted a transparent design process with close and regular engagement with a wide range of proposal stakeholders including the local community. Transport remains committed to achieving a world-class urban design and heritage outcome for the proposal that responds to the site's important open space and heritage values, including recognition of Aboriginal voices and occupation of the site.

3.3 Construction activities

3.3.1 Work methodology

Construction would be carried out in three main construction zones, as shown in detail in Figure 3-5, being:

- South construction zone: located in Bradfield Park Central, between Burton Street and Fitzroy Street. This zone would be established during Phase 1: Site establishment and enabling work. Construction of the elevated linear bike ramp, temporary ancillary facility and construction workforce parking would be located within this construction zone
- Central construction zone: located between Burton Street and Middlemiss Street at the southern extent of Bradfield Park North. This zone would be established during Phase 2: Ramp construction. Construction of the elevated linear bike ramp would be located within this zone
- Northern construction zone: located between Burton Street and Middlemiss Street at the northern extent of Bradfield Park North. This zone would be established during Phase 2: Ramp construction. Construction of the ramp landing and the northern section of the elevated linear bike ramp would be located within this zone, as well as the Alfred Street South cycle path located on the west side of Alfred Street South.

The proposal would be constructed in four phases, being:

- Phase 1: Site establishment and enabling works
- Phase 2: Ramp construction

- Phase 3: Groundwork, cycle path and utility adjustments
- Phase 4: Landscaping and demobilisation.

A description of each phase is provided below.

Figure 3-5: Construction zones

Phase 1: Site establishment and enabling work

This phase would take about one month to complete and would involve the establishment of the temporary ancillary facility located at the bowling greens in Bradfield Park Central. Construction of temporary driveways allowing access to La Capannina restaurant and the ancillary facility, would also be completed during this phase. Works would be completed to modify all kerbs and kerbside infrastructure to enable construction of the later phases to occur. Additionally, establishment of the south construction zone, located at Bradfield Park Central between Burton Street and Fitzroy Street, would be completed.

Phase 2: Ramp construction

Phase 2 would take between 12 -15 months and involve establishing the north and central construction zones, located in Bradfield Park North between Burton Street and Middlemiss Street, as well as pedestrian and traffic management. The removal of five Poplar trees and one ornamental pear in Bradfield Park North would occur, noting that these trees are not considered significant and currently cause issues due to their proximity to the rail corridor and the lean of the ornamental pear tree due to shading from the adjacent Chinese Elm (that would be retained).

Cutting and excavation and installation of the columns for the bike ramp would be carried out, followed by assembly and fit out of deck section and sequential lift and installation of the bike ramp deck sections. Precise excision and removal of the Sydney Harbour Bridge parapet would then occur, followed by installation of the final ramp section that would link the ramp to the Sydney Harbour Bridge.

The bike ramp and associated design features detailed in Section 3.1.1 have been designed specifically to minimise impacts to landscape character and visual amenity of the surrounding area as well as impacts to heritage items during both construction and operation. The lightweight modular design of the bike ramp deck and precast columns means that much of the bike ramp would be constructed off-site and would be installed as a kit of parts, without the need for long closure periods of Bradfield Park.

Phase 3: Groundwork, cycleway and utility adjustment

This phase would take between 12 – 15 months and occur concurrently with the ramp construction. It would involve demolishing existing kerb lines and constructing new kerb lines as well as excavation, leveling and backfilling of the site where necessary. Removal of the Canary Island Date palm, from the middle of the existing roundabout, would occur during this phase.

The Alfred Street South bus stop (Stop ID 206128) would be relocated about 60 metres south of its current location. Upgrades and/or replacements to the road network and infrastructure near the proposal would also take place, including:

- Replacement of the pedestrian refuge at the north end of Alfred Street South with a new pedestrian and bike rider crossing at 110 Alfred Street South
- Upgrading the Lavender Street pedestrian crossing to a pedestrian and bike rider crossing
- Widening the footpath at the corner of Lavender Street and Middlemiss Street to accommodate a low speed shared path
- Installation of a new pedestrian crossing at Middlemiss Street.

Any required utility adjustments, such as lighting, communications and electrical, including underground adjustments on the immediately adjacent roads would be undertaken to support the upgrade works.

Street signage, pavement and road markings would be updated and/or installed during this phase as well as the upgrade to lighting within Bradfield Park and on adjacent streets.

Phase 4: Landscaping and demobilisation

Lastly, landscaping treatments would be applied, including planting of indigenous and currently existing plant species in areas such as the gathering space at the ramp landing.

Demobilisation of the proposal would take about two months and occur progressively following the opening of the elevated linear bike ramp and Alfred Street South cycle path. This would include the removal of the temporary ancillary facility located at the boules piste and bowling greens, construction site fencing and any remaining plant and equipment. Lighting installed within Bradfield Park North and adjacent street and within the balustrade on the ramp would be tested prior to demobilisation of the proposal and opening of the proposal to users.

3.3.2 Construction workforce

Workforce numbers would fluctuate depending on the phase of construction and final numbers of construction workers would be identified by the construction contractor. The peak construction workforce is anticipated to be up to 40 workers per day. On average workdays, the workforce is anticipated to be 15 to 20 workers per day.

3.3.3 Construction hours and duration

Construction of the proposal would take around 18 months to complete and, subject to planning approval, is expected to commence in mid-2023. The anticipated duration of each construction phase is:

- Phase 1: Site establishment and enabling works: a duration of one month
- Phase 2: Ramp construction: a duration of 12 - 15 months
- Phase 3: Groundwork, cycle path and landscaping: a duration of 12 - 15 months (concurrent with ramp construction)
- Phase 4: Landscaping and demobilisation: a duration of two months.

Typical construction hours would be set in accordance with the standard construction hours as defined in the Interim Construction Noise Guideline (NSW Department of Environment, Climate Change and Water (DECCW), 2009):

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturday
- No work on Sundays and public holidays.

Work outside standard construction hours would be required at times to minimise disruption to traffic and train operations and disturbances to surrounding landowners, businesses, pedestrians and commuters. Potential construction work that would be carried out outside of standard construction hours would include, but not be limited to:

- Delivery of pre-fabricated bike ramp sections and columns
- Crane lifts adjacent to the Sydney Harbour Bridge
- Installation of bike ramp sections across Milsons Point Station entrance
- Upgrade of the Lavender Street crossing, requiring temporary lane closures
- Installation of the new pedestrian crossing on Middlemiss Street, requiring temporary lane closure of the one-way street
- Installation of the new cyclist and pedestrian crossing on Alfred Street South, requiring temporary lane closures
- Roundabout works on Lavender Street.

Any work outside of standard construction hours would be undertaken in accordance with the Interim Construction Noise Guideline (DECC, 2009), the Construction Noise and Vibration Guidelines (RMS, 2016), any road occupancy licence requirements and the environmental management measures listed in Chapter 7.

The local community would be notified a minimum of five working days before any work proposed to be carried out outside of standard construction hours in accordance with the proposal's Community Liaison Plan. They would be provided with work details and contact information.

3.3.4 Plant and equipment

Table 3-2 identifies the indicative plant and equipment required as well as their associated construction phase. This list is indicative and may not be limited to the plant and equipment included below.

Table 3-2 Plant and equipment

Construction phase	Plant and equipment needed
Phase 1: Site establishment and enabling works	• Trucks • Concrete cutting saw • Concrete mixer
Phase 2: Ramp construction	• Large delivery trucks • Mobile cranes • Gantry crane • Cherry pickers • Scissor lifts • Welders • Excavators • Drilling equipment • Jackhammers • Chainsaws
Phase 3: Groundwork, cycleway and landscaping	• Trucks • Excavators • Concrete cutting saw • Concrete pourer • Forklifts • Jackhammers
Phase 4: Demobilisation	• Trucks

3.3.5 Construction resources and waste management

Construction would require various resources and materials. Typical materials that would be used for the construction of the proposal would be select fill, recycled aggregate, topsoil, concrete, steel and non-ferrous alloy. The quantities of the material required to build the proposal would be finalised during detailed design.

It is anticipated that about 1,000 metres cubed of material would be excavated for the proposal. This material would be re-used or disposed of in accordance with the requirements of the Waste Classification Guidelines (NSW EPA, 2014) and the *Protection of the Environment Act 1997*.

The source of materials required to construct the proposal would be finalised during detailed design through the development of a construction materials and resources plan. Material sources would comply with relevant Transport material quality specifications and would be sourced from local commercial suppliers where available.

3.3.6 Traffic management and access

Construction traffic and access

Construction of the linear bike ramp would generate up to 10 heavy and 10 light vehicle movements per day (at night) at the peak of construction activity.

Construction of the Alfred Street South cycle path is expected to generate up to two heavy and five light construction vehicle movements per day at the peak of construction activity.

Site access to and from the construction zones would be available off either Alfred Street South or Burton Street. All deliveries and vehicle access to site would be via Alfred Street South. Larger deliveries would arrive heading south bound and exit north bound. Smaller deliveries would access the ancillary facility site using a left in left out approach.

Road closures and temporary parking loss

Multiple temporary road closures would be required along Alfred Street South, associated with the delivery and installation of pre-fabricated ramp segments. This is anticipated to occur outside of standard construction hours to minimise traffic

impacts on the surrounding road network. Temporary road closures would also be required on Burton Street during the installation of the ramp and Lavender Street during the pedestrian crossing installation.

No impacts or changes are expected to bus routes or service frequencies as a result of construction work, however the Lavender Street bus stop (Stop ID 206128) would be permanently relocated about 60 metres south of its original location on Alfred Street South.

Temporary parking loss during construction would include:

- 13 car spaces and two motorbike spaces on Burton Street for a duration of nine months
- 15 car spaces on the east side of Alfred Street South for a duration of three months
- Eight car and six motorbike spaces on the west side of Alfred Street South for a duration of three months.

The works on Alfred Street South would be staged, with works carried out on one side of the street at a time to minimise the loss of parking at any one time. Any impacts to transport and access would be managed through a traffic management plan (TMP) in accordance with Traffic Control at Work Sites Manual Issue No 6.1 (Transport, 2022) and the management measures listed in Section 6.4 and Chapter 7.

Pedestrian and bike rider access

Pedestrian and bike rider access would be maintained during construction, however minor diversions may be temporarily introduced for certain areas. Access to the steps and the Sydney Harbour Bridge Cycleway would be maintained during construction, with the exception of brief periods when it would be necessary to close the stairs to allow for cutting of the parapet and installing the bridge connection. These works would likely be outside of times of peak use by bike riders, and closures would be of short duration.

The pathway leading to Milsons Point Station is the main access to the station and would be maintained throughout construction. The entrance to the station would be shrouded with a scaffold while works are carried out on the bike ramp and would remain in place until completion. While cranes are lifting sections of the ramp into position over Burton Street, pedestrians wanting to cross under the rail corridor would be directed to the adjacent Milsons Point Station subway. Traffic controllers would direct pedestrians while the ramp sections are installed.

A catch scaffold would be built over the entrance to the stairs leading to the Harbour Bridge to protect bike riders.

The western pathway from the corner of Lavender Street and Alfred Street South would remain open at all times. Water filled barriers would be used to protect pedestrians from workers building the cycle path and adjusting kerbs and pathways up to the cross over on Alfred Street South. The eastern pathway would continue to be shared by pedestrians and cyclists and would remain open.

3.4 Ancillary facilities

Ancillary facilities would be required during construction of the proposal. The proposed temporary ancillary facility site would be located at the boules piste and northern bowling green at Bradfield Park Central, Alfred Street South (refer Figure 1-2). The ancillary facility is expected to be established during Phase 1 of construction, as described in Section 3.3.1.

The ancillary facility would operate during construction hours, as described in Section 3.3.3, and act as a material lay down area, temporary stockpiling and storage area for the plant and machinery. A site office, meeting room, change room(s), amenities, lunchroom(s) and drinking water station would also be located here for construction staff. Limited worker parking would be available within the ancillary facility. Construction workers would be encouraged to use public transport to access the proposal.

The location of the facility would impact the Kirribilli markets which are held on the second Saturday and fourth Sunday of every month. Discussions have been held with North Sydney Council and the market manager to agree on the temporary relocation of the impacted stalls to Ennis Road for the duration of the works. Discussions have also been held with the groups that use the boules piste to find an alternative location for the duration of construction.

The ancillary facility would be established in accordance with relevant Transport's guidelines. The ancillary facility site would be securely fenced with temporary fencing and signs would be erected advising the general public of access restrictions and contact details in the event of emergency or incident. Following construction, the ancillary facility site would be removed, and the site would be cleared of all rubbish and materials and rehabilitated to its existing condition, or as otherwise agreed with the North Sydney Council, on completion of works.

3.5 Public utility adjustment

Table 3-3 identifies the utilities located in close proximity to the proposal. Impacts to public utilities would be confirmed during the further design development.

Table 3-3: Utilities in close proximity to the proposal

Utilities	Owner	Details
Gas	Jemena	Jemena has 7 kilopascal (kPa) low pressure gas mains running along the east and west side of Alfred Street South and along the south side of Glen Street. A 210 kPa medium pressure gas main runs east-west and is located about 85 metres south of the Lavender Street roundabout. Network valves are located on the corner of Lavender Street and Alfred Street South, about 60 metres south of the Lavender Street roundabout and on Alfred Street South, in line with Burton Street. Two network valves are also located on the corner of Glen Street and Alfred Street South.
Telecommunications	AARNet	AARNet fibre optic cable assets run along the east side of Alfred Street South, continuing north on Middlemiss Street. Fibre optic cable also run along the lengths of Burton Street and Fitzroy Street. Additional AARNet assets may be contained within the Telstra duct.
	Axicom	Axicom own a mobile phone tower that is located adjacent to the boules piste on Alfred Street South.
	NBN Co	Telstra owned NBN cables run along the length of Alfred Street South, located on the east and west side of the street, and along Lavender Street. An NBN cable connection is present from Alfred Street South to Lot 102. About 17 manholes are located along Alfred Street South, between the Lavender Street roundabout and just south of Burton Street. Several manholes are also located on Lavender Street. About 10 pits are located along Alfred Street South, with pits also located on Lavender Street, Glen Street and the residential/commercial structures on the west side of Alfred Street South.
	Nextgen Networks	Nextgen network cable assets are located between the railway line and Ennis Road, running parallel in a general north-south alignment.
	Optus	Optus underground inter office fibre cable run along the north side of Burton Street then along the west side of Alfred Street South. It then proceeds to the southern side of Lavender Street before entering the west side of Middlemiss Street.
	Primus Telecom	Primus assets are located within the Telstra duct and conduit networks and are located between the railway line and Ennis Road, running parallel in a general north-south alignment.
	Telstra	Telstra underground cables located in proximity to the proposal located: • Along Lavender Street and Middlemiss Street, adjoining Alfred Street South • Along the west side of Alfred Street South, between the Chinese Christian Church (Lot 100) to the southern extent of undergrounding works • Along the east side of Alfred Street South • Underground cable crossing Alfred Street south at Burton Street • Along both sides of Glen Street for about 100 metres. Cable joining pits and footway access chambers are located along the above-mentioned streets.
	Verizon	Within the vicinity of the proposal, a Verizon duct runs along the east side of Alfred Street South, between the intersection with Cliff Street

Utilities	Owner	Details
		and Fitzroy Street. The duct then terminates on the eastern side of the viaduct on Fitzroy Street. Verizon pits are located along the Verizon duct.
	Vocus	The Vocus Group telecommunications conduit is located between the railway line and Ennis Road, running parallel in a general north-south alignment.
Electrical	Ausgrid	Ausgrid assets are located along Alfred Street South, Lavender Street, Glen Street and Burton Street.
	North Sydney Council	North Sydney Council assets in close proximity to the proposal include: • Redundant parking metre cable along both sides of Alfred Street South, Burton Street, Glen Street and Lavender Street and active parking metre sensors • Drainage pipes and associated drainage pits on Burton Street.
	Sydney Trains	Sydney Trains assets are located on the east side of Bradfield Park north and central.
	Transport for NSW	Transport's cables are located on Alfred Street South, between the intersections at Glen Street and Burton Street.
Water and sewer	Sydney Water	Sydney Water watermain and sewer assets are located within the vicinity of the proposal and include: • Watermains along the length of Alfred Street South located on the east and west side of the street. Potable water hydrants and potable water stop valves are present on these watermains • Watermains along the south side of Lavender Street and along southernmost side of Glen Street • Sewer mains located on Lavender Street and Glen Street. • Sewer mains also occur on east side of Burton Street, then south along Alfred Street South.

3.6 Property acquisition

Following a temporary ground lease during construction, a permanent land acquisition parcel would be defined once the piling for columns is set out on site and the detail ramp fabrication finalised. The columns would be defined by a site survey. The permanent land parcel would have two components:

- An airspace stratum that incorporates the above ground elements of the ramp, including a construction tolerance for variations in the fabrication of the steel ramp.
- Surface land where the elevated bike ramp structure touches the ground (or are so close to the ground that other open space or community uses are not feasible) and the surface cycle path connection to Alfred Street.

Most ramp maintenance would be carried out from the deck level and those activities that require access to Bradfield Park would be undertaken by Transport in consultation with North Sydney Council.

4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.109 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. The definition for road infrastructure facilities in Section 2.108 of SEPP (Transport and Infrastructure) includes 'road related areas' within the meaning of the *Road Transport Act 2013* (Road Transport Act). The definition for a road related area under that Act includes 'an area that is open to the public and is designated for use by cyclists'.

The proposal involves an upgrade of the existing cycleway connection between the Sydney Harbour Bridge and the bike network in Milsons Point and as such, it meets the definition of 'road infrastructure facility' under the SEPP (Transport and Infrastructure) and 'road related area' under the Road Transport Act. In addition, as the proposal is to be carried out by Transport, it can be assessed under Part 5, Division 5.1 of the Environmental Planning and Assessment Act 1979. Development consent from North Sydney Council is not required.

The proposal is not located on land reserved under the National Parks and Wildlife Act 1974 and does not require development consent or approval under State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP (Resilience and Hazards)), State Environmental Planning Policy (Planning Systems) 2021 (SEPP (Planning Systems)) or State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021 (SEPP (Precincts – Eastern Harbour City)).

Section 2.10 to 2.15 of the SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation)) outlines planning principles and provisions that will apply to vegetation in non-rural areas, koala habitat protection, River Murray lands, bushland in urban areas, canal state development, Sydney drinking water catchment, Hawkesbury-Nepean River, and Sydney Harbour Catchment. The SEPP (Biodiversity and Conservation) was amended by the State Environmental Planning Policy Amendment (2022) and came into force in 21 November 2022.

The proposal is located within the Sydney Harbour Catchment and Chapter 6 of the SEPP (Biodiversity and Conservation) therefore applies. Chapter 6, Part 6.2, Division 2 of the SEPP (Biodiversity and Conservation) SEPP sets general controls for consideration by consent authorities assessing a development on land in a regulated catchment, including the Sydney Harbour Catchment. which are addressed in Table 4-1.

Table 4-1: SEPP (Biodiversity) Development in regulated catchments - controls on development generally

Controls on development generally	Response / where addressed in REF
6.6 Water quality and quantity	
(a) whether the development will have a neutral or beneficial effect on the quality of water entering a waterway	Stormwater falling within the proposal boundary would run off the hard paved surfaces and then be conveyed into the municipal stormwater system and discharged into Sydney Harbour. Water from the proposal would not enter a natural waterway and would not have a negative effect on water quality within a waterway.

Controls on development generally	Response / where addressed in REF
	No permanent change to drainage pathways would occur as a result of the proposal. Further details are provided in Section 6.8.
(b) whether the development will have an adverse impact on water flow in a natural waterbody,	As noted above, stormwater falling within the proposal boundary would drain to Sydney Harbour via the municipal stormwater system. The proposal would not therefore have an adverse impact on water flow in a natural waterbody. Further details are provided in Section 6.8.
(c) whether the development will increase the amount of stormwater run-off from a site,	Most of the rain falling within the proposal boundary would run off the hard paved surfaces and be conveyed to the local stormwater system. The proposal would not increase the amount of stormwater entering the system. The proposal would not alter natural drainage systems. Further details are provided in Section 6.8.
(d) whether the development will incorporate on-site stormwater retention, infiltration or reuse	Potential impacts to water quality associated with construction would be temporary, minor and limited to construction. During operation, the management of stormwater would remain unchanged from the existing conditions. Stormwater retention or reuse does not form part of the proposal.
(e) the impact of the development on the level and quality of the water table,	The limited scope and extent of the works means that the proposal would not impact groundwater and no permanent change to drainage would occur because of the proposal. Further details are provided in Section 6.8 and 6.5.
(f) the cumulative environmental impact of the development on the regulated catchment,	The proposal would not alter the hydrology within the proposal boundary and is not predicted to have an impact on the Sydney Harbour Catchment. Cumulative impacts as a result of the proposal and other developments are therefore not predicted. Section 6.13 of the REF includes an assessment of cumulative impacts.
(g) whether the development makes adequate provision to protect the quality and quantity of groundwater,	The limited construction works for the proposal mean that the proposal would not impact on the quality or quantity of groundwater within Sydney Harbour Catchment during construction or operation. Further details of the potential for groundwater interaction is provided in Section 6.5 of the REF.
6.7 Aquatic ecology	
(a) whether the development will have a direct, indirect or cumulative adverse impact on terrestrial, aquatic or migratory animals or vegetation,	The proposal boundary is a highly urbanised area with no remnant native vegetation present. The vegetation within the proposal boundary has been extensively modified by urban development over the past 100 years or so. A review of the Native Vegetation of the Sydney Metropolitan Area map (OEH, 2016) did not identify any mapped plant community types (PCTs). A review of the Biodiversity Values Map (DPE EES) did not identify any areas of land with high biodiversity value within the proposal boundary. A database search of the NSW BioNet Atlas of NSW Wildlife was undertaken for the wider 10 kilometre area and found no threatened flora records. The threatened species recorded with a moderate or high likelihood of occurrence in the proposal boundary includes Grey-headed Flying-fox and Powerful Owl. A detailed biodiversity assessment is provided in Section 6.7, including management measures to mitigate biodiversity impacts. The trees proposed to be removed are identified and proposed ratios to offset tree loss are also provided in Section 6.7.
(b) whether the development involves the clearing of riparian vegetation and, if so, whether the development will require - (i) a controlled activity approval under the *Water Management Act 2000*, or (ii) a permit under the *Fisheries Management Act 1994*,	The proposal would not require the clearing of any riparian vegetation. See Section 6.7.

Controls on development generally	Response / where addressed in REF
(c) whether the development will minimise or avoid – (i) the erosion of land abutting a natural waterbody, or (ii) the sedimentation of a natural waterbody,	The proposal would not impact any natural waterbodies. Erosion and sediment controls would be implemented throughout the construction period to prevent soil loss from within the proposal boundary, as described in Section 6.9 and Chapter 7.
(d) whether the development will have an adverse impact on wetlands that are not in the coastal wetlands and littoral rainforests area,	The proposal would not impact any wetlands.
(e) whether the development includes adequate safeguards and rehabilitation measures to protect aquatic ecology,	The proposal would not affect aquatic ecology. All safeguards and mitigation measures are provided in Chapter 7.
(f) if the development site adjoins a natural waterbody – whether additional measures are required to ensure a neutral or beneficial effect on the water quality of the waterbody.	The proposal boundary does not adjoin a natural waterbody.
6.8 Flooding	
In deciding whether to grant development consent to development on land in a regulated catchment, the consent authority must consider the likely impact of the development on periodic flooding that benefits wetlands and other riverine ecosystems.	The proposal is not located adjacent to a wetland or riverine ecosystem and would not have an impact on these features. No permanent change to drainage pathways would occur as a result of the proposal. Further details are provided in Section 6.8.
6.9 Recreation and public access	
(a) the likely impact of the development on recreational land uses in the regulated catchment,	The proposal would improve mobility of bike riders and pedestrians and improve amenity and accessibility of the Sydney Harbour Bridge, which would potentially attract more users and tourists to Milsons Point and Kirribilli. Considerable effort has been made through the options identification and proposal design (refer to Chapters 2 and 3) to ensure a high quality urban design outcome that will enhance the amenity of the area and result in a minimal loss of usable open space.
(c) whether the development will maintain or improve public access to and around foreshores without adverse impact on natural waterbodies, watercourses, wetlands or riparian vegetation.	The proposal would not alter public access to foreshore areas. The proposal would improve mobility of bike riders and pedestrians, improve amenity and accessibility of the Sydney Harbour Bridge, without causing adverse impacts to Sydney Harbour.

The proposal is not located within the Foreshores and Waterways Area Boundary of the SEPP (Biodiversity and Conservation) therefore the planning principles for the land within the Foreshores and Waterways Area, set out under Part 6.3 of the SEPP (Biodiversity and Conservation) do not apply to the proposal.

Chapter 6, Part 6.4 of the SEPP (Biodiversity and Conservation) SEPP applies to land in the Sydney Harbour Catchment that is shown on the Heritage Map for the purposes of identifying a heritage item or an Aboriginal place of heritage significance. Schedule 5 of the SEPP (Biodiversity and Conservation) lists the Sydney Harbour Bridge, including approaches and viaducts

(road and rail), as a heritage item of State significance (Item no 124). The heritage provisions of Chapter 2, Part 6.4, Sections 6.53(4) and (5) of the SEPP (Biodiversity and Conservation) therefore apply to the proposal in relation to potential impacts to this item and are to be taken into consideration by Transport before determining this REF. A Statement of Heritage Impact (SoHI) was carried out for the proposal and is presented in Appendix D – Statement of Heritage Impacts and Section 6.1 and the minimisation of heritage impacts has been considered throughout the design development for the proposal. Table 4-2 sets out the requirements to be considered by the consent authority and how they have been addressed in this REF.

Table 4-2 Requirements for development consent- heritage provisions

SEPP (Biodiversity and Conservation)	Response / where addressed in REF
6.53(5) Requirement for development consent	
(a) the heritage significance of the item, object or site as part of the environmental heritage of the land to which this Part applies	A SoHI has been prepared for the proposal and is presented in Appendix D – Statement of Heritage Impacts and summarised in Section 6.1. The SoHI provides details of the heritage significance of the listed heritage items within the vicinity of the proposal boundary, assesses potential impacts to the significance of the heritage items from the proposal and assesses potential impacts to non-Aboriginal archaeological remains. The SoHI concludes that the proposal would result in minor to moderate impacts on listed heritage items. Measures to mitigate impacts to heritage items have been identified in Section 6.1 and Chapter 7.
(b) the impact of the development on the heritage significance of the item, object or site and its setting, including landscape or horticultural features	The proposal has been designed to fit with the context of the location, heritage values of the area and architectural qualities of the Sydney Harbour Bridge. The proposal would have some adverse impacts on fabric of the Burton Street viaducts, the setting of the Sydney Harbour Bridge within Bradfield Park, and also on views to the northern approaches of the Bridge. However, the technical achievement of the Sydney Harbour Bridge's design and its status as an iconic cultural landmark would be respected and not diminished by these works. The proposal would improve accessibility and amenities for commuters and visitors to the Sydney Harbour Bridge, and would enhance and strengthen the core function of the Sydney Harbour Bridge as an iconic and critical transport link, and have a positive impact on its National Heritage values. The SoHI prepared for the proposal is presented in Appendix D – Statement of Heritage Impacts and summarised in Section 6.1. The Landscape Character and Visual Impact Assessment (LCVIA) prepared for the proposal is presented in Appendix C – Landscape Character and Visual Impact Assessment and summarised in Section 6.2.
(c) the measures proposed to conserve the heritage significance of the item, object or site and its setting	The SoHI prepared for the proposal is presented in Appendix D – Statement of Heritage Impacts and summarised in Section 6.1. The SoHI provides details of the heritage significance of the listed heritage items within the vicinity of the proposal boundary, assesses potential impacts to the significance of the heritage items from the proposal and assesses potential impacts to non-Aboriginal archaeological remains. The SoHI concludes that the proposal would result on minor to moderate impacts on listed heritage items. Measures to mitigate impacts to heritage items have been identified in Section 6.1 and Appendix D – Statement of Heritage Impacts.
(d) whether an archaeological site will site will be adversely affected by the development	The SoHI prepared for the proposal assessed non-Aboriginal archaeological potential by identifying former land uses and associated features through historical research and evaluating whether subsequent actions may have impacted on evidence for these former land uses. The SoHI concluded that archaeological remains were heavily impacted by bulk excavation for the construction of the Sydney Harbour Tunnel. There is potential that archaeological deposits would be present, although it would be isolated. The Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) identified no Aboriginal archaeological sensitivity within the study area and concluded that excavation works for the proposal would not impact Aboriginal archaeological deposits. Further details are presented in Section 6.10

SEPP (Biodiversity and Conservation)	Response / where addressed in REF
	and Appendix J - Aboriginal heritage due diligence assessment. The PACHCI concluded that it is unlikely to encounter intact subsurface soil profiles. This is a result of extensive previous landscape modification (foreshore modification, historic building and demolition, construction of the Sydney Harbour Bridge and landscaping of Bradfield Park). Excavation works for the proposal would not impact Aboriginal archaeological deposits.
(e) the extent to which the development will affect the form of historic subdivisions	Design refinement for the proposal has led to the retention of existing heritage interpretation elements within Bradfield Park, including as the sandstone strips outlining previous subdivisions and road alignments. The proposal would not affect the form of historic subdivisions.
(f) other matters the consent authority considers relevant.	A comprehensive environmental assessment of issues is provided in Chapter 6. A list of environmental safeguards and management measures is presented in Chapter 7.

4.1.2 North Sydney Local Environmental Plan 2013

The proposal is located on land that is zoned RE1 Public recreation, B4 Mixed use, SP2 Infrastructure (Classified Road) and R4 High density residential under the North Sydney Local Environment Plan 2013 (North Sydney LEP). Cycleways, cycle paths or similar are not defined by the North Sydney LEP, however, development for the purposes of 'roads' is permissible with development consent in each of these zones.

The SEPP (Transport and Infrastructure) operates to remove the consent requirements under the North Sydney LEP. As the proposal is considered road infrastructure facilities under the SEPP (Transport and Infrastructure), as detailed in Section 2.1.1, it can be assessed under Part 5, Division 5.1 of the Environmental Planning and Assessment Act 1979. As such, development consent from North Sydney Council is not required.

The North Sydney LEP provides a listing of local heritage items, including the Sydney Harbour Bridge north pylons, Milsons Point Station, and Bradfield Park (including northern sections). Clause 5.10 relates to the conservation of listed heritage items. Potential impacts to heritage items located on or near the proposal are discussed and assessed in Chapter 7 non-Aboriginal heritage and Chapter 14 Aboriginal heritage of this REF.

While the policies and provisions of the LEP do not apply to the proposal (refer Section 2.1.1), they are relevant in identifying potential land use impacts and planning policy conflicts.

The land adjoining the proposal boundary is zoned RE1 – Public Recreation, B4 – Mixed Use, SP2 – Infrastructure and R4 – High Density Residential, as shown in Figure 6-14 presented in Section 6.6. Table 4-3 demonstrates the proposal's consistency with the North Sydney LEP zoning objectives.

Table 4-3: Consistency of REF proposal with LEP zone objectives

Land use zone and objectives	Consistency of proposal with objectives
RE1 – Public Recreation • To enable land to be used for public open space or recreational purposes • To provide a range of recreational settings and activities and compatible land uses • To protect and enhance the natural environment for recreational purposes • To ensure sufficient public recreation areas are available for the benefit and use of residents of, and visitors to, North Sydney.	The proposal would aim to integrate with the surrounding area and maximise the natural environment and positive view opportunities to and from the Sydney Harbour Bridge. The proposal would retain the uses of the existing open spaces and optimise their performance by increasing safety and accessibility for residents and visitors.

Land use zone and objectives	Consistency of proposal with objectives
B4 – Mixed use • To provide a mixture of compatible land uses • To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling • To create interesting and vibrant mixed-use centres with safe, high quality urban environments with residential amenity • To maintain existing commercial space and allow for residential development in mixed use buildings, with non-residential uses concentrated on the lower levels and residential uses predominantly on the higher levels.	The proposal would improve accessibility and safety, encouraging active transport such as walking and cycling in the area. The proposal would not impact on the existing commercial space or residential areas. The amenity and function of the streetscape would be improved with the new cycle path between Burton Street and Middlemiss Street, connecting to the existing cycle network. Streetscape improvements such as new paving and planting, would also enhance the character of this part of Alfred Street South.
SP2 – Infrastructure • To provide for infrastructure and related uses • To prevent development that is not compatible with or that may detract from the provision of infrastructure.	The proposal would be consistent with the objectives of this zone as it involves an upgrade of the existing cycleway connection between the Sydney Harbour Bridge and the bike network in Milsons Point. The cycleway is considered a road infrastructure facility under the SEPP (Transport and Infrastructure). While defining road infrastructure facilities, the Road Transport Act includes 'road related areas' as 'an area that is open to the public and is designated for use by cyclists. Therefore, the proposal would improve the existing active transport network and allow greater accessibility for a wider range of customers to use the existing cycleway. Implementation of the proposal would also support future growth in bike riders travelling between the Sydney CBD and the lower north shore and improve safety for pedestrians, bike riders and road users on Alfred Street South.
R4 – High Density Residential • To provide for the housing needs of the community within a high density residential environment • To provide a variety of housing types within a high density residential environment • To enable other land uses that provide facilities or services to meet the day to day needs of residents • To encourage the development of sites for high density housing if such development does not compromise the amenity of the surrounding area or the natural or cultural heritage of the area • To ensure that reasonably high level of residential amenity is achieved and maintained.	The proposal would benefit the day to day needs of local residents and would not compromise the amenity of the surrounding area or the natural or cultural heritage of the area. Whilst public amenity would be temporarily altered during construction, it would also promote a positive impact given that mobility of bike riders and pedestrians would be improved. The proposal would improve amenity and accessibility of the Sydney Harbour Bridge and potentially attract more users. An Urban Design Plan would be prepared to mitigate impacts on visual amenity, as detailed in Section 6.2. Refer to Section 6.2, Section 6.3 and Section 6.6 for further details.

4.2 Other relevant NSW legislation

4.2.1 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) is the primary piece of State legislation affording protection to all items of environmental heritage (natural and cultural) in NSW. Under the Heritage Act, 'items of environmental heritage' include places, buildings, works, relics, moveable objects and precincts identified as having heritage significance based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items of State significance can be listed on the NSW State Heritage Register (SHR) and are afforded automatic protection against any activities that may damage an item or affect its heritage significance under the Heritage Act. The Heritage Act also protects 'relics', which can include archaeological material, features and deposits. Section 57(1) of the Heritage Act requires an application under section 60 for any action that would adversely affect an item that is subject to an Interim Heritage Order or a listing on the State Heritage Register. The Sydney Harbour Bridge and approach viaducts are listed on the State Heritage Register and would be impacted by the proposal and a section 60 permit would therefore be required for the proposal.

A SoHI has been prepared to assess the impact the proposal would have on any listed heritage items. The details of the assessment can be found in Section 6.1 and Appendix D – Statement of Heritage Impacts.

An excavation permit is required when disturbing or excavating any land that is known to contain or suspected to contain a relic, where disturbance or excavation would or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Section 139(4) of the Heritage Act makes provision for the issuing of an exception in certain prescribed circumstances. An excavation permit would be required for the proposal where there is archaeological potential.

Section 6.1 of the REF discusses the heritage potential of the proposal boundary as well as potential impacts to the Sydney Harbour Bridge. The Heritage Act requires all government agencies to identify and manage heritage assets under their ownership and control. Under Section 170 of the Heritage Act, government agencies must establish and keep a register which includes all items of environmental heritage listed on the SHR, environmental planning instruments or which may be subject to an interim heritage order that are owned, occupied or managed by that government body. Government agencies must also ensure that all items entered on its register are maintained with due diligence in accordance with State Owned Heritage Management Principles (Heritage Council, 2005) approved by the Minister on advice of the NSW Heritage Council.

4.2.1 Roads Act 1993

The *Roads Act 1993* (Roads Act) provides for the construction and maintenance of public roads and regulates the carrying out of activities on public roads. The proposal requires construction work on Alfred Street South, Lavender Street and Middlemiss Street which are unclassified roads within the North Sydney LGA, and temporary impacts to traffic during construction.

Works on the local roads would be undertaken in accordance with section 72 of the Roads Act, which allows Transport to carry out work on a public road that is not a classified road where those works would benefit a classified road, or it is necessary to do so in connection with the carrying out of road work on an adjoining classified road. Under the Roads Act, Transport is the relevant Roads Authority for the proposal, for works on an adjoining classified road. A Road Occupancy Licence would be required from the relevant roads authority by the Construction Contractor prior to work on public roads and any temporary road closures during construction of the proposal.

4.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* provides for the conservation and management of nature and objects, places and features of cultural value. It is the primary legislation for the protection of Aboriginal cultural heritage in NSW. Part 6 of the National Parks and Wildlife Act 1974 provides protection for all Aboriginal objects and Aboriginal places in NSW. Under Section 90 of the Act, where harm to an Aboriginal object or Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit is required before the disturbance of Aboriginal objects or places.

As there are no identified impacts to Aboriginal cultural heritage associated with the construction and operation of the proposal an Aboriginal Heritage Impact Permit would not be required.

4.2.3 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* is 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.

The NSW Biodiversity Offsets Scheme is established under Part 6 of the Biodiversity Conservation Act 2016 and the Biodiversity Assessment Method is established under section 6.7 of the Biodiversity Conservation Act 2016. The purpose of the Biodiversity Assessment Method is to prescribe requirements for the assessment of certain impacts on listed threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

Section 7.3 of the Biodiversity Conservation Act 2016 provides a test for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Where a significant impact is likely, a Species Impact Statement must be prepared.

The significant impact test applied to threatened species and ecological communities relevant to the proposal is presented in Section 6.7 of the REF. The proposal is unlikely to have a significant impact on any Biodiversity Conservation Act 2016 listed species, populations or ecological communities or their habitats.

4.2.4 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* establishes a process for investigating, managing and remediating contaminated land and outlines the circumstances in which notification to the Environment Protection Authority (EPA) is required, such as certain levels of soil contamination, potential to contaminate neighbouring land, presence of friable asbestos and potential surface and groundwater contamination.

There are no registered contaminated sites within the site investigation area. Management of potential unregistered contaminated land that would be impacted by the proposal is discussed in Section 6.5 of the REF.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legislative framework for the protection and management of matters of national environmental significance, which includes heritage items on the World Heritage List, Commonwealth Heritage List or the National Heritage List. The Sydney Harbour Bridge, including the bridge, pylons, constructed approaches and parts of Bradfield and Dawes Point Parks, is a listed item (00781) under the EPBC Act. Under Part 9 of the EPBC Act, approval is required for any action occurring within, or outside, a Heritage place that has, will have, or is likely to have a 'significant impact' on the heritage values of a World, National or Commonwealth heritage listed property (referred to as a 'controlled action' under the Act).

A 'significant impact' is defined as:

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

These are considered in Appendix D – Statement of Heritage Impacts and Sections 6.1 of the REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015. The EPBC also provides a legislative framework for the protection and management of matters of environmental significance. This protects heritage items on the World Heritage List (WHL), National Heritage List (NHL) or the Commonwealth Heritage List (CHL).

Potential impacts to these matters are also considered as part of Appendix E – Biodiversity searches and Test of Significance and Section 6.7 of the REF.

The proposal is not expected to impact on world heritage values. On 28 June 2007 the Sydney Opera House and buffer zone (including part of Sydney Harbour and the Sydney Harbour Bridge) was included on the UNESCO World Heritage List under the World Heritage Convention. The Sydney Harbour Bridge is not listed on the World Heritage List, but the bridge is within the visual catchment (buffer zone) of the World Heritage listed Sydney Opera House. However, as the proposal is outside the buffer zone, a referral under the EPBC Act is not required.

The proposed actions on the historical heritage values of the place were not considered to be significant as defined by the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance and EPBC Act, and do not require a referral to the Federal Environment Minister.

In addition, no referral under the EPBC Act is required for the National Heritage listings of Sydney Harbour Bridge given that the proposal would not see lasting impacts to the significant National Heritage values of the Sydney Harbour Bridge.

Findings - matters of national environmental significance

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.

The assessment of the proposal's impact on nationally listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance, within the meaning of the EPBC Act. Chapter 7 of the REF describes the safeguards and management measures to be applied. Transport has determined a referral to the Australian Department of Climate Change, Energy, the Environment and Water under the EPBC Act is not required, however Transport would consider referring the proposal to ensure all Commonwealth assessment requirements have been met.

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 Section 2.109 of the SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Transport for NSW is the determining authority for the proposal. This REF fulfils Transport's obligation under section 5.5 of the EP&A Act including 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. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future. Transport is committed to consulting with the community and stakeholders throughout the development of the proposal.

5.1 Consultation strategy

In this section, the term *engagement* is used to mean is the process of working with stakeholders and groups of people to leverage existing strong relationships, building deeper understanding and achieve better outcomes. *Communication* refers to the channels and formats used to disseminate information about the proposal and the opportunity to participate in engagement activities to different audiences.

The purpose of this chapter is to:

- Summarise community, stakeholder and government agency consultation approach used to inform selection of the linear ramp concept and proposal design competition scheme
- Outline stakeholder engagement activities undertaken since announcement of the winning design competition scheme (April 2022) to exhibition of this REF (November 2022)
- Detail how community and stakeholder feedback will be sought and used to inform planning approvals as part of this REF process
- Outline the future approach for community and stakeholder relations that would be employed if the proposal is determined to proceed and transitions to delivery.

Transport is committed to ongoing consultation with stakeholders and the community in relation to the proposed design. This REF will be subject to formal consultation via public display as outlined in Section 5.7.

5.1.1 Engagement and communication approach

Since revisiting the proposal in late 2020, Transport has undertaken an engagement-led and design-excellence focused approach to improving the northern access to the Sydney Harbour Bridge Cycleway.

The engagement objectives of the proposal are:

- Build broad understanding of the proposal need and options developed to progress the proposal
- Provide interested community members and stakeholders with the information they need to give informed and considered feedback on the proposal
- Understand how community and stakeholder groups currently use the proposal location. to minimise potential impacts related to construction and operation of the proposal
- Be transparent and genuine about how feedback will be and continues to shape proposal development, including how input has been used to narrow and select the preferred ramp option and inform ongoing design development
- Build collaborative relationships with impacted and local stakeholders, residents and groups to understand, mitigate and therefore help minimise potential proposal impacts.

Transport has used and is committed to a communication approach that seeks to:

- Keep the local community (including residents, businesses and other groups) and key stakeholders regularly informed of proposal need, options development, rationale for decision-making and proposal progress
- Ensure issues are identified early and effectively managed
- Regularly provides updates to keep key stakeholders informed of outcomes and progress as the proposal progresses
- Detail how relevant stakeholder concerns and issues will be managed should the proposal proceed.

Should the proposal be approved, interactions with the community would be undertaken in accordance with a Community Liaison Plan that will be developed as the proposal transitions to delivery.

5.2 Community engagement

The proposal has incorporated engagement with directly and indirectly affected landowners and cycleway users including North Sydney Council, Heritage NSW, Bike North, Bicycle NSW, local community groups and local, impacted stakeholders.

5.2.1 Early stakeholder engagement for the Sydney Harbour Bridge northern cycleway

As described in Section 2.5, around 30 ramp concepts have been considered by Transport NSW since 2012 to address issues with northern access to the Sydney Harbour Bridge Cycleway. Transport reviewed these concepts against user, place and heritage criteria and short-listed two that met the proposal objectives: a linear ramp extending north over Burton Street above Milsons Point Station plaza, and a loop extending over the southern bowling green at Bradfield Park Central south of Burton Street.

Regular consultation occurred between July 2020 and May 2021 to raise awareness that the proposal was being revisited, explain the drivers for the proposal, provide an overview of alternatives considered and receive feedback on draft requirements and the present ramp options. This was undertaken with key stakeholders including Felicity Wilson MP and representatives from North Sydney Council, Heritage NSW, Transport Design Review Panel, resident group, Milsons Point Resident Action Group, National Trust, Lavender Bay Precinct Committee, Bicycle NSW and Bike North.

One-on-one consultation with adjoining and impacted stakeholders including La Capannina restaurant, Axicom Pty Ltd, Kirribilli Neighbourhood Centre (as operators of the Kirribilli Markets) and St Aloysius School and Loretto College was commenced in May 2021 to inform them of the proposal prior the launch of public engagement.

Linear and looped ramp options

From 7 to 28 June 2021, Transport sought input and feedback from the stakeholders and the community on two options for a ramp as well as their level of support for the proposed Alfred Street South separated cycle path and the Burton Street shared zone. A total of 2,578 survey responses and 461 submissions was received from individuals and organisations including:

- Australian Institute of Landscape Architects
- Tourism and Transport Forum
- Lane Cove Council
- North Sydney Council
- Committee for North Sydney
- Edward East Precinct Committee
- The Kirribilli Centre
- North Shore Historical Society
- Park Precinct Committee
- Bicycle NSW
- Bike East
- Bike North
- Sydney Cycling Club
- Sydney East Riders
- Walk Sydney NSW.

Feedback showed the linear ramp has strong public support. The survey received 2,578 responses of which, 82.9 per cent supported the concepts put forward, and 68.3 per cent preferred the linear option, noting its clearer sight lines, and its more direct and easier connection for the bike riders. The linear design was perceived as less visually intrusive than the loop, and providing a better separation between bike riders, pedestrians and motorists. A summary of the outcomes of the comments of support and concern raised by the community for each option is provided at this location: https://roads-waterways.transport.nsw.gov.au/projects/01documents/sydney-harbour-bridge/sydney-harbour-bridge-cycleway-community-consultation-report-2021-08.pdf

The respondents raised concerns about the bulkiness of the loop design, and regarding its safety due to the bends potentially making the ascension and descent more challenging for less confident riders and creating conflicts with pedestrians on Burton Street. The loop option was also perceived as potentially impacting the Kirribilli Markets and school sporting activities negatively, given these groups use the bowling greens on a regular basis.

Issues raised by the community are summarised on Table 5-1 and further detail on the ramp options and design feedback is discussed in Chapter 2.

Table 5-1: Summary of initial community feedback

Group	Issue raised	Response / where addressed in REF
Residents	Construction, cost and timing	• Details on construction, cost and timing of the proposal is provided in Chapter 3.
	Cycling demand, congestion and projections have been overstated	• Transport used bicycle counters at select locations between 2007 and 2019. The capturing of daily data in the context of overall cycleway usage tracked for over a decade has been used to validate the accuracy of the projected demand • Further detail on cycling demand, congestion and projections is discussed in Chapter 2.
	Existing cycleway and steps	• Information on existing infrastructure is discussed in Chapter 2.
	Heritage impacts	• The proposal design has been refined to minimise damage to heritage items. Non-Aboriginal and Aboriginal heritage impact assessments were conducted for the proposal and are summarised in Section 6.1 and Section 6.10, respectively.
	Kirribilli Markets impacts	• The Kirribilli Markets would be temporarily moved to Ennis Road for the duration of construction. A socio-economic assessment was undertaken for the proposal and is provided in Section 6.6 which discusses impacts to the Kirribilli Markets.
	Lifts and travelators would be a better solution	• Alternatives and options considered for the proposal are discussed in Chapter 2.
	Ramps would have a negative visual and social impacts, such as loss of open space	• The proposal design has been refined to minimise the impacts to open space through careful placement of the bike ramp columns and pre-fabrication of the bike ramp. Further details on the social impacts of the proposal are included in Section 6.6. • A competitive design process has been completed which sought community input for the preferred option of the proposal. A visual impact assessment was conducted for the proposal and is summarised in Section 6.2.
	On-bridge deck solutions	• The feasibility of on-bridge deck solutions was assessed as a potential alternative to the proposal. Further details can be found in Chapter 2.
	Safety concerns of Alfred Street separated cycle path	• The Alfred Street South new 2.5-metre-wide two-way cycle path and upgrades to the Lavender Street roundabout would be designed to meet future cycling demand, whilst safely and efficiently accommodating other road users. Further

Group	Issue raised	Response / where addressed in REF
		details on the Alfred Street South cycle path are provided in Chapter 2.

While the survey also showed that 60 per cent of respondents from the two immediate postcodes of 2060 and 2061 opposed the proposal, they also expressed higher levels of support for the linear option compared to the loop. Thirty two percent of immediate residents supported the linear option versus 20 per cent support for the loop.

The linear option was selected to proceed as it provides better rideability, removes conflict with pedestrians, minimises impact on Kirribilli market operations and recreation activities in Bradfield Park Central, and is a lighter, smaller structure. The linear option also requires considerably less ramp length and structure compared to the loop.

A detailed description of the consultation approach, feedback and outcomes can be reviewed at the proposal portal: Sydney Harbour Bridge Cycleway Ramp Options - Consultation Report - August 2021 (nsw.gov.au).

Linear ramp design competition

In response to community feedback and the preference for the linear ramp, Transport proceeded with this option and, in August 2021, released a Registration of Interest seeking leading architectural firms to take part in a design competition. The design competition outputs would develop a more refined concept of the preferred option. Key stakeholders were given opportunities to attend briefings with the design teams during the competitive design process. Transport exhibited the three shortlisted designs between 6 December 2021 and 16 January 2022, as well as the Alfred Street South plans, for public feedback. The public consultation extended across a period of six weeks and more than 1,000 submissions were received.

Stakeholder engagement activities during the design competition process included:

- Promotion of the public display period via traditional and social media, stakeholder calls and emails, mailbox drops and via the proposal webpage
- Online engagement during the public display period including design reports produced by the three shortlisted firms available on the proposal webpage
- Two livestream events held to provide the stakeholders with an opportunity to ask questions about the proposal. The livestream recordings were uploaded on the proposal webpage after each event and written responses to community questions were made available
- Key stakeholders were briefed in the lead up to the public display period. Briefings were also held during the public display period with Bicycle NSW, Bike North, Committee for Sydney, and North Sydney Council officers.

Transport selected a final winning design, taking into consideration the community feedback received, as well the recommendations by a Design Jury, chaired by the Government Architect which sat twice in January 2022. The design's potential cost and constructability were also considered. Just over half of all respondents said they preferred Aspect's design. Eleven per cent of people provided a null response. Against the six assessment criteria, on average, the community rated Aspect's design higher compared to the other two designs. A summary of the comments of support and concern raised by the community for each of the three designs is provided at this location: https://roads-waterways.transport.nsw.gov.au/projects/01documents/sydney-harbour-bridge/cycleway-access-proposals/cycleway-access-proposals-consultation-outcomes-report-04-2022.pdf.

Aspect's design received more positive comments than negative, with open space, visual impact and heritage integration being the top three issues raised. The design was noted for its 'lightness' and 'modesty'. The positioning close to the bridge was seen as an effective way to keep visual impacts to a minimum and avoid the structure from cutting across the park. Many felt the design blended in respectfully with the Sydney Harbour Bridge and commented on the gentle gradient and good sightlines, noting that this would do much to encourage cycling. Concerns were raised regarding the design:

- About potential tree loss caused by the design extending too far into the park
- Concern regarding the design's heritage impacts, noting that running the ramp close to the entrance of Milsons Point Station could impede views of the Art Deco station façade
- About the angle of the take-off from the bridge, and a perceived narrowness at this location potentially causing a 'pinch point'
- How bike riders would integrate with pedestrians on Alfred Street.

REALMstudios' design mostly attracted comments about visual impact, open space, and heritage integration. The design was noted for its natural, organic shape and bold, contemporary, and interesting design. Supporters appreciated that the design mimicked and transition the design of the Sydney Harbour Bridge. The lighting and provision of shade by the ramp were also noted as a positive feature as was the considered approach to Aboriginal culture and Designing for Country. Concerns were raised regarding the design:

- Being too 'dominating and 'imposing'
- That the alignment over the park was intrusive, with potential for shadowing. The ramp balustrade, with its exterior structure, was considered 'heavy' with respect to the heritage precinct
- About an apparent sharp turn-off where the ramp connects with the Bridge, and how the ramp integrates with pedestrians at ground level, including the safety of pedestrians at ground level.

Civille's design received generally balanced comments with the top three issues being open space, design general and ramp geometry. Supporters noted the design's consideration of the landing including the water feature, native plantings, and dwelling spaces. The design was considered 'modest', 'graceful' and 'simple'. The rest area and lightweight balustrade were also commended. Commentors liked the rideability of the design's broad sweep. Many also noted the smooth transition of the ramp to the existing cycleway with its diagonal connection. It was also noted that Civille had measured and considered pedestrian movement in their design and had provided a suggestion to how the top of the existing stairs could be adjusted for pedestrian access. Concerns were raised regarding the design:

- Being 'outdated' and 'whimsical'
- That the alignment of the design and its width at the most westerly point, have an intrusive impact on Bradfield Park that would be visually dominant, particularly as the ramp comes to the ground
- That the steep section at the end of the ramp means the gradient might be difficult for inexperienced riders.

A summary of community submissions from the linear bike ramp design competition is presented in Table 5-2.

Table 5-2: Summary of community submissions from linear ramp design competition

Feedback received	Response / where addressed in REF
Ramp designs	
The ramp design impacts on the heritage of nearby listed items	Transport has facilitated a robust Design Excellence process which is grounded in NSW Government Policy and supported by key heritage and design experts. External challenge and input have been sought, and the process has been supported by the Government Architect NSW, Heritage NSW, and the Heritage Council Approvals Committee. The linear ramp has been designed to respond sensitively to key heritage sightlines.
The ramp designs interfere with the radial elements of the Milsons Point Station Plaza Design	The alignment of all designs responds to the historic radial geometry of the plaza and maintains pedestrian access to/from the three radial pathways and Railway Station. The Aspect design has the least physical impact of the three designs on the plaza and lawn terraces.
The ramp designs • impede recreational use of Bradfield Park North • result in a net loss of public open space • cut Bradfield Park North off from rest of park	The linear ramp would result in a marginal net loss of open space where the ramp and columns meet the ground. All design teams thoroughly considered how the ramp landing could 'give back' through the provision of enhanced landscaping and community dwelling spaces. Aside from the area where the ramp meets the ground, there is no reason ground level activities could not continue.
The linear ramp restricts views and creates visual clutter	Transport acknowledges that all three designs would impact on view corridors. However, all three designs strived to make a positive contribution to the public open space through high-quality design treatments and finishes and considered responses to the ground integration. Visual impacts were considered in the selection of the winning design, the location of the Aspect design

Feedback received	Response / where addressed in REF
	closer to the bridge viaduct wall resulting in a lowered the visual impact overall.
The ramps would cut off sunlight	Each of the designs could provide shade and cover in the otherwise exposed Station Plaza.
The ramps force bike riders onto the streets – and into positions of conflict with pedestrians. An elevated cycleway is needed.	An elevated cycleway would have far greater impacts than the ramps proposed. It is not structurally possible to cantilever a cycleway to the side of the Sydney Harbour Bridge, so column supports would be needed for the entire length of the cycleway, including through Bradfield Park North and up Middlemiss Street.
Alfred Street South cycle path	
Separated cycle path: • Separating riders from pedestrians would make it safer for all • The western side of Alfred Street is considered to not be the right place for a bike path • Concern regarding how riders using the road join the proposed ramp • It is suggested to continue the separated cycleway down Burton Street and through to Broughton Street • Bike riders should not be encouraged to use the Burton Street tunnel as a through-fare to Broughton Street.	Transport have tried to keep the bike path to the east of Alfred Street South to avoid the driveways, building entrances and bus stops along the western edge. It is necessary to direct riders to the west side so they can cross Lavender Street and join Middlemiss Street. This crossing needs to be located far enough south to avoid the slipway from the Sydney Harbour Bridge. Burton Street is part of North Sydney Council's Cycle Route 3. Continuing the separated bike path from Burton Street to Broughton Street would be a matter for North Sydney Council to progress.
Crossings: • Concern regarding the position of the Alfred Street crossing. Suggestion to move the Alfred Street crossing south to improve safety and reduce congestion • Concern regarding the position of the Lavender Street crossing • The two crossings require bike riders to make several right-hand turns. This is considered to be dangerous, particularly if riders are carrying loads • Concern regarding how the bike and pedestrian crossing would work and whether bikes and pedestrians would be separated • Consider signals at the street crossings to reduce the risk of collision • Continue the bike path to Lavender Street and upgrade the roundabout so riders go directly over to Middlemiss. Consider Dutch-style roundabouts as they are good at integrating bikes, pedestrians, and cars.	The proposed Alfred Street South crossing has been modelled and it is expected to result in minimal queues and delays to road traffic, while significantly enhancing the level of service for pedestrians and bike riders moving safely through Milsons Point. Extending the bike path on the western side of the road to move the Alfred Street crossing south would create additional conflict points with driveways and result in more parking spots being removed. Transport appreciates that directing riders across the road to the west side of Alfred Street South is not in keeping with the 'directness' typically sought in bike path design. However, this is necessary so riders can then safely cross Lavender Street and join the bike path on Middlemiss Street. The crossing is proposed for pedestrians and bikes and would be a pedestrian crossing with delineated area for bike riders. These have become common in other parts of Sydney and typically don't have signals, in keeping with the stated road hierarchy that prioritises pedestrian and bikes over cars. Cars would be slowed through road treatments and good urban design would slow them further at this point. Continuing the bike path all the way to Lavender Street on the east side of Alfred Street would bring it into direct conflict with the Sydney Harbour Bridge slip road. A Dutch-style roundabout would not be appropriate in this location due to the need to keep the slip lane from the Harbour Bridge. In addition, spatial constraints and the existing street geometry also work against the feasibility of this kind of response.
Parking and bus stops:	Reallocating road space to encourage a much-needed mode shift from cars to bikes often means making a trade-off with car parking. Transport has tried to minimise the number of lost

Feedback received	Response / where addressed in REF
• Removal of parking spaces would improve aesthetics and increase the available open space for community use • Bike paths are a better use of public spaces that car parking • Given the walkability and nearby trans station, lots of parking is not needed in the area • Removal of parking would reduce transport choices for residents and cause difficulties for visitors, deliveries and the Kirribilli markets • Moving the southern bus stop would take away parking, add extra distance to walk between the station and bus stop, and require people to cross over Burton Street causing potential conflict • Two bus stops might not be needed on the western side of Alfred Street. Would prefer to keep the northern bus stop where it is due to the narrowness of the footpath in the proposed new location • Provide better shade at the new, relocated bus stops.	parking spaces due to the proposal. It is proposed to remove up to 15 metered parking spaces along Alfred Street South. Transport has met community representatives to discuss moving the southern bus stop. As a result of further design refinement is was determined that the exiting, southern bus stop and shared path would be retained, and relocation of the southern bus stop is no longer required. The northern bus stop would be relocated about 60 metres to the south and the footpath at this location would be widened. Options for shade and cover for any relocated bus stops would be considered further during the next stage of the design process. New street tree planting would be included on Alfred Street South that would provide additional shade. Upgrades to the bus stop are proposed and would be refined during further design development.
Shared path: • There was support for the shared path at the corner of Lavender and Middlemiss Street on the grounds that it would give pedestrians more separation from bike riders and cars • Concerns were raised regarding the limited width of the shared path and the potential safety implications • A redesigned roundabout to allow riders to safely go straight over to Middlemiss Street was considered be preferable.	The road has been narrowed as much as possible to allow for the greatest amount of space for walkers and riders around the roundabout. The proposed section of shared path meets the minimum width of 2.5 metres, required to enable bikes and pedestrians can pass safely. It is considered likely that experienced bike riders would continue to ride on the road through the roundabout with the shared path being available for novice and slower riders. Narrowing the road lanes and changing the surface of the roundabout would slow vehicles and allow for a calmer traffic environment for all road users.

North Sydney community proposal ("Bradfield Park Central" design)

During the consultation on the three competition entries, members of the local community submitted a proposal for an alternative ramp design within Bradfield Park Central. This was supported by North Sydney Council as it avoided Bradfield Park North and had a smaller construction footprint. An independent assessment of the design was undertaken by an active transport expert, who determined the design to meet 'acceptable' requirements in the Austroad guidelines and suitable for commuter bike riders, the largest bike rider cohort expected to use the ramp.

Following a review of the proposal, Transport met the proponents and architect of the scheme on 10 February 2022. Though the proposal met acceptable bike rider guidelines, it fell short of 'desirable' standard necessary to accommodate the widest possible range of bike riders. Transport also met North Sydney Councilors on 14 February 2022 to provide an overview of the proposal and Transport's assessment of the alternative proposal.

An independent assessment of the proposal was carried out by Arcadis' Sustainable Mobility Advisor, following requests from the Minister for Cities and Active Transport. The response provided verified the initial assessment that the scheme did not meet wide accessibility requirements.

Transport received a submission from Senior Landscape Architect of North Sydney Council on 14 January 2022 strongly opposing the three competition entries. The main concerns raised in the submission related to the impedance of views of the Sydney Harbour Bridge at several key vantage points and the interruption of the north-south vista through Bradfield

Park. Concerns were also raised over the disruption to pedestrian connectivity through the park, loss of amenities and impacts to the Bradfield Park North Heritage Walk.

Transport also received a submission prepared by the Milsons Point Community Group in association with Lavender Bay Precinct, North Sydney LGA on 17 January 2022. The submission suggested that Transport's proposal does not meet the key objectives of improving accessibility and safety for all bike riders and catering for future growth of bike rider travel between North Sydney CBD and Sydney CBD. The submission also suggests the misrepresentation of Transport data, specifically overrepresentation of bike rider trip data. Concerns were also raised over the lack of costings for the selected ramp option and a corresponding Benefit Cost Analysis, with the submission providing a Cost Benefit Analysis under varying scenarios and based on available data. Lastly, concerns were raised over lack of consideration for alternative solutions, including HarbourLink, an elevated cycleway east of the railway line, a cycle lane on the Sydney Harbour Bridge and mechanical devices.

The National Trust provided a submission to Transport with initial comments on the proposed designs for the Sydney Harbour Bridge Northern cycleway access on 16 January 2022. The main concerns raised include the need for the northern and southern approaches to be designed simultaneously as an integrated project and part of a broader cycle network. Furthermore, the submission suggested the interests of all members of the community, including pedestrians, station and park users and bike riders of all skill and fitness levels must be considered. The design should also minimise intrusion of the structure on the park and its landscape setting and be recessive in nature to the bridge and its environs, resulting in minimised impacts to the heritage values of the Sydney Harbour Bridge, Milsons Point Station and Bradfield Park.

5.3 Aboriginal community involvement

Aboriginal heritage impacts were considered in accordance with the 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 Chapter 7) and hence there was no statutory requirement to consult with the Local Aboriginal Land Council.

In September 2021, WSP held some yarns with significant elders from both the Cammeraygal and Gadigal tribal lands. They were briefed on the proposal and given the opportunity to provide feedback. During this engagement, WSP were informed of the historical and cultural significance of the proposal site and surrounds, with the proposal design being an opportunity to celebrate Country and culture. Other key issues identified during the yarns included the minimization of ground disturbances and catering for important viewpoint of Gadigal and Cammeraygal Country.

Transport's engagement with WSP Australia also provided client-side Designing with Country services and advice in 2021 during the Scoping Design Phase of the proposal. Transport's commitment to Designing with Country during the Scoping Design phase and Initial Design Phase is demonstrated by:

- Development of an Aboriginal Design Principles document which included potential Aboriginal design themes and a summary of the proposal's engagement with Aboriginal elders. The document was provided to the three Initial Design Phase (Competition) teams to assist development of the teams' proposals
- Engagement sessions with local Aboriginal elders from Cammeraygal and Gadigal tribal lands to better understand proposal specific issues of importance to elders, Aboriginal stories and aspirations for the proposal
- Incorporation of specific Designing with Country Design Principles within the Initial Design Phase Services Brief and a mandated requirement for all teams to include a Designing with Country specialist
- Facilitation of an engagement session with Aboriginal elders in the presence of the three Initial Design Phase teams
- Inclusion of a Designing with Country expert within the six person Initial Design Phase Design Jury chaired by the Government Architect NSW
- Incorporation of Designing with Country as part of the formal evaluation criteria by Transport's Tender Assessment Committee during the Initial Design Phase.

To ensure that Designing with Country remains a priority during Concept Design and Detailed Design phases, the following has been undertaken:

- Continued consultation throughout concept and detailed design proposed
- WSP and/or Yerrabingin advises Transport on matters relating to Country including facilitation of engagement sessions with Aboriginal elders

- The Design Jury's advice regarding Designing with Country would be provided to the design team and progress against recommendations would be tracked by the Project team and the Design Integrity Panel
- The Design Integrity Panel, to be chaired by the Government Architect NSW, would include advice from a Designing with Country expert
- Engagement sessions with local Aboriginal elders from Cammeraygal and Gadigal tribal lands would continue through all stages of the design. The design team would meet directly with the elders to assess whether the design is reflecting the elders' inputs and feedback. Transport and the lead designer would facilitate these meetings
- The design team would continue to include a Designing with Country specialist, Yerrabingin, as a mandatory requirement
- The proposal's interpretation strategy would include Designing with Country as a central element
- The Project team would continue to engage with Transport's internal Aboriginal stakeholders to communicate design progress and take on board feedback
- At the competition of the Concept Design phase the design team's performance, including on matters of Country, would be assessed by Transport. This assessment would impact a decision by Transport on whether to engage the design team for the Detailed Design phase of the proposal.

A Connecting with Country "Design Jam" was facilitated by Yerrabingin on 1 June 2022. The Design Jam brought together the local Indigenous community, the design team, and Transport to explore design ideas, merge different styles of thinking, start conversations and refine insights. The Design Jam generated a variety of ideas and opportunities for incorporating into the development of the Concept Design and future stages. Key ideas and themes included:

- The 1988 Australia Day march
- Providing a place to stop, reflect, educate
- Stringybarks and grass tress
- Gadigal totem – goanna
- Fishing enterprise narrative
- Sensory experiences.

5.4 SEPP (Transport and Infrastructure) consultation

5.4.1 Consultation in April 2022

North Sydney Council was consulted in April 2022 about the proposal as per the requirements of Sections 2.10 and 2.11, Division 1, Part 2.2 of the SEPP (Transport and infrastructure). Appendix B - Statutory consultation checklists contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

Sections 2.10, 2.11 and 2.12, Division 1, Part 2.2 of the SEPP (Transport and Infrastructure), respectively state that development that may have an impact on council-related infrastructure or services, local heritage items or flood-liable land may require consultation with the relevant council, in this case North Sydney. The proposal is not located within flood-liable land however it would impact on council-related infrastructure services and therefore requires consultation with North Sydney Council. Potential impacts to any local heritage sites are be assessed in the SoHI, together with proposed safeguards and mitigation measures.

Issues that have been raised as a result of this consultation are outlined below in Table 5-3.

The proposal is not located on land next to a National Park, declared Marine Park, declared aquatic reserve, or within a foreshore area as defined by the Sydney Harbour Foreshore Authority Act 1998 (SHFA Act). The proposal would not involve development over navigable waters within a National Park or Nature Reserve and is not within a mine subsidence district or a dark sky region. As such, no consultation with public authorities other than councils would be required in accordance with Section 2.15 of the SEPP (Transport and Infrastructure).

Table 5-3: Issues raised through SEPP (Transport and Infrastructure) consultation

Group	Issue raised	Response / where addressed in REF
North Sydney Council	Impacts on amenity and useability of Bradfield Park North	The proposal would improve accessibility and amenities for commuters and visitors to the Sydney Harbour Bridge and would enhance and strengthen the core function of the Sydney Harbour Bridge as an iconic and critical transport link. Refer to Section 6.2 and Appendix C – Landscape Character and Visual Impact Assessment for further details. Transport acknowledges that public amenity is a key value of the community within the vicinity of the proposal. The bike ramp alignment has been developed to align closely with the Sydney Harbour Bridge viaduct to minimise intrusion into Bradfield Park North, maximising the amenity and open to the sky quality of the park. The proposal includes additional landscaping and pavement improvements that would enhance the amenity of the park and attract more users.
North Sydney Council	Impacts and heritage of Bradfield Park North and associated impacts on the Sydney Harbour Bridge heritage elements north of and including the bridge stairs	The proposal would result in a minor to moderate impact to the heritage fabric of the Sydney Harbour Bridge, as well as moderate impact to the locally listed Bradfield Park. Associated impacts would be mitigated through good contemporary design, by locating the proposed elevated linear bike ramp close to the concrete bridge approach, and by graduating the proposed elevated linear bike ramp from its connection to the Sydney Harbour Bridge and Bradfield Park. The achievement of the Sydney Harbour Bridge's design and its status as an iconic cultural landmark would be respected and not diminished by the proposal. Refer to Section 6.1 and Appendix D – Statement of Heritage Impacts for further details.
North Sydney Council	Loss of space, pedestrian and traffic conflicts	The proposal would result in minor and temporary road closures, diversions to footpaths, temporary loss of parking spaces during construction, traffic management and localised diversions. Once operational, the proposal would result in the loss of up to 15 parking spaces. Refer to Section 6.4 and Appendix G – Traffic and transport impact assessment for further details.
North Sydney Council	Removal of Bradfield Park heritage walk along the bridge approach wall	The proposal has considered retaining Bradfield Park's existing sandstone heritage inlays and proposes that the interpretive sign of Bradfield Park's heritage would be retained by the proposal's design refinements. Refer to Section 6.1 and Appendix D – Statement of Heritage Impacts for further details.
North Sydney Council	Concern about the planning assessment pathway and request that the proposal be subject to an integrated development assessment and Environmental Impact Statement.	A described in Section 4.1.1, the proposal is assessable by Transport under Section 2.108 of the SEPP (Transport and Infrastructure). A separate approval would be sought under Section 60 of the Heritage Act for the impacts of the proposal to the State Heritage Listed Sydney Harbour Bridge. Permits would be obtained, as required under Section 139 of the Heritage Act and Section 138 the Roads Act, as identified in Section 7.3.

5.4.2 Consultation in November 2022

North Sydney Council has been further consulted in November 2022 about the proposal as per the requirements of Sections 2.10 and 2.11, Division 1, Part 2.2 of the SEPP (Transport and infrastructure). An updated letter was sent to North Sydney Council and any response received will be addressed in the submissions report for the proposal and through on-going consultation.

5.5 Government agency and stakeholder involvement

Transport has met regularly with key stakeholders during the proposal development process including:

- North Sydney Council
- Heritage NSW
- Heritage Council NSW
- Milsons Point Resident Group representatives (including North Sydney Council Mayor and Ward Councillor)
- Lavender Bay Precinct Committee representatives
- Felicity Wilson MP
- Transport Design Panel
- Community and Bike User Group
- Bicycle NSW
- Bike North
- Kirribilli Neighbourhood Centre
- La Capannina Restaurant
- St Aloysius School and Loretto College representatives
- Billi Boules Club representatives.

In addition to the above, various government agencies and stakeholders have provided feedback on the proposal, including:

- North Sydney Council Approvals Committee
- Department of Climate Change, Energy, the Environment and Water (Formerly Department of Agriculture, Water and Environment)
- North Sydney Council
- Committee for North Sydney
- Edward East Precinct Committee
- North Shore Historical Society
- Park Precinct Committee
- National Trust
- Heritage Engineers Australia
- Australian Historic Garden Society
- Australian Institute of Landscape Architects
- Tourism and Transport Forum
- Milsons Point Community group
- Lavender Bay PC
- Kirribilli PC
- Parks PC
- Edwards PC
- Bike East
- Sydney Cycling Club
- Sydney East Riders
- Walk Sydney NSW.

Issues raised during early consultation with these agencies and stakeholders are outlined in Table 5-4.

Table 5-4: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
Heritage NSW	Considerations around the linear bike ramp alignment, elevations, Milsons Point Station entry, ramp architecture, lighting approach and landscape approach for Bradfield Park	These matters are addressed in the considerations for detailed design outlined in the SoHI and in this REF at Section 6.1. These recommendations respond to the key heritage issues that have arisen out of the ongoing consultation process with Heritage NSW.
Heritage Council NSW	Consideration of all heritage value articulated in the Statements of Significance for the National Heritage Listing and the State Heritage Listings of the Sydney Harbour Bridge and Milsons Point Station	A SoHI has been undertaken for the proposal which assesses the impacts to non-Aboriginal heritage and provides mitigation measures to minimise the impact of the proposal. Refer to Section 6.1.
	Recommends a heritage expert be appointed to the Design Competition jury	A heritage expert from Heritage NSW acted as an observer of the jury assessment process, as described in Section 6.1.
North Sydney Council	Requests Transport to establish a Proposal Control Group with representation from both North Sydney and City of Sydney Councils and generate three alternative designs through the delivery of a Sydney Harbour Bridge Cycling Infrastructure Design Competition. These alternative designs would then be considered as part of the Western Harbour Tunnel Active Transport Network Review	A number of alternatives and options have been considered for the proposal. Extensive community feedback has been sought and taken into consideration in the design. Refer to Chapter 2 for further detail on the alternatives and options considered.
Committee for North Sydney	Concerns about level of community participation, hastiness and lack of consultation in the identification of cycle access options	Following early stakeholder engagement in 2020, the community was given opportunity to provide feedback on the two shortlisted ramp options as well as on the Alfred Street cycle path. The design options process including alternatives and options considered are detailed in Chapter 2.
Edward East Precinct Committee	Less bulky ramp next to the bridge approach wall should be assessed Alternative exit points should be considered	A number of alternatives and options were considered for the proposal. Refer to Chapter 2 for more detail.
The Kirribilli Neighbourhood Centre	Impacts during construction including loss of amenity, parking, public space and impacts to Kirribilli markets Potential heritage impacts to Millers Point Station and Bradfield Park	Visual impact, traffic and transport and socio-economic assessments have been conducted which assess the construction impacts associated with the proposal. These assessments include mitigation measures which would minimise the impacts of the proposal. Refer to Sections 6.2, 6.4 and 6.6, respectively.
St Aloysius School and Loreto College	The schools use the bowling greens for school sports. Up to 1000 children use the greens each week	The bowling greens would only be impacted during construction and would be reinstated following completion of the construction. Further details are provided in the socio-economic impact assessments in Section 6.6.
North Shore Historical Society	Impact to the heritage values of the Sydney Harbour Bridge, Bradfield Park and the Millers Point Station entrance Impact to local amenity, loss of parking, green space and trees Consideration of additional, more heritage sensitive options in addition to further community consultation	A SoH) has been undertaken for the proposal which assesses the impacts to non-Aboriginal heritage and provides mitigation measures to minimise the impact of the proposal. Refer to Section 6.1. Visual impact, traffic and transport, socio-economic and biodiversity assessments have been conducted for the proposal. These assessments include mitigation measures which would minimise the impacts of the proposal. Refer to Sections 6.2, 6.4and 6.6, respectively.

Park Precinct Committee	Loss of public space should be offset through the provision of additional useable public space in the North Sydney LGA	Impacts to public space have been assessed in the socio-economic assessment refer to Section 6.6 for more detail.
Australia Institute of Landscape Architects	Recognition of the heritage value of the Harbour Bridge and parkland and value in a participatory design process involving Council and local community groups	A SoHI has been undertaken for the proposal that recognises all heritage listed items that would be impacted by the proposal and provides mitigation measures to minimise impacts. Refer to Section 6.1.
BIKEast	Existing accessibility and equality issues posed by stairs	The proposal seeks to improve accessibility for bike riders and pedestrians. Refer to Chapter 3 for further details on accessibility improvements of the proposal.
Bike North	Better solution is needed for Lavender Street involving closing the exit from the Sydney Harbour Bridge or providing grade separated across Lavender Roundabout	The proposal underwent a robust design selection process which considered numerous alternatives and options and took into consideration community feedback, including consideration of closing of the slip lane from the Warringah Freeway. See Chapter 2.
Sydney Cycling Club	Safety concerns and cycleway congestion at existing stairs, poor separation between pedestrians and bike riders and poor-quality cycle paths on surrounding cycleways	Improving safety of bike riders, pedestrians and motorists as well as supporting future growth of bike riders are key objectives the proposal aims to achieve. Further details on these as well as upgrades to the Alfred Street cycleway are included in Chapter 3.
Sydney East Riders	Poor accessibility of current stair access and pinch point at the top of the stairs	Improving accessibility is a key objective the proposal. Refer to Chapter 2 for how this would be achieved.
Walk Sydney NSW	Suggest conversion of a trafficable lane on eastern side of the bridge into an active transport connection	The proposal underwent a robust design selection process which considered numerous alternatives and options and took into consideration community feedback. However, the eastern side of the bridge is outside of the scope of the proposal. Refer to Chapter 2 for the design selection process and alternatives considered for the proposal.

5.5.1 Design competition consultation

A summary of the government and stakeholder submissions in response to the three design concepts exhibited in the linear ramp design competition is provided in Table 5-5.

Table 5-5: Summary of government and stakeholder submissions from linear ramp design competition

Agency	Issue raised	Response / where addressed in REF
The Kirribilli Neighbourhood Centre	Does not support the proposal and has provided the following comments: • The markets would need to be relocated and assistance is sought both financially and in finding a temporary location. Additionally, contractors should be made aware that the markets have a standing licence for the free, unobstructed use of the Burton Street tunnel • Ramp columns should not be in the zone of the existing bollards between the steps and the gravel area • The ramp should be prefabricated • Site sheds should not be located in the Burton Street tunnel • Requests to be involved in the staging plan for construction	Transport is working with the Kirribilli Neighbourhood Centre to develop a plan for the temporary relocation of the market stalls and the maintaining of market operations throughout the entire construction period. At this time Transport does not believe that construction would impede on the use of the Burton Street Tunnel. Transport is committed to involving the Kirribilli Neighbourhood Centre in the ongoing design and construction planning processes.

Agency	Issue raised	Response / where addressed in REF
	• Requests the incorporation of power poles and banner anchor points in the columns.	
Milson Point Community Group, Lavender Bay Precinct Committee and Cr Ian Mutton	It is considered that the proposal: • Fails to meet Transport's key objectives • Is based on a misrepresentation of data • Fails to consider alternatives that could gain broad support.	Due to the length of this submission, a full response to this submission can be found on the proposal engagement portal at https://caportal.com.au/tfnsw/sydney-harbour-bridge-cycleway/faqs.
Bicycle NSW	Bicycle NSW supports the Aspect Studios design and has the following suggestions: • Widening of sections to allow rest and overtaking • Retaining the steps for the benefit of bike riders heading east • Reconsidering the junction to ensure the angle of approach is comfortable.	The proposed suggestions would be considered during the next phase of the design development.
Edward East Precinct Committee	Edward Precinct prefers the Aspect design because it has least impact on green/open space and on the residents of the apartments on Alfred Street South.	The preference of the Edward Precinct's for the Aspect design has been considered in Transport analysis and design selection process.
National Trust	Has made the following comments: • Both the northern and southern approaches to the Harbour Bridge cycleway must be designed at the same time as an integrated project and design integrity of the bridge • The cycleway approaches must not be considered in isolation, but instead as part of a wider network • Funding and land acquisition arrangements should be resolved prior to further design phases • Community concerns should be considered • The proposed designs would have varying levels of impact on the heritage values of the Harbour Bridge, Milson's Point Station and Bradfield Park • Any design should seek to minimise the intrusion of the structure on the park and its landscape setting.	Both the northern and southern cycle way access points have been considered in Transport's strategic examination of the need for investment. Transport are committed to providing the right long-term solution however an upgrade to the southern access is not currently proposed. As demand increases in response to the upgrade to the northern access, the investment need for the southern access would be reviewed. The Design Excellence Strategy has considered both the northern and southern approaches to the Harbour Bridge and would be applied to any future plans for the southern access.

5.6 Concept design consultation

5.6.1 Ongoing engagement and communication with impacted and interested stakeholders

Since the April 2022 announcement of the team led by Aspect as winners of the design competition, Transport has been working with Aspect team to progress the design.

During the concept design development, Transport continued to consult key stakeholders and community groups to understand and reduce potential impacts of the proposal, which included:

- Regular workshops with an expert Design Integrity Panel chaired by the NSW Government Architect – see Section 5.6.2
- Establishment of the Community and Bike User Group – see Section 5.6.3
- Regular meetings with North Sydney Council

- Updates to Heritage NSW and the NSW Heritage Council Approvals Committee
- Meeting with local precinct communities and groups (Milsons Point Community Group and Lavender Bay Precinct Committee)
- Meetings with Bicycle NSW and Bike North
- meetings with Kirribilli Neighbourhood Centre as operators of the Kirribilli Markets
- Update meetings with Billi Boules Club
- Meetings with St Aloysius School and Loreto College
- Meeting with St George Community Housing as managers of Greenway social housing
- Communication with GoGet car share operators
- La Capannina restaurant
- A doorknock of businesses along Ennis Road, with Kirribilli Neighbourhood Centre, to gauge views on the Proposal.

A summary of communication, issues raised and Transport's response is shown in Table 5-6.

Table 5-6: Summary of stakeholder consultation since April 2022

Stakeholder	Summary of communications	Response / where addressed in REF
North Sydney Council	• Presentation of 30% design concept, stakeholder consultation update, outline of proposed construction compound lease area (reduced footprint) • Discussion of impact on open space in Bradfield Park North, property access requirements, construction compound impacts on recreational users • Briefing with Council's Active Transport Officer on concept design • Update on consultation with Kirribilli Neighbourhood Centre, Billi Boules Club and local schools. Discussions regarding options for temporary relocation of these recreational and cultural activities during proposal construction • North Sydney Council has expressed requirement for Transport to consult with local businesses on Ennis Road regarding impacts of market relocation – consultation outcomes would be presented as part of traffic approval requirements • Request for support to facilitate Ennis Road GoGet car share relocation • Briefings to provide detail of site investigation work required to progress design.	Additional targeted consultation about market relocation would be undertaken as part of this REF process. For further details see Section 6.6. Transport and the Kirribilli Neighbourhood Centre carried out a doorknock of businesses on Ennis Road about market relocation plans and to gauge views on the Proposal. The response was positive. Transport would also provide support to North Sydney Council to undertake consultation regarding GoGet relocation at an appropriate time.
Heritage NSW officer and Heritage Approvals Committee	Heritage NSW and the Heritage Council Approvals Committee have been consulted at key milestones during both the competition phase and development of the concept design for the proposal. Issues raised during consultation include: • The high significance of the site and open space/landscape values of Bradfield Park necessitating an exceptional design outcome	These matters are addressed in the considerations for detailed design outlined in the SoHI and in this REF at Section 6.1. These recommendations respond to the key heritage issues that have arisen out of the ongoing consultation process with Heritage NSW.

Stakeholder	Summary of communications	Response / where addressed in REF
	• The need to retain the integrity of the competition winning design • The need for a whole of landscape approach considering Bradfield Park and interface with the new structure • The need for ongoing consultation and involvement with Heritage NSW and the Heritage Council Approvals Committee, including a touchpoint at 70% detailed design • The need to progress with the design incorporating ongoing heritage advice Further detailed discussions with Heritage NSW have covered the ramp alignment, elevations, Milsons Point Station entry, ramp architecture, lighting approach and landscape approach for Bradfield Park, with feedback given iteratively.	
Department of Climate Change, Energy, the Environment and Water (DCCEEW)	DCCEEW has been consulted for briefing on the proposal and to discuss implications under the EPBC Act on the National heritage values of the Sydney Harbour Bridge. The main issue raised during consultation regarded the importance of the 'self-assessment' process in undertaking whether or not the proposal constitutes a significant impact on the NHL.	Impact on the NHL is addressed in the SoHI and in this REF in Section 6.1.3.
Heritage stakeholder groups (National Trust, Australian Garden History Society, Engineering Australia – Heritage Engineers)	Impact on heritage layout of Bradfield Park North. Discussion about interaction of cyclist and pedestrians, encouragement to introduce visual indicators for bikes to reduce speed. Presentation to update on stakeholder engagement, Community and Bike User Group (CBUG) consultation, bike group consultation, Design with Country process and emerging themes and 30% design concept. Discussion about impact of ramp landing on open space and feedback from Council regarding urban domain improvements. Discussion about ramp connection to bridge and details of parapet cut, opportunity to reinterpret parapet cut out in a nearby local space. Discussion around lighting – stakeholders support subtle lighting approach and potential opportunity to celebrate local events throughout the year.	Transport outlined design updates made to reduce impact on Bradfield Park North, heritage views and Heritage Walk (reduction of ramp length, alignment to product station views, response of ramp to bridge design). Further information about how the design responds to the proposal's heritage location is found in Chapter 2. Ramp lighting would balance need for cyclist safety with impacts on local residents and park users – See Section 3.1. The design responds to original Bradfield Park plaza paving design (See Section 6.1.3). Details about urban domain improvements and cycle path are outlined in Section 3.1 and would be refined based on ongoing feedback from North Sydney Council, stakeholders and the wider community.
Milson Point Community Group and Lavender Bay Precinct Committee representatives	Presentation on going stakeholder engagement, CBUG consultation, Design with Country process and 30% design concept. Representatives reiterated their concern with the linear ramp concept and associated impact on Bradfield Park North. They felt unable to provide feedback on input on the linear concept.	Transport confirmed the Project team had been instructed to progress concept design based on the linear ramp and not alternative designs. For further details see Section 5.2. Transport is committed to engaging with the community and impacted stakeholders through the detailed design and planning approvals process.

Stakeholder	Summary of communications	Response / where addressed in REF
Kirribilli Neighbourhood Centre (KNC)	Monthly and fortnightly in person meetings held with General Manager and Markets Manager. Discussion of existing markets layout, frequency, relocation needs, power requirements, storage facility requirements. Markets provide a critical source of income for KNC activities. Action planning discussions about market relocation arrangements should the proposal proceed including stallholder consultation, assistance required with updating markets website for stallholder bookings, importance of ensuring business continuity via well-managed relocation process for KNC and market vendors.	Socio-economic impacts associated with the proposal during construction are detailed in Section 6.6. Transport holds regular(fortnightly) KNC market-relocation planning meetings with formal record of action plan, timeline and responsibilities. Agreement has been reached regarding: • Target date for market relocation (July 2023 – Dec 2024) • Market stall layout on Ennis Road • Access to Burton Street tunnel for stalls • Lease for temporary storage and change room facilities during proposal construction • Support to update Kirribilli Markets website for stall-booking purposes • Support to apply to North Sydney Council for market-date traffic arrangements. Transport would be committed to continuing this collaborative approach.
Meetings with Bicycle NSW and Bike North	Ongoing updates regarding updated design. Discussion of ramp landing, separated cycle path, interaction with pedestrians. CBUG overview: outcomes were support for Design with Country, importance of separation of bikes and pedestrians. DIP update and 30% design concept plan, issues covered: • Ramp gradient, design update on heritage views and ramp alignment, discussion of ramp curve and bump rail/grab rail, separation between bike travel lanes at bridge connection • Discussion of lighting requirements to minimise impact on residents while maintaining rider safety • Rest area needs to be further refined to address potential safety concerns / overcrowding • Discussion about ramp deck width, landing space and ramp landing turn curve. Discussion of directional markings, landscaping around ramp landing, realignment of ramp with Heritage Walk • Bicycle Groups would like to continue to collaborate with Transport to provide input that can be used to refine the proposal design for the benefit of the wider community and bike users.	Details of proposal concept design are outlined in Sections 2.5 and 2.7. The proposal has been designed to fit with the context of location, heritage values of the area and architectural qualities of the Sydney Harbour Bridge. Measures to mitigate impacts to heritage items have been identified in Section 6.1 and Appendix D – Statement of Heritage Impacts. Bike user groups and other key stakeholders would be consulted as part of this REF (Section 5.6.3). Transport would continue to provide ongoing updates to stakeholders and the community as the proposal progresses.
Billi Boules Club	Meeting to discuss long-list of potential alternative locations of boules piste given	Transport is continuing to work with the boules club to progress alternative playing locations in the local area.

Stakeholder	Summary of communications	Response / where addressed in REF
	impact of the proposal construction compound on current playing location. Discussion of club requirements – proximity to public transport, playing surface, amenity requirements and gradient.	North Sydney Council is also providing input as part of this process. Further details are provided in Section 6.6.
Meetings with St Aloysius School and Loreto College	Meeting to discuss the proposal timeline, construction compound location, access and impacts on school sporting activities. Playing area would be reduced from two to one field from July 2023 to December 2024 during proposal delivery. The northern field would remain available for school use. Question about whether area of Bradfield Park South currently used as construction compound would be available for school sport use. Discussion of opportunity for schools to be involved with providing archival images or artwork for hoarding design.	Socio-economic impacts of construction compound and impact on school sports relocation has been detailed in Section 6.6. Anderson Park would be available to provide additional playing area for Loreto College and for after school sport use by St Aloysius School. Transport would continue to provide updates to both schools, including updates on potential access to additional playing space in Bradfield Park South.
La Capannina restaurant	Meetings to provide general proposal updates, concept design and discuss property impacts. Discussion of impact of construction compound and changed access arrangements (patrons and deliveries).	Access to La Capannina for loading, deliveries and less mobile patrons would be provided through the bowling greens, off Alfred Street South. The main access to the restaurant for patrons would continue to be via the stairs from Fitzroy Street. For further details and management measures see Sections 6.4 and 6.6. Transport would continue to liaise with the restaurant owners regarding property acquisition, compensation and impacts of construction compound.
St George Community Housing as managers of Greenway social housing	Onsite meeting to introduce St George to the proposal, provide overview of the proposal need and potential impacts on Greenway complex should Kirribilli Markets be moved to Ennis Road. Discussion of pedestrian and vehicle access impacts on market days, complex needs of some tenants, importance of communicating with tenants frequently and via multiple channels.	Pedestrian access from Greenway to Ennis Road would be maintained on market days. Moving vans would be able to access complex via Broughton Street entrance. For further details and management measures see Section 6.4. Targeted consultation with Greenway tenants is being undertaken as part of this REF – refer to Section 5.6.3. Transport would work closely with Kirribilli Neighbourhood Centre, St George Community Housing, Greenway Tenants Association to keep residents informed and updated of traffic changes and other impacts associated with market operations.
GoGet car share operators	Meeting to provide general proposal update and discuss potential requirement to relocate Ennis Road carshare pod due to market relocation.	Targeted consultation about market relocation is being undertaken as part of this REF. Refer to Section 6.6. Transport would provide support to North Sydney Council to undertake consultation regarding GoGet relocation at an appropriate time.
Ennis Road businesses	Doorknock to introduce concept of potential market relocation to Ennis Road. Questions	Footpath access would be maintained, outdoor seating and outdoor produce

Stakeholder	Summary of communications	Response / where addressed in REF
Axicom Pty Ltd	regarding footpath access, outdoor table arrangement and outdoor produce stalls. Business owners expressed in-principle support.	sales would remain permitted. For further details and management measures see Section 6.4. Transport committed to provide further detail once relocation plans are more progressed. Targeted consultation about market relocation is being undertaken as part of this REF – refer to Section 5.6.3.
	Discussions to provide general proposal updates, concept design, property impacts and impact of construction compound.	Socio-economic impacts of construction compound have been detailed in Section 6.6. Transport would continue to liaise with the company regarding property acquisition, compensation and impacts of construction compound.

5.6.2 Design Integrity Panel

Transport has created a proposal-specific Design Integrity Panel to provide independent, urban design, architectural, landscape, heritage and Designing with Country review of the Sydney Harbour Bridge cycleway access design as it progresses through concept and detailed design. The Design Integrity Panel would provide ongoing review of the design to ensure the integrity of design is maintained or enhanced.

The Terms of Reference for the Design Integrity Panel have been endorsed by the Government Architect NSW.

The Design Integrity Panel members are:

- Abbie Galvin (Chaired by Government Architect NSW)
- Alec Tzannes (Architecture & Urban Design (Alternative Chair)
- Michael Hromek (Designing with Country)
- Peter Phillips (Non-Aboriginal Heritage)
- Garth Paterson (Landscape Architecture & Active Transport).

The Design Integrity Panel has met to review the design progress and provide verbal and written feedback and design-excellence challenge at three meetings during Concept design phase. The Panel would continue to regularly meet to review design throughout the Detail Design phase to guide the design development.

5.6.3 Community and Bike User Group

To secure important community and user input to the design development process, Transport established a CBUG to provide input during the design development phase. The key objectives of the CBUG are to:

- Advise Transport on how the linear bike ramp design and the Alfred Street South cycle path can contribute to the public realm and amenity and encourage cycling
- Help develop solutions that might resolve potential conflicts between bike riders, pedestrians, and road users.

The CBUG comprises 14 randomly selected members of the local community and within the cycling catchment of approximately 7.5km from the proposal boundary, covering a range of ages and bike riding experience. The CBUG has met twice and provided deeply considered feedback on the design. A report of the CBUG meetings can be found at the proposal's website.

The CBUG guided the design team on:

- The importance of separating bikes and pedestrians in busier locations.
- The use of 'soft' design treatments like planting to integrate the ramp with Bradfield Park North.
- Ensuring the proposal is well connected with the wider bike network.

- The opportunity to acknowledge Aboriginal Culture throughout the proposal.

The CBUG worked with Transport and the winning design team to ensure community and rider perspectives influence the development of the ramp and bike path design.

5.7 REF action plan

The REF would be placed on public display from Monday 28 November to Sunday 18 December 2022 for community input and feedback. The REF would be placed on an interactive online engagement platform with a feedback form and information on how to make a written or email submission about the proposal. To support the REF exhibition, a series of engagement and promotional activities would be completed.

At the conclusion of the public display period for this REF, Transport would acknowledge receipt of feedback from each respondent issues raised would be considered by Transport before determining whether to proceed with the proposal.

Shortly after the end of the REF display period, a submissions report would 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 would be published on the proposal website. Should Transport determine to proceed with the proposal, the Determination Report would be made available on the Transport website and would summarise the key impacts identified in this REF, demonstrate how Transport considered issues raised during the public display period, and include a summary of mitigation measures proposed to minimise the impacts of the proposal.

Should Transport determine to proceed with the proposal, the Project team would keep the community, councils and other key stakeholders informed of the process, identify any further issues as they arise, and develop additional mitigation measures to minimise the impacts of the proposal. Future community liaison would be delivered in line with a Community Liaison Plan developed before construction starts.

Transport would continue to update the proposal's website (https://nswroads.work/cycleway) and issue community update newsletters during detailed design and construction.

An action plan has been prepared for the purpose of the REF and summarised in Table 5-7.

Table 5-7: REF action plan

Activity	Audience
Week commencing Monday 28 November 2022	
Engagement platform/website live • Special mapping tool • Feedback form and submission information • REF chapters	All community Proposal stakeholders Government agencies
Promotion of REF and submission opportunities: • Newsletter (distributed to letterboxes) • Postcard (distributed to letterboxes) • Signage/poster erected in the area • Advertisement in print media • Social media geo targeted advertisements	Local residents and businesses
Promotion of REF and submission options: • Frequently Asked Questions (on website) • Fact sheets (on website) • Media release	All community and stakeholders

Activity	Audience
Promotion of REF and submission options: • Email to stakeholders	Stakeholder distribution list/key groups
Door knocking: • Ennis Road and other Kirribilli businesses (Kirribilli Market relocation) • Kirribilli Residents • St George Community Housing for Greenway residents • Alfred Street South businesses	Local residents and businesses
Pop up information event at Kirribilli Markets	Local residents
Week commencing Monday 5 December	
Pop up information event at Kirribilli Markets	Local residents
Pop up information events at the bottom of the steps	Commuter bikers
Follow up phone calls to local businesses / organisations and key stakeholder groups	Key stakeholder groups Local schools Local businesses/organisations
Week commencing Monday 12 December	
Follow up door knocks of those missed	Local residents and businesses
Reminder emails to stakeholders	Stakeholder distribution list/key groups
Reminder social media geo targeted advertisements	Local residents and businesses

5.8 Ongoing consultation

Transport would continue to update the local community and identified stakeholders about relevant activities and other proposal updates using the following engagement channels:

- Website updates, social media and electronic direct mail
- Community Update newsletter
- Proposal update briefings with impacted stakeholders and groups
- Key stakeholder meetings
- Notifications to impacted property owners, residents, businesses and user groups.

A Community Liaison Plan would be prepared and implemented as part of the Construction Environmental Management plan (CEMP) to help provide timely and accurate information to the community during construction. The Community Liaison Plan would include (as a minimum):

- Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions
- Contact name and number for complaints.

The Community Liaison Plan would be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008).

During the ongoing development of the proposal, the project community engagement team would continue to respond to community and stakeholder enquiries and feedback. During proposal delivery, a dedicated community relations team would implement the Community Liaison Plan. This would include providing regular community update or construction notifications as required and responsibility for investigating and resolving any feedback or complaints made about construction activities.

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 Guideline for Division 5.1 assessments (DPE 2022) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land.
- Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Non-Aboriginal heritage

This chapter provides an assessment of the potential impact on non-Aboriginal heritage as a result of the proposal and identifies environmental management measures to minimise these impacts. This chapter draws on information provided in the SoHI carried out for the proposal Appendix D – Statement of Heritage Impacts, and as part of the application for a Section 60 approval under the Heritage Act.

6.1.1 Methodology

The study area assessed by the SoHI generally includes an area of 50 metres either side of the centre of the proposal and the maximum possible extent of the potential ancillary facility site, as shown in Figure 6-1.

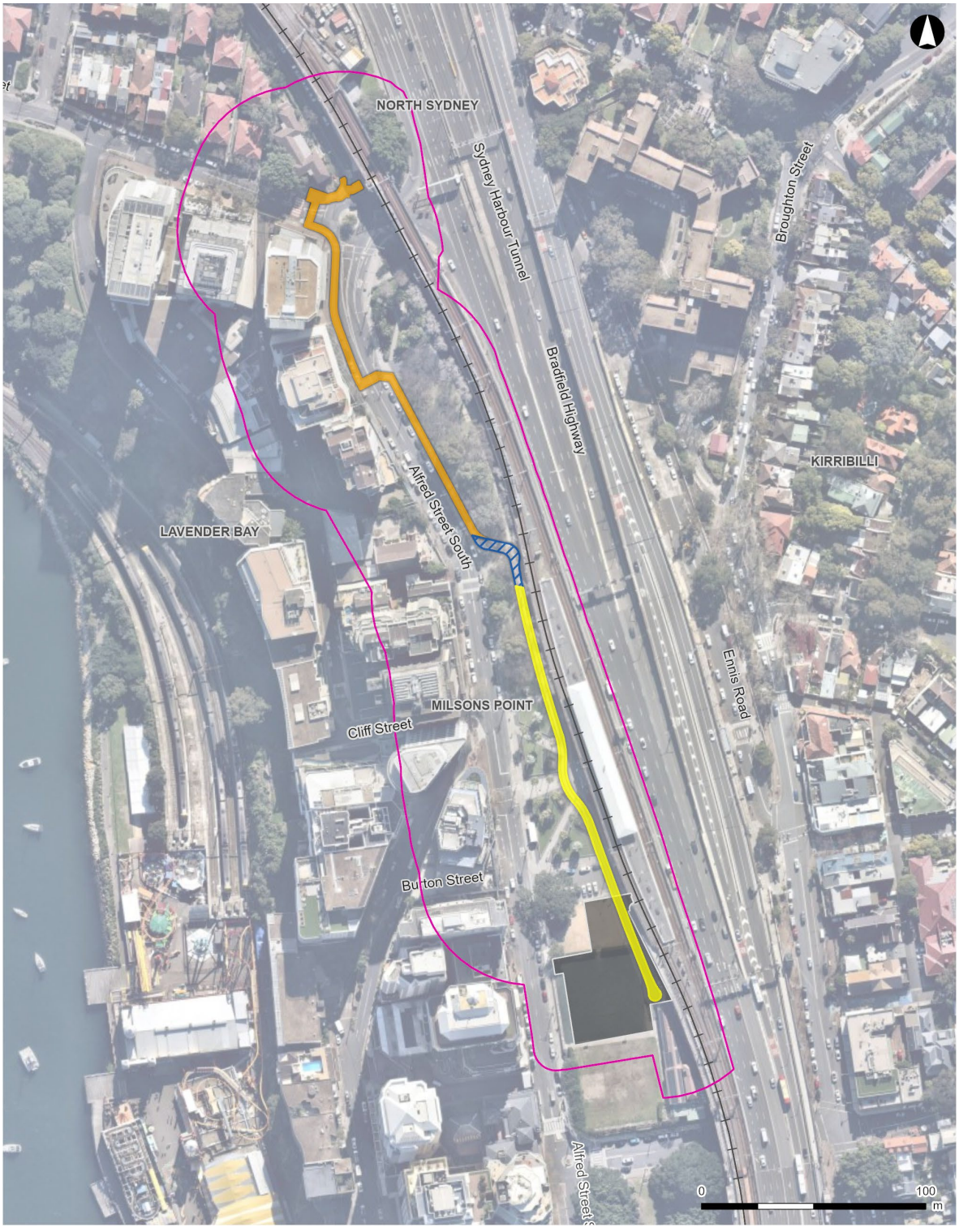


Figure 6-1: Study area

The preparation of the SoHI has been informed by searches of NSW and Commonwealth heritage registers and was carried out in alignment with the following guidelines:

- Assessing Heritage Significance (NSW Heritage Office, 2001)
- Statements of Heritage Impact (NSW Heritage Office and Department of Urban Affairs & Planning, 2002)
- Design in Context: Guidelines for Infill Development in the Historic Environment (NSW Heritage Office and Royal Australian Institute of Architects, 2005)
- The Burra Charter (Australia ICOMOS, 2013)
- NSW Heritage Manual (NSW Heritage Office & Department of Urban Affairs and Planning, 1996)
- Commonwealth of Australia, Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (Department of the Environment, 2003).

The SoHI has also considered and is consistent with the heritage management strategies described in the Sydney Harbour Bridge Conservation Management Plan (2021).

Additionally, the assessment has been informed by a site visit conducted by a qualified heritage specialist on 18 January 2022 to inspect the overall intactness of the study area and items of heritage value and a review of previous assessments, heritage studies and historical information relevant to the proposal.

Assessment of heritage significance

A review of Statements of Significance for relevant heritage items within the vicinity of the proposal was conducted and assessments of significance were prepared. As shown in Figure 6-1: Study area

, the study area is contained within the National Heritage Listing for the Sydney Harbour Bridge, therefore the self-assessment process outlined in Significant Impact Guideline 1.1 – Matters of National Environmental Significance has been carried out, to assess the impact of the proposed action on the heritage values for the Sydney Harbour Bridge. The self-assessment process examines the environmental context of the Place, the proposed impact of the proposal on historic heritage values and avoidance or mitigation strategies to determine if a significant impact would occur. Further details of the self-assessment are provided in Section 8.6 of Appendix D – Statement of Heritage Impacts.

Archaeological impact assessment

Non-Aboriginal archaeological potential was assessed by identifying former land uses and associated features through historical research and evaluating whether subsequent actions (either natural or human) may have impacted on evidence for these former land uses. Previous studies were reviewed to gain an understanding of the study area and contribute to the assessment of the potential and significance of the proposal boundary.

Potential impacts to any built (historic) heritage places or items and any non-Aboriginal archaeology within the subject study area are defined as either:

- Direct impacts, resulting in a planned and intentional physical change to a heritage item from proposal activities within the heritage item boundary
- Indirect impacts, resulting in changes to the heritage item or its surroundings from proposal activities outside of the heritage boundary, such as vibration, settlement, visual impacts, social impacts, impacts to landscapes and vistas, changes to ongoing use, changed associations, or change to access
- Impacts to archaeological remains, resulting in the removal, destruction, damage or disturbance of archaeological deposits or artefacts from proposal activities within the proposal boundary.

The level of impact on the heritage significance of each heritage item in the study area has been assessed as major, moderate, minor, negligible or neutral, as outlined in Table 6-1.

Table 6-1 Terminology for assessing the 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.

In response to potential impacts mitigation and management measures were developed to avoid impacts where possible. Further detail on the assessment methodology is provided in Appendix D – Statement of Heritage Impacts.

6.1.2 Existing environment

Development of Milsons Point and Kirribilli

The post-contact history of what is now Bradfield Park dates to 1800, when the area comprised part of a land grant to Robert Ryan (HLA, 2003). Little to no evidence exists of subdividing or farming taking place in present-day Kirribilli until 1806, when prominent merchant Robert Campbell purchased the grant. In 1822, the whole area was leased to James Milson, the first European to permanently settle in the Kirribilli area and after whom Milsons Point is now named. Milson kept cattle and grew various crops on the land and the property remained undisturbed until the late 1820s, with no records of subdivision, lease or development in existence.

Following the death of Robert Ryan in 1846, George Campbell took over the ownership of the site. Subdivision and sale of the land during the 1850s resulted in the development of Milsons Point Wharf and Lane Cove Road (Alfred Street) in 1861. Development in the area increased after the establishment of the North Shore Steam Ferry Company that year and facilitated the consolidation of the road network and services in the area. Urban development continued in the area in the decades that followed, with working class terrace housing taking effect in the Milsons Point area until construction of the Sydney Harbour Bridge northern approaches in 1924 (HLA, 2003).

Establishment of Bradfield Park

In 1934 after the construction of the Sydney Harbour Bridge a comprehensive plan for the layout of Bradfield Park was adopted and the planned rockery garden was completed. In 1935, North Sydney Council purchased approximately 14 acres of land beneath the newly completed Sydney Harbour Bridge (HLA, 2003). During World War Two, Bradfield Park was temporarily used by the Royal Australian Air Force for use as a mobilisation and demobilisation depot. After World War Two, Bradfield Park became a reception centre for migrants from Europe. In 2003, Bradfield Park North was significantly upgraded with substantial landscaping works.

Development of Milsons Point Railway Station

Milsons Point Railway station originally opened at Lavender Bay in 1893. The original location provided direct access to ferries and the one-time terminus of the North Shore railway line. This was an earlier station serving the Hornsby to Milsons Point line. Prior to the construction of the Sydney Harbour Bridge there was no rail line crossing the harbour linking northern and southern Sydney. Milsons Point Railway Station had two temporary locations during construction of the Harbour Bridge before opening at its current location in 1932.

Milsons Point Railway Station was added to the New South Wales State Heritage Register on 2 April 1999.

Sydney Harbour Bridge

As early as 1815, Francis Greenway had suggested to Governor Macquarie that a bridge be constructed across the harbour, and throughout the nineteenth century various proposals were made for such a bridge. Tenders were eventually called for the design of a bridge in 1923. Construction of the northern approaches commenced in 1924 and continued until 1932. The construction of the approaches of the Sydney Harbour Bridge also included the construction of the railway infrastructure. From 1929 to 1932, Milsons Point Railway Station Group was constructed at the northern approach, relocated from its

original location at Lavender Bay where it provided direct access to ferries and the one-time terminus of the North Shore railway line. The Sydney Harbour Bridge was officially opened on 19 March 1932 by Premier Jack Lang, followed by a parade over the bridge (GML, 2021).

The Sydney Harbour Bridge is listed on the several statutory and non-statutory registers or lists, as summarised in Table 6-2. The Sydney Harbour Bridge is not listed on the World Heritage List, however the bridge is within the visual catchment of the World Heritage listed Sydney Opera House.

Table 6-2: Statutory and non-statutory listing for the Sydney Harbour Bridge

Register or list	Year of listing	Number	Name	Location
National Heritage List	Since 2007	105888	Sydney Harbour Bridge	Bradfield Highway and North Shore Railway, Milsons Point/Dawes Point, NSW 2000
State Heritage Register	1999	00781	Sydney Harbour Bridge, approaches and viaducts (road and rail)	Bradfield Highway and North Shore Railway, Milsons Point/Dawes Point, NSW 2000
North Sydney Council LEP	2001	I0530	Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Bradfield Highway and North Shore Railway, Milsons Point/Dawes Point, NSW 2000
Transport's Section 170 Register		4301067	Sydney Harbour Bridge, approaches and viaducts	Arthur and Argyle Streets, Sydney, NSW 2000
Transport Asset Holdings Entity (TAHE) Section 170 Register		4801059	Sydney Harbour Bridge (Rail Property Only)	Arthur and Argyle Streets, Sydney, NSW 2000
National Trust Register	1974	-	-	-
Register of the National Estate	1978	-	-	-

The National Heritage listing for the Sydney Harbour Bridge includes the bridge, pylons, constructed approaches, and parts of Bradfield and Dawes Point Parks. The curtilage for the listing is the same as the State Heritage Register curtilage, except that the northern extent of the National Heritage listing ends at Lavender Street, Milsons Point, while the State Heritage Register curtilage ends at Blues Street, North Sydney (refer to Figure 6-2).

A Conservation Management Plan (CMP) for the Sydney Harbour Bridge was prepared in 2007 by Godden Mackay Logan for Transport. The report was revised in 2021 by GML Heritage and was endorsed by the Heritage Council of NSW in July 2021.

Other listed heritage items

Table 6-3 outlines other listed heritage items within the study area.

Table 6-3: Other listed heritage items located within the study area

Register or list	Number	Name	Location
State Heritage Register	01194	Milsons Point Railway Station Group	North Shore railway, Milsons Point, NSW 2061
North Sydney Council LEP	I0538	Bradfield Park (including northern section)	Alfred Street South, Milsons Point
North Sydney Council LEP	I0539	Milsons Point Railway Station Group	North Shore railway, Milsons Point, NSW 2061
Transport's Section 170 Register	4801026	Milsons Point Railway Station	Alfred Street, Milsons Point, NSW 2061

There are 19 heritage places within Milsons Point which are nearby to the proposal and listed on North Sydney LEP 2013 but are not within the study area.

Figure 6-2: Listed heritage items within the vicinity of the proposal

Archaeological potential and significance of the study area

Several previous reports were reviewed to gain an understanding of the archaeological potential of the study area by identifying former land uses and associated features through historical research. Archaeological remains within the area were heavily impacted by bulk excavation for the construction of the Sydney Harbour Tunnel. However, results of the archaeological monitoring program carried out by Higginbotham (1992) demonstrate the range of archaeological remains that are present within Bradfield Park despite the significant impact caused by the construction of the Sydney Harbour Bridge to the surrounding area. Similarly, a program of archaeological monitoring carried out during landscaping upgrades to Bradfield Park North identified several archaeological features within the park including walls and paved area, sandstone walls, foundation walls at the northern end of the site, and wells, tanks or cisterns (HLA, 2004). The archaeological remains were seen to extend beyond the investigated area therefore substantial archaeological remains likely remain within the study area. . More recently, during the excavation of footings for a sculpture in Bradfield Park no archaeological remains were identified. Despite this JCIS Consultants (2017) concluded that Bradford Park retained a high archaeological potential for sub-surface archaeology, supporting the previous assessment by HLA (2004).

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

- Phase 1: Early land grants (1800 – 1861)
- Phase 2: Residential and commercial development (1861 – 1920s)
- Phase 3: Resumption and major construction (Sydney Harbour Bridge) (1920s – 1932)
- Phase 4: Minor changes to Bradfield Park area (Sydney Harbour Bridge) (1940s – 2016).

The study area, in comparison to the southern approaches of the Sydney Harbour Bridge, has undergone less phases of development. Table 6-4 provides a summary of the archaeological potential of the study area and associated significance of potential archaeology. Archaeological potential is assessed against criteria laid out in 'Assessing Significance for Historical Archaeological Sites and Relics' (Heritage Branch, 2009).

Table 6-4: Archaeological potential and significance summary for the study area

Phase	Potential archaeological remains	Potential	Significance
Phase 1 (1800 – 1861)	Evidence of land clearance and use, informal camps and early road surfaces, such as tree boles, burnt stumps, furrows, irrigation channels, post holes, fire pits, isolated artefact scatters and informal road surfaces, kerbing and drainage. It is possible remains associated with the quarry may be present although these would likely have been infilled and be difficult to discern.	Nil-low	Local
Phase 2 (1861 – 1920s)	Evidence of the residential and commercial development of workers cottages and terraces, including brick or stone building footings, lot boundaries, yard surfaces and minor occupation-related deposits. Evidence of more formal road surfaces, drainage and kerbing. Remains of residences along Alfred Street may also be present and are known to have been excavated in the north of the park (HLA, 2003).	High	Local
Phase 3 (1920s – 1932)	Backfill deposits from the Sydney Harbour Bridge construction.	High (Nil potential for relics)	Unlikely to reach the threshold of local significance
Phase 4 (1940s – 2016)		Nil	None

The potential archaeological remains within the study area are associated with early agricultural land use and the historical development of the Milsons Point settlement and community. Any remains recovered could provide information regarding domestic life, agricultural development, living conditions and the growth of the local economy from the late nineteenth century to the early twentieth century. Archaeological remains would primarily be structural footings of former structures. Based on the finds by HLA (2004) of a cess pit or well within the study area, there is potential that archaeological deposits containing relics would also be present, although they would be isolated. The identification of a rock cut sewer during work in the southern area of Bradfield Park demonstrates the potential for limited archaeological remains below the level of the natural sandstone, such remains are unlikely to reach the level of local significance and are likely to be classified as 'works'.

6.1.3 Potential impacts

Impacts to listed heritage items

The Sydney Harbour Bridge is a monumental landmark in the centre of the city of Sydney, and one of the world's most globally recognised bridges. It is an important visual element in the Sydney cityscape viewed from many key points around the harbour. The Sydney Harbour Bridge is listed on multiple heritage registers and has heritage value at a local, state, and national level. Milsons Point Railway Station and Bradfield Park have separate listings at the state and local levels and are also captured by the State Heritage Register curtilage for the Sydney Harbour Bridge.

There is the potential for the proposal to impact on the heritage significance of surrounding heritage items as a large, new structure would be introduced within a park setting. The elevated linear bike ramp would be highly visible from street level and from all vistas within Bradfield Park. However, this impact would be mitigated through good contemporary design, by locating the proposed elevated linear bike ramp close to the concrete bridge approach, and by graduating the proposed elevated linear bike ramp from its connection to the Sydney Harbour Bridge and Bradfield Park.

Direct heritage impacts

The direct (physical) impacts to listed heritage items associated with the proposal are shown in Table 6-5.

Table 6-5: Direct heritage impacts to the Sydney Harbour Bridge and surrounding heritage listings

Listing(s) impacted	Design feature	Impact grading	Discussion
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail)	Removal of part of a parapet near the Burton Street stairs along the viaduct.	**Minor to Moderate**	The cutting of part of a parapet on the western cycleway would result in Moderate physical impacts. This would see a removal of original fabric and replacement with contemporary material in the form of a linking ramp between the new structure and the existing. Whilst it is not ideal to remove original fabric, it would see a small section of the larger parapet removed whilst the remaining of the structure would be retained. Design refinement has also included aligning the cutting before the roundel decorative piece to ensure the symmetry of the parapet is retained and the cut is flush. The section of parapet being removed is also proposed to be reused within Bradfield Park North as an interpretation piece, subject to detailed design.
TAHE Section 170 Register: 4301067: Sydney Harbour Bridge, approaches and viaducts	The connection between the newly built ramp and the existing cycleway on the bridge.	**Minor to Moderate**	The connection between the new ramp and the existing cycleway would be designed to be at the same level as the existing and would not be dominant in material, colour, form or scale. Keeping the landing level and clean would ensure the new design would merge with the existing heritage fabric in a sympathetic way.
North Sydney LEP: I0530: Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Raised median strips in the middle of the upper connection platform.	**Minor to Moderate**	Raised median strips, line marking, and different pavement finishes are also proposed on the upper platform of the ramp structure which would delineate cyclists to slow down or move to the side. Whilst these design elements are necessary for the safety of pedestrians and cyclists, they present a Minor physical and visual impact to the existing viaduct structure, disturbing the flush concrete finish and introducing a physical and visual obstruction between the ramp connection and existing cycleway.
	Paving finishes and line marking between on the existing cycleway and new cycleway.	**Minor to Moderate**	There would also be Minor visual impacts as a result of the partial demolition of the parapet and construction of a connection between the new ramp and the existing cycleway. Impacts would see a change to the existing approach of the cycleway and staircase near Burton Street but would not compromise the visual prominence of the bridge itself.
North Sydney LEP 2013: I0538: Bradfield Park (including northern section)	Creation of a landing point for the ramp in Bradfield Park.	**Moderate**	The landing point for the ramp structure would result in Moderate physical and visual impacts to the setting of Bradfield Park North. The construction would see a direct physical impact to the park layout and a disturbance to the landscape features of Bradfield Park North. This change would see the existing wayfinding altered and the visual appeal of the park as an open, public space partially obstructed. Whilst public amenity of the park would be altered due to the landing, it would also see a positive impact as general mobility of cyclists and pedestrians would be improved, relieving the congestion of Burton Street stairs and surrounds.

Listing(s) impacted	Design feature	Impact grading	Discussion
SHR: 01194: Milsons Point Railway Station Group **TAHE Section 170 Register:** 4801026: Milsons Point Railway Station **North Sydney LEP 2013:** I0539: Milsons Point Railway Station Group	Partial obstruction of the Burton Street entrance to Milsons Point Station and the Burton Street archway.	**Minor to negligible**	The new structure would partially obstruct the Burton Street archway and entrance to Milsons Point Station. This would result in Minor to negligible direct visual impact to these key heritage features in the precinct. Current renders from Alfred Street South facing the viaducts show that the new ramp structure and piers would not fully block viewpoints to these features but would see a minor interruption from the public domain. The archway and the entrance to the Station would remain legible.
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) 01194: Milsons Point Railway Station Group **TAHE Section 170 Register:** 4301067: Sydney Harbour Bridge, approaches and viaducts 4801026: Milsons Point Railway Station **North Sydney LEP 2013:** I0538: Bradfield Park (including northern section) I0539: Milsons Point Railway Station Group I0530: Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Introduction of a new structure into the setting of Bradfield Park, Milsons Point Station and the Bradfield Highway approaches of the bridge.	**Minor to Moderate**	The ramp and associated structural elements would see a Moderate to Minor direct physical and visual impact to the setting of Bradfield Park Central and North, the Northern Bowling Green, Milsons Point Station and the Bradfield Highway approaches on the Alfred Street South side. Generally, the interface of the ramp and the public domain is sympathetic to the heritage precinct and the landscape features of the open park setting. The materiality of the slim-line balustrades and piers, as well as the light colour palate, winding profile, setback from Alfred Street South, clearance from the viaducts, as well as the height of the structure, all blend well within the wider precinct. However, it is noted that the introduction of this structural element would result in a change to this open space and would partially obstruct the existing uncluttered feel to the precinct. Physical impacts would include the construction of the piers and the ramp landing, which would see potential disruption to the layout of the park space, the removal of original fabric within Bradfield Park Central and North, and the removal of some vegetation.
North Sydney LEP: I0538: Bradfield Park (including northern section)	A change to the layout of Bradfield Park, including the removal of some landscaping elements, vegetation, and introduction of new pedestrian and cycle pathways.	**Minor**	The proposal would see a change to the layout of Bradfield Park Central and North, with the construction of the ramp structure and landing, as well as the introduction of new pedestrian and cycle pathways within and along the parks. Minor physical and visual impacts would result from this change however it is noted that the layout of the park would remain largely similar to the existing with small changes such as the removal of some landscaping elements, retaining walls or garden beds, and some vegetation. It is also noted that the new pathways would generally mirror the existing alignment of pedestrian footpaths along Alfred Street South and within Bradfield Park North. Design refinement has also included the retention of significant trees within the park area, as well as existing heritage interpretation elements such as the sandstone strips outlining previous subdivisions and road alignments. The design also proposed to include more heritage interpretation opportunities in this area, including plantings and use of paving finishes and potentially the reuse of the parapet cutting, subject to

Listing(s) impacted	Design feature	Impact grading	Discussion
			detailed design. These would all result in positive impacts to the overall setting of the heritage precinct.
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) **North Sydney LEP:** I0538: Bradfield Park (including northern section)	Upgrading of lighting within Bradfield Park and adjacent streets.	**Minor**	The proposed upgrades to lighting within Bradfield Park and on adjacent streets would result in Minor physical impacts, particularly to Bradfield Park. It is noted these works only slightly intersect with the nearby listings. Installation works would see a disruption to the Alfred Street South pedestrian pathway which would be temporarily excavated to insert the pole footings below ground however there would be make good works following these activities.
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) **North Sydney LEP:** I0538: Bradfield Park (including northern section)	Alfred Street south cycleway and pedestrian pathway adjustments. Bus stop adjustments along Alfred Street. On-street parking adjustments. Associated landscaping.	**Minor to Neutral**	The proposed works along Alfred Street South, such as the associated pathway adjustments and transport and amenity adjustments, would result in a Minor to Neutral physical and visual impact to nearby listings. These works would see a change to the existing arrangement of Alfred Street South but would not detrimentally impact the heritage values of any nearby listed items. It is noted majority of these works would occur outside of the curtilage of the listed items but may intersect with a listing boundary closer to the Bradfield Park side of the street. These works would result in a change to the streetscaping and amenities along Alfred Street south which would see a positive impact to the efficiency, useability and character of the street.
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail)	New pedestrian crossings and round about adjustments on both Middlemiss and Lavender Streets. Associated landscaping.	**Minor to Neutral**	**Minor to Neutral** The proposed works at the roundabout intersection with Middlemiss, Lavender and Alfred Streets would result in a Minor to Neutral physical and visual impact to nearby listings. These works would see a change to the existing arrangement of the roundabout but would not detrimentally impact the heritage values of any nearby listed items. It is noted majority of these works would occur outside of the NHL and SHR curtilages but may intersect with a listing boundary closer to the Bradfield Park side of the intersection. These works would result in a change to the streetscaping and amenity at this intersection which would see a positive impact to the efficiency, useability and character of the street. It is also noted that the palm tree in the middle of the roundabout is to be retained, maintaining the visual appeal and notability of this intersection.

Indirect heritage impacts

The indirect impacts to the Sydney Harbour Bridge and surrounding heritage listings would consist of the following design elements, summarised in Table 6-6.

Table 6-6: Indirect heritage impacts to the Sydney Harbour Bridge and surrounding heritage listings

Listings(s) impacted	Design feature	Impact grading	Discussion
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) 01194: Milsons Point Railway Station Group **TAHE Section 170 Register:** 4301067: Sydney Harbour Bridge, approaches and viaducts 4801026: Milsons Point Railway Station **North Sydney LEP:** I0538: Bradfield Park (including northern section) I0539: Milsons Point Railway Station Group I0530: Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Construction of a new structure into the setting of Bradfield Park, Milsons Point Station and the Bradfield Highway approaches of the bridge.	**Moderate to Minor**	A Moderate to Minor level of indirect visual impacts would result from the construction of the elevated bike ramp. The construction of the new structure would see indirect visual impacts to the wider heritage precinct in the form of construction works, temporary hording, and plant movement. These works would also see temporary interruption to free-flowing movement and amenity in the public domain of the parks, the Burton Street archway and staircase, and the entrance to Milsons Point Station.
NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) **TAHE Section 170 Register:** 4301067: Sydney Harbour Bridge, approaches and viaducts **North Sydney LEP:** I0538: Bradfield Park (including northern section) I0530: Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Excavation in Bradfield Park Central and North, and on each side of Burton Street for the columns footings and associated works.	**Negligible to Neutral**	Excavations associated with these works is expected to have Negligible to Neutral indirect physical impacts. It is unlikely any excavation associated with the construction phase of this proposal would result in any adverse physical impacts to the heritage listings and features of the precinct. However it is possible that indirect physical impacts such as cracking or displacement could be caused by works associated with trenching, piling, jackhammering or concrete cutting within the vicinity of heritage items.

NHL: 105888: Sydney Harbour Bridge **SHR:** 00781: Sydney Harbour Bridge, approaches and viaducts (road and rail) **TAHE Section 170 Register:** 4301067: Sydney Harbour Bridge, approaches and viaducts **North Sydney LEP:** I0538: Bradfield Park (including northern section) I0530: Sydney Harbour Bridge approach viaducts, arches and bays under Warringah Freeway	Ancillary sites during construction.	**Negligible to Neutral**	The use of sites such as the space adjacent to the Northern Bowling Green and Burton Street archway as ancillary sites during the construction phase of this proposal would result in Negligible to Neutral indirect physical and visual impacts. The impacts would be temporary in nature and are not expected to have any heritage impact.

Impacts to National Heritage Listings

The proposal is not expected to impact on world heritage values. The overall impact of the proposal would be positive.

On 28 June 2007 the Sydney Opera House and buffer zone (including part of Sydney Harbour and the Sydney Harbour Bridge) was included on the UNESCO World Heritage List under the World Heritage Convention. The Sydney Harbour Bridge is not listed on the World Heritage List, but the bridge is within the visual catchment (buffer zone) of the World Heritage listed Sydney Opera House. However, as the proposal is outside the buffer zone, a referral under the EPBC Act is not required. In relation to the national heritage values of the Sydney Harbour Bridge, the new structure and associated elements would provide a better experience of cycling and commuting across the Sydney Harbour Bridge. It would also improve functionality and accessibility to the Sydney Harbour Bridge and to both the inner city and North Sydney areas. It would also ensure the continuation of the Sydney Harbour Bridge being a critical transport link between north and south Sydney, which is completely in line with the identified National Heritage values.

The works proposed as part of the proposal would result in some adverse impacts on fabric of the Sydney Harbour Bridge parapets, however, the design aesthetic and choice of materials of the new design respects the original fabric. These impacts are acknowledged as not substantial and improvements of commuter experience and mobility across the Sydney Harbour Bridge Cycleway would be considerable. These impacts are considered necessary to ensure the Sydney Harbour Bridge continue to be used as a critical and iconic transport link. The proposal would strengthen the core function of the Sydney Harbour Bridge as an iconic and critical transport link, and have a positive impact on its National Heritage values.

Construction of the linear bike ramp would occur within sight-lines of the Sydney Harbour Bridge, however it would not obscure or block any significant views to and from the bridge.

The proposed actions on the historical heritage values of the place would not constitute a significant impact as defined by the *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* and EPBC Act, and do not require a referral to the Minister.

Impacts on State Heritage Listings

The proposal is considered to have an impact on State heritage values. The proposal involves works to an SHR item which exceed the threshold of little or no adverse impact to the heritage item. The standard exemptions are not applicable to the proposal, and the final design proposal must be submitted to the NSW Heritage Council as a section 60 application. Due to the size of the proposal a major works application form would be required. To support this application, an Archaeological Research Design would be prepared for the proposal. Impacts to historical archaeology outside of the SHR curtilage may be eligible to be managed under an excavation permit exception under Section 139 (4) of the Heritage Act. The Archaeological Research Design would include a management plan for potential archaeological remains, including an assessment as to which works would be managed under the relevant Sydney Harbour Bridge Conservation Management Plan exemptions from Heritage Act approval. The following aspects of the proposal respect or enhance the heritage significance of the place for the following reasons:

- The proposal design process recognises and addresses the heritage values of the Sydney Harbour Bridge
- The placement of the proposed elevated linear bike ramp retains a large proportion of the park setting and retains the park for public use
- The introduction of the cycleway provides new opportunities for interpretation of the Sydney Harbour Bridge and Bradfield Park
- The introduction of the proposed linear bike ramp allows the park to be viewed and experienced from above as well as at ground level
- The visual impacts of proposed elevated linear bike ramp are ameliorated to some extent by placing it to the east (close to the bridge approach) and extending the proposed elevated linear bike ramp to make it a linear addition consistent with the bridge approach structure, while also reducing the gradient of the bridge and maximising the topography of the site
- Providing a contemporary and original design that embraces the Indigenous and non-Indigenous history and heritage of the place.

As described in Section 4.2.1, the proposal would require approval under section 60 of the Heritage Act.

Assessment against Sydney Harbour Bridge Conservation Management Plan

The proposal has been assessed against the Sydney Harbour Bridge Conservation Management Plan and has been found to be generally consistent with the policies outlined in the document. The proposal is partially consistent with policy 13 'Retention of existing open space for public use/recreation' and policy 14 'Integrity of original' design.

In relation to Policy 13, the proposal does not change the current use of Bradfield Park and does not impede access to the park or restrict views to the Sydney Harbour Bridge. It does result in a visual impact, but this is ameliorated by good design and by locating most of the proposed linear bike ramp at elevation. The preferred design has been selected with a view to preserving the open nature of the plaza and parklands, with some inevitable change to current conditions due to the need to land the ramp near where the existing concrete bandstand is sited and the need to construct new piers. The installation of the proposed elevated linear bike ramp to some extent detracts from the existing setting but retains the open space and existing use of Bradfield Park.

As per Policy 14, the proposed elevated linear bike ramp does not obscure the Sydney Harbour Bridge from any key viewing points. The design of the proposed elevated linear bike ramp respects the design of the Sydney Harbour Bridge. Views of the granite pylons and approach spans are not impeded. The proposed elevated linear bike ramp does interrupt the view of the concrete approach from the park and Alfred Street South but the design of the cycleway improves the hard visual transition between the park and the concrete approach. The work involves minimal impact to fabric where the proposed elevated linear bike ramp connects to the Sydney Harbour Bridge northern approach. There is no significant impact to significant decorative and or functional elements.

The introduction of the proposal can be understood within the context of the change that has occurred to the Sydney Harbour Bridge over time necessitated by new and evolving transport and user requirements. It would form one of many changes to the bridge since its construction. The new elevated linear bike ramp is therefore part of a history of change that involves some level of impact to the original design of the Sydney Harbour Bridge and to Bradfield Park and is part of the evolution of the bridge to meet commuter needs. The proposal is therefore part of a history of change that involves a Moderate to Minor level of impact to the original design of the Sydney Harbour Bridge and to Bradfield Park. However, the proposal supports the ongoing and continued use of the Sydney Harbour Bridge as a major transport link, a use which is intrinsic to the item's heritage value.

Archaeological impact

Impacts to significant archaeological resources are likely to occur during the construction works.

It is assumed that earthworks for the proposal would be limited to relatively shallow excavation including:

- Service location works (excavation of shallow potholes): impacts of potholing would be generally negligible to minor
- Excavation required for columns footing: the impact area of piling is generally small. Pilling rigs may have a minor impact
- Construction of Alfred Street South cycle path: previous excavations have demonstrated that archaeological remains are located immediately below the ground level. Resurfacing is likely to expose archaeological remains, however impacts are likely to minor
- Construction of elevated bike ramp connection: It is assumed that the movement of plant required to construct the elevated cycle path is unlikely to result in archaeological impacts
- Reinstatement of any disturbed areas: previous excavations have demonstrated that archaeological remains are located immediately below the ground level. Resurfacing is likely to expose archaeological remains, however impacts are likely to be minor.

Evidence from previous excavations has demonstrated that historical structures and associated deposits, dating from Phase 2 (1861-1920) are present throughout Bradfield Park. If intact archaeological remains survive within the proposal boundary, then these remains are likely to be subject to moderate impacts in areas proposed for excavation. As previous work has demonstrated that the archaeological remains are present immediately below the current ground surface, even shallow ground works have the potential to result in impact to archaeological resources. It is likely that archaeological relics would be impacted as, although such deposits would be isolated and limited compared to the potential for structural remains, the presence of artefact deposits associated with structural remains and wells/tanks containing artefactual material has already been demonstrated. The level of impact is dependent on the methodology adopted for excavation works and the precise degree of archaeological impacts would be confirmed during construction planning. Overall, the potential for the works to impact on significant archaeological resources is moderate.

6.1.4 Safeguards and management measures

Table 6-7 identifies non-Aboriginal heritage management measures to minimise or avoid impacts to listed heritage items as part of the proposal.

Table 6-7: Non-Aboriginal heritage safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
NAH1	Non-Aboriginal heritage	The proposal will update and/or provide further assessment of heritage impacts to Heritage NSW during the detailed design phase of the proposal, as required by the s60 approval by Heritage NSW. This may include: • Further heritage impact assessment on the detailed design for the proposal • A materials and finishes palette • Photographic Archival Recording of the site and surrounding areas.	Detailed design	Additional safeguard NAH1
NAH2	Non-Aboriginal heritage	Design of the proposal will progress in accordance with the conservation policies and management measures outlined in the Sydney Harbour Bridge Conservation Management Plan prepared by GML (2021) and the Supplementary Detailed Heritage Framework (draft) prepared by TZG (2021).	Detailed design	Additional safeguard NAH2
NAH3	Non-Aboriginal heritage	A Heritage Interpretation Strategy (HIS) will be prepared and considered during progression of detailed design, in accordance with the recommendations in the Sydney Harbour Bridge Conservation Management Plan (GML, 2021) and the Supplementary Detailed Heritage Framework (draft) (TZG,2021) as well as any other future heritage interpretation documentation prepared for the proposal. Appropriate heritage interpretation must be incorporated into the design for the proposal in accordance with the NSW Heritage Office's NSW Heritage Manual (1996), Interpreting Heritage Places and Items Guidelines (2005b), and Heritage Interpretation Policy (2005a). The Sydney Harbour Bridge Interpretation Plan 2007 must also be referred to during the preparation of the HIS. Opportunities for interpretative displays in appropriate locations will be explored as part of the HIS.	Detailed design	Additional safeguard NAH3
NAH4	Non-Aboriginal heritage	The Design Integrity Panel (DIP), incorporating heritage, design and Connecting with Country expertise, will have continued involvement in the design process and throughout the construction of proposal. Specialist heritage advice will continue to inform the detailed design of the proposal. Detailed design will consider the following design improvements: • Refinements to the architectural and structural design of the bike ramp to ensure a lightweight and contemporary architectural and structural design that compliments its heritage and open space context • Refinements to the detailing for the ramp connection with the bridge viaduct to ensure the design is sensitive and elegant, but remains safe for users • Refinements to the section of parapet to be removed for the cycleway ramp connection • Refinements to the lighting design along the proposal. The lighting design will retain and minimise impacts to the existing lighting arrangement	Detailed design and Construction	Additional safeguard NAH4

ID	Impact	Environmental safeguards	Timing	Reference
		• The existing heritage walk in Bradfield Park including heritage interpretive signage will be incorporated within the new design for the northern landing plaza and public domain.		
NAH5	Non-Aboriginal heritage	Further consultation with key heritage stakeholders, including (but not limited to) Transport for NSW Heritage, Heritage NSW, and the Department of Climate Change, Energy, the Environment and Water (DCCEEW) must be undertaken in detailed design.	Detailed design	Additional safeguard NAH5
NAH6	Non-Aboriginal heritage	An appropriately qualified and experienced heritage architect will provide independent review periodically throughout detailed design and construction. The heritage architect will prepare or review and approve a materials and finishes palette for the proposal for approval by Heritage NSW.	Detailed design	Additional safeguard NAH6
NAH7	Non-Aboriginal heritage	A materials and finishes palette for the bike ramp and landing in Bradfield Park will be further developed in detailed design, incorporating specialist heritage input and DIP advice.	Detailed design	Additional safeguard NAH7
NAH8	Non-Aboriginal heritage	The heritage interpretation and Connecting with Country opportunities will be developed and documented within the HIS in consultation with the Design Integrity Panel (DIP), Aboriginal knowledge holders and Heritage NSW.	Detailed design	Additional safeguard NAH8
NAH9	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific drafting guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and methodology around when and from where heritage advice will be sought.	Detailed design / Pre-construction	Section 4.9 of QA G36 Environment Protection
NAH10	Non-Aboriginal heritage	An Archaeological Research Design will be prepared for the proposal by a suitably qualified Excavation Director prior to ground disturbance activities. The Archaeological Research Design will include a management plan for potential archaeological remains, this will include an assessment as to which works will be managed under the relevant Sydney Harbour Bridge Conservation Management Plan exemptions from Heritage Act approval.	Detailed design / Pre-construction	Additional safeguard NAH10
NAH11	Unexpected non-Aboriginal heritage finds	The Transport for NSW Unexpected Heritage Finds Procedure (2021) 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.	Construction	Section 4.9 of QA G36 Environment Protection
NAH12	Non-Aboriginal heritage	Photographic Archival Recording (PAR) and reporting will be carried out prior to commencement of construction. The PAR will be prepared in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998a), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006). The record will be prepared by a suitably qualified heritage consultant using archival-quality material. Records will be provided as follows: • Records for SHR listed items would be provided to NSW Heritage Council and the State Library. • Records for LEP-listed items will be provided to North Sydney Council and local library(s).	Pre-construction	Additional safeguard NAH12

ID	Impact	Environmental safeguards	Timing	Reference
		• A copy of the record will be provided to the owner of the asset.		
NAH13	Non-Aboriginal heritage	Site rehabilitation measures related to construction sites will be incorporated within an Urban Design and Landscape Plan. The objective of the rehabilitation will be to minimise long-term impacts on the visual amenity of the items by recreating a sympathetic environment.	Pre-construction / Construction	Additional safeguard NAH13
NAH14	Non-Aboriginal heritage	A heritage induction will be prepared for the proposal and delivered to all staff working on the proposal.	Construction	Additional safeguard NAH14
NAH15	Non-Aboriginal heritage	Operating plant (swinging, reversing, moving etc.) will adhere to standard setbacks and clearances from heritage structures and items which are not identified to be impacted.	Construction	Additional safeguard NAH15
NAH16	Non-Aboriginal heritage	Temporary hording and signage will be placed around heritage buildings and structures to be avoided during works and will include interpretative signage or artwork on the hording to reduce the visual impacts during construction.	Construction	Additional safeguard NAH16
NAH17	Non-Aboriginal heritage	Vibration monitoring will be carried out throughout construction to ensure no indirect impacts occur to heritage items and the public domain.	Construction	Additional safeguard NAH17

6.2 Landscape character and visual impact

This section provides an assessment of the potential impacts of the proposal on landscape character and visual amenity and identifies safeguards and management measures to avoid or minimise these impacts. A detailed assessment of landscape character and visual impacts is presented in Appendix C – Landscape Character and Visual Impact Assessment.

6.2.1 Methodology

A Landscape Character and Visual Impact Assessment (LCVIA) was carried out for the proposal and is presented in Appendix C – Landscape Character and Visual Impact Assessment. The LCVIA considered potential impacts on landscape character impacts and visual impacts.

The assessment of landscape character and public domain views followed the directions of the Environmental Impact Assessment practice note EIA-N04 Guidelines for Landscape Character and Visual Impact Assessment (Transport for NSW, 2020b) and The Guidance Note for Landscape and Visual Assessment (GNLVA) (Australian Institute of Landscape Architects Queensland, 2018). The assessment of private domain views was conducted in alignment with the 'view sharing' principles of the judgement of the NSW Land and Environment Court in the Tenacity Consulting V Warringah Council [2004], NSWLEC 140.

The study area for the LCVIA generally included the area from which the proposal would be visible during construction and operation and the adjoining landscape character areas which form the setting of the proposal.

Landscape character assessment

The landscape character assessment involved the identification of landscape sensitivity, magnitude of change and landscape impact level, as per the following:

- Landscape sensitivity: refers to the value placed on a landscape character area or element, such as amenity, recreation opportunity, tranquillity, visual relief, shade and contribution to microclimate. The landscape sensitivity levels are 'National', 'State', 'Regional', 'Local', and 'Neighbourhood'
- Magnitude of change: refers to the extent of change that would occur as a result of the proposal and is classified as 'High', 'Moderate', 'Low' and 'Neutral'

- Landscape impact level: determined by a combination of sensitivity and magnitude level, in accordance with the matrix shown in Table 6-8.

Visual impact assessment

The visual impact assessment covered a number of viewpoints that have been selected to illustrate the visual influence of the proposal. Particular attention has been paid to views from places where viewers are expected to congregate such as the Milsons Point Station platforms, Bradfield Park and approaches to the station and Sydney Harbour Bridge Cycleway. It involved the identification of:

- Visual sensitivity: refers to the nature, quality and duration of views. Locations from which a view would potentially be seen for a longer duration, where there are a higher number of potential viewers and where a visual amenity is important to viewers, can be regarded as having a higher visual sensitivity. The levels are 'National', 'State', 'Regional'. 'Local' and 'Neighbourhood'
- Magnitude of change: refers to the extent of change that would occur as a result of the proposal and the compatibility of these elements with the surrounding landscape, as is classified as 'High', 'Moderate', 'Low' or 'Neutral" Visual impact level: determined by a combination of sensitivity and magnitude level, in accordance with the matrix shown in Table 6-8 and Table 6-9.

Table 6-8: Landscape character and visual impact levels

	Sensitivity:				
Magnitude of change:	National sensitivity	State sensitivity	Regional sensitivity	Local sensitivity	Neighbourhood sensitivity
High	High adverse	High adverse	Moderate-high adverse	Moderate adverse	Low-moderate adverse
Moderate	Moderate-high adverse	Moderate-high adverse	Moderate adverse	Low-moderate adverse	Low adverse
Low	Moderate adverse	Moderate adverse	Low-moderate adverse	Low adverse	Negligible
Neutral	Negligible	Negligible	Negligible	Negligible	Negligible
Low improvement	Moderate benefit	Moderate benefit	Low-moderate benefit	Low benefit	Negligible
Moderate improvement	Moderate-high benefit	Moderate-high benefit	Moderate benefit	Low-moderate benefit	Low benefit
High improvement	High benefit	High benefit	Moderate-high benefit	Moderate benefit	Low-moderate benefit

Table 6-9: Night-time visual impact levels

	Sensitivity:			
Magnitude of change:	A0/A1: Dark / Intrinsically dark landscapes	A2: Low district brightness	A3: Medium district brightness	A4: High district brightness
High	High adverse	Moderate-high adverse	Moderate-high adverse	Moderate adverse
Moderate	Moderate-high adverse	Moderate-high adverse	Moderate adverse	Low adverse
Low	Moderate adverse	Moderate adverse	Low adverse	Negligible
Neutral	Negligible	Negligible	Negligible	Negligible
Improvement	High benefit	Moderate benefit	Low benefit	Negligible

6.2.2 Existing environment

The proposal boundary includes the northern Sydney Harbour Bridge cycle path, stairs and bridge approaches, Milsons Point Railway Station entrance plaza, Bradfield Park Central and Bradfield Park North and the adjacent boules piste and north bowling green, south of Burton Street. It passes through Bradfield Park North and northern part of Bradfield Park Central, and is bounded by Fitzroy Street to the south, Milson Point Station and railway line to the east, and Alfred Street South to the west. The landscape and visual conditions of the proposal are shown in Figure 6-3.

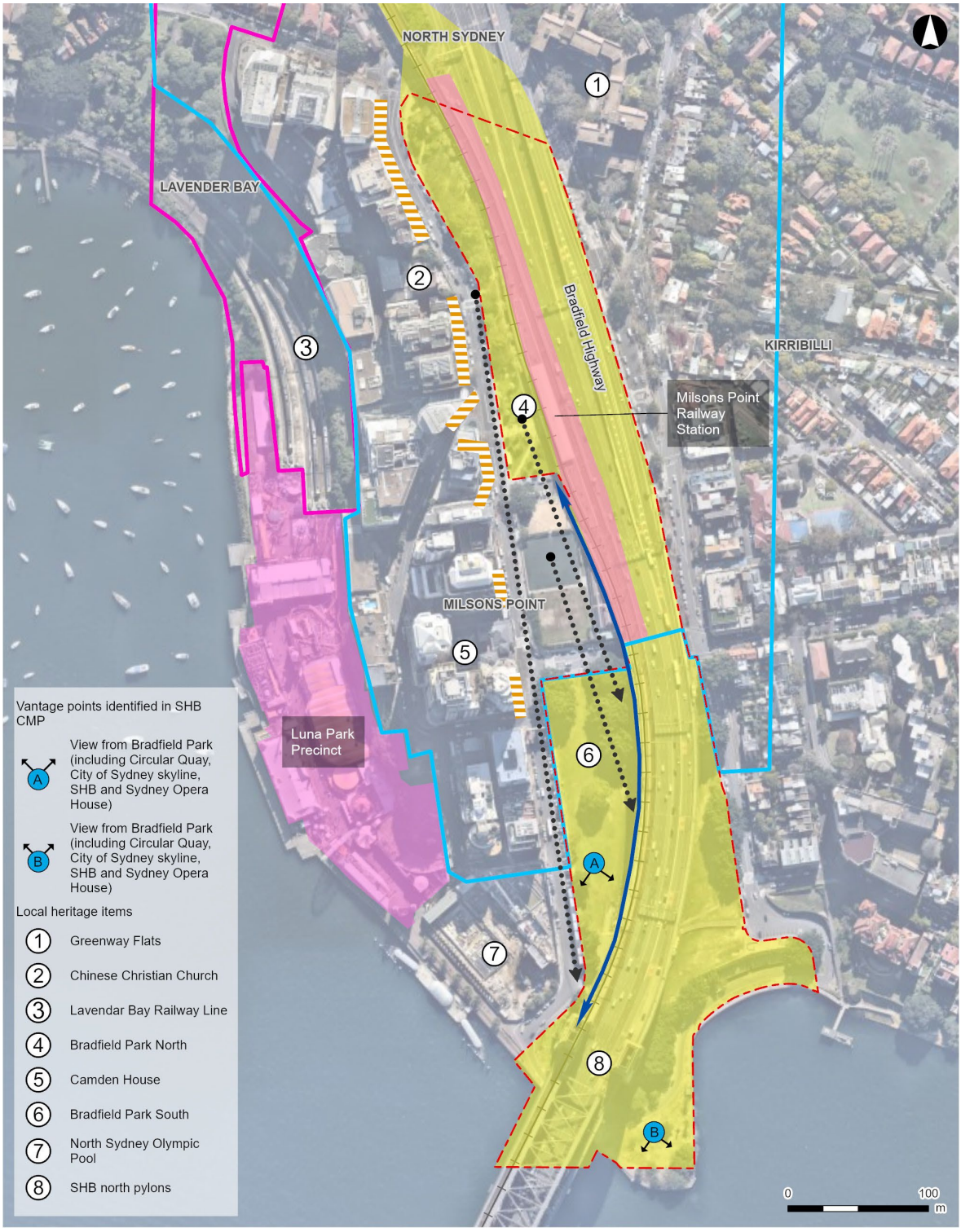


Figure 6-3: Landscape and visual context of proposal boundary and surrounds

Landscape character areas

The following landscape character areas were identified for the study area, as shown in Figure 6-4:

- Sydney Harbour Bridge and Milsons Point Station
- Bradfield Park
- Recreational and entertainment areas
- Kirribilli village centre
- Kirribilli residential area
- Milsons Point mixed use core
- Lavender Bay residential area.

Table 6-10 identifies the landscape sensitivity of the remaining landscape character areas.

Table 6-10: Landscape character area sensitivity

Landscape character area	Landscape sensitivity
Sydney Harbour Bridge and Milsons Point Station This character area is defined by Sydney Harbour Bridge and Milsons Point Station, both historic and prominent features of North Sydney. The large scale and mass of the bridge structure is very apparent in close range views, including the tall vertical walls, pylons and steel structure. Milsons Point Station is an essential component of the northern bridge approach to the Sydney Harbour Bridge. The station includes a number of original features and decorative elements from its original construction which contribute to the character of the area, including the western station entrance at Bradfield Park, with the original awning, light fittings and cartouche. The transport character of the bridge is reinforced by busy traffic along the rail corridor, cycle path and road corridor on the bridge deck. There are urban views from the bridge approaches which become sweeping elevated views across Sydney harbour as the bridge crosses the water.	National landscape sensitivity This character area is used by local residents and visitors to this part of North Sydney, using the station and bridge, including the Sydney Harbour Bridge Cycleway. The buildings and structures are heavily used and are iconic to the nation.
Bradfield Park This character area stretches between Alfred Street South and Sydney Harbour Bridge between Lavender Street and the Milsons Point waterfront. The park is a local heritage item under the North Sydney LEP, including a northern, central and southern section of the park, each providing a range of uses and variations in character: • Northern section: consists of a linear park extending between Alfred Street South and Sydney Harbour Bridge to Burton Street, including mature trees and lawn areas, pathways and a formal plaza providing an entrance to Milsons Point Station • Central section: is located between Burton Street and Fitzroy Street and is occupied by the Bradfield Park Community Centre, a restaurant, the bowling greens, and the Kirribilli Markets and Kirribilli Art and Design Markets which operate from the site twice a month, transforming the use and character of this area. • South section: includes a broad expanse of grassed parkland, gently descending to the harbour foreshore. The underside of Sydney Harbour Bridge, particularly the northern approach span piers and northern pylon that run through the centre of the park, are prominent features in this part of Bradfield Park. This area also provides extensive views of the underside of Sydney Harbour and the city skyline.	Regional landscape sensitivity This landscape is used by local residents and visitors arriving to North Sydney via Milsons Point Station. The park is part of the North Sydney Heritage Walk and features significant tree plantings and heritage features. The plaza provides a setting to Milsons Point Station western entrance.
Milsons Point mixed core use This character area is defined by a high-density mixed-use area to the west of Milsons Point Station, along the western side of Alfred Street South. The area	Local landscape sensitivity This area is a local centre, attracting local residents, workers and visitors.

Landscape character area	Landscape sensitivity
includes a mixture of commercial and residential buildings, ranging in height from 2 to 20 storeys in height. The streetscape character along Alfred Street South is mixed, with some buildings containing active ground floor frontages with restaurants, local services and commercial tenancies, and others presenting inactive frontages. The street includes a small number of heritage buildings, such as the Chinese Christian Church and two storey terrace houses, which provide contrast in scale and character with the surrounding contemporary buildings. Alfred Street South is a busy street with two lanes of traffic, bus stops, on-street vehicle and motorcycle parking, loading zones and on-road cycle routes. Pathways, awnings, mature street trees and gardens in the adjacent Bradfield Park provide pedestrian scale and amenity to this streetscape and the eastern part of this character area.	
Lavender Bay residential area This character area is defined by the concentration of low-rise residences to the northwest of Milsons Point Station, including historic terrace buildings, single storey cottages, larger houses as well as churches, gardens and parkland such as Clark and Watt Parks, offering tree-framed views of Lavender Bay and Sydney Harbour Bridge. Several of the buildings and structures in this area are local heritage items and fall within the Lavender Bay Heritage Conservation Area (North Sydney DCP). The steep topography falling towards the harbour provides views to the CBD, Sydney Harbour Bridge and harbour from several elevated streets in northern parts of this area, as well as the parkland areas along the waterfront and rail infrastructure.	Local landscape sensitivity This is a predominantly residential area, used by local residents and their visitors.

Figure 6-4: Landscape character areas

Visual setting

The Sydney Harbour Bridge is a visual icon and the focal point of many significant views of the city. The Sydney Harbour Bridge and the Sydney Opera House Conservation Management Plans identify views of the bridge that are of national and state significance. The local planning controls also identify important views relevant to the study area.

The study area contains many views of varying scales and quality to the Sydney Harbour Bridge. The proposal would be mainly viewed in the context of the Sydney Harbour Bridge northern approach and several associated heritage items, including Milsons Point Station and Bradfield Park. North of Fitzroy Street, the northern approach of Sydney Harbour Bridge consists of rendered concrete retaining walls with decorative arches, parapet and stairs. In the vicinity of Burton and Fitzroy Streets there are views through the arched under bridges. In the vicinity of Milsons Point Station, the approach walls of Sydney Harbour Bridge are viewed, largely unobstructed, and framed by formal gardens and tall palm trees. Further north, the trees within Bradfield Park filter and screen views of the bridge approach wall, so that it is mainly glimpsed from surrounding areas. The view to the walls and another arched roadway opens up again at Lavender Street. There are several locations along Alfred Street South where there are views south towards the Sydney Harbour Bridge pylons and glimpses to the bridge arch.

The proposal would also be overlooked by several residences in multi-storey apartment buildings to the west of Alfred Street South. These residences include east facing living spaces and balconies, orientated towards Bradfield Park and the Sydney Harbour Bridge.

Viewpoints

Seven viewpoints have been selected to represent the range of public domain views to the proposal:

- Viewpoint 1: View north along Alfred Street South
- Viewpoint 2: View south along Alfred Street South
- Viewpoint 3: View from Bradfield Park north
- Viewpoint 4: View east from Alfred Street South to the Milsons Point Station entry
- Viewpoint 5: View south from Milsons Point Station western entry
- Viewpoint 6: View southwest from Milsons Point Station platform
- Viewpoint 7: View northeast along Alfred Street South.

The location of these viewpoints is shown in Figure 6-5, and a viewpoint description and corresponding visual sensitivity is identified in Table 6-11.

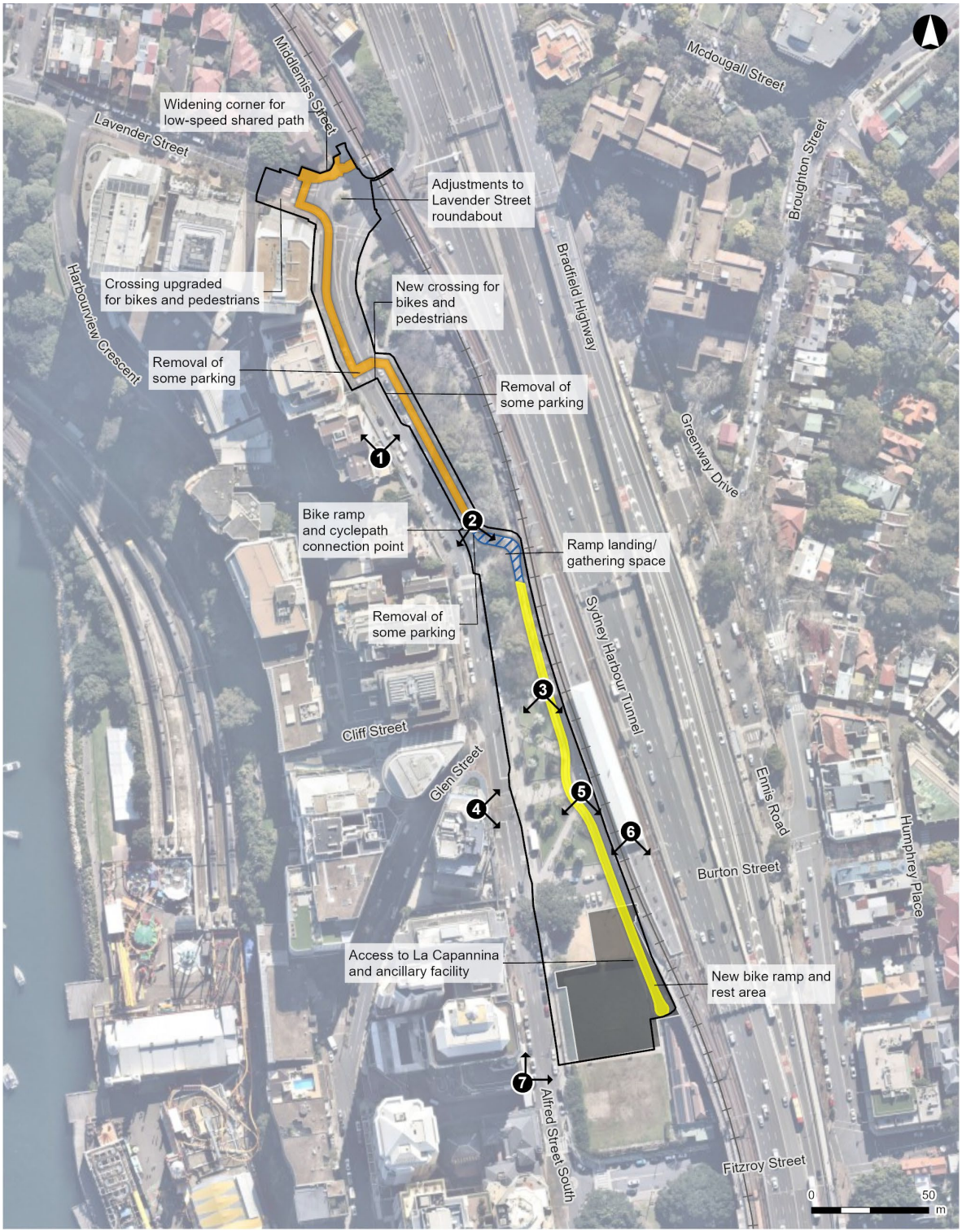


Figure 6-5: Viewpoint location plan

Table 6-11: Visual sensitivity from selected viewpoints

Viewpoint location	Visual sensitivity
Viewpoint 1 – View north along Alfred Street South 	Local visual sensitivity This view shows the northern end of Alfred Street South, with the Lavender Street intersection in the background. Bradfield Park North is located to the east. The mature canopy trees within this park mostly screen views to the rendered concrete wall of the Sydney Harbour Bridge northern approach beyond, which can be glimpsed through the trees. This view is outside the Sydney Harbour Bridge curtilage and Sydney Harbour Bridge setting boundary, however, it provides glimpses to the Sydney Harbour Bridge walls. Views from this location would be experienced by concentrations of residents and visitors, accessing the local area including Bradfield Park.
Viewpoint 2 View south along Alfred Street South 	Regional visual sensitivity This view along Alfred Street South includes Bradfield Park North to the east, including flat lawns and gravel areas, pathways and a concrete based shelter with seating, and mature canopy trees. This view is on the boundary of the Sydney Harbour Bridge curtilage and Sydney Harbour Bridge setting boundary and includes a view of the Sydney Harbour Bridge walls, and the Sydney Harbour Bridge pylons, elevating the sensitivity of the view. Views from this location would be experienced by concentrations of residents and visitors, accessing Milsons Point Station, Bradfield Park and surrounding recreational and commercial areas.
Viewpoint 3: View south from Bradfield Park north 	Regional visual sensitivity This view through the central area of Bradfield Park shows the entrance plaza at Milsons Point Station in the background. The plaza forms part of Bradfield Park, a local heritage item. This view is within the Sydney Harbour Bridge curtilage and includes several heritage listed items, such as the northern approach to Sydney Harbour Bridge, Milsons Point Station and Bradfield Park. Views from this location would be experienced by concentrations of residents and visitors, accessing Milsons Point Station, Bradfield Park and surrounding recreational and commercial areas.
Viewpoint 4: View east from Alfred Street South to the Milsons Point Station entry 	Regional visual sensitivity This view shows the Alfred Street entrance to Milsons Point Station, including the original awning, light fittings either side and decorative '1932' cartouche above. These elements all have aesthetic significance and are the main focal point of this view. The station has a state heritage listing and is an essential component of the northern approach to the Sydney Harbour Bridge. While this view is outside the Sydney Harbour Bridge heritage curtilage and Sydney Harbour Bridge setting boundary, it is a direct view to Milsons Point Station and the northern Sydney Harbour Bridge approaches.

Viewpoint location	Visual sensitivity
Viewpoint 5: View south from Milsons Point Station western entry 	Regional visual sensitivity This view shows two axial pathways extending south and southwest from Alfred Street South entrance to Milsons Point Station, through the plaza. The Sydney Harbour Bridge is an iconic feature in this view, including the northern approach spans and pylon towers, as well as a glimpse to the arch rising above the vegetation. This is a high-quality view including National, State and Local Heritage listed items. It is located within the Sydney Harbour Bridge curtilage, includes a view to iconic elements of the Sydney Harbour Bridge and is located at the entrance of a State Heritage listed place. The view would be experienced by large numbers of commuters and visitors to Bradfield Park, Milsons Point Station, the bowling greens and Sydney Harbour Bridge Cycleway.
Viewpoint 6: View southwest from Milsons Point Station platform 	Regional visual sensitivity This view from the western platform of Milsons Point Station shows Sydney Harbour Bridge, including the northern approach spans and pylon towers, as well as a partial view to the arch. To the west of the track, the cycle path on the western side of Sydney Harbour Bridge is visible, with security screens extending between the rail corridor and path. The upper section of the stairs linking between Sydney Harbour Bridge Cycleway and Burton Street is visible, with bike riders seen dismounting and remounting their bike at the top of the stairs, to use the steps. This view would be experienced by large numbers of residents and visitors, accessing the station. It is a high-quality view including national, state and local heritage listed items, such as Sydney Harbour Bridge and Milsons Point Station.
Viewpoint 7: View northeast along Alfred Street South 	Local visual sensitivity This view shows the northern approach to the Sydney Harbour Bridge, including the decorative concrete walls, stairs and the high arch of the Burton Street underbridge linking Milsons Point with Kirribilli. The Sydney Harbour Bridge approach forms part of the bridge State heritage curtilage and is featured in this view. The bowling greens at Bradfield Park are visible in the middle ground of view, slightly elevated from the street by a low retaining wall. When the bowling greens are used for the Kirribilli Markets, there would be a high centration of stalls, with customers providing movement and activity in this view when open on Saturdays and Sundays. This view is from a location outside the Sydney Harbour Bridge heritage curtilage and Sydney Harbour Bridge setting boundary. While the view includes several heritage listed items, elevating the quality of the view somewhat, this is an incidental view to part of the Sydney Harbour bridge. Views from this location would be experienced by concentrations of residents and visitors, accessing the local area including the bowling greens, Luna Park and the Burton and Fitzroy Street underbridges, linking to Kirribilli.

Viewpoint location	Visual sensitivity
'Postcard' views of the Sydney Harbour Bridge  	National visual sensitivity The Sydney Harbour Bridge is a visual icon which features extensively in imagery representing the city of Sydney, New South Wales and Australia. They often show the Sydney Harbour Bridge viewed together with the Sydney Opera House and most often viewed across the waters of Sydney Harbour. The 'postcard' views of the Sydney CBD are iconic to the nation and a focal point of views across the inner harbour. They highlight the most important visual features of the city and are viewed by millions of people online and replicated by tourists visiting Sydney from around the world.

Views at night

Areas in the vicinity of the Milsons Point Station and Bradfield Park, including the proposal, are of high district brightness. This is due to the combination of surrounding land uses with high light levels. It includes the bright lighting at the station and entrance plaza, on the Sydney Harbour Bridge and Luna Park Precinct, street lighting along the Bradfield Highway and lighting of commercial and residential apartment towers along Alfred Street South. The lighting includes both fixed and headlights from moving cars and trains. There are lower light levels in the surrounding predominantly residential urban areas of Lavender Bay and Kirribilli, to the northwest and east.

6.2.3 Potential impacts

Construction

Landscape character impacts

The proposal has the potential to impact upon the Sydney Harbour Bridge and Milsons Point, Bradfield Park, Milsons Point mixed core use, and Lavender Bay residential area landscape character areas.

Table 6-12 identifies the landscape sensitivity of the area, magnitude of change, and the landscape character impact, as a result of the proposal during construction.

Table 6-12: Landscape character impacts during construction

Landscape sensitivity	Magnitude of change	Landscape character impact
Sydney Harbour Bridge and Milsons Point Station		
National landscape sensitivity	Moderate Milsons Point Station and the Sydney Harbour Bridge would remain open, including the Sydney Harbour Bridge cycle path, western entrance and platforms. Construction of the cycle ramp would be raised above the station entrance plaza, with the ramp installation alongside the station platform, bringing construction character activity within proximity to the station patrons and bike riders using the existing cycle path and stairs. To construct access to the new cycleway, part of the Sydney Harbour Bridge parapet alongside the cycle path would be removed. Apart from this, there would be no direct impact on the Sydney Harbour Bridge structure. The existing cycle path and stairs would remain, however the proximity of construction activities and the presence of hoarding would reduce the level of comfort and legibility for pedestrians and bike riders. The proposal construction would affect a relatively small area of the Sydney Harbour Bridge character area, the construction activity would be relatively small scale, and the public domain areas would remain largely open to community use.	Moderate-high

Landscape sensitivity	Magnitude of change	Landscape character impact
Bradfield Park		
Regional landscape sensitivity	Low Bradfield Park would remain open to public use, however the eastern most pathway would be closed and there would be about five Simons Poplar trees removed along the Sydney Harbour Bridge approach wall and one small ornamental pear tree, at the northern end of the ramp. The columns supporting the cycleway would be installed along the eastern edge of the park, following the existing pathways. There would be a small direct impact in these areas, otherwise, the main landscape features of Bradfield Park, including the central lawn areas and majority of the features trees, would not be impacted. During construction, however, the appeal of the station entrance plaza as a meeting place and recreational area would be reduced by the proximity to construction activities. The closure of the pathway along the eastern side of the park would also divert pedestrians to surrounding footpaths and alter the patters of access to and movement through the plaza. A construction compound would be established in Bradfield Park Central, temporarily occupying part of the boules piste and northern bowling green. The character of the ancillary facilities would contrast with the parkland setting, influencing the adjacent areas of Bradfield Park.	Moderate adverse
Milsons Point mixed use core		
Local landscape sensitivity	Neutral There would be no direct construction activity occurring in this landscape character area. However, the construction activity within Alfred Street South would influence the character of the adjacent areas of Milsons Point mixed use core area. The nearby construction activities within Alfred Street South would result in a minor change the character, amenity and function of the landscape.	Negligible
Lavender Bay residential area		
Local landscape sensitivity	Neutral There would be some construction activity on Lavender Street and at the roundabout at the intersection with Alfred Street South to construct a short section of the on-street cycle path and to resurface the roundabout. Although the Canary Island Date Palm in the centre of the roundabout would be removed, the surrounding street trees would be retained. The construction activities would generally be of a small scale and would not alter the character, amenity and/or function of the landscape. There would be some footpath closures and diversions around the construction site temporarily, which would have a small impact to local accessibility and legibility.	Negligible

Visual impacts

The proposed works are likely to result in mostly moderate adverse short-term impacts during the construction phase due to the introduction of construction sites, enclosed by site fencing and hoarding, in the middle ground of most viewpoints. Views of Bradfield Park and the Sydney Harbour Bridge would largely remain visible, however there would be construction activity partly obstructing many viewpoints, altering the character of the view temporarily. The work would remove a row of poplar trees in Bradfield Park North however the central areas of the park, including mature trees, gardens and lawn areas would remain. A summary of the visual impacts from select viewpoints is provided in Table 6-13.

Viewpoints 5 and 7 have been assessed as experiencing a moderate-high visual impact. In both viewpoints, the southern construction site would be visible in the background of this view, as well as the ancillary facility sites which are located at the northern bowling green and piste courts next to Burton Street. The ancillary facility sites would be used for site sheds, stockpiling and temporary storage of equipment, including mobile cranes. The southern end of the Alfred Street South cycle path construction site would also be seen in this view. The proposal would partially obstruct the views to heritage features and substantially alter the character of the views, however this impact would be temporary and experienced in the short term.

Table 6-13: Summary of visual impacts from selected viewpoints

Viewpoint	Visual sensitivity	Magnitude of change	Visual impact
1: View north along Alfred Street South	Local	Low	Low adverse • The construction of the linear bike ramp would not be seen. Movement of construction vehicles, machinery and plant may be seen on occasions • Construction of the Alfred Street South cycle path would be seen (temporary site fencing or hoarding and the use of construction equipment) • The proposed works would not appreciably obstruct the view to these local visual features.
2: View south along Alfred Street South	Regional	Moderate	Moderate adverse • The northern part of the ramp construction site would be seen. The pathway between Bradfield Park and Alfred Street South would be temporarily closed and works to construct the northern landing of the linear bike ramp would be visible. This work would include the removal of several trees along the Sydney Harbour Bridge approach wall, establishment of a construction site fencing and hoarding, and works to install the concrete deck, balustrade and columns extending south. This work would obstruct the view of the awning at the Milsons Point Station entrance • Construction of the Alfred Street South cycle path would be seen. Works would include the establishment of site fencing and minor road works, which would partly obstruct the view to the Sydney Harbour Bridge northern pylons • Landscape features of Bradfield Park and the Sydney Harbour Bridge pylons would largely remain visible.
3: View south from Bradfield Park north	Regional	Moderate	Moderate adverse • The central part of the construction site would be seen. Works would include removal of about five Simons Poplar trees, none of which are visually prominent or significant specimens • The view to the Milsons Point station entrance, awning and surrounding features would be obstructed at times given the use of construction equipment and installation of the linear bike ramp. The construction of several supporting columns would be visible • The construction of Alfred Street South cycle path would be seen along the eastern side of the street, beside Bradfield Park • There would be some obstruction to the view of the Sydney Harbour Bridge approach walls and work would contrast in character with the landscape features of Bradfield Park (moderate portion of the view, altering the character of the view temporarily).
4: View east from Alfred Street South to the Milsons Point Station entry	Regional	Moderate	Moderate adverse • The southern and central part of the bike ramp construction site would be seen. The gravel area (boules piste) at the foot of the Sydney Harbour Bridge stairs would be used temporarily for mobile crane use and site sheds would be seen in front of and obstruction views to the Sydney Harbour Bridge stairs • Lawn areas and ornamental plantings of Crepe Myrtle, Cabbage Tree Palm and Jelly Palm would be retained • Construction of several columns would be visible • Construction work would partially obstruct this view of the Sydney Harbour Bridge approach walls, Milsons Point Station entry and the arch of the Burton Street underbridge. This work

Viewpoint	Visual sensitivity	Magnitude of change	Visual impact
			would contrast in character with the landscape features of Bradfield Park and would comprise a moderate portion of the view.
5: View south from Milsons Point Station western entry	Regional	High	Moderate – high adverse • Construction of several columns would be visible • The southern construction site would be visible in the background, south of Burton Street. The gravel area (boules piste) at the foot of the Sydney Harbour Bridge stairs would be used temporarily for mobile crane use. Site sheds would be erected alongside the Sydney Harbour Bridge, south of Burton Street, blocking views to the Sydney Harbour Bridge stairs. • There would be hoardings around the perimeter of each worksite blocking views to the northern approach spans and pylon towers of the Sydney Harbour Bridge. The upper section of the pylons and arch would be visible • This work would comprise a large portion of this view.
6: View southwest from Milsons Point Station platform	Regional	Low	Moderate-adverse • The southern and central part of the ramp construction would be seen. The upper section of the raised platform worksite would be seen, allowing clear views to the ramp deck and balustrade installation • Site sheds, proposed to be located on the boules piste and bowling green, would be below the trees and out of view. The use a mobile crane in this area would be visible rising above the bridge wall on occasion • Views to the Sydney Harbour Bridge would be retained. Views to northern approach spans would be partially obstructed by the southern construction site • Bike riders would continue to be seen. Trains would also continue to be seen. • This work would only comprise a relatively small portion of the view, being located mainly below the main view line.
7: View northeast along Alfred Street	Local	Moderate	Moderate – high adverse • Site sheds would be installed on the boules piste, obstructing views to the Sydney Harbour Bridge stairs and approach walls • Construction of several columns would be visible, as well as the bike riders' rest area at the ramp entrance. There would be hoardings around perimeter of each worksite. This work would obstruct the view to the heritage features of this view and comprise a moderate portion of the view.
'Postcard' view	National	Neutral	Negligible • The proposal would be located on the western side of the Sydney Harbour Bridge approach walls and set back from Sydney Harbour. This area does not typically feature in 'postcard' views of the Sydney Harbour Bridge. • There may be glimpses to construction equipment, rising above the trees which contain views from the harbour in the south. However, it is unlikely that any construction activity would be visible in views towards the Sydney Harbour Bridge from the east, where the bridge is viewed together with the Sydney Opera House. It is also unlikely that any views from the air would include the proposal.

Views at night

Night works may be required for the ramp construction site which would require lighting for site offices, staff amenities, laydown areas and work areas. All lighting within the construction site would be designed to minimise light spill and directed away from neighbouring properties. This lighting would make a negligible contribution to the general skyglow above the North Sydney CBD. There would be direct light sources visible from surrounding areas, including residences of nearby apartments. This lighting would be largely consistent with the prevailing light levels of this area of A4: High district brightness. As such, there would be a negligible and temporary visual impact at night during construction. This impact would be temporary and experienced in the short term.

Operation

Landscape character impacts

Table 6-14 identifies the landscape sensitivity of the area, magnitude of change, and the landscape character impacts, as a result of proposal operation.

Table 6-14: Landscape character impacts during operation

Landscape sensitivity	Magnitude of change	Landscape character impact
Sydney Harbour Bridge and Milsons Point Station		
National landscape sensitivity	Low The new linear bike ramp would: • Constitute a relatively small physical change to the bridge structure, with the removal of a short section of the balustrade. It would be set back from the curved northern approach spans of the bridge and out of view from the southern areas of Bradfield Park, • Incorporate thin round piers and be aligned parallel to the bridge approach walls, so to not detract from the character and prominence of the Sydney Harbour Bridge. The ramp would be elevated above the arched Burton Street underpass, so that it would not obstruct views to the arch • Have a relatively simple alignment, paralleling the bridge approach walls and curving away from the Milsons Point Station entry, minimizing any impact on the character of the station entry • Have a contemporary character and considerably improve the functioning of the Sydney Harbour Bridge due to the improved cycleway access.	Moderate
Bradfield Park		
Regional landscape sensitivity	Neutral • The new linear bike ramp would be located at the eastern edge of Bradfield Park, alongside the Sydney Harbour Bridge and minimising the intrusion into the park. The main landscape features of the park would be maintained • The location of the new linear bike ramp, set back from the curved northern approach spans of the bridge, and out of view from the southern areas of Bradfield Park, limits its influence on the character of Bradfield Park as a whole • About five Simons Poplar trees and one ornamental pear tree would be removed in the northern park area, none of which are visually prominent or significant specimens • The tennis table would be relocated in consultation with North Sydney Council • From the bike ramp landing, the walkway along the eastern edge of the park would be realigned slightly to the west to maintain pedestrian access through park • The cycleway deck would be raised above the park and curve around the station entrance, avoiding the awning structure. This elevated section of the linear bike ramp would create shade and enclose the edge of the park somewhat • The separation of pedestrians and bike riders within the station entrance plaza and substantial improvement to the route for bike riders would improve accessibility of the area, the level of comfort and safety in Bradfield Park	Low-moderate

Landscape sensitivity	Magnitude of change	Landscape character impact
	• Due to the substantial improvements to accessibility and minimal impacts on the park, the effects of the proposal would balance and there would be a neutral change to this landscape character area.	
Milsons Point mixed use core		
Local landscape sensitivity	Low improvement There would be no direct impact on this landscape character area. However, along Alfred Street South, the amenity and function of the streetscape would be improved with the new cycle path between Burton Street and Middlemiss Street, connecting to the existing cycle network. Streetscape improvements such as new paving and planting, would also enhance the character of this part of Alfred Street South.	Minor beneficial
Lavender Bay residential area		
Local landscape sensitivity	Neutral There would be a short section of on street cycle path along and crossing Lavender Street, near the intersection with Alfred Street South. While the new cycleway would slightly improve accessibility for bike riders in this area, the works would not alter this landscape character area.	Negligible

Visual impact

In relation to Bradfield Park, the main features of the park would be retained. Pedestrians would continue moving through the plaza and bike riders would be seen moving along the cycleway ramp, elevated from the plaza. Bike riders would also be seen travelling in both directions along Alfred Street South cycle path.

The cycleway ramp would incorporate design features that minimise the visual bulk and scale of the structure, reducing its prominence. The ramp generally follows the gradient of the Sydney Harbour Bridge ramp, curving around and away from the Milsons Point Station entrance, allowing space and light visible between the ramp and station entrance. A flat section of the ramp passes the heritage awning, allowing mostly unobstructed views of the station entrance. The ramp would be located close to the bridge approach walls and only partially obstruct some features of the wall and stairs from certain viewpoints. As such, the proposal has been assessed as mostly having a low-moderate visual impact during operation.

Viewpoint 1 has been assessed has having a low beneficial impact. This view would include an upgraded streetscape incorporating the new Alfred Street cycle path.

Viewpoints 2 to 7 have been assessed as having low to moderate adverse impacts. These viewpoints are characterised by views of Bradfield Park and/or Milsons Point Station. Though the presence of the proposal within these viewpoints creates an adverse visual impact, the original features of the view are still maintained. The incorporation of good contemporary design also acts to mitigate the visual impacts of the proposal, reducing the overall visual bulk and scale within the existing environment.

A summary of the visual impacts from select viewpoints is provided in Table 6-15.

Table 6-15: Summary of visual impacts from the selected viewpoints

Viewpoint	Visual sensitivity	Magnitude of change	Visual impact
1: View north along Alfred Street South	Local	Low	Low beneficial • This view would include an upgraded streetscape incorporating the new Alfred Street South cycle path • From the crossing, the cycle path would be located on the western side of Alfred Street, extending west at the intersection with Lavender Street, in the background. This would include raised and textured paving, new traffic islands and public domain improvements such as new garden beds and street trees.

Viewpoint	Visual sensitivity	Magnitude of change	Visual impact
2: View south along Alfred Street South	Regional	Moderate	Moderate adverse • The three-metre-wide concrete deck would be seen, with cast balustrades to either side • The main features within Bradfield Park would continue to characterise this view with the new cycleway being located to the east and next to the Sydney Harbour Bridge northern approach walls • The view to the rendered concrete wall of Sydney Harbour Bridge could be opened up with the removal of about five Simons Poplar trees, and only slightly obstructed by the lower section of the cycleway bridge • The northern pylons of the bridge and approach spans would continue to be seen • The entrance to the Milsons Point Station would be obstructed by the ramp • The footpath along Alfred Street South and the new cycle path would be visible in the foreground. Bike riders would be seen travelling along Alfred Street South cycle path and ramp.
3: View south across Milsons Point Station entrance plaza	Regional	Low	Low – moderate adverse • The cycleway ramp would block views to the approach wall including the decorative details on the parapet. The view of the station entry would be obstructed by the cycleway ramp • Five Simons Poplar trees and a small, ornamental pear tree would be removed, however the main features of Bradfield Park would be retained and continue to be seen • The footpath along Alfred Street South and the new cycle path would be visible.
4: View east from Alfred Street South to the Milsons Point Station entry	Regional	Moderate	Low – moderate adverse • The new linear bike ramp would be visible, above the station entrance. The underside of the bridge deck would be seen, with steel balustrade extending along the ramp and columns set either side of the station entrance • The alignment and flattening of the ramp grade would respect the symmetry of the station entry. The ramp would, however, obstruct the view to the decorative '1932' cartouche above the station entrance and decorative parapet from this location. The ramp would also obstruct the decorative top section of the approach walls • Bike riders would be seen travelling along the cycleway • The main features of this view would be retained, or only slightly obstructed. The main features of Bradfield Park would continue to be seen.
5: View south from Milsons Point Station western entry	Regional	Low	Low - moderate adverse • The bike ramp would be visible, including a three-metre-wide concrete deck supported by steel structure and columns. The underside and eastern elevation of the ramp would be visible. • At the station entrance, the ramp alignment would curve outwards, away from the heritage awning • The main features of this view would be retained or only slightly obstructed. The main features of Bradfield Park would be retained and continue to be seen.

Viewpoint	Visual sensitivity	Magnitude of change	Visual impact
6: View southwest from Milsons Point Station platform	Regional	Low	Low - moderate adverse • The bike ramp would be visible to the west and parallel to the Sydney Harbour Bridge. The cycle bridge deck and cast balustrades would be seen • Trains would continue to be seen entering and departing the station • The main features in this view would be retained, including the northern approach spans, pylon towers, cycle path and arch of the Sydney Harbour Bridge, as well as the building and platform at Milsons Point Station. The top of the ramp, including railings, would not be prominent, however, there would be bike riders activating this view.
7: View northeast along Alfred Street	Local	Moderate	Low - moderate adverse • The new bike ramp would be visible • The underside of the bridge deck would be seen, with steel balustrade extending along ramp and columns equally spaced, supporting the bridge. Although the ramp would be offset from Sydney Harbour Bridge, the structure would partially block views to the concrete detailing along top of Sydney Harbour Bridge walls • The upper section of the existing stairs would be partially obstructed by the bike ramp. Views to the arch of the Sydney Harbour Bridge would be retained. • Trains would continue to be seen entering and departing Milsons Point Station, as well as bike riders moving along the bike ramp.
'Postcard' view	National	Neutral	Negligible • Due to its location, the proposed new bike ramp would not be expected to be visible in 'postcard' views of the Sydney Harbour Bridge. The proposed bike ramp would not noticeably rise above the bridge walls and would not be seen in views of the bridge from the east, where the bridge is viewed together with the Sydney Opera House.

Views at night

The linear bike ramp would be brightly lit to provide for bike rider safety, which would include lighting integrated within the balustrade structures to light the ramp deck and lighting underneath the structure, to illuminate the underside of the deck. All lighting would be designed to minimise light spill and direct away from neighbouring properties, and to ensure that the cycle way does not distract from the scale and prominence of the Sydney Harbour Bridge.

The level of lighting required to provide safety for bike riders and pedestrians at night would be consistent with the light levels around these areas of the city and would be consistent with the bright lighting levels in this area of A4: High district brightness. As such, there would be no perceived change in the amenity of this area at night, and a negligible visual impact.

Impacts on views from private dwellings

The proposal would be overlooked by several residences in multi-storey buildings to the west of Alfred Street South. An assessment of two representative views from the private domain was carried out and found that the while there would be a new structure visible, partly obstructing elements of the Sydney Harbour Bridge, the main features of the views would be maintained. The prominence of the proposed linear bike ramp would be reduced by the distance and angle of view in relation to the main view line. As such, there would be a low visual impact to the private dwellings.

6.2.4 Safeguards and management measures

Table 6-16 identifies urban design and place safeguard and management measures to minimise or avoid impacts to landscape character and visual amenity.

Table 6-16: Landscape character and visual safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
LV1	Landscape character and visual impact	An Urban Design Plan will be prepared to support the final detailed proposal design and implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and bike rider elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage • Tree replacement requirements as identified in the Tree Hollow Replacement Plan • Procedures for monitoring and maintaining landscaped or rehabilitated areas. The Urban Design Plan will be prepared in accordance with relevant guidelines, including: • Beyond the Pavement urban design policy, process and principles (Transport for NSW, 2020c) • Landscape Design Guideline (Roads and Maritime Services, 2018b) • Bridge Aesthetics (Transport for NSW, 2019a) • Noise Wall Design Guidelines (Transport for NSW, 2019b) • Shotcrete Design Guideline (Roads and Maritime Services, 2016a) • All lighting will be managed in accordance with AS4282:2019 *Control of the obtrusive effects of lighting*.	Detailed design / pre-construction	Core standard safeguard LV1 Beyond the Pavement urban design policy, process and principles (Transport for NSW, 2020) Landscape Design Guideline (Roads and Maritime Services, 2018) Bridge Aesthetics (Transport for NSW, 2019a) Noise Wall Design Guidelines (Transport for NSW, 2019b) Shotcrete Design Guideline (Roads and Maritime Services, 2016a)
LV2	Landscape character and visual impact	The following design elements will be considered in detailed design: • Ensure the width of the ramp piers are slender to minimise their visual mass and scale • Use of visually light-weight materials and a neutral colour palette to reduce the visual prominence of the ramp • Contemporary materials and design to differentiate the structure from the heritage features and	Detailed design	Additional safeguard LV2

ID	Impact	Environmental safeguards	Timing	Reference
		minimise the impact on the landscape character of the bridge and its setting • Bridge alignment to minimise the obstruction to the visual features of the bridge including the Milsons Point Station entry, including the cartouche where possible • Minimise the height of the ramp so that it does not rise substantially above the Sydney Harbour Bridge walls • Minimise the removal of trees and vegetation where possible • Where vegetation removal is necessary, avoid trees that contribute to the symmetry and integrity of the station entrance plaza design where possible • Ensure line markings are sympathetic to the character of the station entrance plaza and heritage values of the setting • Minimise any visual clutter created by lighting, signage, CCTV and any other aboveground infrastructure within the visual setting of the Sydney Harbour Bridge • Relocate or provide new table tennis in another location in the local area to replace the removed table from within Bradfield Park.		
LV3	Wayfinding	Temporary access arrangements will be well signed and provide a visually legible route for bike riders and pedestrians.	Construction	Additional safeguard LV3
LV4	Public access	Construction staging will ensure public access to recreational areas of the station entrance plaza are maintained where possible and reduced access to these facilities is minimised.	Pre-Construction/ Construction	Additional safeguard LV4
LV5	Hoarding	High quality hoarding will be used and incorporate artwork prepared in consultation with stakeholders.	Construction	Additional safeguard LV5
LV6	Public spaces	Construction equipment and activity will be consolidated to maximise the area of useable public realm where possible.	Construction	Additional safeguard LV6

6.3 Noise and vibration

This section provides an assessment of the potential impacts of the proposal on noise and vibration and identifies safeguards and management measures to avoid or minimise these impacts. A detailed assessment of noise and vibration impacts are presented in Appendix F – Noise and vibration impact assessment.

6.3.1 Methodology

Noise monitoring

Noise monitoring surveys were conducted between February and March 2022 to establish the existing background noise levels. Unattended noise monitoring was conducted at two locations within the study area. Attended monitoring was conducted at four locations to confirm the key contributing noise sources at each location and verify the validity of the noise logger data. Monitoring was carried out at similar locations to previous unattended monitoring undertaken between March and April 2018. The noise monitoring locations are shown in Figure 6-6.

Construction noise and vibration assessment

Relevant construction noise and vibration criteria for sensitive receivers were established based on the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and Transport's *Construction Noise and Vibration Guideline* (CNVG) (Transport for NSW, 2016).

The likely construction equipment and activities, and the sound power and noise emission levels for each of these activities, were predicted to determine:

- Construction noise predictions based on noise modelling software SoundPLAN v8.2, ISO 9613 prediction algorithm
- Locations at which the noise management levels are predicted to be exceeded, and to what extent during standard construction hours and out of hours work (OOHW)
- Construction vibration levels in accordance with relevant standards for building damage and human comfort levels.

Based on the results of the above, safeguards and management measures were identified to manage potential construction noise and vibration impacts.

Construction noise management levels

The rating background level (RBL) was used to determine the construction noise management levels (NMLs) for the noise catchment area in accordance with the ICNG and the *Noise Policy for Industry* (NPfI) (EPA, 2017). The NMLs for residential receivers are presented in Table 6-17. Refer to Section 6.3.2 for a discussion on the methodology used to determine construction NMLs.

Construction scenarios, noise sources and activities

Sources of construction noise and vibration would comprise a range of heavy vehicles, plant, equipment and hand tools.

Construction noise source levels for the anticipated equipment, 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 are presented in Table 6-18.

Table 6-17: Construction NMLs for residential receivers

Time	NML (dBA)
Day Standard hours 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday	RBL + 10 dB(A)
Day OOHW (Out of Hours Work) (1 pm to 6 pm Saturday, 7 am to 6 pm Sunday and public holiday)	RBL + 5dB(A)
Evening OOHW (6 pm to 10 pm)	RBL + 5dB(A)
Night OOHW (10 pm to 7 am)	RBL + 5dB(A)

Table 6-18: Construction scenarios and assumed sound power levels

Construction scenario	Duration	Plant item	Typical sound power level dB(A)	Number	Operating time (per cent of typical 15-minute assessment period	Estimated Sound Power Level dB(A)
CS1 – Site establishment	Approximately 1 month	Truck	103	1	50%	100
		Concrete saw[1]	123	1	25%	117
		Concrete mixer	109	1	25%	103
		Total $L_{Aeq(15minute)}$				**117**
CS2 – Ramp construction	Approximately 12 months	Large delivery truck (road truck)	109	1	50%	106

Construction scenario	Duration	Plant item	Typical sound power level dB(A)	Number	Operating time (per cent of typical 15-minute assessment period	Estimated Sound Power Level dB(A)
		Mobile cranes	113	1	25%	107
		Cherry picker	97	1	25%	91
		Scissor lift	98	1	25%	92
		Welders	110	1	50%	107
		Excavators	110	1	50%	107
		Piling rig (bored)	112	1	50%	109
		Jackhammers[1]	118	1	50%	115
		Total $L_{Aeq(15minute)}$ **Total L_{Amax} (based on mobile crane for OOHW)**				**118** **116**
CS3 – Groundwork, cycleway and landscaping	Approximately 12 months	Trucks	103	1	50%	100
		Excavators	110	1	50%	107
		Concrete pouring (concrete pump)	109	1	25%	103
		Forklifts	85	1	50%	85
		Jackhammers[1]	118	1	50%	115
		Concrete saw[1]	123	1	25%	117
		Total $L_{Aeq(15minute)}$ **Total L_{Amax} (based on concrete saw for OOHW)**				**120** **130**
CS4 – Demobilisation	Approximately 4 months	Trucks	103	1	50%	100
		Power tools (rattle gun)	104	1	50%	101
		Total $L_{Aeq(15minute)}$				**104**
Ancillary site	Duration of construction	Trucks	103	1	50%	100
		Total $L_{Aeq(15minute)}$				**100**

1. Plant item includes a 5 dB annoyance penalty in accordance with the requirements of the NpfI.

Out of hours work

The activities that are required to be undertaken outside of normal construction hours for reasons of operation road and rail user and pedestrian safety are described in Table 6-19.

Table 6-19: OOHW description

Construction activity	Description	Construction plant and equipment
Ramp works	Prefabricated bridge sections would be delivered at night and stored on Burton Street on low bed loaders, articulated and flatbed trucks between 12.00am and 4.00am. The sections of the ramp would be dropped into place with cranage at night between 10.00pm and 4.00am Monday to Thursday when trains are not operational and when pedestrians and bike riders' numbers are low. This activity may occur non-consecutively depending on wind or other environmental conditions which may affect the ability to lift panels safely.	Construction plant and equipment would be as per Construction Scenario CS2 – Ramp Construction as described in Table 6-18, with the exception of jackhammers and bored piling rigs, which would not be used during OOHW.
Adjustment to the Lavender Street roundabout and pedestrian and bike rider crossings	The adjustment to pedestrian crossing and roundabout works on Lavender Street and Alfred Street South would be completed out of hours on either a weekend and or weeknights between the end of the PM peak and beginning of the AM peak.	Construction plant and equipment would be as per Construction Scenario CS3 - Groundwork, cycleway and landscaping as described in Table 6-18. Concrete saw has been assessed for OOHW to provide a conservative assessment. However, it is anticipated that concrete saw would rarely be used during OOHW, and if it is being used, it would only be used for a very brief period of time.

Construction traffic noise

An estimation of the anticipated noise level contribution of construction traffic on local roads has been conducted using the Transport's Construction Noise Estimator Tool. The following indicative construction road traffic has been assumed on the local access roads next to the proposal area and Alfred Street South:

- Cycleway works
  - Five two-way light vehicle movements per day
  - Two two-way heavy vehicle movements per day
- Ramp works
  - Ten two-way light vehicle movements per day
  - Ten two-way heavy vehicle movements per day.

Operation

According to Transport's Road Noise Criteria Guideline, (2022) 'minor works' are defined as work that is primarily intended to improve safety, including minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments. The proposed road upgrades as part of the cyclepath are not considered 'redeveloped' or 'new' as the main purpose is not to increase road traffic flow volumes. It is therefore reasonable to assume the proposal would be defined as 'minor works' in accordance with the guideline. Noise emissions from bike riders on the upgraded cycleway would be minimal and unlikely to adversely impact on surrounding noise sensitive receivers.

A qualitative desktop review of a potential road traffic noise level increase has been conducted with regard to source-receiver distance and traffic volume sensitivity.

6.3.2 Noise and vibration criteria

Construction hours

The ICNG (DECC, 2009) defines working hours for which different construction noise assessment procedures apply. Standard working hours, during which the majority of construction work would occur, are:

- 7 am to 6 pm, Monday to Friday
- 8 am to 1 pm Saturday
- No work on Sundays or public holidays.

Any works outside of these hours would be classified as out of hours works.

The CNVG defines time periods when certain construction activity should be limited, where practicable, as described in Table 6-20.

Table 6-20: Construction hours

Activity	Working hours		
	Monday to Friday	Saturday	Sunday and public holiday
Standard construction	7 am to 6 pm	8 am to 1 pm	No work
Construction activities with impulsive or tonal noise emissions	8 am to 5 pm	9 am to 1 pm	No work

Construction noise management levels

The ICNG contains procedures for determining proposal specific NML for sensitive receivers based on the existing background noise in the area.

The NML for residential receivers set in accordance with the CNVG (Roads and Maritime Services, 2016b) are provided in Table 6-21. NMLs are set with reference to time of day and the background noise, known as the RBL. The RBL for each monitoring location is presented in Table 6-28 and Table 6-29 and has been determined based on the quietest period of the day, evening or night assessment period in accordance with the NPfI, above which reasonable and feasible noise mitigation needs to be considered. The NMLs apply at the property boundary most exposed to construction noise.

The NML for non-residential receivers are provided in Table 6-22. These levels apply only during hours when the non-residential premises are being used.

The difference between an internal noise level and the external noise level is 10 dB(A), which provides a conservative assumption that windows are open. Buildings where windows are fixed or cannot otherwise be opened may achieve a greater noise level performance.

Table 6-21: Noise Management Levels for residential land uses (ICNG)

Time of Day	Noise Management Level, LAeq(15-minute)	How to apply
Standard hours: 7 am to 6 pm, Monday to Friday 8 am to 1 pm, Saturday	**Noise affected** RBL +10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Actions: • Where the predicted or measured construction noise level exceeds the noise-affected level, all feasible and reasonable work practices should be applied to meet the noise affected level • All residents potentially impacted by the works should be informed of the nature of the works, the expected noise levels and duration, and provided with site contact details.

Time of Day	Noise Management Level, LAeq(15-minute)	How to apply
OOHW	**Highly noise affected (HNA)** >= 75 dB(A)	The HNA level represents the point above which there may be strong community reaction to noise. Actions: • Where construction noise is predicted or measured to be above this level, the relevant authority may require respite periods that restrict the hours that the very noisy activities can occur • Respite activities would be determined taking into account times identified by the community when they are less sensitive to noise, and if the community is prepared to accept a longer period of construction to accommodate respite periods.
	Noise affected RBL +5 dB(A)	A strong justification Is typically required for these works. Actions: • All feasible and reasonable work practices should be adopted • Where all feasible and reasonable work practices have been adopted and the noise level is more than five dB(A) above the NML, negotiation should be undertaken with the community.

Table 6-22 Noise Management Levels for other sensitive land uses (DECC, 2009)

Land use	Noise Management Level, $L_{Aeq(15\text{-}minute)}$[1]
Classrooms at schools and other educational institutions	Internal noise level – 45 dB(A)
Places of worship	Internal noise level – 45 dB(A)
Active recreation areas (characterised by sporting activities and activities that generate their own noise or focus for participants, making them less sensitive to external noise intrusion).	External noise level – 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (i.e. reading and meditation).	External noise level – 60 dB(A)
Community centres	Dependent on the intended use. Refer to the recommended 'maximum' internal levels by AS/NZS 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors.*

Note 1. Applies when premises are in use

Sleep disturbances

The CNVG (Roads and Maritime Services 2016) considers night works exceeding an external L_{Amax} sound pressure level at a receiver of 65 dB to impact upon occupant sleep amenity.

Construction traffic noise

Construction traffic noise were assessed with reference to the NSW Road Noise Policy (DECCW, 2011). Road traffic generated by the operation of the proposal would not increase from the existing operational traffic volumes, and as such, there would be no increase to the existing road traffic. Hence, road traffic noise impact due to operational noise has not been assessed in this study.

The NSW Road Noise Policy (DECCW, 2011) requires any increase in the total traffic noise level to be limited to two dBA above that of the existing road traffic noise level for both construction and operation.

Project specific Noise Management Levels

NMLs for the identified sensitive receivers have been identified based on the measured RBLs summarised in section 6.3.3 and the ICNG. The NMLs relevant to this assessment are presented in Table 6-23.

Table 6-23: NMLs for sensitive land uses

Land use	Noise Catchment Area (NCA)	Noise Management Level, $L_{Aeq(15\text{-}minute)}$			
		Day (Standard hours)	Day (OOHW)	Evening	Night
Residential	01	67	62	61	49
Residential	02	66	61	61	49
Classrooms[1]	-	55 (external - when in use)			
Places of worship	-	55 (external - when in use)			
Active recreation	-	65 (external - when in use)			
Passive recreation	-	60 (external - when in use)			
Commercial	70				
Industrial	75				

1. Typically, a facade insertion loss performance of 10 dB may be achieved where windows are open. For this reason, an external NML of $L_{Aeq(15\text{-}minute)}$ 55 dB has been established for educational and place of worship land uses.

Construction vibration criteria

Ground vibration generated by construction can have a range of effects on buildings and building occupants, with the main effects generally classified as:

- Human disturbance – disturbance to building occupants: vibration which inconveniences or interferes with the activities of the occupants or users of the building
- Effects on building structures – vibration that may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on building contents and structural damage.

Construction vibration screening criteria have been adopted from the following sources:

- Cosmetic and structural damage to buildings: German Standard DIN 4150-3, 1999, *Structural Vibration – Part 3: Effects of vibration on structures*
- British Standard BS 7385 Part 2-1993 Evaluation and Measurement for Vibration in Buildings
- Assessing Vibration: a technical guideline (DEC, 2006).

Human comfort

Table 6-24 presents the management levels for continuous and impulsive vibration at different land uses. The management levels specified are as overall unweighted root-mean-square (rms) vibration velocity levels (Vrms). The guideline Assessing

Vibration: a technical guideline (DEC, 2006) specifies the management levels as suitable for vibration sources predominantly in the frequency range 8-80 Hz as would be expected for construction vibration.

Table 6-24: V_{rms} management for continuous and impulsive vibration

Receiver	Continuous vibration V_{rms}, mm/s		Impulsive vibration V_{rms}, mm/s	
	Preferred	Maximum	Preferred	Maximum
Residences – daytime	0.2	0.4	6	12
Residences – night-time	0.14	0.28	2	4
Offices, schools, places of worship	0.4	0.8	13	26
Workshops	0.8	1.6	13	26

For intermittent vibration, the Vibration Dose Value (VDV) is used as the metric for assessment as it accounts for the duration of the source, which would occur intermittently over the assessment period. The VDV management levels at different land uses for intermittent vibration sources are presented in Table 6-25.

Table 6-25: Vibration dose value management levels for intermittent vibration

Receiver	VDV – Intermittent vibration	m/s1.75
	Preferred	**Maximum**
Residences – daytime	0.2	0.4
Residences – night-time	0.13	0.2
Offices, schools, places of worship	0.4	0.8
Workshops	0.8	1.6

Cosmetic and structural damage

Table 6-26 presents the German Standard DIN 4150-3 minimum safe levels of vibration at different frequencies for commercial and residential buildings, and Table 6-27 presents the BS 7385-2 guideline values relating to cosmetic damage from transient vibration.

DIN 4150-3 and BS 7385-2 state that exceedances of the guidance values do not necessarily mean that damage would occur, but that more detailed analysis may be required in order to quantify the site-specific relationship between vibration levels, strain and the potential for damage.

Table 6-26: DIN 4150-3 vibration cosmetic and structural damage criteria

Line	Structural type	Peak Particle Velocity (PPV) mm/s			
		Foundation of structure			Vibration of horizontal plane of highest floor at all frequencies
		<10 Hz	10-50 Hz	50-100 Hz	
1	Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20-40	40-50	40
2	Dwelling and buildings of similar design and/or use	5	5-15	15-20	15
3	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 (e.g. heritage-listed buildings)	3	3-8	8-10	8

Table 6-27: Transient vibration guide values for cosmetic damage (BS7385-2)

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		Frequency range	
		4-15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes: 1. Values referred to are at the base of the building.

2. For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

6.3.3 Existing environment

Noise sensitive receivers

The sensitive receivers within the study area comprise residential and commercial buildings, places of worship, aged care facilities, educational facilities and recreation areas.

Two noise catchment areas (NCAs) have been identified for the purpose of assessing potential construction noise impacts. NCA01 incorporates the sensitive receivers to the west of the proposal and NCA02 incorporates the sensitive receivers to the east of the proposal.

The proposal construction footprint, noise catchment area and noise sensitive receiver locations are shown in Figure 6-6.

Figure 6-6: Noise catchment areas and nearest receiver locations

Existing noise environment

Existing ambient environment that surrounds the proposal is typically dominated by the road traffic noise and passing trains.

The results of the noise monitoring carried out is provided in Table 6-28.

Table 6-28: Unattended noise survey results summary

ID	Location	Noise level dB(A)					
		Day (7 am to 6 pm)		Evening (6 pm to 10 pm)		Night (10 pm to 7 am)	
		RBL	L_{eq}	RBL	L_{eq}	RBL	L_{eq}
2022 Monitoring							
UM-01 (22)	52 Alfred Street South, Milsons Point (Level 4 balcony)	61	66	60	65	48	60
UM-02(22)	26 Willoughby Street, Kirribilli	56	67	54	65	44	60
2018 Monitoring							
UM-01 (18)	100 Alfred Street South, Milsons Point	57	60	56	59	44	56
UM-02 (18)	26 Willoughby Street, Kirribilli	56	63	56	62	45	57

The previous unattended noise monitoring was carried out at similar locations to those adopted for the 2022 monitoring; however, the location on the western side of the proposal boundary was located at ground-level at 100 Alfred Street South, approximately 200 metres to the south of the location selected for the 2022 monitoring.

For conservatism, the construction noise management levels have been based on the 2018 noise measurement data for the noise sensitive receivers located on the western side of the proposal (NCA01).

Attended noise monitoring was conducted to capture further information relating to the prevailing ambient noise environment. The results of the attending noise monitoring carried out is provided in Table 6-29.

Table 6-29: Attended short-term noise results summary

ID	Location	Measurement period	L_{eq} dB(A)	L_{max} dB(A)	L_{90} dB(A)
A1	52 Alfred Street South, Milsons Point (Level 4 balcony)	25/03/2022 11:04 – 11:19	66	76	64
A2	Opposite 70-72 Alfred Street South, Milsons Point	11/03/2022 16:23 – 16:38	64	73	60
A3	Opposite 126 Alfred Street South, Milsons Point	11/03/2022 16:01 – 16:16	67	86	62
A4	26 Willoughby Street, Kirribilli (First floor balcony)	9/02/2022 10:06 – 10:21)	63	77	57

The lowest measured L_{A90} noise level aligned with the daytime and evening RBLs determined from the unattended noise monitoring at 52 Alfred Street, Milsons Point. This demonstrates that high confidence that the RBLs established are appropriate for use in this assessment.

6.3.4 Potential impacts

Construction

Airborne construction noise – standard construction hours

The majority of work would be carried out during standard construction hours. NML exceedances would typically range between zero and 22 decibels in NCA01 and zero to five decibels in NCA02. During construction, exceedances of the noise management level are predicted when using the concrete saw during groundworks occurring directly next to receivers

located on Alfred Street South. Similarly in NCA02, the highest noise level is predicted for when cycleway works occur to the north of the proposal area that have direct line of sight to sensitive receivers on the eastern side of the Warringah Freeway. Under the worst-case scenario during standard construction hours, the proposal construction is predicted to exceed the highly noise affected level of the NML + 20 decibels at up to five residential receivers and two commercial receivers.

Worst case noise impacts from most construction activities, except ramp works, on multi-storey building are typically experienced by the receivers on the lower levels as works are carried out on ground level. Worst case noise impacts from ramp works on multi-storey building are typically experienced by the receivers on levels four and five as works would be carried out at a similar elevation.

The highest noise levels, such as saw cutting and jack hammering, would not occur for long durations and would generally be limited to just a small number of shifts throughout the construction process . Work would generally be conducted progressively from one end of the construction footprint to the other, however some work may occur in discrete locations within the proposal construction footprint, as required. Exceedances are based on all assumed plant and equipment working continuously adjacent to a sensitive receiver and consequently are the maximum impact from that activity. In reality, this would only occur for short periods of time, if at all, and actual noise levels would generally be lower.

NML exceedances are predicted at the places of worship and educational facilities during construction scenarios CS1, CS2 and CS3.

Based on the predicted NML exceedances, noise levels at a number of sensitive receivers would potentially exceed construction noise management levels during standard hours during various construction scenarios in accordance with the CNVG (refer to Table 6-30). Noise levels at one commercial receiver would potentially exceed noise management levels in construction scenarios CS2, CS3 and CS4 during standard hours. Predicted exceedances during standard construction hours would be managed via the safeguards and management measures discussed in section 6.3.5.

Table 6-30: Number of residential building NML exceedances during standard hours

Construction scenario	Noise management level exceedance category (CNVG)	
	NML +10 to 20 dB(A)	NML +20 dB(A)
CS1 – Site establishment	Up to 5 residential buildings	None
CS2 – Ramp construction	Up to 3 residential buildings	None
CS3 – Groundwork, cycleway and landscaping	Up to 17 residential buildings	Up to 5 residential buildings
CS4 - Demobilisation	None	None

Construction noise heat maps for standard construction hours are shown in Figure 6-7 and present the worst case scenario potential noise impacts that may result from the construction of the proposal during standard construction hours.

Figure 6-7: Worst case standard construction hours scenario

Airborne construction hours – out of hours work

OOHW would potentially be required for certain activities for reasons of operational road and rail user safety. These activities would include ramp works and roundabout adjustments on Lavender Street and Alfred Street South.

When OOHW is carried out, typical construction noise levels are expected to range between 32 dB(A) and 76 dB(A) for NCA01 and 32 dB(A) and 52 dB(A) for NCA02. NML exceedances for work would typically range between zero and 56 decibels. The highest predicted noise level would be up to 92 dB(A) for ramp works and 105 dB(A) for cycleway works at NCA01 and up to 71 dB(A) for cycleway works at NCA02. The highest noise levels are predicted for when works occur directly next to receivers located on Alfred Street South and when works have direct line of sight to sensitive receivers on the eastern side of the Warringah Freeway. Operation of the concrete saw and jackhammer used for cycleway works are expected to cause the maximum recorded noise levels. Cycleway works are expected to take about 12 months to complete construction. Predicted exceedances during OOHW would be managed via the safeguards and management measures discussed in section 6.3.5.

The highest noise levels would not occur for long durations at a particular receiver location. As noted above, exceedances are based on all assumed plant and equipment working continuously adjacent to a sensitive receiver and consequently are the maximum impact from that activity. In reality, this would only occur for short periods of time, if at all, and actual noise levels would generally be lower. Nightwork is currently proposed to occur periodically across the 18 month construction program. These works would be carried out for short times only and would be limited to three consecutive evenings in any one week. The noisiest activities, such as saw cutting and jack hammering would not occur past midnight.

For completeness, all construction activities have been assessed for OOHW, however not all construction activities would occur outside of standard construction hours. Table 6-31 and Table 6-32 outlines the number of residential building NML exceedances during ramp construction (CS2) and groundwork, cycleway and landscaping (CS3) for NCA01 and NCA02.

Table 6-31: Number of residential building NML exceedances within NCA01 for OOHW

Construction scenario	Noise management level exceedance category (CNVG)				
	NML	NML +5	NML +5 to 15	NML +15 to 25	NML +25
CS2	30	10	26	16	9
CS3	30	5	19	27	11

Table 6-32: Number of residential building NML exceedances within NCA02 for OOHW

Construction scenario	Noise management level exceedance category (CNVG)				
	NML	NML +5	NML +5 to 15	NML +15 to 25	NML +25
CS2	156	52	13	1	0
CS3	107	77	36	1	0

Construction noise heat maps for OOHW are shown in and Figure 6-8 and present the worst case scenario potential noise impacts that may result from the construction of the proposal during OOHW.

Exceedances of sleep disturbance criteria (i.e. external L_{Amax} sound pressure level at a receiver of 65 dB or greater) are predicted to occur during ramp and cycleway construction. The locations that would be affected by potential sleep disturbance exceedances are shown in Figure 6-9.

It should be noted that extensive night-time works are not expected to occur and would occur periodically throughout Phases 2 and 3 of construction. Night works would occur for short durations only and would not occur over more than three consecutive evenings in any one week. The potential for sleep disturbance would be considered in determining reasonable and feasible noise mitigation measures during construction.

Predicted exceedances during out of hours work and sleep disturbance exceedances would be managed via the environmental management measures discussed in Section 6.3.5.

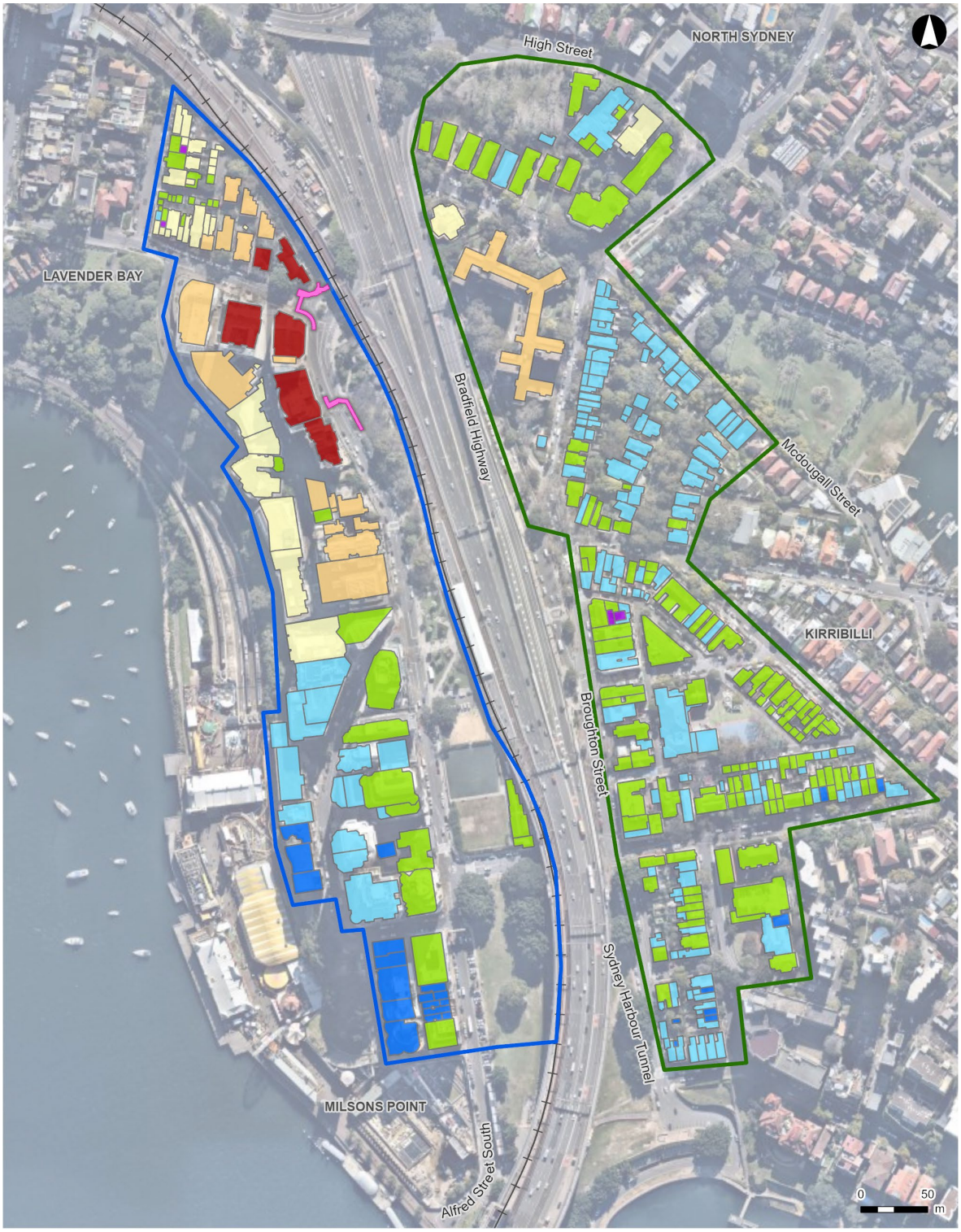


Figure 6-8: Worst case out of hours construction scenario

Figure 6-9: Map of potential sleep disturbance locations

Construction vibration impacts

There is potential for vibration impacts from construction based upon the plant and equipment described in Table 6-18. The assumed construction staging indicated that pile boring and jack hammering would be required for some of the construction activities. These plant items have minimum working distances of two metres and one metre for cosmetic damage, respectively. Minimum working distances based on the nominated three millimetres per second criterion for heritage structures have been estimated for pile boring and jackhammer as four metres and two metres, respectively.

The Nationally and State Heritage Listed Sydney Harbour Bridge and the State Heritage Listed Milsons Point Railway Station Group are located within the minimum working distances for pile boring and jackhammers. These plant items would be required for the construction of the piers that would support the bicycle ramp and connection of the ramp to the existing cycleway located on the Sydney Harbour Bridge approach span.

Working within the minimum working distances may present a risk of cosmetic or structural damage to the Sydney Harbour Bridge approach spans and the Milsons Point Station Railway Station. Work within the established minimum working distances would include the following activities:

- The pile boring required as part of the ramp pier construction
- The removal of a section of the Sydney Harbour Bridge parapet to enable the connection between the newly built ramp and the existing cycleway on the bridge.

The potential vibration impacts would be managed by the safeguards and management measures outlined in section 6.3.5 would be implemented to reduce the impacts as far as practicable.

Construction traffic noise

As outlined in Section 6.4.3, construction vehicle movements are expected to be minor and would not increase traffic noise more than two decibels from existing traffic noise levels. Measures to mitigate construction traffic noise are not therefore proposed.

Operation

The distance between roads and cycleway altered by the proposal as relative to the nearest noise sensitive receivers is not anticipated to change and therefore operational road traffic and bike rider related noise levels are not expected to change as a result of the proposal. The bike ramp would result in minimal noise emissions and therefore, the change in elevation of the cycleway would not adversely impact on surrounding noise sensitive receivers.

The proposal would also not result in an increase of road traffic volumes, classification or speed, and therefore road traffic noise levels are unlikely to change as a result of this proposal.

6.3.5 Safeguards and management measures

Environmental management measures proposed to avoid, reduce or manage noise and vibration impacts are listed in Table 6-33.

Table 6-33: Noise and vibration safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
NV1	Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and identify: • All potential substantial noise and vibration generating activities • Feasible and reasonable mitigation measures to be implemented to avoid and minimise noise impacts • A monitoring program to assess performance against relevant noise and vibration criteria	Detailed design / Pre-construction	Section 4.6 of QA G36 Environment Protection

ID	Impact	Environmental safeguards	Timing	Reference
		• A communications plan with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.		
NV2	Noise	Noise mitigation measures that will be adopted in the NVMP will include: • Selection of less noisy and less vibration emitting construction methods/plant and equipment, where feasible and reasonable • The noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the Construction Noise and Vibration Guideline (Transport for NSW, 2016) • Maximising the offset distance between noisy plant and adjacent sensitive receivers • Avoiding simultaneous operation of noisy plant, where feasible • Planning construction traffic flow, parking and loading/unloading areas to minimise reversing movements • Selecting site access points and delivery locations as far as possible from sensitive receivers.	Construction	Additional safeguard NV2
NV3	Vibration	Vibration mitigation measures that will be adopted in the NVMP include: • Undertaking a plant and vibration assessment to identify potential vibration risks to human comfort and cosmetic and structural damage • Where identified as being required, undertaking a pre-construction building surveys for structures prior to commencement of activities with the potential to cause property damage • Conducting vibration monitoring at high-risk receptors during construction • Consideration of feasible alternative construction methodologies or equipment where vibration intensive equipment is expected to exceed the criteria.	Pre-construction/ Construction	Additional safeguard NV3
NV4	Noise and vibration	All sensitive receivers (e.g. schools and local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	Detailed design / Pre-construction	Standard safeguard NV4

ID	Impact	Environmental safeguards	Timing	Reference
NV5	Noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All project specific and relevant standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures.	Pre-construction, construction, operation or other as required	Standard safeguard NV5
NV6	Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. If the work cannot be undertaken during the day, it should be completed before 11 pm. Where work is to be carried out outside of recommended working hours, all affected receivers will be notified of all relevant details of the proposed activities.	Construction	Additional safeguard NV6
NV7	Construction hours	Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations, whether at an institution or within a residence, such as before or during Higher School Certificate and at the end of higher education semesters.	Construction	Additional safeguard NV7
NV8	OOHW	OOHW during evening and night periods will be managed in accordance with Transport's Construction Noise and Vibration Strategy to provide respite from construction noise High noise activities, such as saw cutting and jack hammering, would be completed prior to midnight.	Construction	Additional safeguard NV8

6.4 Traffic and transport

This section provides an assessment of the potential impacts of the proposal on traffic and transport and identifies safeguards and management measures to avoid or minimise these impacts. A detailed assessment of traffic and transport impacts is presented in Appendix G – Traffic and transport impact assessment.

6.4.1 Methodology

The traffic and transport impact assessment included the following:

- Review of the construction methodology to understand the likely traffic demands and patterns
- Commissioning of parking/traffic movement surveys:
  - Parking survey of Alfred Street South (between Fitzroy and Lavender Street) – 6am to 8pm on a weekday, at 30 minute intervals
  - Traffic movement counts at the intersections of (two, two hour am/pm periods at 15 minute intervals) Lavender Street/Alfred Street South/Middlemiss Street and M1 off/on ramps, Alfred Street South/Cliff Street/Glenn Street and Alfred Street/Fitzroy Street

- Review of previously commissioned and currently commissioned data to reconfirm pedestrian, bike rider, traffic and parking conditions surrounding the site
- Sidra intersection modelling for up to three intersections for construction peak, on open and 10 year future horizon
- Consideration and identification of construction traffic and transport (vehicle, pedestrian and bike rider) impacts, including:
  - Access routes and scheduling of construction vehicle movements, including deliveries
  - Indicative daily number, frequency and size of construction related vehicles (passenger, commercial/heavy, including spoil management movements)
  - Construction worker parking and travel demand management approaches
  - Existing traffic movements and the cumulative impact created by construction vehicle movement
  - Access constraints and impacts on pedestrians and bike riders
  - Potential road closures, diversions or other configurations of the road, pedestrian and cycle network during construction and the duration of these changes
  - Temporary and permanent impacts to on-street parking, including to residents and businesses
- Consideration and identification of operational impacts of the proposed cycleway, including impacts on property and business, on-street parking and bike riders and pedestrian access and safety
- Identification of appropriate mitigation and management measures.

The study area includes Lavender Street, Alfred Street South, Burton Street, Middlemiss Street, the Bradfield Highway and Bradfield Park North.

6.4.2 Existing environment

Cycling facilities

The Sydney Harbour Bridge Cycleway is a two-way separated bicycle path, which is used by bike riders to travel between the Sydney CBD and the North Shore. Access at the northern end of the Sydney Harbour Bridge Cycleway is currently via 55 steps that connect with Bradfield Park at Milsons Point. Bike riders need to disembark to travel between the street level and the Sydney Harbour Bridge Cycleway. The steps create a bottleneck, present a safety hazard and may deter people from cycling.

An off-road pedestrian and bike rider shared path is currently provided on the eastern side of Alfred Street South between Lavender Street and Burton Street. An on road shared lane is also provided on Alfred Street South.

Middlemiss Street is a southbound one-way street for vehicles. Bike riders travelling on Middlemiss Street in the southbound direction would share the lane with vehicles, while bike riders travelling in the northbound direction are provided with a contraflow bicycle lane on the road.

The study area is surrounded by mixed use development consisting of the following:

- Commercial operations and residential premises at the west
- Public recreational facilities including Bradfield Park at the east and south
- Luna Park theme park near Lavender Bay
- Milsons Point Station located east of the study area
- Residential land uses and a neighbourhood centre east of the station.

These land uses are generally considered to be high intensity in terms of cycling demand generation. Cycling serves the short trips that people make around centres and local areas.

A Journey to Work analysis has been conducted of the catchment surrounding the study area using publicly available data collected during the 2016 Census, sourced from the Australian Bureau of Statistics (ABS) Census TableBuilder. Analysis based on 2016 data shows that 39 per cent of residents both live and work within North Sydney, and 42 per cent travel to Sydney City and Inner South such as Botany and Marrickville for employment.

The primary mode of transport to work for residents of North Sydney is via public transport such as train or bus, accounting for 43 per cent of all trips. Travel via private vehicle account for 25 per cent, followed by active transport modes such as cycling or walking at 18 per cent.

The primary mode of transport for work commuters to North Sydney is by public transport such as train or bus, accounting for 58 per cent of all trips. Private vehicle travel accounts for 26 per cent and active transport for six per cent of trips.

Cycling demand

Lavender Street and Alfred Street South, within the study area, are part of current high bicycle use routes (North Sydney Council's cycling map). The proposal connects the study area with the established Sydney Harbour Bridge Cycleway, which constitutes the only eastern cross-harbour cycle route and is a critical link in the metropolitan Sydney regional bicycle network. As the access point to the cycleway is located within the study area, high cycling demand is expected in the study area.

Daily and hourly bike rider counts collected in 2017 at the Sydney Harbour Bridge Cycleway indicate that around 2000 bicycle trips are taken across the Sydney Harbour Bridge Cycleway every weekday. When also considering weekend movements, a weekly daily average of about 1700 bicycle trips are taken.

Additional counts were collected on 10 March 2022 at eight locations within the vicinity of the Sydney Harbour Bridge Cycleway and Milsons Point Station. The data gathered is shown in Figure 6-10 and indicates less bicycle trips are currently taken across the Sydney Harbour Bridge Cycleway however factors that would contribute to the differences in volumes include different locations of the counts, ongoing COVID-19 impacts on travel patterns e.g. more people working from home, and high amounts of rainfall in the early months of 2022 deterring people from active modes of transport.

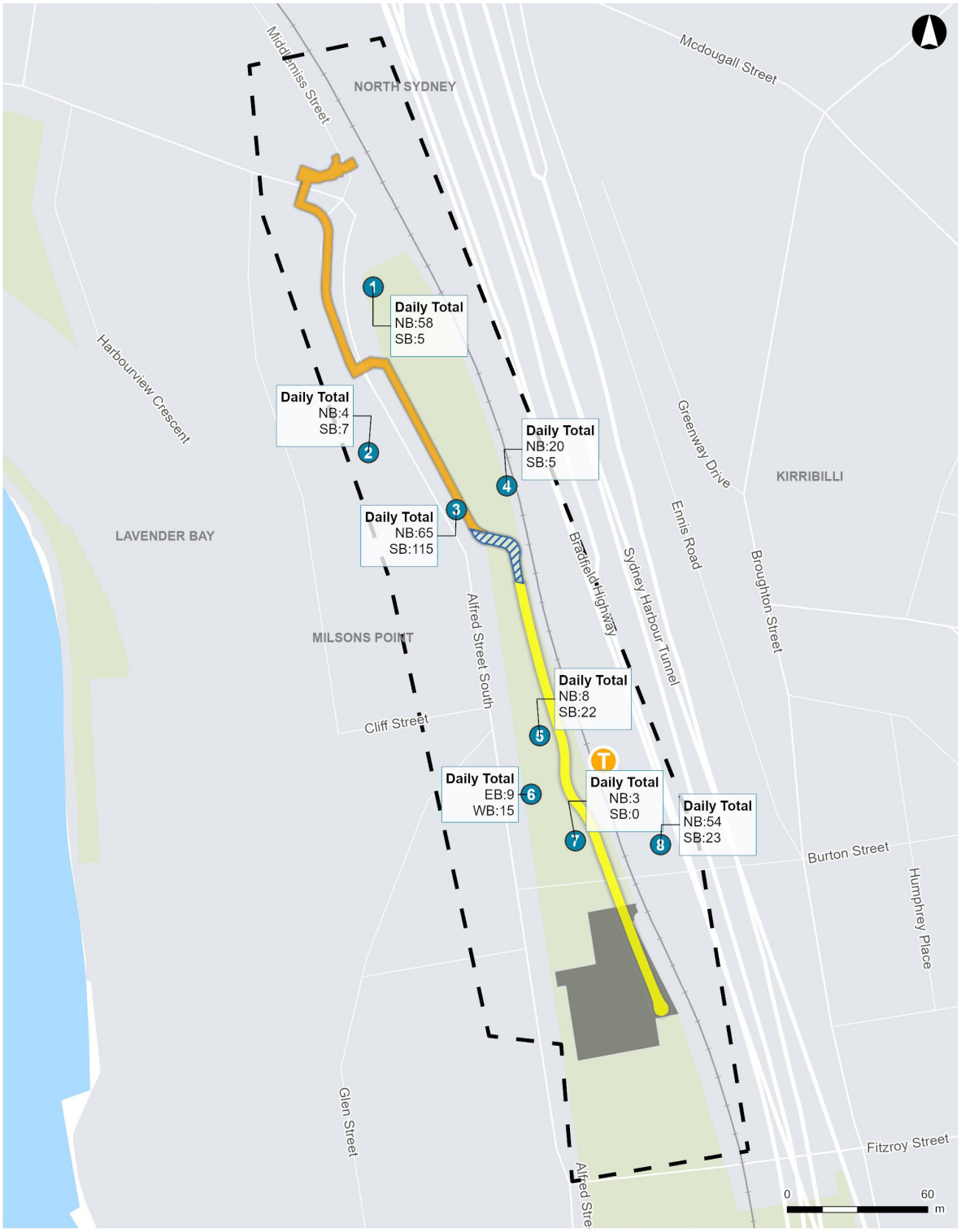


Figure 6-10: 2022 Bike rider count locations

Pedestrian facilities

Pedestrian footpaths are provided along both sides of all the roads within the study area, as well as the following road crossings:

- Raised pedestrian crossing on Lavender Street
- Two-stage pedestrian refuge on Alfred Street South near Lavender Street (non-compliant with the current standards)
- Traffic signals on Alfred Street South.

The current crossing point of two pedestrian refuges on Alfred Street South near Lavender Street, one of which crosses a slip lane that is used by motorists turning off the Bradfield Highway, a road with a posted speed limit of 70 kilometres per hour, is non-compliant with the current standards, with insufficient width to allow safe storage of bicycle or pram.

A walkway is provided at the eastern side of the Sydney Harbour Bridge for pedestrians to walk across the bridge from the Rocks to Milsons Point. Pedestrians can access the bridge via stairs or an elevator located on Broughton Street for the northern side of the bridge.

Pedestrian demand

Pedestrian counts were collected on 10 March 2022 for seven locations (refer to Figure 6-11). The data indicates a high level of pedestrian movement within the study area, which can be attributed to its close proximity to Milsons Point Station. However, whilst the data indicates that there are significantly higher pedestrian counts compared to bike rider counts, the pedestrian demand is not expected to increase as residential/commercial growth is not forecasted for the immediate area.

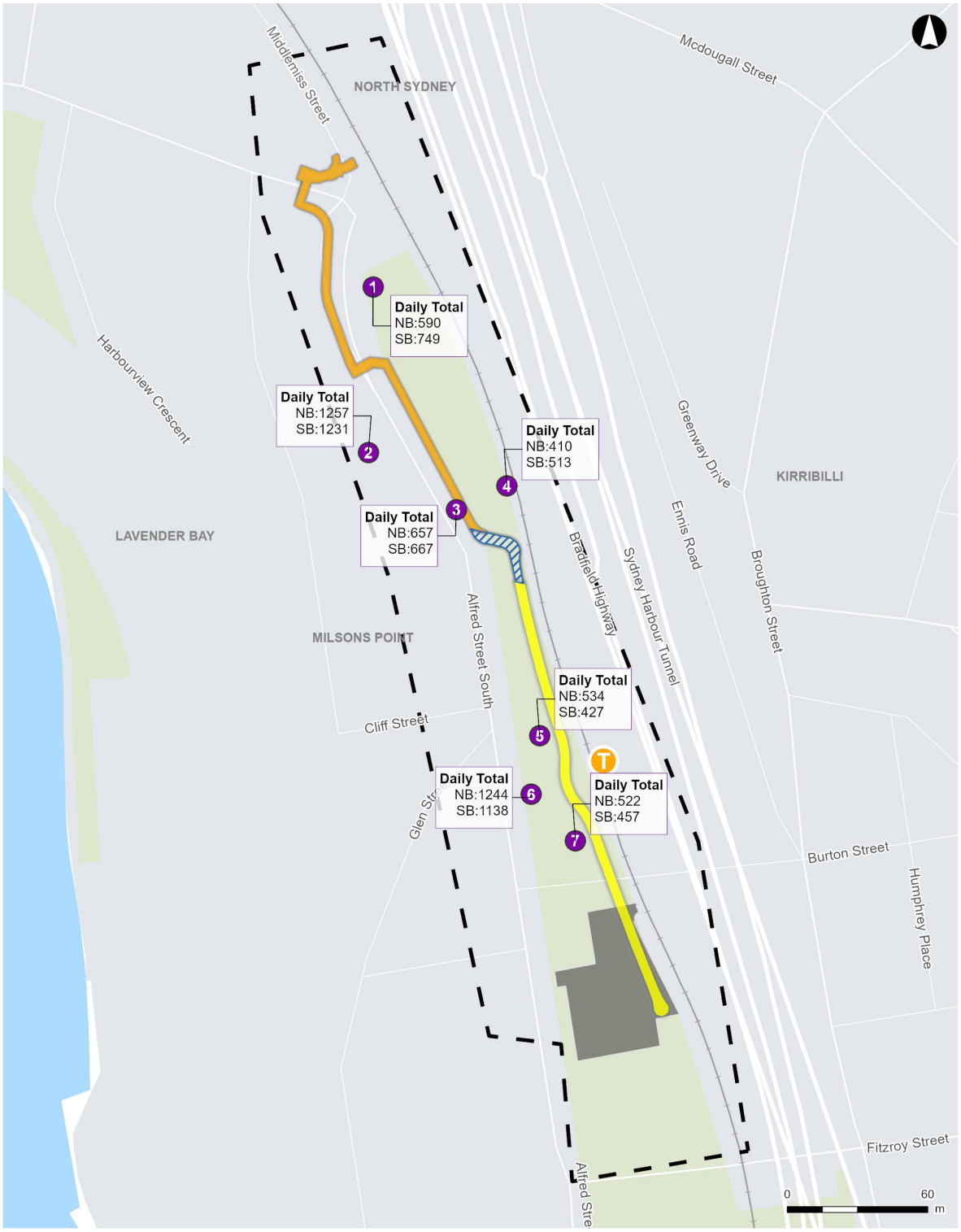


Figure 6-11: Pedestrian count locations

Motorist parking facilities

There are no commuter parking spaces provided at Milsons Point Station. There are a total of 73 parking spaces in the study area, including:

- Metered on-street parking provided at the end of Alfred Street South with a two-hour limit
- Kerbside parking on Lavender Street, Alfred Street South, Burton Street and Fitzroy Street for up to four hours
- Dedicated all day free parking spaces for motor bikes
- During the period from 8.30am to 6pm, the section of Alfred Street South directly north of the traffic signals outside Milsons Point Station is designated as a no parking zone, which is expected to be used by commuters as a pick-up and drop-off zone.

Vehicles of eligible residents are permitted to overstay the short-to-medium term parking restrictions, with a permit.

Public transport

Milsons Point Station is located near the intersection of Alfred Street South and Burton Street. The station has two platforms which are serviced by three lines including T1 North Shore and Western Line, T9 Northern Line and the CCN Central Coast and Newcastle Line.

There are four bus stops within the study area, located along Lavender Street and Alfred Street South, servicing public bus routes, as shown in Table 6-34.

Table 6-34: Bus services within the study area

Bus stop	Bus services
Lavender Street opposite Cliff Street (Stop ID: 206058)	Routes 150X, 154X, 209, 228, 229, 230, 286, 287 and 622
	School bus routes 587n, 589n, 594n, 681w, 707n, 773w, 774w, 775w
Alfred Street at Lavender Street (Stop ID: 206128)	Routes 150X, 154X, 203, 209, 228, 229, 230, 269, 286 and 287
	School bus routes 589n, 681w, 765n
Alfred Street South opposite Milsons Point Station (Stop ID: 206121)	Routes 150X, 154X, 203, 209, 228, 229, 230, 569, 286, 287 and 622
	School bus routes 568n, 569n, 589n, 617n, 648w, 665w, 673w, 681w, 707n, 708n, 710n, 711n, 760n, 761n, 763n, 764n, 765n, 769n, 770w, 772w, 776w, 778w
Milsons Point Station, Alfred Street South (Stop ID: 206123)	Routes 150X, 154X, 209, 228, 229, 230, 286, 287
	School bus routes 587n, 589n, 594n, 681w, 707n, 773w, 774w, 775w

Source: Google Maps

The four bus stops presented in Table 6-34 are also serviced by several school bus routes operated by Busways North West and Keolis Downer Northern Beaches. The majority of school bus routes run one service a day.

Milsons Point Wharf is located south of the study area, about 400 metres from Milsons Point Station.

Road network

Bradfield Highway

Bradfield Highway is a State highway, which connects the Sydney CBD with North Sydney via the Sydney Harbour Bridge. There are a total of eight lanes of traffic including one bus lane, two permanent northbound lanes, one permanent southbound lane and four interchangeable lanes. The direction of these lanes changes during the peak hour to allow for tidal flow arrangements and are indicated by the electronic signage above each lane. To the west of Bradfield Highway there is a two-way cycleway running parallel to two railway lines, separated from motor vehicle traffic. On the opposing eastern side of the Bradfield Highway there is a pedestrian walkway. The highway has a variable speed limit with a posted speed limit of 70 kilometres per hour in the event the sign is blacked out.

Alfred Street South

Alfred Street South is a two-lane and two-way street that is classified as a local road and extends from Lavender Street in the north to Olympic Drive in the south. Within the study area, it has a posted speed limit of 40 kilometres per hour and designated a high pedestrian activity area. There are pedestrian footpaths on both sides of the street, including a shared path with bike riders on the eastern side. An additional footpath passes through Bradfield Park North. The vehicle lanes on Alfred Street South are marked to as shared with bike riders.

There are two locations along Alfred Street South between Lavender Street and Burton Street that allow for formal pedestrian crossing point. One consists of traffic signals in front of Milsons Point Station and the other, a two-stage pedestrian refuge located south of Lavender Street. One of the pedestrian refuges crosses the slip lane used by vehicles exiting the Bradfield Highway.

There are two pavemented marked bus zones in front of the Milsons Point Station and a bus stop at the north of the street.

Lavender Street

Lavender Street is a two-lane and two-way street that is classified as a local road and extends from Union Street to Alfred Street South at the roundabout. It has a posted speed limit of 50 kilometres per hour and is the key pedestrian route connecting Milsons Point with North Sydney. There are pedestrian footpaths on both sides of the street. A signalised pedestrian crossing is provided at the western end of Lavender Street outside of the study area, and two zebra crossings are provided near Walker Street and at the Alfred Street South roundabout. As there are no dedicated cycle lanes, bike riders on Lavender Street share the road with vehicles.

Middlemiss Street

Middlemiss Street is a southbound one-way street that is classified as a local road and extends from Walker Street to Alfred Street South at the roundabout. Bike riders travelling in the southbound direction would share the lane with vehicles, while bike riders travelling northbound are provided with a contraflow bike lane on the road. Bike riders travelling southbound on Middlemiss Street have been observed either using the pedestrian crossing on Lavender Street or riding through the roundabout before connecting to the existing cycle path on the eastern side of Alfred Street South.

Burton Street

Burton Street is classified as a local road and connects Alfred Street South with Broughton Street via an underpass. However, as it is not a through road for motor vehicles, only pedestrians and bike riders can pass through. Multiple car parking spaces are provided in the underpass with various parking restrictions, accessed through Alfred Street South. Burton Street provides direct access to the Sydney Harbour Bridge Cycleway via bridge stairs, and the underpass allows pedestrians to access the Sydney Harbour Bridge Cahill Walk at Broughton Street.

Fitzroy Street

Fitzroy Street is a two-lane and two-way street that is classified as a local road and connects with Alfred Street South and Carabella Street via an underpass. It has a posted speed limit of 40 kilometres per hour.

Crash history

Crash data available on Transport's interactive crash and casualty statistics report, for a five-year period between 2016 and 2020, indicates twelve crashes were recorded within the study area along Alfred Street South, between Lavender Street and Fitzroy Street. Figure 6-12 shows the location and severity of crashes within the study area which include:

- Eight crashes occurred at roundabouts, with the Lavender Street/ Alfred Street South roundabout recording the highest number of crashes
- One recorded crash involved a pedestrian that resulted in serious injury
- Eight crashes resulted in moderate injury.

Figure 6-12: Crash map of the study area

6.4.3 Potential impacts

Construction

Pedestrian and bike rider impacts

Pedestrian and cycling connections would be maintained in all scenarios, however slight diversions may be made as necessary such as along sections of footpath on Alfred Street South. Where required, alternate pedestrian paths would be identified, and safe crossings of the road to access these alternate paths would be provided. Separation of pedestrians from construction sites and vehicles would be maintained. Pedestrian and cycle connections through Alfred Street South would be also maintained for the duration of construction.

During the three-week closure of Burton Street to install ramp sections, slight diversions for pedestrians would be made as required as works progress.

The installation of temporary construction barriers along the side of the roadworks would result in some reduction in lane width for vehicles and bicycles.

Parking

Parking loss during construction would be temporary and would include:

- Thirteen car spaces and two motorbike spaces on Burton Street for a duration of 9 months
- Fifteen car spaces on the east side of Alfred Street South for a duration of three months
- Eight car and six motorbike spaces on the west side of Alfred Street South for a duration of three months.

Works along Alfred Street South would be staged and be carried out on one side of the street at a time, to minimise impacts to parking.

Construction of the proposal would not alter the existing permit parking requirements for residents.

Limited parking for workers would be provided within the ancillary facility with three parking spaces provided. Construction workers would be encouraged to use the adjacent public transport, including trains and buses, to reach the proposal.

Public Transport

No impacts or changes are expected to bus routes or service frequencies as a result of construction works. However, the Alfred Street South bus stop (Stop ID 206128) would be relocated up to 60 metres further to the south of its current location (on the western side of Alfred Street South). Additional relocations during the construction period may be required to enable the cycleway works but would be temporary, would be minor (i.e. in close proximity) and would be well sign-posted.

Trains may be impacted in the case of crane lifts next to the Sydney Harbour Bridge requiring temporary rail closures and would be managed to occur during nights and on weekends during scheduled rail possessions and track shutdowns to minimise disruptions to the operation of the rail network.

Surrounding road network

Multiple temporary road closures along Alfred Street South, associated with the delivery and installation of pre-fabricated bike ramp segments, would be required. This is anticipated to occur outside standard construction hours. Two-way vehicle movements would be maintained on Alfred Street South during commuter peak hours, and a temporary reduction in lane widths and travel speeds are expected during the construction period.

Temporary road closures would be required on Burton Street during the extension of the Sydney Harbour Bridge Cycleway, and on Lavender Street during the installation of the pedestrian crossing. While the reduced speeds would decrease the vehicular throughput of the road, any travel time impacts on vehicles travelling along the road are expected to be minimal, as the road is currently designated as a high pedestrian activity area, with a low posted limit of 40 kilometres an hour.

The adjustment works on the roundabout connecting Alfred Street South, Lavender Street, Middlemiss Street, and Bradfield Highway would require temporary road closures, impacting movements on all connected roads. Vehicles exiting from Bradfield Highway enter the roundabout travelling at a high speed. The high speeds in combination with the short distance around the corner exacerbates the risk of collision with construction workers. Adjustment works at the Lavender Street roundabout would occur outside standard construction hours to minimise disruption to the traffic network and safety risks.

Loading and delivery impacts

The loading and delivery for La Capannina, located at 41 Alfred Street South, would be subject to change.

Access to La Capannina for loading, deliveries and less mobile patrons would be provided through the bowling greens, off Alfred Street South. The main access to the restaurant for patrons would continue to be via the stairs from Fitzroy Street.

As construction would be limited to the eastern side of Alfred Street South, it is expected loading and delivery for the restaurants and food retail storefronts located along the western side of the street would not be impacted during the construction period.

Deliveries to the construction site would be made at night or during off-peak hours where possible to mitigate the impact to traffic along Alfred Street South and adjoining streets.

Other impacts

The temporary relocation of the Kirribilli markets to Ennis Road during construction of the proposal would cause localised parking impacts around Ennis Road on market days. This may require additional parking and/or traffic management measures to accommodate the redirected demand and would be managed by the market operators, in consultation with the relevant road authority.

Operation

Linear bike ramp connecting to Bradfield Park North

The proposed new linear bike ramp would connect the existing Sydney Harbour Bridge Cycleway with the Milsons Point bike network. The ramp would provide a gradient that would enable bike riders to cycle without interruption between the Sydney Harbour Bridge and street level, which connects directly onto the cycleway along Alfred Street South. It would also allow bike riders to bypass the potential conflict point with vehicles on Burton Street for bike riders travelling north of Milsons Point Station.

In consideration of the bike rider speed on the steeper part of the ramp, the design gradient has been limited to five per cent maximum. The break in gradient in the flat and curved section of the proposed bike ramp would facilitate both an easier journey for bike riders riding up the ramp (in the southbound direction), as well as reducing speeds of bike riders travelling down the ramp (in the northbound direction).

The new connection would however create new potential for conflict with pedestrians walking along Alfred Street South and Bradfield Park North, particularly if bike riders do not slow down sufficiently while travelling down the ramp. To assist cyclist traffic flow and safety in the landing area, a raised planted median would separate the north and south bound bike riders at the landing and would act as a guide assisting bike riders to make the turn.

Widening of the corner of Lavender Street/ Middlemiss Street and new raised pedestrian and bike rider crossing

The corner of Lavender Street and Middlemiss Street would be widened to allow for the installation of a 2.5-metre-wide shared path. This expansion would result in a reduction in road width along the north-west corner of the roundabout, which would alter the corresponding approach and exit lanes. A swept path was conducted and confirmed a 12.5-metre-long rigid vehicle would be able to safely make the turn.

A new raised pedestrian and bike rider crossing would replace the existing pedestrian crossing on Lavender Street, connecting the new shared path to Middlemiss Street. The new raised crossing would have the following impacts:

- Improve safety for bike riders and pedestrians by improving their visibility crossing the road, reducing vehicle speeds and creating a more coherent connection with the existing bicycle lane on Middlemiss Street
- Move the pedestrian crossing closer to the bus stop on Lavender Street opposite Cliff Street services. This has the potential to reduce visibility of pedestrians waiting to use the crossing
- Create potential conflict points with shared path users and the existing cycle connection on Middlemiss Street located on the corner of the intersection
- Create potential conflict point with northbound bike riders using the roadway to access the cycle lane on Middlemiss Street with southbound vehicles approaching the roundabout.

Replacement of the existing pedestrian refuge

The existing two-stage pedestrian refuge located on Alfred Street South directly south of Lavender Street roundabout, is non-compliant with current standards. Bradfield Highway has a variable speed limit which is generally in the range of 70 kilometres per hour during commuter peak periods. While the posted speed limit of the exit lane is 15 kilometres per hour, vehicles exiting the high-speed highway can be expected to exceed those speeds, posing a safety risk to pedestrians and bike riders crossing at the roundabout. Poor sight distances exist for vehicles turning into Alfred Street South due to the

alignment of the road, exacerbating safety issues at the crossing. The proposed new raised pedestrian and two-way bicycle crossing would replace this pedestrian refuge and be located 70 metres further south, having the following positive impacts:

- Removes the conflict point on the Bradfield Highway exit lane, ensuring sufficient distance for vehicles existing the Bradfield Highway to reduce travel speeds and improve sight distance to the crossing
- Increases visibility of the mid-crossing zone and prioritise pedestrian and bike rider movements over the motorised traffic
- Improves road safety for active transport users
- Improves the linkage of the cycle route from Middlemiss Street to Alfred Street South cycle path.

A high-level SIDRA analysis was undertaken of the future year 2036 to assess the operation impacts of the proposed new crossing (Stantec, 2021). No adverse operational impacts on the connecting traffic network are expected as a result of the proposed crossing under any of the assessed scenarios.

Removal of parking spaces

The proposal would result in the removal of about 15 parking spaces along Alfred Street South. The loading zones would remain in place, located on the western side of Alfred Street South. Providing parking alongside a road or footpath used by bike riders poses a potential safety risk through the movement of vehicles into the path of bike riders as they turn out of a parking space, as well as presents the risk of dooring. The removal of parking along the cycleway would provide substantial improvements to safety of active transport users and contribute to encouraging people to use the proposed bike rider connection. It would also ensure compliance with required setbacks for pedestrian and bike riders crossings and traffic signals. The removal of on-street parking to facilitate the proposal would be carried out in consultation with key stakeholders, local businesses and the Local Pedestrian, Cycling and Traffic Calming Committee (LPCTCC). Given that the site is well served by public transport, being located close to Milsons Point Station and bus stops as well as active transport links, travelling by private vehicles to and from the area is not essential. Additionally, on-street parking would be available on adjoining streets such as Lavender Street, Cliff Street, Glen Street, Burton Street and Fitzroy Street. There is also an off-street parking area located at the southern end of Alfred Street South.

Operation of the proposal would not alter the existing permit parking requirements for residents.

Proposed relocation of bus stops

One bus stop on Alfred Street South would be relocated as part of the proposal to accommodate the pedestrian crossing improvement works and operation of the new two-way separated cycle path. As shown in Figure 6-13, the existing bus stop near Lavender Street (Stop ID: 206128) would be relocated 60 metres south along Alfred Street South.

The relocated bus stop would be accessible and appropriate signage provided. The relocated bus stop would have no impact to existing bus routes and services and minimal impact to public transport customers.

Figure 6-13: Bus stop relocation map

Alfred Street South cycle path

The Alfred Street South cycle path and pedestrian upgrade would involve a new cycle path from Burton Street to the existing bike network on Middlemiss Street. The cycle path would consist of a two-way separated path about 2.5 metres wide. South of the bike ramp landing in Bradfield Park North, the existing shared cycle path to Burton Street would be retained. North of the bike ramp landing to the new pedestrian and bike rider crossing on Alfred Street South, the parking and travel lanes would be narrowed, allowing construction of a new footpath and cycle path. The footpath would be located next to the parking lane, allowing a safe and accessible space for motorists to enter/exit parked vehicles.

Reallocation of road space

The total width of the carriageway on Alfred Street South is currently 12 metres, with bike riders sharing the road with cars. The road space is proposed to be reallocated such that at the proposed Alfred Street South crossing:

- The width of the two-way cycle path is about 2.4 metres
- The width of the pedestrian footpath is around 4.3 metres on the eastern side of the road, and about 3.5 metres on the western side of the road
- The total width of the carriageway is around 8.9 metres.

6.4.4 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage traffic and transport impacts are discussed in Table 6-35.

Table 6-35: Traffic and transport safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport Traffic Control at Work Sites Manual (Transport, 2022) and QA Specification G10 Control of Traffic (Transport for NSW, 2008). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site-specific traffic control measures (including signage such as portable and static variable message signs) to manage and regulate traffic movement • Measures to maintain pedestrian and bike rider access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • Designated areas within the proposal area for heavy vehicle turning movements, parking, loading and unloading • On-site parking arrangements for construction, supervisory and management personnel • Sequence for implementing traffic works and traffic management devices • Safety principles for construction activities, such as speed limits around the site and procedures for specific activities • Induction requirements for construction, supervisory and management personnel	Detailed design / Pre-construction	Section 4.8 of QA G36 Environment Protection

		• Procedures for inspections and record keeping for maintaining traffic control measures • Contact details of key proposal personnel • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.		
TT2	Traffic and transport	Further traffic modelling will be carried out to confirm the impacts of the raised pedestrian and cyclist priority crossing on Alfred Street South and its impacts on the road network. This would include obtaining traffic counts and queue data for intersections in the vicinity of the proposal and assessing the impacts of the proposal. This would include obtaining traffic counts and queue data for intersections in the vicinity of the proposal and assessing the impacts of the proposal.	Detailed design	Additional safeguard TT2
TT3	Pedestrians and bike riders	Appropriate signage and wayfinding facilities relating to changes to pedestrian and bike rider access during construction will be developed and implemented.	Pre-construction, construction	Additional safeguard TT3
TT4	Pedestrians and bike riders	The TMP will provide details on managing active transport movements near the construction site. The following key principles will guide the development safe active transport arrangements: • Pedestrians and bike riders will be kept clear of work sites at all times. Construction areas will be defined by temporary pedestrian fencing or more substantial fencing in urban or shopping areas • Temporary footpaths will be adequately signposted to indicate the direction of the footpath, be of all-weather standard, consist of equivalent material and performance to adjacent footpath and have an unobstructed width at local constrictions no less than one metre (elsewhere at least two metres) • Crossing facilities and associated signs will be maintained where possible. If access to an existing crossing cannot be provided, alternative facilities as close as possible to the established crossing are to be provided • Traffic management in the form of lowered speed limits will be implemented to facilitate a safer environment for pedestrians who may have been displaced from the footpath as a result of construction work • Where traffic is flowing temporarily in the opposite direction from normal, medians, refuges or other physical devices are required to separate lanes • The installation of construction barriers along the side of the road may result in some reduction in lane width for vehicles and bicycles alike, increasing the risk of collision. The speed limit on Alfred Street South will therefore be reduced to minimise potential conflicts between bike riders and vehicles • Bike rider needs and visibility will need to be considered in providing lighting at night	Detailed design / construction	Additional safeguard TT4

ID	Impact	Environmental safeguards	Timing	Reference
		therefore be reduced to minimise potential conflicts between bike riders and vehicles • Bike rider needs and visibility will need to be considered in providing lighting at night • Roadworks signs will be positioned above the head height of bike riders • Barrier boards will not be placed so that they direct bike riders away from allocated cycle paths • Adjacent to the work site, pavement surfaces will be maintained in a clean smooth state to ensure bike rider comfort and safety. The edges of temporary surfaces will be 'feathered' to remove any hazardous edges.		
TT5	Parking	Parking spaces identified for removal will be removed progressively as construction works dictate, and works will be optimised to limit the impact on vehicle spaces outside of the necessary construction zone.	Pre-construction, construction	Additional safeguard TT5
TT6	Parking	Construction works will be staged to minimise the loss of parking at any one time during construction.	Pre-construction, construction	Additional safeguard TT6
TT7	Parking	Consultation with Council will be undertaken from an early stage of design to enable the proposed temporary reductions in metered parking arrangements throughout the construction period and for any permanent changes to metered parking.	Pre-construction	Additional safeguard TT7
TT8	Parking	Construction workers will be encouraged to use public transport to access the proposal.	Construction	Additional safeguard TT8
TT9	Public transport	If any additional bus stop relocations are required during the construction period, consultation and coordination with affected bus operators, Council, other stakeholders and appropriate Transport staff will be undertaken in conjunction with any temporary bus stop relocations, in addition to the provision of signage to assist in wayfinding.	Pre-construction, construction	Additional safeguard TT9
TT10	Public transport	Wayfinding tools such as sign posting will be implemented in the event that pedestrians are required to be diverted from the Alfred Street South Milsons Point Station access. A detailed construction traffic and access assessment will be carried out before construction when the detailed staging and work methodology has been developed.	Pre-construction, construction	Additional safeguard TT10
TT11	Traffic and ancillary facilities access management	For each stage of construction, detailed TGSs (Traffic Guidance Scheme) will be prepared and implemented in accordance with the Traffic control at work sites, version 6.1 (Transport, 2022) by suitably qualified personnel.	Pre-construction, construction	Additional safeguard TT11
TT12	Traffic and ancillary facilities access management	For each stage of construction, access will be maintained to the La Capannina restaurant. For the duration of construction works where direct access is unavailable, an alternative route will be provided via a driveway through the bowling green of Alfred Street South.	Pre-construction, construction	Additional safeguard TT12

ID	Impact	Environmental safeguards	Timing	Reference
TT13	Traffic and ancillary facilities access management	Dilapidation surveys of roads around the proposal will be undertaken prior to their use for construction as well as after construction is complete. Any damage to roads resulting from construction of the proposal will be repaired.	Pre-construction, construction	Additional safeguard TT13
TT14	Traffic and ancillary facilities access management	Direct access at the frontages of the ancillary facility will be provided with adequate sight distances relating to the posted road speed. This will allow vehicles on the main road to see vehicles emerging from the construction compound and will allow ample room to slow down and stop if necessary. Similarly, it will allow vehicles waiting to emerge from the site access, adequate sight distance to see approaching vehicles and determine acceptable gaps for them to enter the main road traffic.		Additional safeguard TT14
TT15	Traffic and ancillary facilities access management	The ancillary facility will generally have traffic control at the site access to manage the vehicular traffic into and out of the ancillary facility and to manage pedestrian movement across the access.	Construction	Additional safeguard TT15
TT16	Traffic and ancillary facilities access management	All vehicles accessing the construction site for the purpose of material delivery and construction works will be fitted with safety flashing lights located on the top of the vehicle and functioning reverse beepers. All operators will be licensed for the particular item of plant/ equipment, and will demonstrate competence in the use of the plant/ equipment as part of the site management and safety plan.	Construction	Additional safeguard TT16
TT17	Traffic and ancillary facilities access management	All vehicles accessing the construction site will be sized adequately to address clearance constraints such as the clearance over the Burton Street underpass, and powerlines and trees.	Construction	Additional safeguard TT17
TT18	Traffic and ancillary facilities access management	Routes used for access and haulage during construction will be developed in consultation with relevant stakeholders upon confirmation of material source and disposal locations, and will be outlined in the TMP.	Construction	Additional safeguard TT18
TT19	Traffic and ancillary facilities access management	Appropriate construction speed limits will be implemented in consultation with Transport to facilitate safety of road users and construction personnel during construction.	Construction	Additional safeguard TT19
TT20	Traffic and ancillary facilities access management	Traffic management plans will specifically address night works safety issues to protect motorists and construction personnel.	Pre-construction, construction	Additional safeguard TT20
TT21	Traffic and ancillary facilities access management	Temporary accesses, entrances and exits, road works and other traffic management measures will be designed and operated to conform with relevant road safety and Transport requirements and will not impact upon the safety of the users of the existing road network.	Pre-construction, construction	Additional safeguard TT21
TT22	Load and delivery	Pedestrian and vehicle access to adjoining properties will be maintained throughout the duration of the work, where possible.	Pre-construction, construction	Additional safeguard TT22

ID	Impact	Environmental safeguards	Timing	Reference
TT23	Access	Properties impacted during construction, such as the businesses located along the western side of Alfred Street South, will be notified prior to the commencement of construction and advised to schedule deliveries outside of work hours. Store owners will additionally be consulted regarding temporary access arrangements to their properties.	Pre-construction	Additional safeguard TT23
TT24	Pedestrian and bike rider safety	Appropriate signage will be installed warning bike riders of potential conflict points and the need for lowered speeds. Barricades will be installed as required by the ROLs and TMP. This will avoid pedestrians and bike riders following desire line through the roundabout.	Construction	Additional safeguard TT24
TT25	Pedestrian safety	Detailed design will consider the potential for safety issues resulting from reduced visibility for eastbound drivers to pedestrians waiting to cross on the northern side of Lavender Street when a bus is stopped at the Lavender Street opposite Cliff Street bus stop. Consultation with stakeholders with reference to relevant bus stop design guidelines should be undertaken to ensure the safety of the pedestrian crossing will be maintained.	Detailed design	Additional safeguard TT25
TT26	Pedestrian safety	Pedestrian fencing will be installed along Alfred Street South near the location of the existing pedestrian refuge to deter unsafe crossings near the roundabout after the completion of the raised pedestrian crossing	Construction	Additional safeguard TT26
TT27	Cyclist safety	Potential conflict points between cyclists and vehicles that may result from the widening of the shared path at the corner of Lavender Street and Alfred Street South, consideration for cyclist safety across this connection will be included in further design development.	Detailed design	Additional safeguard TT27
TT28	Parking	The operational impact of the removal of up to 15 parking spaces will be managed through consultation with impacted stakeholders, including Council and adjacent property occupiers.	Construction	Additional safeguard TT28
TT29	Road Safety Audit	A Road Safety Audit will be conducted of the proposed cycleway upgrade and impacts on the surrounding road network by an independent party at each stage of design and implementation (concept design, detailed design, temporary works arrangement and pre-opening). Any potential safety issues identified through these audits will be addressed prior to progressing to the next stage of design or prior to opening the facility.	Concept design. Detailed design/Pre-construction	Additional safeguard TT29

6.5 Contamination

This chapter describes potential contamination impacts that may be generated by construction and operation of the proposal and identifies safeguards and management measures to manage these impacts.

6.5.1 Methodology

A preliminary site investigation (PSI) assessment has been undertaken to assess the potential risk for contamination and the potential contamination impacts to construction and operation of the proposal. This assessment is attached as Appendix H - Preliminary Site Investigation of this REF. The methodology and results of this assessment are summarised in this section.

The PSI involved:

- Undertaking a desktop study of available information for the proposal boundary to assess for potentially contaminating activities, which included:
  - Review of available reports for the proposal boundary provided by Transport. These documents included historical environmental site assessments, groundwater monitoring programs and site plans
  - Commissioning of a Lotsearch Enviro Professional report for the proposal boundary and a one-kilometre buffer (report buffer), which collates the majority of publicly available information for the area within the report buffer from a variety of sources
  - Detailed review and collation of pertinent information from the LotSearch 2022 report
  - Identification of key information, potential risks and areas for further assessment at the proposal boundary to inform a site walkover inspection
- Undertaking a site walkover inspection, conducted on 18 January 2022 by an experienced contamination specialist that comprised:
  - Detailed visual inspection and assessment of accessible areas of the proposal boundary
  - Assessment of items of interest or concerned raised in the desktop study
  - An on-site discussion/interview with Transport representatives with site-specific experience and history
  - Verification of the proposal boundary plans and layout
- Identification of known and potential sources of contamination and contaminants of concern
- Identification of potential areas and contaminants of environmental concern and their associated risks
- Identification of appropriate mitigation and management measures, or where further investigation or contaminated land remediation may be required.

Development of a preliminary Conceptual Site Model (CSM) to assesses potential sources, pathways and receptors for the proposal boundary and potential linkages that may pose a risk to human health and / or ecological receptors.

6.5.2 Existing environment

Site History

A historical title search for the proposal boundary was completed in January 2022 and the findings, including copies of the Historical Title Search documentation and Cadastral Records Map are presented in Appendix C of the PSI (Appendix H - Preliminary Site Investigation).

Land use in the proposal boundary has seen significant modification since the early 1920's, with the beginning of construction on the Sydney Harbour Bridge. Prior to this the land was used primarily for agriculture, followed by housing, roads and a network of infrastructure.

Historical aerial photography shows the historical land use of the study area and its surroundings including:

- 1930: Large expanses of vacant land surrounding the site, associated with land required for the construction of the Sydney Harbour Bridge. Within the proposal boundary appear two structures to the north and two structures to the south
- 1943: The proposal boundary appears as an underdeveloped lot. A multilane roadway on the Sydney Harbour Bridge has been developed. Residential and commercial development appear to the west, with the construction of Luna Park to the southwest
- 1955/1956: Trees were planted on the western border of the proposal boundary. A bowling green appears to have been developed at the southern end of the site requiring the construction of a retaining wall to level the area
- 1965-2000: Continued development and redevelopment of the surrounding area continued. Land within the proposal boundary remained relatively unchanged
- 2005: Extension and addition of footpaths within the proposal boundary. New and existing paths were sealed with concrete

- 2011: Vegetation, including trees and shrubberies were planted throughout the proposal boundary, with grass at the bowling green replaced with hardstand.

Topography

The location of the proposal boundary is relatively flat, ranging in elevation between 38 metres and 32 metres. The land begins to slope gradually towards the south. Terracing was identified at the southern end of the bowling green to level the area.

Soil and Geology

Gymea soil is present throughout the entire proposal boundary. This soil profile is characteristic of the surrounding region, including the Hornby Plateau, Sydney Harbour Foreshore and the Parramatta and Georges River. Gymea soil profiles within these regions are made up of gleied podzolic soils and yellow podzolic soils on shale lenses.

The proposal boundary is underlain by medium to coarse grained quartz sandstone with minor Triassic shale and laminate lenses (DPE, 2009).

There is no data on the presence of acid sulfate soils (ASS) at the proposal boundary according to the Atlas of Australian ASS map. Land parcels encroaching Sydney Harbour, approximately 125 metres west of the proposal boundary, were found to have low probability of encountering ASS.

Hydrology and Hydrogeology

No surface water bodies were identified within the proposal boundary. Sydney Harbour is located to the south of the proposal boundary and the proposal boundary is within the Sydney Harbour Catchment, with stormwater inlets located in Bradfield Park and Alfred Street South. This stormwater may contain contaminants from the roadway and surrounding infrastructure.

The proposal is located in an area of porous, extensive aquifers of low to moderate productivity. 42 registered groundwater bores were identified within two kilometres of the proposal boundary, with the closest bore site 612 metres to the north.

Database Searches

Council Record Review

North Sydney Council records identified eight historical activities with the potential for contamination, located within 500 metres of the proposal boundary and included dry cleaners, pressers and/or and motor garage/service stations.

The Bradfield Park Plan of Management, North Sydney (North Sydney Council, 2008) identified two potentially contaminating activities within 500 metres of the proposal boundary. These included the Sydney Harbour Bridge construction, located on-site and Milsons Point Station, east of the proposal boundary. The North Sydney Council document reported that a 1992 investigation identified leaded paint, train brake dust and vehicle emissions as potential contaminants (North Sydney Council, 2008). The LotSearch 2022 report identified no naturally occurring asbestos potential or properties affected by loose-fill asbestos within or surrounding the proposal boundary, however a detailed asbestos survey was not included as part of the scope of works.

Anecdotal records also suggest that during World War Two Bradfield Park was used by the Royal Australian Air Force as a mobilisation and demobilisation depot (HLA Envirosciences, 2003).

NSW EPA Records

A search of the NSW EPA Contaminated Site Record of Notice (under section 58 of the Contaminated Land Management Act 1997) and the list of contaminated sites notified to the NSW EPA (under section 60 of the Contaminated Land Management Act 1997) indicated two sites within the report buffer that were either regulated or had been notified. These sites are Subbase Platypus (previously HMAS Platypus), 475 metres north-east of the proposal boundary and Neutral Bay Sediments, 544 metres north-east of the proposal boundary.

A search of the NSW EPA Protection of the Environment Operations Act public register identified six activities with current environmental protection licenses:

- Sydney Trains for railway system activities, on-site
- John Holland Pty Ltd for road construction, 17 metres north of the proposal boundary
- Royal Sydney Yacht Squadron for boat construction/maintenance, 645 metres east of the proposal boundary

- Sydney Harbour Tunnel Company for miscellaneous licensed discharge to waters (at any time), 658 metres north of the proposal boundary
- Metro Trains Sydney Pty Ltd for railway systems activities, 694 metres west of the proposal boundary
- CPB Contractors Pty Ltd for railway systems activities, 694 metres west of the proposal boundary.

Based on the review of the available information it was concluded that it is unlikely that significant contamination is present on the proposal boundary as a result of the historical land use. There is potential for contamination to have entered the proposal boundary from the following, historical activities:

- Contaminated fill material historically used at the proposal boundary
- Current and historical activities associated with park and garden maintenance, including the use of pesticides and herbicides
- Off-site sources associated with the cross contamination of the proposal boundary from nearby land uses
- Groundwater contaminated as a result of on-site activity or off-site migration onto the proposal boundary.

It is noted that the proposal boundary is mostly covered with hardstand and grassed soils, which limits exposure pathways to current land users.

6.5.3 Potential impacts

Construction

The construction phase of the proposal presents several potential sources of contamination leading to possible exposure to construction and intrusive maintenance workers. Table 6-36 identifies potential contamination sources from within the proposal boundary, the potential exposure pathway, potential receptors and the likelihood of Source-Pathway-Receptor (SPR) linkages (i.e. the linkage between the known or potential source(s), via a known or potential pathway(s) to a known or potential receptor(s)) occurring at the proposal boundary.

As construction would include earthworks, there is the potential for the uncovering and exposure of contaminated soils and materials. Pathways of exposure may include ingestion, dermal contact, dust and vapour inhalation.

Table 6-36: Summary of potentially complete SPR linkages

Potential Source	Pathway	Receptor	Likelihood
Potentially contaminated fill material – arising from historical usage and filling of the proposal boundary	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Site users (staff and visitors) • On-site ecological receptors (limited).	**Low** – Land within the proposal boundary is covered in a combination of concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to potentially contaminated soils onsite.
	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Construction / Intrusive Maintenance Workers.	**Possible** – Intrusive activities onsite that disturb or expose underlying soils may uncover Potentially contaminated fill material.
Current and historical activities associated with land as a park / garden – application of pesticide and/or herbicides	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Site users (staff and visitors) • On-site ecological receptors (limited).	**Low** - Land within the proposal boundary is covered in a combination of concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported

Potential Source	Pathway	Receptor	Likelihood
			garden soils of a standard suitable for that use. The proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Construction / Intrusive Maintenance Workers.	**Possible** – Intrusive activities onsite that disturb or expose underlying soils may uncover contamination as a result of surface application of pesticide and/or herbicides.
Off-site sources – cross contamination of the proposal boundary from nearby land uses	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Site users (staff and visitors) • On-site ecological receptors (limited)	**Low** – Land within the proposal boundary is covered in a combination of concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported garden soils of a standard suitable for that use. Land within the proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	• Ingestion and dermal contact. • Vapour / dust Inhalation.	• Construction / Intrusive Maintenance Workers.	**Possible** – Intrusive activities onsite that disturb or expose underlying soils may uncover contamination as a result of offsite migration. This contamination is expected to be located at depth due to migration from neighbouring sites would not only act in a lateral direction, it would migrate down at the same time. Therefore, it is not likely a significant hazard for shallow soil disturbance.
Groundwater contamination – groundwater that could be potentially contaminated as a result of onsite activity, or offsite migration onto the proposal boundary	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Site users (staff and visitors) • On-site ecological receptors (limited)	**Low** – Land within the proposal boundary is covered in a combination of concrete/asphalt hardstand or well-established grassed vegetation and gardens. Vegetation present onsite is well established and appears to not be subject to stress resulting in minimal exposure to soils onsite. Raised garden beds likely have imported garden soils of a standard suitable for that use. The proposal boundary is also well-ventilated resulting in the inability to accumulate potentially harmful vapours.
	• Ingestion and dermal contact • Vapour / dust Inhalation.	• Construction / Intrusive Maintenance Workers.	**Possible** – While groundwater may not be encountered during any proposed future works onsite, there is a potential for contaminated groundwater to be present. It is possible that, if present, impacted groundwater may be encountered by

Potential Source	Pathway	Receptor	Likelihood
			construction workers, while maintenance staff are unlikely to encounter groundwater as a result of day-to-day maintenance activities.

As shown in Table 6-36, the potential for complete SPR linkages to occur on the proposal boundary are low to possible. Measures to mitigate the potential risk are presented in Section 6.5.4.

Operation

There would be no disturbance of soils or contamination during the operation of the proposal. As such, contamination impacts during operation are not anticipated.

6.5.4 Safeguards and management measures

Safeguards and management measures proposed to avoid, reduce or manage impacts of contamination are listed in Table 6-37.

Table 6-37: Contamination safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
C1	Unexpected contamination exposure	An Unexpected Finds Protocol will be developed to be implemented during onsite soil disturbance works in the event of the identification of any unforeseen contaminated land evidence.	Pre-construction	Additional safeguard C1
C2	Contamination exposure	A targeted site investigation in accordance with the requirements of NEPM 2013 will be undertaken at the proposal boundary before the start of construction to assess contamination status. This will include an in-situ waste classification of soils as disposal of soils will require classification prior to excavation and removal from the proposal boundary.	Pre-construction	Waste Classification Guidelines-Part 1: Classifying Waste (NSW EPA, 2014)
C3	Contamination exposure	The findings of the targeted site investigation and in-situ waste classification will inform the appropriate management, handling and/or disposal of excess soils.	Construction	Additional safeguard C3

6.6 Socio-economic and land use

This section assesses the potential land use, property and socio-economic impacts of the proposal and provides proposed safeguards and management measures to avoid and minimise these impacts.

6.6.1 Methodology

Property and land use

The property and land use assessment involved:

- Identifying the existing environment
- Identifying potentially affected property
- Reviewing existing land uses and potential future land uses
- Assessing impact on property and land use, considering both existing and future uses
- Identifying safeguards and management measures to mitigate potential impacts.

Socio-economic

The social and economic impact assessment considered the direct, indirect and cumulative, social and economic impacts of the proposal on the following groups and communities:

- Residents (directly affected and local)
- Nearby businesses and local stakeholder groups
- Users of public services and facilities such as open space and recreation areas
- Bike riders
- Road users.

A socio-economic impact assessment was carried out in accordance with *Environmental Impact Assessment Guideline: Socio-economic Assessment* (Transport for NSW, 2020d). The assessment methodology involved:

- Defining the proposal boundary (Figure 1-2)
- Identifying groups or communities that may be affected by the proposal including community groups, the general community, local business, directly affected property owners and occupiers, bike riders, open space users and road users
- Reviewing the information and outcomes of engagement conducted by Project team with interested and impacted community members, stakeholder groups and property occupiers
- Developing a socio-economic profile of the proposal and its surrounding
- Assessing the proposal's potential impacts on community facilities, open space, public domain, community values, access and connectivity, property and business
- Identifying measures to mitigate or manage the potential social and economic impacts of the proposal.

6.6.2 Existing environment

Property and land use

The proposal is located at Milsons Point within the North Sydney LGA between Middlemiss Street to the north, the Sydney Harbour Bridge to the east, Fitzroy Street to the south and Alfred Street South to the west. The proposal boundary is on land largely owned by North Sydney.

The area in the vicinity of the proposal comprises residential and metropolitan centre uses including residential dwellings (multi-unit flat buildings), public infrastructure such as roads and rail, street level retail operators, commercial and office uses, and recreational open space. Key social infrastructure in the vicinity of the proposal includes Bradfield Park, boules piste and bowling greens, Milsons Point Railway Station, North Sydney Olympic Pool, St Aloysius School, The Bridge Church (Kirribilli), and the Chinese Christian Church (Milsons Point). The bowling greens and boules piste are used by the Kirribilli Neighbourhood Centre as the location for fortnightly Kirribilli Markets. St Aloysius School and Loreto College also use these areas for sporting activities during the school week.

The land adjoining the proposal boundary is zoned RE1 – public recreation, B4 – mixed use, SP2 – infrastructure and R4 – high density residential under North Sydney LEP 2013. Local land use zoning within and surrounding the proposal boundary is shown in Figure 6-14.

Legend

- Proposal boundary

Land Zoning

- B1 Neighbourhood Centre
- B3 Commercial Core
- B4 Mixed Use
- IN2 Light Industrial
- IN4 Working Waterfront
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- RE2 Private Recreation
- SP1 Special Activities
- SP2 Infrastructure
- UL Unzoned Land

1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56
Date issued: November 9, 2022
Imagery: SIX Maps

Path: C:\Users\gcaz2278\ARCADIS\30119208 - SHB Northern Cycleway REF - 05 GIS\A_Current\B_Maps\SHBNC_EIS_A4P\SHBNC_EIS_A4P_v5.aprx
Created by: TK Updated by: XX QA by: GC

Figure 6-14: Local land use zoning

Population and demographics

The proposal is within the ABS North Sydney – Lavender Bay Statistical Area 2 (SA2) which encompasses the suburbs of North Sydney, Lavender Bay, McMahons Point and Milsons Point.

The locality also has an above average level of cultural diversity with 35.6 per cent of households speaking a language other than English at home, compared to 29.5 per cent in New South Wales and 24.8 per cent in Australia. Based on the top languages spoken at home and country of birth, the locality includes different nationalities such as Chinese, English, Indian and New Zealander.

Table 6-38 presents relevant baseline data primarily derived from the 2021 Australian Census Population and Housing (ABS, 2022). This data provides an overview of the social characteristics of the local area that could potentially be impacted by the Proposal and demonstrates the importance of factors such as access to public transport and green and open spaces to the local community.

Table 6-38 Local socio-demographic context

Social measure	North Sydney-Lavender Bay description
Population and education	• The total population was 12,798 with a median age of 37 years • The majority of the population was working age (15-64 years). The majority of the population completed Year 12 or equivalent and 27.2 per cent completed university or other higher education • The population was relatively young with 35 per cent between ages 25-39 years compared to the Greater Sydney population (23 per cent) • The locality is a high-density community with more than half of the population made up of renters rather than homeowners (59 per cent and 38 per cent respectively) compared to NSW (33 per cent and 64 percent respectively) and Australia (31 per cent and 66 per cent respectively). Residents tend to live in smaller dwellings and households tend to be small, with relatively low car ownership (average of one car per household compared to 1.8 in both NSW and Australia).
Industry and employment	• The majority of the population work full-time • Unemployment was low (3.8 per cent) compared to the NSW and Australian averages (6.3 and 6.9 per cent, respectively) in 2016 • Professional scientific and technical services, financial and insurance services, health care and social assistance, education and training, accommodation and food services are the most prominent industries of employment.
Income	• The median total income (excluding Government pensions and allowances) was $80,107 in 2019. NSW and Australian median weekly personal incomes were $51,818 and $51,389 respectively in 2019.
Housing	• Property in Sydney is generally the most expensive in Australia and this scenario is reflected in the median mortgage repayments in North Sydney-Lavender Bay, with dwelling owners paying a median monthly mortgage repayment of $2,850 compared to $2,167 and $1,863 for NSW and Australia respectively • In 2016, about 20 per cent of the North-Sydney-Lavender Bay population had housing repayments greater than or equal to 30 per cent of the household income. This indicates that housing stress is generally low in the area and similar to Greater Sydney 20 per cent.
Travel behaviour	• 42 per cent of the population travel to work by public transport with 17 per cent walking, both slightly higher than in Greater Sydney • 26 per cent of the population travel to work by car (as driver or passenger) which is slightly higher than in Greater Sydney.

Social infrastructure

Social infrastructure refers to the facilities and services that enhance the social capacity of communities and would provide a reference point against which the social impacts of the proposal can be measured. The locality is well serviced by social infrastructure. It is located close to major facilities which service the whole of Sydney and local facilities and spaces designed for the community. The following social infrastructure is in the vicinity of the proposal:

- Parks, reserves and ovals (Bradfield Park)
- Sport facilities (Bowling greens, boules piste and North Sydney Olympic Pool)
- Education institutions (St Aloysius College)
- Transport infrastructure (Milsons Point Station, bus stops along Alfred Street South and Milsons Point Ferry Wharf)
- Place of worship (The Bridge Church Kirribilli, and the Chinese Christian Church Milsons Point)
- Community housing (Greenway complex)
- Aged care facilities (James Milson Village).

Figure 6-15: Social infrastructure and local business

Travel and access

Travel behaviour

The primary mode of transport to work for residents of North Sydney-Lavender Bay is via public transport (42 per cent), followed by private vehicles and active transport. Travel via private vehicle accounts for 25 per cent and active transport modes such as cycling or walking accounts for 18 per cent (ABS, 2022).

Daily bike rider counts collected in 2017 indicates that about 2,000 bike trips are taken across the Sydney Harbour Bridge every weekday, making it the busiest cycleway in Sydney. The Sydney Harbour Bridge provides the only bike rider access between the lower north shore and Sydney CBD. Bike rider counts from 10 March 2022 at eight locations surrounding the Sydney Harbour Bridge Cycleway and Milsons Point Station are shown in Figure 6-10. The number of bike trips over the bridge has seen a decline since 2014, however demand data from the City of Sydney, bike sales data, Journey to Work information and customer research demonstrates strong growth in the uptake of bike riding. It is therefore apparent that cross-bridge bike trips may be suppressed by the limitations of the current infrastructure, and that improved access would be met with increased and wider ridership (Transport for NSW, 2022c).

Milsons Point Station and four bus stops are located within the proposal boundary. The bus stops are located along Lavender Street and Alfred Street South and service public and school bus routes. The bus stops provide connections to several town centres including train stations for Sydney Train services to destinations across Greater Sydney.

Safety, accessibility and congestion

The stair access to Sydney Harbour Bridge on the northern side is a hazard for bike riders as they need to push or carry their bikes up and down the steps. This hazard is worsened in wet conditions or for users of heavier e-bikes. The stairs create congestion by creating a pinch-point as access and egress through the steps are constrained to a single file in each direction. Bike riders need to dismount at the barriers at the top of the stairs to allow for a single user at a time which creates a bottleneck.

Local businesses

There are a range of businesses on Alfred Street South between Middlemiss Street and Fitzroy Street (shown in Figure 6-15). These include:

- Professional services
- Food services
- Health services
- Accommodation facilities
- Retail trade
- Personal care services
- Commercial.

Community values

Community values are those socio-economic aspects that people deem important to their quality of life and wellbeing including local character, identity, community cohesion, safety, environmental values, sense of place and heritage.

The North Sydney Vision 2040 Community Strategic Plan (North Sydney Council, 2020a) outlines the community's future priorities and aspirations, and details strategies for achieving them. The Plan notes one of the key challenges of the area is the growing population which continues to increase the demand for social infrastructure and services. One of the desired outcomes of the Plan is improving the bult infrastructure to provide vibrant and safe places for the community. In particular, 'Outcome 2.3' is to prioritise sustainable and active transport via providing infrastructure to support sustainable, innovative and active transport and providing a connected walking and cycling network for people of all ages and abilities.

The issues raised during the community consultation carried out by Transport from 2017 – 2021 indicate that the North Sydney community values improving road safety, creating a sustainable city where active transport was safe and enjoyable, and preserving the amenity of their open spaces.

Early community engagement to inform the preferred ramp option assessment and through the design competition elicited information about local values for community members and local residents near the proposal. Recurring issues of concern included:

- Impacts to the surrounding heritage items, such as the Sydney Harbour Bridge, Milsons Point Station and Bradfield Park (Section 6.1)
- Loss of some public open and green space in Bradfield Park North (Section 6.2)
- Visual impacts of an elevated linear bike ramp (Section 6.2).

6.6.3 Potential impacts

Construction

During construction, the proposal would have the following potential social and economic impacts:

- Impacts on property and land use
- Impacts on social infrastructure
- Impacts on travel and access
- Impacts on community values
- Changes to economy and local businesses.

These impacts are discussed below.

Property and land use

The design of the proposal has minimised the open space required. The proposal would be built largely on land owned by North Sydney Council. Initially, only a temporary ground lease would be established for the construction site which would include the right for Transport to also install the permanent works. A permanent land acquisition parcel, including linear ramp columns, footings and airspace, would subsequently be defined after surveying the finished works.

Potential land use and property impacts associated with construction of the proposal would include:

- Temporary occupation of land, to allow for construction of the proposal
- Use of land for ancillary facilities such as compounds and stockpile sites
- Loss of parking spaces on Alfred Street for local residents and businesses for the duration of construction
- Temporary changes and/or temporary disruption to property access due to traffic diversions during construction, including deliveries to local businesses
- Restriction of the uses of land for the duration of construction

Social infrastructure

The temporary ancillary facility would occupy the bowling green and boules piste courts in Bradfield Park Central. The compound would impact the following uses of this open space, including:

- Kirribilli Markets, which are held on the second Saturday and fourth Sunday of every month. Discussions have been held with North Sydney Council and the Kirribilli Neighbourhood Centre to support the temporary relocation of the impacted stalls to Ennis Road for the duration of the works. The new location would still be accessible by bus and train services. The relocation of the markets to Ennis Road would have flow-on impacts to local businesses, tenants of the Greenway social housing complex and users of GoGet share car vehicles. Targeted consultation with these stakeholders would take place as part of this REF exhibition and would continue through detailed design.
- The south bowling green would remain open for use by school children during the week and the Project team has had ongoing engagement with Loreto Kirribilli and St Aloysius School to ensure impact on school use is minimised as much as possible. Reconstruction work at Anderson Park is expected to reach completion by March 2023, at which point use of this area by local schools would resume (noting Anderson Park is more easily accessible for Loreto Kirribilli students due to its proximity).
- Billi Boules Club meets twice per week to play boules on the gravel pistes next to the bowling greens. As this area is impacted by the construction compound, the Project team has been working alongside officer bears of the club (as well as North Sydney Council) to identify potential alternate playing locations within the local area for the duration of proposal construction.

Construction of the proposal would also require the relocation of the existing table tennis table in Bradfield Park North and the removal or relocation, if possible, of the existing rotunda. The new locations of the items would be determined through consultation with North Sydney Council.

The construction site access to and from the construction zones would be available from either Alfred Street South or Burton Street. All deliveries and vehicle access to the site would be via Alfred Street South. Larger deliveries would arrive heading south bound and exit north bound. Smaller deliveries would access the ancillary facility site by using a left in left out approach. Pedestrian and cycling connections would be maintained during construction, however minor diversions may be temporarily introduced for certain areas.

Localised environmental impacts during construction for the remaining social infrastructure, including increased noise (Section 6.3), air quality (Section 6.12.2) and visual (Section 6.2) disruption may impact on the amenity of the social infrastructure facilities located close to the proposal. Potential impacts on amenity are considered minor due to the short duration and limited intensity of works required.

Travel and access

During construction, alternative walkways that maintain the separation of pedestrians from construction sites and vehicles would be maintained. Pedestrian and bike rider accessibility would be maintained during construction and managed through a series of shared pedestrian and bike rider zones and diversions. Pedestrian and bike rider access on Burton Street would also be maintained during construction with very minor potential for disruptions.

While pedestrian and bike rider access would be maintained throughout the works, the level of service along the cycleway may be temporarily reduced and bike riders and pedestrians travelling in the area may experience delays and longer travel distances due to temporary diversions. The impacts would be limited to the period of the construction works as described in Section 3.3.4.

No impacts or changes are expected to bus routes or service frequencies as a result of construction work, however the Lavender Street bus stop (Stop ID 206128) would be permanently relocated about 60 metres south of its original location on Alfred Street South. Two-way vehicle movements would be maintained on Alfred Street South during commuter peak hours, and a temporary reduction in lane widths and travel speeds are expected during the construction period.

Minor traffic delays, parking loss, detours and congestion are likely to be experienced near the proposal area during construction. Additional discussion on travel and access including measures to manage these impacts are discussed in Section 6.4.

Amenity

The construction phase of the proposal has the potential to result in impacts on the amenity of the surrounding area. These are addressed in the following sections of this REF:

- Landscape character and visual impact – Section 6.2
- Noise and vibration – Section 6.3
- Air quality – Section 6.12.2.

Economy and local business

Construction of the proposal is expected to take around 18 months. Over the construction period, the workforce would generally be sourced from the local labour market, requiring an average of 15-20 workers per day. The peak workforce would be around 40 workers during significant construction milestones (eg the delivery of significant sections of ramp). Construction activities would also generate demand for goods and services, potentially creating opportunities for local businesses. Due to the temporary nature of the construction work, which would also be divided in four phases as outlined in Section 3.3.1, it is expected the proposal would result in minor economic benefits associated with the creation of employment.

Some economic costs may result from congestion, traffic delays and loss of on-street parking along Alfred Street South during the work. The majority of the work is proposed to occur on the eastern side of Alfred Street, as such impacts to businesses along the western side are expected to be minimal. Loading and delivery services to restaurants, food retail storefronts and any other businesses are not anticipated to be impacted with the exception of La Capannina.

Loading, delivery and access for less mobile patrons for La Capannina, located at 41 Alfred Street South, would be provided through the bowling greens, off Alfred Street South, as described in Section 6.4.3. There is also the potential for impacts to patronage due to the presence of the construction site and ancillary facility that are in close proximity to La Capannina.

Some businesses in the immediate vicinity of the proposal area on Alfred Street South and Fitzroy Street may experience an impact to patronage during construction due to presence of the construction site and loss of some parking spaces. Impacts are expected to be low due to the limited duration of construction. Additionally, alternative on-street parking available in proximity to these businesses, described in Section 6.4.3, would limit the impact of lost parking spaces on Alfred Street South.

Community values

The proposal would temporarily affect the amenity of the proposal boundary during construction as a result of impacts on public open space, visual impacts, noise and vibration, lighting during night works, and temporary access to and disruption to road, cycleway and pedestrian traffic.

As previously mentioned, public amenity is a key value of the community within the vicinity of the proposal. The impacts on amenity would be experienced mostly by nearby residents and those who frequently use the area for formal and informal recreational activities. Impacts would vary between individuals and groups and depend on the exposure of individuals to the impacts and the degree to which the works affect their use or enjoyment of land within and surrounding the proposal boundary. The amenity impacts would be temporary and short-term and have been discussed above.

Operation

Property and land use

As mentioned above, the proposal would be constructed largely on land owned by North Sydney Council under a temporary ground lease. As described in Section 3.6, following construction, a permanent land acquisition parcel would be defined and acquired by Transport. The acquisition would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the *Property Acquisition Process (IP-001-PS V1.0)*. There is no intention to acquire areas of the proposal that fall within the road corridor at the ground plane.

Social infrastructure

The proposal would benefit nearby social infrastructure by improving safety and ease of access to and from the facilities by bicycle. The benefits arise largely through reducing congestion, increasing access, and improving safety.

Travel and access

The operation of the proposal would provide long-term and broad ranging benefits namely:

- Increasing access for a broader range of customer groups and abilities including seniors, families, people with disability and lower levels of fitness
- Removing the existing bottleneck and congestion caused by the stairs
- Providing a safe separation between users and other modes
- Improving linkages with existing cycle routes
- Removing existing conflict points.

Though the proposal would result in the removal of about 15 parking spaces, alternative on-street and off-street parking would remain available in close proximity. The proposal would also result in the minor relocation of one bus stop on Alfred Street South (Stop ID 206128), with no predicted impacts on bus services.

The proposal would encourage cycling as an alternative form of transport to driving or using public transport. By increasing the mode share for cycling, the proposal would assist in relieving congestion on roads and improving the level of service of roads and public transport in the area.

Amenity

Operation of the proposal would promote a positive impact given that mobility of bike riders and pedestrians would be improved. The proposal would improve amenity and accessibility of the Sydney Harbour Bridge and potentially attract more users and tourists to Milsons Point and Kirribilli. Considerable effort has been made through the options identification and proposal design (refer to Chapters 2 and 3) to ensure a high quality urban design outcome that would enhance the amenity of the area and result in a minimal loss of usable open space.

The operational amenity impacts are also addressed in the following sections of this REF:

- Landscape character and visual impact – Section 6.2

- Noise and vibration – Section 6.3
- Air quality – Section 6.12.2.

Local business

The removal of 15 parking spots along Alfred Street South may impact any businesses who rely on customers parking close by to use their business. The availability of alternative parking spots suggests any impact are likely to be minor.

The operation of the proposal may result in some minor increase to the patronage of businesses in the area through potential increases in bike rider and pedestrian through trips and visitors seeking to use the Sydney Harbour Bridge Cycleway for sightseeing and recreation.

Community values

Accessibility, the safety and amenity of pedestrian and bike rider facilities, and preservation of open spaces, are valued highly by the community surrounding the proposal. Some loss of open and green space would be experienced within Bradfield Park north due to the introduction of the elevated linear bike ramp within and above the park. The proposal would, however, improve safety and accessibility for bike riders and pedestrians and support future growth in the number of bike riders travelling between the lower north shore, North Sydney CBD and Sydney's CBD. The upgrades would provide users of the proposal with greater confidence to walk or cycle to their destination and allow them to feel safe when using the cycle path. The upgrades to pavement and landscaping would also enhance the amenity along Alfred Street South for park users.

6.6.4 Safeguards and management measures

Table 6-39 identifies management measures to minimise or avoid negative impacts to socio-economic and land use associated with the proposal.

Table 6-39: Socio-economic and land use safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
SE1	Property acquisition	All property acquisition will be carried out in accordance with the Property Acquisition Process (IP-001-PS V1.0 (Transport for NSW, 2021a) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Pre-construction/ Construction	Core standard safeguard SE1
SE2	Socio-economic	A Community Liaison Management Plan (CLMP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CLMP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. The CLMP will be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008).	Detailed design/Pre-construction	Core standard safeguard SE2
SE3	Major events	Coordination with North Sydney Council and key stakeholders including Kirribilli markets operator will be undertaken to minimise impacts on major events.	Pre-construction/ Construction	Additional safeguard SE3

Other safeguards and management measures to address socio-economic impacts are identified in sections 6.1, 6.2, 6.3 and 6.4.

6.7 Biodiversity

This chapter provides an assessment of the potential impact on biodiversity as a result of the proposal and identifies environmental management measures to minimise these impacts. The biodiversity assessment has considered Transport's Biodiversity Assessment Guidelines (July 2022) and Transport's Biodiversity Policy (August, 2022).

6.7.1 Methodology

A Preliminary Arboricultural Report (Tree iQ, 2022) was prepared to inform the design of the proposal (Appendix I – Preliminary aboricultural report). Thirty four trees were assessed in relation to their landscape significance and allocated a retention value, as detailed in Appendix I – Preliminary aboricultural report.

Biodiversity database searches were undertaken on 9 March 2022 and 5 October 2022 to identify State and Commonwealth records of threatened entities and Commonwealth Matters National of Environmental Significance (MNES) that occur or have the potential to occur within 10 kilometres of the proposal boundary. Database searches are listed below in Table 6-40.

Table 6-40: Biodiversity database searches

Database	Purpose of the search
BioNet Atlas of NSW Wildlife, managed by the Department of Planning and Environment, Environment, Energy and Science division (DPE EES)	Used to compile a list of threatened species records listed under the BC Act to within 10 kilometres of the proposal boundary
Protected Matters Search Tool managed by the Commonwealth Department of Agriculture, Water and the Environment (DAWE)	Used to compile a list of potentially occurring MNES listed under the EPBC Act to within 10 kilometres of the proposal boundary
The Native Vegetation of the Sydney Metropolitan Area map data – Version 3.1 (OEH, 2016)	Used to identify the plant community types (PCT) within 10 kilometres of the proposal boundary
Threatened species, populations, and ecological communities profile database, managed by DPE EES	Contains information for all listed threatened species, populations and communities
NSW Biodiversity Values Map (DPE EES)	Used to identify land with high biodiversity value that is particularly sensitive to impacts from development or clearing.

The results of the searches of BioNet records (DPE EES) and the Protected Matters Search Tool (PMST) (DAWE) were used to prepare a list of threatened flora, fauna and ecological communities known or considered likely to occur within 10 kilometres of the proposal boundary. This list was then refined based on suitability of habitat features present within the proposal boundary, including associated PCTs, soil and geological preferences. Marine animals and shorebirds have been assigned a low likelihood in the assessment as the proposal would not impact on the marine or shore environments. The 'likelihood of occurrence' for each threatened entity identified from the database searches is provided in Appendix E – Biodiversity searches and Test of Significance. Criteria used to determine likelihood of occurrence categories for the assessment are provided in Appendix E – Biodiversity searches and Test of Significance.

In addition, an ecological field survey was undertaken on 18 January 2022 by an ecologist to survey for flora and fauna species and document habitat features.

6.7.2 Existing environment

The proposal is a highly urbanised area with no remnant native vegetation present within the proposal boundary. The vegetation within the proposal boundary has been extensively modified by urban development over the past 100 years or so. It includes the bowling greens and Bradfield Park Central, and Bradfield Park North.

The proposal is bounded by treed parkland area to the north, a car parking area at the end of Burton Street to the south, Milsons Point Station and railway line to the east, and a footpath and carriageway on Alfred Street South to the west. The proposal comprises pavement areas, turf and garden beds, including planted native and non-native shrubs and planted native and exotic including Chinese Elm, Ornamental Pear Cultivars, Canary Island Date Palm, London Plane Tree, Brush Box, Simons Poplar, Jelly Palm, Cabbage Tree Palm, Crepe Myrtle and Spotted Gum and Moreton Bay Fig. (Plate 6-1).

The Preliminary Arboricultural Report (TreeiQ, 2022) identified a total of 34 trees within the vicinity of the proposal. Of these, seven were identified as having a low landscape significance, 12 as having a moderate landscape significance, 11 as

having high landscape significance and four as having a very high landscape significance. Most trees within Bradfield Park North and vegetation within the bowling greens would be retained by the proposal.

Plate 6-1: Planted native and non-native vegetation within the study area (Arcadis, 2021)

A review of the Native Vegetation of the Sydney Metropolitan Area map (OEH, 2016) did not identify any mapped plant community types (PCTs). Additionally, a review of the Biodiversity Values Map (DPE EES) did not identify any areas of land with high biodiversity value within the proposal boundary. The closest area identified by the Biodiversity Values Map as having high biodiversity value is located about 500 metres from the site at McMahons Point.

The 34 trees assessed in the Aboricultural Report comprise a mix of Australian-native and exotic species. The following conclusions were made:

- 14 trees were allocated a retention value of 'priority for retention'
- 12 trees were allocated a retention value of 'consider for retention'
- Six trees were allocated a retention value of 'consider for removal'
- One tree was allocated a retention value of 'priority for removal'
- One tree was dead.

Protected biodiversity

Database searches of the Commonwealth Protected Matters Search Tool and the BioNet Atlas of NSW Wildlife were undertaken for a 10 kilometre area of the proposal boundary (Appendix E – Biodiversity searches and Test of Significance).

Threatened ecological communities

A number of Threatened Ecological Communities (TECs) were identified from the PMST report within 10 kilometres of the proposal boundary. TECs identified as likely to occur within the search area are provided below in Table 6-41. The full list of TECs are included in the PMST report (Appendix E – Biodiversity searches and Test of Significance).

Table 6-41: listed Threatened Ecological Communities likely to occur within 10 kilometres of the proposal boundary

Threatened Ecological Community	EPBC Act status	Likelihood of occurrence
Castlereagh Scribbly Gum and Aqnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community may occur within 10 kilometres of the proposal boundary
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and East Queensland ecological community	Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within 10 kilometres of the proposal boundary
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community may occur within 10 kilometres of the proposal boundary
Eastern Suburbs Banksia Scrub of the Sydney Region	Critically Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within 10 kilometres of the proposal boundary
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community may occur within 10 kilometres of the proposal boundary
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within 10 kilometres of the proposal boundary
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within 10 kilometres of the proposal boundary
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within 10 kilometres of the proposal boundary

Given the highly modified nature of the land within the proposal boundary, it does not support or conform to any PCT or subsequent TEC listed under the BC and EPBC Act. For this reason, listed TECs included in the PMST report were exluded from the likelihood of occurrence assessment.

Threatened flora

A total of 43 threatened flora species were identified in the PMST report. Based on habitat requirements, known range and proximity and number of recent records, these flora records were refined to identify species with a moderate to high likelihood to occur within the proposal boundary. Given the highly modified nature of the site as a landscaped park area, it is considered unlikely that any threatened species would be present within the study area.

A database search of the NSW BioNet Atlas of NSW Wildlife found no threatened flora records within 10 kilometres of the proposal boundary.

Threatened fauna

A total of 154 threatened fauna species were identified in the in the PMST report and BioNet records. Based on habitat requirements, known range and proximity and number of recent records, these fauna records were refined to identify species with a moderate to high likelihood to occur within the proposal boundary, which are shown in Table 6-42.

Table 6-42: Threatened fauna species with a moderate to high likelihood to occur

Fauna species	BC Act status	EPBC Act status	Likelihood of occurrence
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Vulnerable	Vulnerable	Recorded
Powerful Owl (*Ninox strenua*)	Vulnerable	-	Known

6.7.3 Potential impacts

Construction

Tree removal

Transport's Biodiversity Policy aims to "protect and enhance biodiversity, with the goal of achieving a no net loss of biodiversity as a consequence of its infrastructure development activities". The Policy requires Transport to apply the 'Avoid, Minimise, Mitigate and Offset' hierarchy to all Transport infrastructure. In accordance with the Policy the proposal design development has avoided tree removal where possible. For example, the linear bike ramp alignment has been refined to avoid interface between the ramp piers and the viaduct footings to minimise the need for tree removal.

Notwithstanding, the proposal would require the removal of seven trees, as detailed in Table 6-43 and shown in Figure 6-16.

The trees proposed to be removed would be offset via trees planting, in accordance with the provisions of the Transport's Tree and hollow replacement guidelines (2022).

Table 6-43 Trees proposed to be removed

Trees to be removed / species	Location	Reason	Discussion
Five Simons Poplar (*Populus simonii*) Trees numbers 2, 3, 28, 29 and 30	Southern section of Bradfield Park North, adjacent to the Sydney Harbour Bridge viaduct wall		The form of these trees has been significantly impacted by reduction pruning to provide clearance for the Sydney Harbour Bridge viaduct wall and have reduced structural condition as a result. The trees were planted in the 1990's and have a short life-span of 5-15 years.
Ornamental Pear Cultivars *(Pyrus cvs)* Tree number 27	Southern section of Bradfield Park North	Allow for the ramp footprint and the new, adjacent footpath.	The tree is a young specimen. The tree is of low landscape significance and has been allocated a retention value of 'consider for removal'.
One Canary Island Date Palm (*Phoenix canariensis*) Tree number 31	Roundabout at the junction of Alfred Street South and Fitzroy Street	Accommodate the modified roundabout at the corner of Lavender Street and Middlemiss Street	The tree is an exotic palm species and unlikely to be a culturally significant specimen. The tree is in good health and structural condition with no significant defects. The Arboricultural Report notes that new planting of this species is now uncommon due to its propensity to self-seed and become weedy and its susceptibility to fungal disease.

To minimise proposal impacts it is the following trees would be retained and pruned, and retained, as part of the proposal:

- Two Chinese Elm (*Ulmus parvifolia*) (Trees 1 and 23) are proposed for retention, however reduction pruning may be required to pruning to provide vertical clearance to the cycle ramp. These works would be relatively minor and would impact the useful life expectancy of the tree of the trees
- One Moreton Bay Fig (*Ficus Macrophylla*) (Tree 21), is proposed for pruning to allow access in and out of the Burton Street carpark and general crane movements. This tree is located in the south-western corner of the proposal boundary.

Figure 6-16: Trees proposed to be removed and pruned by the proposal

Biodiversity impacts

The proposed for removal and pruning are considered to provide limited habitat for any threatened species with the potential to occur. Any threatened species which may potentially use the trees would most likely be moving through the site to gain access to other areas which contain more valuable and important habitat features.

Any mobile species, such as birds and bats, affected by construction of the proposal would be able to temporarily move away from the affected area, removing the risk of injury or death. Threatened species recorded with a moderate or high likelihood of occurrence in the area includes microbats bats and nesting birds (refer to Appendix E – Biodiversity searches and Test of Significance). Due to the highly modified nature of the study area, the proposal is unlikely to have a significant impact on these species. As a result it has been determined that the proposal would have a low biodiversity impact on the local area. Adequate alternative areas within nearby vegetated areas, containing more valuable and important habitat features, exist in proximity to the site.

Protected biodiversity

Tests of Significance (ToS) have been carried out under the BC Act and Significant Impact Criteria assessments (SIC) have been undertaken under the EPBC Act for all species listed in Table 6-44. Where threatened/migratory species share similar life histories or habitat requirements, the assessments have been grouped, allowing similar assessment. The results of the assessments are summarised in Table 6-44 and provided in full in Appendix E – Biodiversity searches and Test of Significance.

Table 6-44: BC Act Test of Significance and EPBC Act Significant Impact Criteria results summary

Fauna species	BC Act	ToS result	EPBC Act	SIC result
Grey-headed Flying-fox *(Pteropus poliocephalus*)	Vulnerable	Not significant	Vulnerable	Not significant
Powerful Owl (*Ninox strenua*)	Vulnerable	Not significant	-	-

The land within the proposal boundary contains a number of flowering gums and fruiting trees which may be used by Grey-headed Flying-fox for foraging One of these trees (Canary Island Date Palm) would be removed by the proposal, however this tree is not considered critical foraging habitat for the species, and as such, it is unlikely that the removal of one Canary Island Date Palm would result in a significant impact to Grey-headed Flying-fox. The land within the proposal boundary does not contain any roosting habitat for the species, and a total of three known Grey-headed Flying-fox camps are located within 10 kilometres of the proposal boundary. The Powerful Owl is also known to occur in the area, however the trees proposed to be removed would not provide adequate roosting habitat requirements for the species and therefore it is unlikely to rely on this vegetation for its survival.

During the site inspection, no suitable habitat was found for threatened microbat species, including Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Southern Myotis or Yellow-bellied Sheathtail-bat, within infrastructure or trees present within the proposal boundary. However, there is potential for the site to contain occasional aerial foraging habitat, which may be impacted by lighting, noise and vibration impacts during night construction works. Due to the proposal boundary's location within a well-lit landscaped park area, and its proximity to a train line, the area represents sub-optimal habitat for threatened microbat species. Lighting, noise and vibration impacts during night construction would be short term and considered minor, given that these species are mobile and able to move to areas beyond the proposal boundary for higher quality aerial foraging habitat. As most trees within the Bradfield Park North would be retained, there is adequate relocation potential for any species that may be affected by construction activities associated with the proposal.

There would be no impacts to trees within the proposed ancillary facility, including boules piste and the north bowling green. Vegetation within the proposed ancillary facility does not contain any suitable habitat for threatened species.

The closest area identified as having high biodiversity value by the Biodiversity Values Map (DPE EES) is located about 500 metres south-west from the proposal boundary at McMahons Point and would not be impacted by the proposal.

Operation

During operation, the proposal would not result in removal of any further trees and is unlikely to cause a significant impact on the biodiversity values of the area. There would be additional lighting in the area once operational. However, given the sites proximity to the Sydney Harbour Bridge and other major business districts, which are sources of high levels of artificial light, this is considered to be a negligible impact to common species within the area.

6.7.4 Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the Biodiversity Conservation Act and therefore a *Species Impact Statement* or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act.

6.7.5 Safeguards and management measures

Safeguards and management measures proposed to avoid, minimise or mitigate biodiversity impacts are identified in Table 6-45.

Table 6-45: Biodiversity safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
B1	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Transport's Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects (RMS, 2011), Transport's Tree and hollow replacement guidelines (2022) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in requirements set out in the Landscape Guideline (RMS, 2008) • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Protocols to manage weeds and pathogens. • Identify the process to be followed should additional tree trimming be required as part of the construction activities in accordance with Transport's environmental management systems.	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection
B2	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.	Detailed design / pre-construction	Additional safeguard B2
B3	Biodiversity	A 3D cloud point survey will be undertaken to accurately record the dimensions of the trees and ensure adequate clearance is provided to the trees to be retained. The potential movement of the trees' trunks and crown in high winds and minimum vertical clearances below their crowns will be considered during the design process.	Detailed design / pre-construction	Review of Potential Tree Impacts report (Tree iQ, May2022) (Appendix I – Preliminary aboricultural report)
B4	Biodiversity	An Arboricultural Impact Assessment and Tree Protection Plan will be prepared by an Arborist (AQF Level 5) during detailed design to examine the potential impact of the proposal on trees and provide recommendations for tree sensitive methods and tree protection measures.	Detailed design / pre-construction	Review of Potential Tree Impacts report (Tree iQ, May 2022) (Appendix I – Preliminary aboricultural report)

ID	Impact	Environmental safeguards	Timing	Reference
B5	Biodiversity	A suitably qualified ecologist will supervise the removal of all required trees to observe for fauna welfare in case of injury during tree removal.	Construction	Additional safeguard B5
B6	Biodiversity	Tree removal and pruning shall be undertaken by a Contracting Arborist with minimum AQF Level 3 Arboricultural Qualifications and will comply with the NSW Work Cover Code of Practice for the Amenity Tree Industry.	Construction	Additional safeguard B6
B7	Biodiversity	A Tree and Hollow Replacement Plan will be prepared by professional suitably qualified in rehabilitation and restoration techniques, in accordance with Transport's Tree and hollow replacement guidelines (2022) and implemented as part of the CEMP. The Tree Hollow Replacement Plan will form part of the Urban Design and Landscape Plan that will be developed for the proposal. It will include, but not be limited to: • A site prioritisation and identification, including tenure, current zoning and management arrangements • Soil/site preparation requirements • Planting strategy and maintenance • Reporting.	Detailed design / pre-construction	Transport's Tree and hollow replacement guidelines (2022)

6.7.6 Biodiversity offsets

A Tree and Hollow Replacement Plan would be prepared for the trees proposed for removal. The Plan would be aligned with Transport's Biodiversity Policy 2022, as to 'protect and enhance biodiversity, with the goal of achieving a no net loss of biodiversity as a consequence of its infrastructure development activities'.

The purpose of the plan is to preferably replace the trees removed within the proposal boundary or on nearby land, with the consent of the land owner. Where tree removal could not be avoided, the number of native and amenity trees to be removed would be counted and used to calculate the number of replacement trees. If tree replacement is not possible within the proposal boundary, or on land in the proximity or by agreement with North Sydney Council, a payment would be made to the Transport for NSW Conservation Fund.

The tree replacement calculation would be carried out as part of the Tree and Hollow Management Plan, in accordance with the provisions of the Transport's *Tree and hollow replacement guidelines* (2022). Table 6-46 shows the replacements guidelines per tree size, as determined by the diameter at breast height (DBH).

Table 6-46: Tree and hollow replacement requirements (Tree and hollow replacement guidelines, Transport, 2022)

Tree size	Tree replacement requirement criteria
Very large tree (DBH greater than 100cm)	Plant minimum 16 trees
Large tree (DBH between 50cm and 100cm)	Plant minimum eight trees
Medium tree (DBH greater than 20 cm, but less than 50cm)	Plant minimum four trees
Small tree (diameter at breast height greater than 5cm, but less than 20cm)	Plant minimum two trees
Hollow replacement requirement	Provide three artificial hollows for every occupied hollow removed

Table 6-47 identifies the trees proposed to be removed, their DBH and the minimum tree replacement. Tree replacement requirements would be confirmed during detailed design.

Table 6-47: Trees proposed to be removed and minimum tree replacement criteria

Tree proposed to be removed (tree number and species)	DBH (cm)	Minimum tree replacement
Tree number 2 Simons Poplar (*Populus simonii*)	40 cm	Four
Tree number 3	45 cm	Four

Tree proposed to be removed (tree number and species)	DBH (cm)	Minimum tree replacement
Simons Poplar (*Populus simonii*)		
Tree number 27 Ornamental Pear Cultivares (*pyrus cvs*)	5 cm	No minimum requirement
Tree number 28 Simons Poplar (*Populus simonii*)	50 cm	Eight
Tree number 29 Simons Poplar (*Populus simonii*)	40 cm	Four
Tree number 30 Simons Poplar (*Populus simonii*)	45 cm	Four
Tree number 31 Canary Island Date Palm (*Phoenix canariensis*)	60 cm	Eight
Total minimum tree replacement		**32**

6.8 Hydrology and flooding

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

6.8.1 Methodology

A desktop review and analysis were undertaken of available data and flood studies within the catchment associated with the proposal boundary. The desktop review included a search of topographical mapping, aerial imagery and investigation of flood hazard mapping within the North Sydney LGA Flood Study (WMA Water, 2017).

6.8.2 Existing environment

The proposal is located within the Sydney Harbour Catchment. The catchment is mostly urbanised, with mainly impervious surfaces (e.g., roads, pavements, hardstand area), although areas of bushland still remain particularly at Lane Cove, Garigal and Sydney Harbour National Parks. The stormwater runoff surrounding the proposal is captured by North Sydney Council. The stormwater is then conveyed into Sydney Water drainage infrastructure and is subsequently discharged to Sydney Harbour. This includes the existing road drainage along Alfred Street South, Burton and Fitzroy Street. Sydney Harbour is located about 250 metres south and 175 metres west of the proposal. Most of the rain falling within the proposal boundary would run off the hard paved surfaces. Run-off would then be conveyed into the municipal stormwater system and discharged into Sydney Harbour.

The proposal boundary and surrounding landscape ranges in elevation between 35 metres Australian Height Datum (AHD) at the north bowling green, rising to 42 metres AHD in Bradfield Park North. Continuing north, the elevation begins to fall, reaching 38 metres AHD at the Lavender Street roundabout.

The proposal is not located on high flood hazard land as defined within the North Sydney LGA Flood Study (WMA Water, 2017), however the study identifies Burton Street, north of the boules piste as being affected by a one per cent Annual Exceedance Probability (AEP) flood event.

6.8.3 Potential impacts

Construction

Given the scope and extent of the work, and the limited flooding risk of the sites, the main potential impact on hydrology and flooding is expected to be minor. During construction, sediment-laden runoff from disturbed areas may enter waterways and discharge into Sydney Harbour during the removal of the existing infrastructure and pavement. Run-off has the potential to cause sedimentation and affect flow regimes.

The proposed location of the ancillary facility site is generally outside the one percent AEP flood extent but may slightly encroach around the northern fringe. Loose material stored in the stockpiles at ancillary facilities also has potential to be mobilised during a flood which can become a hazard and may contribute to the partial blocking of 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. No permanent change to drainage pathways would occur as a result of the proposal.

Operation

Runoff captured during the operation of the proposal would be discharged to the same stormwater catchment as the existing conditions.

The proposal boundary is located above the one per cent AEP flood event, with the exception of Burton Street and north of the boules piste. As such, operation of the proposal would not be likely to result in any impacts related to hydrology and flooding.

6.8.4 Safeguards and management measures

Environmental management measures proposed to minimise hydrology and flooding impacts as a result of the proposal are outlined in Table 6-48.

Table 6-48: Hydrology safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
SW1	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 proposal.	Detailed design / pre-construction	Additional safeguard SW1
SW2	Surface run off	During construction site water will be managed locally with appropriate erosion and sediment controls. Off site water will be diverted around and away from the area of disturbance within the proposal boundary to avoid generating sediment laden water on site.	Pre-construction and Construction	Additional safeguard SW2

6.9 Soils and water quality

This section provides an assessment of the potential impacts of the proposal on surface water and soils and identifies safeguards and management measures to avoid or minimise these impacts.

6.9.1 Methodology

A desktop review and analysis of existing information was undertaken to determine potential receptors, characterising the existing environment and identify potential risks to soils and water quality.

6.9.2 Existing environment

Soils

The entirety of the land within the proposal boundary and surrounding landscape is underlain with the Gymea Soil Landscape Group which occurs through the Hornsby Plateau along the foreshores of the Sydney Harbour, Parramatta and Georges Rivers. The Gymea soil landscape is characterised by gleyed podzolic soils and yellow podzolic soils on shale lenses and described as an erosional soilscape. This landscape has localised steep slopes, with a high soil erosion hazard, and very low soil fertility.

The Soil Landscapes of the Sydney 1:100 000 sheet (DPE, 2009) indicates that land within the proposal boundary is underlain by medium to coarse grained quartz sandstone with very minor shale and laminate lenses aged to be Triassic. Man-made fill overlying silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers, aged to be quaternary are located 196 metres north-east of the proposal boundary.

The Atlas of Australian Acid Sulfate Soils (ASS) map identified no data on the presence of ASS to be present within the proposal boundary. The map indicates that ASS in the proposal boundary is a low probability of occurrence in several parcels of land encroaching Sydney Harbor, approximately 125 metre west of the proposal.

Water quality

As noted above in section 6.8, the proposal is located within the highly urbanised Sydney Harbour Catchment. Due to the extent of development in the area, Sydney Harbour is generally affected by reduced water quality and a changed flow

regime. Common urban stormwater pollutants include gross pollutants and litter, sediment and suspended solids, nutrients, toxic organics, heavy metals and hydrocarbons.

6.9.3 Potential impacts

Construction

The local topography and soils would be subject to modification from excavation works associated with column footing site preparation and excavation and construction of the cycle path. Earthworks and removal of the four trees may result in increased erosion risk and sedimentation of downstream waterways, including Sydney Harbour. However, given the minor excavation works and limited vegetation clearing this impact can be adequately managed using standard sediment and erosion control measures as outlined in Section 6.9.4.

- Construction of the proposal may result in an increase in sediment entering watercourses within and surrounding the construction footprint. This could potentially occur through the following activities:
- Sediment release in run off from stockpiles and earthmoving activities
- Transport of material to, from and within the construction footprint
- Settlement of dust generated from construction activities.

An increase in the volume of sediment discharged to watercourses has the potential to increase turbidity, erosion and scouring. The subsequent settlement of sediment in waterways could impact aquatic ecosystem health.

Construction of the proposal could mobilise contaminants and gross pollutants into local watercourses, affecting water quality. Potential mechanisms for mobilisation and discharge would include:

- Spills and leaks from construction plant and equipment
- Runoff or spills from chemical storage areas within ancillary facilities
- General construction waste material and litter entering watercourses.

The above potential impacts would be temporary, minor and limited to the period of construction. The impact on surface water quality is expected to be minor and would be managed effectively through the implementation of erosion and sediment control measures.

Operation

During operation, the management of stormwater would remain unchanged from the existing conditions. The proposal would not increase the risk or likelihood for sediment-laden runoff entering the stormwater network via kerb and guttering systems. Stormwater captured by the elevated linear bike ramp would be managed through drainage integrated into the ramp deck and concrete columns, as outlined in section 5.2.2.

6.9.4 Safeguards and management measures

Environmental management measures proposed to minimise soils and water quality impacts as a result of the proposal are outlined in Table 6-49.

Table 6-49: Soils and water quality safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
SW3	Mobilisation and discharge of sediment 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.	Pre-construction and Construction	Section 2.1 of QA G38 Soil and Water Management
SW4	Mobilisation and discharge of sediment during construction	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	Pre-construction and Construction	Section 2.2 of QA G38 Soil and Water Management

		specific controls and follow-up measures to be applied in the event of wet weather.		

6.10 Aboriginal cultural heritage

This section provides an assessment of the potential impact on Aboriginal cultural heritage as a result of the proposal and identifies environmental management measures to mitigate these impacts. This chapter draws on information provided in the Aboriginal Heritage Due Diligence Assessment carried out for the proposal, attached as Appendix J - Aboriginal heritage due diligence assessment.

6.10.1 Methodology

The Aboriginal heritage assessment was undertaken in accordance with Stage 1 of the PACHCI (Roads and Maritime, 2011).

The study area assessed by the Aboriginal heritage assessment generally includes an area of 50 metres either side of the centre of the proposal and the maximum possible extent of the potential ancillary facility site, as shown in Figure 6-18 and involved:

- Undertaking a desktop review of archaeological literature and databases to identify listed Aboriginal sites and places within the proposal boundary, including:
  - A search of the Aboriginal Heritage Information Management System (AHIMS) for listed Aboriginal sites, carried out on 20 January 2022
  - An assessment of the archaeological context of the proposal boundary, including previous archaeological work in the area
- Undertaking an inspection of land within the proposal boundary, carried out on 18 January 2022, including:
  - Observations of overall site intactness and the potential for identifying Aboriginal objects beneath the ground surface
  - The taking of photographs of landforms and local features whilst on a site walk
  - Examination of ground exposures
- Identifying previously used predictive model to assist in determining archaeological potential
- Analysis of previous archaeological investigations in order to assess the cultural heritage values within the proposal area
- Assessing the potential impacts of the proposal
- Identifying management and mitigation measures to manage impacts to Aboriginal items or areas of Aboriginal cultural sensitivity.

The assessment of Aboriginal heritage was undertaken in accordance with the requirements of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010).

6.10.2 Existing environment

Aboriginal historical and archaeological context

The Milsons Point and Kirribilli area was occupied by the Cammeraygal, with radiocarbon dating of archaeological material from Cammeray proving Aboriginal occupation of the area from at least 5,800 years ago. Sandstone settlements and bark and branch huts were located along the harbour foreshore (GML 2019:6) and used transiently due to the seasonal availability of food. The clans within this area were characterised by a complex cultural life, distinct languages and customs and a rich spirituality (AHO, 2006).

The Cammeraygal experienced a rapid decline in population following European settlement. The introduction of diseases such as smallpox, syphilis and influenza in the early 1800's led to an irreversible decline in the population by the 1820's (AHO, 2006). Physical removal from the land and disruption to traditions further impacted the population. The land became subdivided soon after and traditional groups dispersed.

Following European settlement, the land was granted to Robert Ryan, then to Robert Campbell in 1806. In 1822 the land was leased to James Milson, who utilized the land for cattle and crops. The land began to experience a higher degree of modification throughout the mid-nineteenth century with such development as housing, roads and a network of services.

The construction of the Sydney Harbour bridge saw the reclamation and demolition of 438 houses in the early 1920's, resulting in a more usable foreshore (HLA Envirosciences, 2003). In 1924 construction began on the northern approach, with soil from the North Sydney railway site used to form a ramp to the start of the bridge. Concrete walls were established along Broughton Street, Alfred Street South, Bradfield Highway and Pacific Highway. Concrete bridges were constructed at Fitzroy Street, Burton Street, Lavender Street and Arthur Street between 1928 and 1929. The Sydney Harbour Bridge was completed in 1932.

Section 6.1.2 outlines the establishment of Bradfield Park. This included general clearing, planting and the addition of a rockery garden in the northern portion of the park. During World War Two, control of the park was given to the Royal Australia Air Force to use as a mobilisation and demobilisation depot (HLA Envirosciences, 2003). Huts were constructed at and later removed from the site during this time. Significant upgrades to Bradfield Park in 2003 saw the undertaking of large-scale landscaping work. This uncovered footings and house, and structure remains that existed on the site prior to the construction of the Sydney Harbour Bridge.

National Heritage List

The study area is located within one NHL item and one potential NHL item:

- The gazetted Listed Place ""Sydney Harbour Bridge, Bradfield Hwy, Dawes Point – Milsons Point, NSW" (Place ID 105888). No Aboriginal heritage values are included as part of the listing
- The potential NHL item with Aboriginal heritage values, "Sydney Cultural Crescent Rock Art" (Place ID 106369).

Aboriginal heritage sites within proximity to the study area

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on 20 January 2022 (AHIMS Search ID 653097). The search area included a one-kilometre radius around the study area and inclusion of the ancillary facility site (Figure 6-17).

A total of 42 Aboriginal sites were identified in the AHIMS search area. The majority of the recorded site features are shells and artefacts (17 in total), outlined in Table 6-50.

Table 6-50: Frequency of site features from AHIMS data

Site feature	Frequency
Artefact, shell	17
Art (pigment or engraved)	12
Shell	6
Artefact	3
Artefact, shell, Aboriginal Ceremony and Dreaming	1
Art (pigment or engraved), shell, artefact, burial	1
Aboriginal resource and gathering, shell	1
Shell, artefact, art (pigment or engraved)	1
Total	42

A substantial number of sites are located in close proximity to Sydney Harbour and the Parramatta River. As a result, shell middens are particularly common in these areas.

Four sites have been previously identified within 500 metres of the study area. The nearest site (AHIMS ID 45-6-1271) is described as midden within rock shelter, situated at the eastern end of Clark Park and located 60 metres west. No Aboriginal sites were registered within the study area, as shown in Figure 6-18.

The assessment identified no Aboriginal archaeological sensitivity within the study area and determined it unlikely to encounter intact subsurface soil profiles. This is a result of extensive previous landscape modification, including foreshore modification, historic building and demolition, construction of the Sydney Harbour Bridge and landscaping of Bradfield Park.

Figure 6-17: AHIMS sites within one kilometre of study area

Figure 6-18: AHIMS sites in proximity to the study area

6.10.3 Potential impacts

Construction

The assessment has identified no Aboriginal archaeological sensitivity within the study area. It is unlikely any subsurface profiles remain intact due to extensive previous modification of land within the proposal boundary, therefore excavation works would not impact Aboriginal archaeological deposits.

No identified Aboriginal archaeological sites were located within the proposal boundary, with the nearest located 60 metres to the west (AHIMS ID 45-6-1271) of the study area. The proposal would not impact the ground in the vicinity of AHIMS ID 45-6-1271.

Following a site inspection of land within the proposal boundary, no sandstone outcrops or Aboriginal art sites were identified within the study area. There would be no impact to any heritage values of the potential national heritage listed item "Sydney Cultural Crescent Rock Art" (Place ID 106369).

Operation

There is not expected to be impacts on Aboriginal heritage significance during the operation of the proposal as earthworks would be restricted to the construction phase.

6.10.4 Safeguards and management measures

Environmental management measures proposed to avoid, reduce or manage impacts on Aboriginal cultural heritage are listed in Table 6-51.

Table 6-51: Aboriginal heritage safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Stage 1 Procedure for Aboriginal cultural heritage consultation and investigation (Transport, 2012) and Unexpected Heritage Items Procedure (Transport for NSW, 2022d) and implemented as part of the CEMP. It will provide specific drafting guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Detailed design / Pre-construction	Section 4.9 of QA G36 Environment Protection
AH2	Aboriginal heritage	The nearest AHIMS site (AHIMS ID 45-6-1271) will be marked on all construction plans, ensuring impacts are avoided.	Pre-construction / Construction	Additional safeguard AH2
AH3	Aboriginal heritage	Aboriginal social, cultural and contemporary value would be considered through: • Consultation with the Aboriginal community • Preparation of an interpretive plan for Aboriginal cultural heritage values.	Detailed design/Pre-construction	Additional safeguard AH3
AH4	Aboriginal heritage	Unexpected Heritage Items Procedure (Transport for NSW, 2022d) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport 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.	Pre-construction / Construction	Section 4.9 of QA G36 Environment Protection

6.11 Climate change risk

This section provides an assessment of the potential impacts of the proposal on climate change due to the release of greenhouse gas emissions, and an assessment of the potential impacts of climate change upon the proposal. It provides an assessment of sustainability initiatives associated with the proposal. This section also identifies safeguards and management measures to avoid or minimise these impacts.

6.11.1 Methodology

A Climate Change Risk Assessment was conducted by Arcadis in August 2022, in line with Transport's *Climate Risk Assessment Guidelines* (Transport, 2021c).

The relevant government plans, policies and guidelines that were followed during the climate change risk assessment include:

- Climate Risk Assessment Guidelines (Transport, 2021c)
- Australian Standard, 2013, AS 5334-2013 Climate change adaptation for settlements and infrastructure – A risk based approach
- Australian Greenhouse Office, 2006, Climate Change Impacts & Risk Management A Guide for Business and Government
- Infrastructure Sustainability Council of Australia (ISCA), 2015, Infrastructure Sustainability Rating Tool Technical Manual: Cli 1 – Climate Risk Management
- Infrastructure Sustainability Council of Australia (ISCA), 2018, ISv2.0 Climate and Natural Hazards Risk Guideline
- The Commonwealth Scientific and Industrial Research Organisation (CSIRO), 2018, Climate Compass: A climate risk management framework for Commonwealth agencies
- Green Buildings Council of Australia, 2015, Green Star Communities v1 Submission Guidelines: Credit 04: Adaptation and Resilience.

The methodology applied for the Climate Change Risk Assessment follows the approach presented in the *Climate Risk Assessment (CRA) Guidelines* (Transport, 2021c), which is a ten-step risk management framework

The consequence and likelihood of each risk identified in this process was assessed using the Transport's Climate Risk Assessment Tool 2 likelihood and consequence risk rating system. Based on the assigned likelihood and consequence rating, an overall risk priority level was established using the Transport's Climate Tool 2 using a risk rating matrix, as presented in Table 15 1.

The priority levels in Table 6-52 can be interpreted as follows:

- Very high – These risks are generally intolerable and should be avoided except in extraordinary circumstances. An alternative solution must be found, and all necessary steps must be taken to reduce the risk below this level without delay.
- High – These risks are undesirable. They can only be tolerated if it is not reasonably practicable to reduce the risk further. High risks are considered to be on the verge of being unacceptable and must be given immediate priority.
- Medium – These risks are generally tolerable if it is not reasonably practicable to reduce the risk further. Additional treatment measures should be sought if significant benefit can be demonstrated and/or there is an additional treatment measure which is recognised as good practice in other like environments.
- Low – These risks are considered to be broadly acceptable. If options for further risk reduction exist and costs are proportionate to the benefit, then implementation of such measure should be considered.

Table 6-52: Likelihood and Consequence Risk Rating Matrix

Likelihood	Consequence						
		C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Severe	C1 Catastrophic
	L1 Almost certain	Medium	High	High	Very high	Very high	Very high
	L2 Very likely	Medium	Medium	High	High	Very high	Very high
	L3 Likely	Low	Medium	Medium	High	High	Very high
	L4 Unlikely	Low	Low	Medium	Medium	High	High
	L5 Very unlikely	Low	Low	Low	Medium	Medium	High
	L6 Almost unprecedented	Low	Low	Low	Low	Medium	Medium

6.11.2 Existing environment

Local climate

Historical climate data from Bureau of Meterorolgy (BoM) was analysed from 1859 to 2020 at Sydney (Observatory Hill). The proposal is located in an area which has a temperate climate with warm summers and cool winters. The warmest month is January with a mean maximum temperature of 29.6°C and the coldest month is July with a mean minimum temperature of 8.1°C. Rainfall fluctuates slightly through the year but is marginally higher during the first half of the year, when easterly winds dominate. The highest average rainfall occurs in the month of June with a mean rainfall of 155.6 millimetres. As evaporation and transpiration are lowest in autumn and winter, run-off is highest in autumn and winter and lowest in spring.

Historic and current climate risks

A review of current and historic climate hazards and risks relevant to the proposal was undertaken and summarised as follows:

- Bushfire - Bushfire mapping indicates that the site is not located within a bushfire prone area or within a 100-metre buffer zone of a bushfire risk area
- Flooding – land within the proposal boundary is not mapped as occurring within high flood hazard land as defined by the North Sydney LGA Flood Study (WMA Water, 2017) however the mapping shows parts of the site are still vulnerable to flooding to flood depths up to 1 per cent AEP
- Sea level rise – land within the proposal boundary is not considered to be vulnerable to future seal level rise
- Drought – Major droughts have been experienced in the region in 2004 and 2020 (North Sydney Council, 2021), and also in acute drought periods in 2002 and 2006 (BOM, 2021)
- Extreme weather events and storms - Strong winds have historically been severe enough in the proposal boundary area to damage an overhead train line on the Sydney Harbour Bridge in 2007 (Sydney Morning Herald, 2007).

Climate change projections

A climate risk pre-screening assessment was undertaken as part of the Climate Change Risk Assessment conducted by Arcadis (2022) to identify local climatic change projections for the proposal. The pre-screening assessment is presented in Table 6-53.

Table 6-53: Climate change pre-screening assessment for the proposal

Climate variable	Changes in the near future	Changes in the far future	Changes in the very far future	A there significant changes in the near future?	A there significant changes in the far future?	A there significant changes in the very far future?
Heat Vulnerability Index (current state)	3			Yes		
Disaster Resilience Index (current state)	0.7			Yes		
Maximum temperature (including UHI), °C	+3.5°C from 45.5°C	+4.7°C from 45.5°C	+4.8°C from 45.5°C	Yes	Yes	Yes
Minimum temperature, °C	+2.5°C from 10.1°C	+3.5°C from 10.1°C	+4.4°C from 10.1°C	No	No	No
Number of days over 35°C	+27 from 27 days	+51 from 27 days	+84 from 27 days	Yes	Yes	Yes
Number of days over 40°C	+9 from 7 days	+16 from 7 days	+23 from 7 days	Yes	Yes	Yes
Average humidity at 40°C	-3 from 63%	-3 from 63%	-2 from 63%	Yes	Yes	Yes
Duration of heavy-rain periods, days	+1 from 2 days	+1 from 2 days	+1 from 2 days	No	No	No
Number of heavy-rain periods	+2 from 1	+2 from 1	+2 from 1	Yes	Yes	Yes
Total amount of rain during a maximum rainfall period, mm	+24 from 90 mm	+56 from 90 mm	+123 from 90 mm	No	No	No

Climate variable	Changes in the near future	Changes in the far future	Changes in the very far future	A there significant changes in the near future?	A there significant changes in the far future?	A there significant changes in the very far future?
Precipitation rate, mm/h	+6 from 33 mm/h	+8 from 33 mm/h	+22 from 33 mm/h	No	No	No
Daily precipitation, mm/day	-1 from 148mm/d	+58 from 148mm/d	+1 from 148mm/d	**No**	**Yes**	**No**
Number of days with rainfall intensity over 25mm/h	+1 from 1 days	+1 from 1 days	+1 from 1 days	**No**	**No**	**No**
Drought duration, days	-10 from 48 days	+16 from 48 days	+13 from 48 days	**No**	**Yes**	**Yes**
Number of drought periods (no rain for over 2 weeks)	-1 from 7	+1 from 7	+0 from 7	**Yes**	**Yes**	**Yes**
Number of days with soil moisture below 20%	-4 from 4 days	-4 from 4 days	-4 from 4 days	**No**	**No**	**No**
Wind speed, km/h	+2 from 75km/h	-2 from 75km/h	-1 from 75km/h	**Yes**	**Yes**	**Yes**
Number of days with wind speed over 65km/h	-1 from 2 days	-1 from 2 days	+0 from 2 days	**No**	**No**	**Yes**
Highest Fire index	-2 from 46	+1 from 46	+2 from 46	**No**	**No**	**No**
Number of days with Fire index over 25	+0 from 3	+3 from 3	+3 from 3	**No**	**No**	**No**
Sea level rise (mean projection range), m	+0.15 metres	+0.7 metres	+1.15 metres	**Yes**	**Yes**	**Yes**

Climate variable	Changes in the near future	Changes in the far future	Changes in the very far future	A there significant changes in the near future?	A there significant changes in the far future?	A there significant changes in the very far future?
Sea level rise (maximum projection range), m	+0.25 metres	+1.42 metres	+2.44 metres	**Yes**	**Yes**	**Yes**

6.11.3 Potential impacts

Construction

The climate change pre-screening identified potential climate change risks during construction, outlined in Table 6-54. It is noted that, due to the relatively short timeframe of the construction phase of the proposal, the impacts of climate change are expected to be minimal.

Table 6-54: Climate change risks for proposal construction

Climate variable	Risk description	Management strategy	Risk rating
Bushfire index increase	Smoke being blown onto the construction site	Management measures to be incorporated into construction management documentation	Medium
	Health impacts to construction and maintenance workers most likely through smoke inhalation	Management measures to be incorporated into construction management documentation	Medium
Extreme heat	Heat causing unsafe conditions on site	Stop work on construction site	Medium
	Health impacts on construction and maintenance workers	Management measures to be incorporated into construction environmental management documentation	Medium
	Concrete curing impacts	Management measures to be incorporated into design and materials selection	Low
Extreme wind	Falling trees and debris blown onto the construction site, blocking access roads to the construction site or causing hazards	Management measures to be incorporated into construction environmental management documentation	Low
	Dust on-site during construction, leading to stop workdays	Management measures to be incorporated into construction environmental management documentation	Low
	Dust on-site during construction, leading to the need for additional water carts on site	Management measures to be incorporated into construction environmental management documentation	Low
Increased rainfall	Delays to the construction program	Short construction timeframe means there is a reduced risk	Low
Duration of drought period	Water restrictions being applied during the construction period limiting the availability of water for construction use	Construction planning to identify opportunities to reduce potable water need	Low

Operation

Potential climate change hazards and risks have been identified for the operation of the proposal based on the outcomes of the climate change pre-screening as outlined in Table 6-53 and are presented in Table 6-55.

Table 6-55: Climate change risks for proposal operation

Climate variable	Risk description	Management strategy	Risk rating		
			2021-2050	2051-2080	2071-2100
Extreme temperatures	Damage to road furniture, structural integrity, lighting and traffic signals	Selection of durable materials to withstand solar exposure and temperatures. On-going risk to be managed through maintenance schedules.	L	L	L
	Failure / poor condition / increased maintenance of landscaped areas and loss of amenity	Selection of plant species that are native and endemic to the site. Development of operational maintenance routine to manage risk.	M	M	M
	The increased stress of cycleway connections and expansion joints resulting in potential structural integrity	Selection of durable materials to withstand solar exposure and temperatures. Opportunities to use flexible pavement to be explored in detailed design.	L	M	M
	Materials can become hot to touch, including hydraulics and metallic panels	Material selection to consider material that is low heat conducive. Canopy cover in the park over most benches. Surrounding buildings will provide shading.	L	M	M
	Failure or degradation/reduced operating life of electrical systems	Selection of durable materials	L	M	M
	An increased risk of heat stress for bike riders and pedestrians	Design providing a rest point for bike riders. Material reflectivity to minimise heat reflection. Provision of water bubblers.	M	M	M
	Decrease of customer comfort and outdoor spaces usage		L	L	L
	Increased electricity use around the proposal leading to compromised supply and blackouts of lighting, resulting in safety and maintenance risks	Solar lights not currently considered as they have low output. Bridge lighting instead of overhead lighting to be considered for detailed design.	M	M	M
Drought	Adverse impacts on landscaping areas, including lack of available water for irrigation. Vegetation dying off	Selection of plant species that are native and endemic to the site. Development of operational maintenance routine to manage risk.	L	M	M
	Increased period without rain leading to silt build-up in stormwater drains, causing them to become blocked and requiring increase maintenance and water to clean and ensure regular flow	Waster sensitive urban design (WSUD) and raingardens to be considered to catch overland flow	L	L	L
	Changes in subsurface moisture conditions causing shrink/swell of soils, resulting in impact on earthing on the electrical system	High evaporation landscape or locate earthing next to landscape to be considered in detailed design.	L	L	L
Hail	Damage to vegetation and landscaping	Selection of plant species that are native and endemic to the site.	L	L	L

	Customers slipping, resulting in injury or death	To be managed through detailed design.	L	L	L
	Hail hitting customers, resulting in injury	Sheltered areas to be resilient to hail damage. Unable to increase shelter over cycleway due to heritage impacts.	L	L	L
Extreme wind	Wind causing branches and trees to fall on structures, cycle path, road furniture, and access routes, leading to partial shutdowns and network disruptions	Manage risk through plant species selection and layout.	L	L	L
	Impacts on passenger comfort (rideability)	Design to consider protected vs unprotected changes in wind.	L	L	L
	Increase in the scale and quantity of debris blown onto the motorway causing damage to supporting infrastructure and impacting user safety	Adaption though managing bike rider behaviour when using the cycleway.	M	M	M
Increased rainfall	Surcharge of drainage systems, resulting in increased scour or erosion	Proposal is not increasing impermeable surfaces therefore risk of flooding is low. Use of landscape and vegetation to slow down overland flows.	L	L	L
	Increased rainfall scouring foundations, resulting in structural damage or instability	Approach to foundations to be addressed in detailed design.	L	L	L
	Increased safety risks and disruption to the users of the cycle/pedestrian network due to inundation of infrastructure and / or bike riders not being able to access the network	To be addressed in detailed design.	L	L	L
Bushfire index increase	Health impacts to commuters (pedestrians/bike riders) most likely through smoke inhalation and visibility problems	To be managed through operations.	M	M	M
Other	Carbonation impacting durability of concrete structures	Concrete mix selection to consider carbonation impacts.	L	L	L
	Smog increases causing visibility problems e.g. bike riders not seeing signals or signs	To be managed through operations	L	L	L

6.11.4 Safeguards and management measures

Managing climate change risks requires a dual approach, encompassing mitigation and adaptation. Climate change mitigation works to avoid the risks of a changing climate by reducing the emission of greenhouse gases and preventing more severe climate change (DPIE, 2020) (refer to Section 6.12.1 for greenhouse gas assessment). Climate change adaptation works to manage the risks caused by climate change already locked in and from the potential for more severe changes in the future (Commonwealth of Australia Government, 2015). Given the nature and scope of the proposal, measures to manage the risks of climate change will predominantly be through mitigation including both design measures and operational measures. Safeguards and management measures proposed to reduce or mitigate climate change risk are listed in Table 6-56.

Table 6-56: Climate change risks safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
GGCC1	Greenhouse gas emissions	• The procurement strategy developed for the construction phase will demonstrate value for money and consideration for opportunities to procure goods and services: • From local suppliers • That are energy efficient or have low embodied energy • That minimise the generation of waste • That make use of recycled materials.	Construction	Additional safeguard GGCC1
GGCC2	Climate change	Undertake a detailed climate change risk assessment prior to detailed design	Detailed design	Additional safeguard GGCC2

6.12 Other impacts

6.12.1 Greenhouse gas emissions

Transport (formerly Roads and Maritime Services) in collaboration with other state (and New Zealand) transport authorities, released the Greenhouse Gas Assessment Workbook for Road Projects (Transport Authorities Greenhouse Group, 2013) to help standardise greenhouse gas assessments of road construction projects. The workbook was prepared to estimate the greenhouse gas emissions associated with construction, operation (not including traffic usage) and maintenance stages of road projects. The methodology outlined in the workbook formed the basis for the greenhouse gas assessment for the proposal.

Emissions were categorised into three different categories, known as scopes, to help differentiate between direct emissions from sources that are owned or controlled by the proposal, and indirect emissions that are a consequence of proposal activities, but which occur at sources owned or controlled by another entity. The three scopes are:

- Scope 1 emissions – direct greenhouse gas emissions into the atmosphere as a result of the proposal such as from plant and equipment using fuel
- Scope 2 emissions – indirect greenhouse gas emissions into the atmosphere from the consumption of energy such as electrical lighting
- Scope 3 emissions – other indirect emissions (not included in scope 2) due to upstream or downstream activities such as emissions associated with road users or the embodied energy within a material used to construct the proposal.

Existing environment

The Australian National Greenhouse Gas Accounts *National Inventory Report 2018* (Department of Industry, Science, Energy and Resources, 2020a) and *State and Territory Greenhouse Gas Inventories 2018* (Department of Industry, Science, Energy and Resources, 2020b) provides an overview of the latest available estimates of greenhouse gas emissions at a national and state level.

Australia's total greenhouse gas emissions were estimated to be 537.4 million tonnes of carbon dioxide equivalent (Mt CO_2-e) in 2018. NSW accounted for 24.5 per cent (131.7 Mt CO_2-e) of these emissions. The transport sector accounted for 18.8 per cent (100.8 Mt CO_2-e) of total greenhouse gas emissions nationally and about 21.8 per cent (28.7 Mt CO_2-e) of total greenhouse emissions in NSW. About 85 per cent of the Australian transport sector and 85 per cent of the NSW transport sector was attributable to road transportation in 2018.

Greenhouse gas emissions at the proposal would also be mostly attributed to the transport sector due to the extensive road and rail networks in the vicinity.

Potential impacts

Construction

During construction of the proposal emissions sources would include petrol and diesel-fuelled vehicles and the operation of on-site plant and machinery. Section 67 provides an indicative list of plant and equipment and their associated phase during construction. Contractors would be required to operate and maintain vehicles and equipment to the required standards. The production of construction materials, electricity usage and vegetation clearance would also contribute to greenhouse gas emissions however due to the scale of the proposal the emissions produced during construction are not expected to be significant.

The proposal would incorporate materials with low embodied carbon to reduce indirect greenhouse gas emissions associated with the proposal. This would include the use of a low carbon concrete mix for the precast concrete columns and foundations. A similar low carbon concrete mix would be used for the ramp deck, incorporating a high percentage of recycled aggregate that would improve durability and provide slip resistance, colour contrast and aesthetic quality (Transport for NSW, 2022c).

Due to the construction of the ramp deck, the internal support structure would be designed to minimise weight and embodied carbon, with the damping system allowing further minimisation of mass and embodied carbon (Transport for NSW, 2022c).

Table 6-57 identifies environmental management measures to be implemented by the proposal to minimise greenhouse gas impacts.

Operation

Greenhouse gas emissions during operation of the proposal would be negligible. By creating a safer, more inclusive cycleway, the proposal aims to encourage active transport thereby reducing pressure on the roads. The proposal could result in a net carbon benefit if customers substituted their motorised travel with active travel.

Safeguards and management measures

Environmental management measures proposed to minimise greenhouse gas emission impacts as a result of the proposal are outlined in Table 6-57.

Table 6-57: Greenhouse gas emissions safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
GGCC3	Greenhouse gas emissions	As the proposal will be targeting a Silver rating under SDGv.4, the following compulsory requirements will be prioritised for delivery across the proposal, including: • Carbon Estimate Reporting Tool to be used to reduce emissions across the proposal by a minimum of 10 per cent • Air emissions workbook completed • Compliance with the Transport's *Biodiversity Policy 2022* • Sustainable procurement requirement included in supply chain assessments.	Detailed design / Pre-construction	Additional safeguard SSMP

6.12.2 Air Quality

Air quality in NSW is generally compliant with the national standards, established under the National Environment Protection (Ambient Air Quality) Measure. However, concentrations of particles (as PM10 and PM2.5) and ozone can sometimes exceed national standards, due to pollution events such as bushfires and dust storms (DPIE, 2021). Existing air quality in the study area is likely to be heavily influenced by emissions from vehicles from the adjacent Bradfield Highway, the Cahill Expressway and other main roads surrounding the Sydney Harbour Bridge. Other influences are the prevailing weather and climatic conditions, and any emissions from surrounding industrial and commercial land uses.

An air quality monitoring site was established at the Bradfield Highway (Bradfield Highway site) in 2018 to monitor roadside air quality. The Bradfield Highway site is located approximately 75 metres to the east-north-east of the northern extent of the proposal boundary. Data from the Bradfield Highway site shows that there have been no exceedances of the particulate matter, carbon dioxide, sulfur dioxide, nitrous oxide or ozone standards established under the National Environment Protection (Ambient Air Quality) Measure in the last year (https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-explorer, Accessed: 29 September 2022).

The nearest NSW OEH/ BoM long term air quality monitoring site is the Cook and Phillip site, commissioned in October 2019 and located approximately 3 kilometres to the south of the proposal boundary. The Cook and Phillip site was mostly compliant with ambient air quality standards and goals, as determined by the most up to date New South Wales Annual Compliance Report 2020 (DPIE, 2021). Data from the Cook and Phillip monitoring station shows that there have been no exceedances of carbon monoxide, nitrogen dioxide, sulfur dioxide and ozone standards (DPIE, 2021). During 2020, 86 days were recorded as above national particle standards due to the elevated particle levels from the Black Summer bushfires during the 2019-2020 summer season.

The closest BoM monitoring station is at Observatory Hill. Weather statistics from this site include (Climate statistics for Australian locations (bom.gov.au), Accessed 5 October 2022):

- Mean annual rainfall of 1,213.4 millimetres
- Wettest month June (mean 133.1 millimetres)
- Driest month September (mean 68.1 millimetres)
- Mean wind speed ranges between 7.9 km per hour to 19.5 km per hour and vary in direction across the day and year.

Construction

Dust may cause nuisance impacts when construction activities are located close to sensitive receivers. As described in Section 6.3 and shown in Figure 6-6, the closest sensitive receivers to the proposal boundary include the churches, aged care facilities, a childcare centre and schools. Depending on climate conditions, such as wind speed and direction, impacts to sensitive receivers may be experienced by sensitive receivers as a result of dust, if unmitigated. These impacts are expected to be confined within the area of the immediate works and would be short-term and minor. Potential dust impacts during construction may arise from excavation, materials handling, stockpiling and earthwork activities. Earthwork activities would be limited to relatively shallow excavations and stockpiling of backfill material.

Other potential air quality risks during construction include emissions from construction plant and equipment is associated with the combustion of fossil fuels. A list of indicative plant and equipment required for each construction phase is presented in Table 3-2 of Section 3.3.4.

As such, the extent of impact associated with dust would be short-term and minor, and influenced by the, amount and duration of ground disturbance, local weather conditions (e.g., wind speed and direction), vehicle speeds and frequency of water spraying. Progressive rehabilitation of disturbed areas would also help to reduce the extent of exposed soils.

With the application of the environmental management measures detailed in Section 7.2, it is anticipated that air quality impacts during construction would not result in unacceptable air quality impacts. In addition, contractors would operate and maintain plant and equipment in accordance with required standards.

Operation

Operation of the proposal would not result in an increase in vehicle traffic and it is not associated with forecast traffic conditions. By creating a safer and more accessible cycleway, the proposal aims to reduce the pressure on roads and potentially decrease road-related pollutant contributions, indirectly contributing to an improvement in ambient air quality.

Safeguards and management measures

Environmental management measures proposed to minimise air quality impacts as a result of the proposal, along with the responsibility and timing for those measures are outlined in Table 6-58.

Table 6-58: Air quality Safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
AQ1	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: • Potential sources of air pollution • Air quality management objectives consistent with any relevant published EPA and/or Office of Environment and Heritage (OEH) guidelines • Mitigation and suppression measures to be implemented • Methods to manage work during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces.	Pre-construction / Construction	Section 4.4 of *QA G36 Environment Protection*

6.12.1 Waste

This section describes the potential waste that may be generated by construction and operation of the proposal, including a proposed approach to manage waste.

Existing environment and background

The existing road and cycleway and its use generates little waste. Waste may be generated from pruning or cutting of vegetation and from maintenance activities on the road and cycleway. Litter may also be generated from motorists, bike riders and pedestrians, with waste bin facilities outside the Milsons Point Station entrance.

Assessment of potential impacts

Construction

Various waste streams would be generated during construction and include:

- Cleared excavation
- Spoil
- Utilities and adjustment
- General construction waste
- Vegetation clearing
- Domestic solid and liquid waste from the site compound
- Packaging
- Scrap metal.

Indicative soil spoil volumes as a result of the proposal excavation activities is expected to be up to 1,000 cubic metres.

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 anticipated to be low, as proposed safeguards and management measures would manage potential impact pathways into the surrounding environment.

The proposal would also aim to minimise waste impacts through the adoption of modular design and prefabrication. The incorporation of a lightweight, modular ramp deck and precast concrete columns would allow a high degree of off-site construction and associated efficiency. Once the foundations are formed, the ramp would be constructed and installed as a kit of parts without the need for onsite formwork, temporary works or long closure periods of the park.

Operation

Waste generated during operation would be similar to existing waste that currently occurs along the road and cycleway. No long-term waste-related impacts are anticipated.

The design and materials selected for the proposal have considered the 100-year design life of the structure. Primary elements of the elevated linear bike ramp and elements not easily accessible for inspection or repainting have been designed to a 100-year period as per standard t HR CI 12030 ST. This would include elements such as bearings. For easily accessible elements, the regular maintenance and/or repair period would be up to 25 years, in line with the design life of the coating (paint) systems. All proposed lighting for the proposal would use high-efficiency, long-life LED light sources.

Safeguards and management measures

Environmental management measures proposed to minimise waste impacts as a result of the proposal, along with the responsibility and timing for those measures are outlined in Table 6-59.

Table 6-59: Other impacts safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
W1	Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • Measures to avoid and minimise waste associated with the proposal • Classification of wastes and management options (re-use, recycle, stockpile, disposal) • Statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • Monitoring, record keeping and reporting. The WMP will align with the Environmental Procedure - Management of Wastes on Transport for NSW Land (Transport, 2014) and relevant Transport Waste fact sheets.	Detailed design / Pre-construction	Section 4.2 of QA G36 Environment Protection
W2	Waste	The Sustainability Strategic Management Plan (SSMP) has allocated the following targets for landfill diversion: • 100 per cent of soil spoil volume • Over 90 per cent of inert and non-hazardous waste volume • Over 60 per cent of office waste material volume.	Detailed design / Pre-construction	Additional safeguard SSMP

6.13 Cumulative impacts

Cumulative impacts may arise from the interaction of construction and operation activities of the proposal and other existing or planned projects in the wider area. This may include other Transport projects or large-scale projects within the vicinity of the proposal.

When considered in isolation, specific project impacts may be considered minor. These minor impacts may be more substantial, however, when the impact of multiple projects on the same receivers is considered. Consequently, the extent to which the proposal contributes to the cumulative impacts of existing and planned developments or activities on the environment has been assessed.

6.13.1 Study area

Recently completed, ongoing, or proposed projects within 500 metres of the proposal boundary and their associated impacts have been considered and identified in Table 17 1 below. This analysis was prepared based on the publicly available information as of October 2022.

A Client Control Group (CCG) has been established and is chaired by Transport. It meets monthly to flag and discuss Transport projects in development and delivery within North Sydney LGA and how their respective construction timeframes

interface. The project team also meets fortnightly with the Acting General Manager of North Sydney Council to discuss this proposal.

6.13.2 Other projects and developments

Projects with the potential to contribute to cumulative impacts in combination with the proposal are listed in Table 6-60.

Table 6-60: Past, present and future projects

Project	Construction impacts	Operational impacts
Sydney Harbour Bridge Deck Upgrade The project would involve replacing the existing open transom top and associated railway corridor decking of the Sydney Harbour Bridge with a new concrete deck. Relevant details of the project are as follows: • Located about 150 metres north of the proposal • Currently under construction and expected completion by August 2026.	Construction impacts of the Sydney Harbour Bridge deck upgrade may include: • Traffic impacts: Temporary lane closures of lanes 1 and 2 of the Sydney Harbour Bridge • Several individual possessions of the North Shore Line which would require closure of rail corridor and replacement of buses • Waste generated would include general solid construction waste, consumables generated by site personnel, potential asbestos containing material and other potentially hazardous material e.g., lead based paint • Low and medium construction noise risk impacts in the majority of noise catchments mostly during night works • Visual impacts from construction crews, light spill during night works, cranes and plant visible to local residents, road users and visitors using the walkway or bike lane across the bridge, plant and equipment located within the rail corridor, particularly at night • Low heritage impact on the fabric and significance of the Sydney Harbour Bridge.	Operational impacts of the Sydney Harbour Bridge deck upgrade project may include: • Significant reduction in operational rail noise levels at the most critical receiver locations • Providing improved safety, reliability, and a reduction in maintenance issues and operational noise • No significant impact on overall views of the bridge, only minor impacts on deck, below deck and water views.
Sydney Harbour Bridge Arch Maintenance Units The project would involve the replacement of the four existing arch maintenance units atop the arches of the Sydney Harbour Bridge with a single unit that spans the east and west arches. Relevant details are as follows: • The project is located on the Sydney Harbour Bridge • Construction was expected to commence in 2021 and be completed in 2026	Construction impacts of Sydney Harbour Bridge Arch Maintenance Units project may include: • Direct impacts to the fabric of the Heritage listed Sydney Harbour Bridge associated with a larger work force presence in the area. • Impacts to water quality resulting from discharge of lead contaminated dust into the surrounding environment • Air quality impacts relating to dust generation	Operational impacts of the Sydney Harbour Bridge Arch Maintenance Units project may include: • Heritage and visual impacts to the Sydney Harbour Bridge resulting from the introduction of permanent new elements • Improvements to effectiveness, efficiency, accessibility and safety of critical maintenance activities.

Project	Construction impacts	Operational impacts
North Sydney Olympic Pool Aquatic Centre The project involves a major redevelopment of North Sydney Olympic Pool. Relevant project details are as follows: • Located at 4 Alfred Street, North Sydney, about 200 metres southwest of the proposal • Currently under construction and expected completion by July 2023.	Construction impacts of the North Sydney Olympic Pool Aquatic Centre redevelopment project may include: • The subject site is identified as a heritage item of local significance under the North Sydney LEP 2013 and is located in close proximity to several heritage items of local and state significance including the Sydney Harbour Bridge north pylons • Visual impacts to Bradfield Park South • Traffic generation would include 12 trips in and out per day and would not adversely impact the surrounding road network • Removal of seven trees.	Operational impacts of the North Sydney Olympic Pool Aquatic Centre redevelopment project may include: • Improved water quality of stormwater discharged from the developed site • Visual impacts from various viewpoints including Bradfield Park South, assessed between low and moderate.
Warringah Freeway Upgrade The project would upgrade four kilometres of the Warringah Freeway between High Street at North Sydney and Willoughby Road at Naremburn. • Located on the Warringah Freeway, with the southern extent about 35 metres east of the proposal boundary • Currently under construction and expected completion in 2027.	Construction impacts of the Warringah Freeway Upgrade may include: • Temporary additional construction vehicle traffic movements to and from the project site, resulting in increased local traffic • Temporary noise generated in the area from road works • Short-term changes to public transport locations and routes	Operational impacts of the Warringah Freeway Upgrade may include: • Improved flow and connectivity for motorists, public transport users and active transport users • Future connection to Beaches Link and Western Harbour Tunnel

6.13.3 Potential impacts

Construction

Table 6-61 identifies potential cumulative construction impacts associated with the proposal and other projects identified in Table 6-60.

Table 6-61: Potential cumulative construction impacts

Environmental factor	Construction impacts
Heritage	Access and operational modifications to the Sydney Harbour Bridge are presently ongoing in both design and construction phases. The replacement of the four existing arch maintenance units with a single unit spanning the east and west arches would directly impact the fabric of the Sydney Harbour Bridge however the deck upgrade has been assessed as having low heritage impact on the fabric and significance of the Sydney Harbour Bridge. Heritage impacts attributed to the construction of the proposal are outlined in Section 6.1.3. Increased and cumulative construction activities associated with the replacement of the arch maintenance units, deck upgrade and the proposal may lead to direct impacts to the heritage values of the Sydney Harbour Bridge.
Visual	Cumulative construction works in the area have the potential to impact the aesthetic value of the surrounding area. Section 6.2.3 discusses the potential visual impacts associated with the proposal.

Environmental factor	Construction impacts
	As there are no major projects within the immediate vicinity of this proposal it is likely that cumulative construction impacts on visual amenity would be minimal. The Sydney Harbour Bridge deck upgrade has the potential to cause cumulative visual impacts to the area surrounding the proposal. This may include the presence of hoarding and stockpiling and construction site fencing. The projects close proximity with the proposal construction footprint has potential to result in visual impacts during construction. The majority of bridge deck upgrade works would be completed at night and may occur concurrently with night works for the proposal. During out of hours works, individual lighting and overall cumulative lighting would have a negligible operational visual impact due to the small number of lights proposed.
Noise	Construction of the projects mentioned in Table 6-60, in particular the Sydney Harbour Bridge deck upgrade, Warringah Freeway Upgrade and the proposal would occur concurrently, resulting in potential overlap in construction noise. The deck upgrade and Warringah Freeway upgrade are both currently under construction, with expected completion dates of 2026 and 2027 respectively. Cumulative noise impacts associated with the projects mentioned above and the proposal may be experienced by local residents and businesses. This would potentially include areas within Milsons Point and Kirribilli which are in close proximity to the construction works. Additionally, construction noise from the Warringah Freeway upgrade may include, but not be limited to, the use of temporary noise barriers, using less noisy equipment and staging works to avoid extended periods of disruption. As these projects are managed by Transport, ongoing planning would ensure impacts are adequately reduced. Coordination of noisy construction work, particularly out of hours work, and noise mitigation controls would be undertaken in a consistent manner following Transport's Construction Noise and Vibration Guideline (2016).
Socio-economic	There would be potential for a minor degree of cumulative impacts to occur during construction. Potential cumulative impacts include traffic delays and temporary changes to amenity resulting from environmental impacts. This may cause a decrease in patronage to local businesses in the surrounding area as well as a change in amenity as a result of temporary loss of public open and green space. Potential impacts also include construction fatigue, and the confusion and nuisance of having to keep up with changes relating to access and consultation / notification from multiple contractors relating to multiple projects. The presence of a number of construction sites in the area may result in a general feeling of congestion. The proposal aims to mitigate the cumulative impacts by allocating space for construction vehicles to park at the ancillary facility. A coordinated approach to the management and construction of the proposal and nearby concurrent projects would ensure that cumulative impacts are minimised. The proposal construction is expected to take up to 18 months, with cumulative operational impacts outlined in Table 6-62.
Traffic	There would be the potential for some overlap in construction traffic as a result of North Sydney Olympic Pool redevelopment project. This would be minor as construction is expected to reach completion in July 2023.

Operation

Table 6-62 identifies potential cumulative operational impacts associated with the proposal and other projects.

Table 6-62: Potential cumulative operational impacts

Environmental factor	Operational impacts
Heritage	The proposal and Sydney Harbour Bridge Arch Maintenance Units projects is expected to have low heritage impacts, as stated in Table 6-61. Although minor cumulative impacts to fabric would be likely, these combined projects would allow better access to the public and would support ongoing use and longevity of the Sydney Harbour Bridge as an item of national and state heritage significance. This would be a positive impact in line with the Sydney Harbour Bridge Conservation Management Plan

Environmental factor	Operational impacts
Visual	The proposal design would seek to reduce the cumulative visual impacts by minimising visual impacts of the proposal. This includes a design that is light and transparent and minimises the overall visual intrusion through sympathetic design. The existing landscape setting would be retained to minimise visual impacts to the local community. Negative cumulative visual impacts would occur as a result of the arch maintenance units project due to the introduction of permanent new elements to the Sydney Harbour Bridge.
Noise	The proposal is not anticipated to create any additional operational noise, as outlined in Section 6.3.4.
Socio-economic	During the operation of the proposal, negative cumulative impacts are not anticipated. The implemented cycleway upgrade in combination with the North Sydney Olympic Pool redevelopment would encourage participation in exercise, such as swimming and bike riding, as well as utilisation of green and open spaces. Increased through trips in the area as a result of improved infrastructure and facilities may lead to increased patronage at local businesses.
Traffic	Operation of the proposal has the potential to provide positive cumulative traffic impacts. The proposal would improve active transport accessibility and safety, resulting in a greater active transport participation and decreased motorists on the road. This may offset the increase in road traffic associated with construction workforce presence in the area.

6.13.4 Safeguards and management measures

Environmental management measures proposed to avoid, reduce or manage cumulative impacts as a result of the proposal and surrounding projects have been identified in Table 6-63.

Table 6-63: Cumulative safeguards and management measures

ID	Impact	Environmental safeguards	Timing	Reference
CI1	Cumulative visual	Out of hours works would be coordinated with the Sydney Harbour Bridge Deck Upgrade to minimise light spill at night.	Construction	Additional safeguard CI1
CI2	Cumulative 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.	Pre-construction/ construction	Additional safeguard CI2
CI3	Cumulative 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 Transport projects being constructed at the same time.	Pre-construction/ construction	Additional safeguard CI3

7. Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer, Sydney and surrounds region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the *QA Specification G36 - Environmental Protection (Management System).*

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	Timing	Reference
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Senior Manager Environment and Sustainability prior to commencement of the activity. As a minimum, the CEMP will address the following: • Any requirements associated with statutory approvals • Details of how the project will implement the identified safeguards outlined in the ref • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity.	Pre-construction / detailed design	Additional safeguard GEN1
GEN2	General - notification	All businesses, residential properties and other key stakeholders (eg schools, Council) affected by the activity will be notified at least five days prior to commencement of the construction.	Pre-construction / Construction	Additional 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. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • Areas of non-Aboriginal heritage sensitivity, in particular works adjacent to and impacting the Sydney Harbour Bridge • Adjoining sensitive receivers requiring particular noise management measures.	Construction	Additional safeguard GEN3

No.	Impact	Environmental safeguards	Timing	Reference
GEN4	General – minimise construction footprint	Further design development and construction planning will aim to minimise the area needed for construction. Construction works will be staged to minimise the area required for construction at any one time and minimise impacts to open space in Bradfield Park.	Pre-construction / Construction	Additional safeguard GEN4
NAH1	Non-Aboriginal heritage	The proposal will update and/or provide further assessment of heritage impacts to Heritage NSW during the detailed design phase of the proposal, as required by the s60 approval by Heritage NSW. This may include: • Further heritage impact assessment on the detailed design for the proposal • A materials and finishes palette • Photographic Archival Recording of the site and surrounding areas.	Detailed design	Additional safeguard NAH1
NAH2	Non-Aboriginal heritage	Design of the proposal will progress in accordance with the conservation policies and management measures outlined in the Sydney Harbour Bridge Conservation Management Plan prepared by GML (2021) and the Supplementary Detailed Heritage Framework (draft) prepared by TZG (2021).	Detailed design	Additional safeguard NAH2
NAH3	Non-Aboriginal heritage	A Heritage Interpretation Strategy (HIS) will be prepared and considered during progression of detailed design, in accordance with the recommendations in the Sydney Harbour Bridge Conservation Management Plan (GML, 2021) and the Supplementary Detailed Heritage Framework (draft) (TZG,2021) as well as any other future heritage interpretation documentation prepared for the proposal. Appropriate heritage interpretation must be incorporated into the design for the proposal in accordance with the NSW Heritage Office's NSW Heritage Manual (1996), Interpreting Heritage Places and Items Guidelines (2005b), and Heritage Interpretation Policy (2005a). The Sydney Harbour Bridge Interpretation Plan 2007 must also be referred to during the preparation of the HIS. Opportunities for interpretative displays in appropriate locations will be explored as part of this HIS.	Detailed design	Additional safeguard NAH3
NAH4	Non-Aboriginal heritage	The Design Integrity Panel (DIP), incorporating heritage, design and Connecting with Country expertise, will have continued involvement in the design process and throughout the construction of proposal. Specialist heritage advice will continue to inform the detailed design of the proposal. Detailed design will consider the following design improvements: • Refinements to the architectural and structural design of the ramp to ensure a lightweight and contemporary architectural and structural design that compliments its heritage and open space context • Refinements to the detailing for ramp connection with the bridge viaduct to ensure the design is sensitive and elegant, but remains safe for users • Refinements to the section of parapet to be removed for the cycleway ramp connection • Refinements to the lighting design along the proposal. The lighting design will retain and minimise impacts to the existing lighting arrangement • The existing heritage walk in Bradfield Park including heritage interpretive signage will be incorporated within the new design for the northern landing plaza and public domain.	Detailed design and construction	Additional safeguard NAH4

No.	Impact	Environmental safeguards	Timing	Reference
NAH5	Non-Aboriginal heritage	Further consultation with key heritage stakeholders, including (but not limited to) Transport for NSW Heritage, Heritage NSW, and the Department of Climate Change, Energy, the Environment and Water (DCCEEW) must be undertaken in detailed design.	Detailed design	Additional safeguard NAH5
NAH6	Non-Aboriginal heritage	An appropriately qualified and experienced heritage architect will provide independent review periodically throughout detailed design and construction. The heritage architect will prepare or review and approve a materials and finishes palette for the proposal for approval by Heritage NSW.	Detailed design	Additional safeguard NAH6
NAH7	Non-Aboriginal heritage	A materials and finishes palette for the ramp and landing in Bradfield Park will be further developed in detailed design, incorporating specialist heritage input and DIP advice.	Detailed design	Additional safeguard NAH7
NAH8	Non-Aboriginal heritage	The heritage interpretation and Connecting with Country opportunities will be developed and documented within the HIS in consultation with the Design Integrity Panel (DIP), Aboriginal knowledge holders and Heritage NSW.	Detailed design	Additional safeguard NAH8
NAH9	Non-Aboriginal heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific drafting guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and methodology around when and from where heritage advice will be sought.	Detailed design / Pre-construction	Section 4.9 of QA G36 Environment Protection
NAH10	Non-Aboriginal heritage	An Archaeological Research Design will be prepared for the proposal by a suitably qualified Excavation Director prior to ground disturbance activities. The Archaeological Research Design will include a management plan for potential archaeological remains, this will include an assessment as to which works will be managed under the relevant Sydney Harbour Bridge Conservation Management Plan exemptions from Heritage Act approval.	Detailed design / Pre-construction	Additional safeguard NAH10
NAH11	Unexpected non-Aboriginal heritage finds	The Transport for NSW Unexpected Heritage Finds Procedure (2021) 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.	Construction	Section 4.9 of QA G36 Environment Protection
NAH12	Non-Aboriginal heritage	Photographic Archival Recording (PAR) and reporting will be carried out prior to commencement of construction. The PAR will be prepared in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998a), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006). The record will be prepared by a suitably qualified heritage consultant using archival-quality material. Records will be provided as follows: • Records for SHR listed items would be provided to NSW Heritage Council and the State Library. • Records for LEP-listed items will be provided to North Sydney Council and local library(s). • A copy of the record will be provided to the owner of the asset.	Pre-construction	Additional safeguard NAH12

No.	Impact	Environmental safeguards	Timing	Reference
NAH13	Non-Aboriginal heritage	Site rehabilitation measures related to construction sites will be incorporated within an Urban Design and Landscape Plan. The objective of the rehabilitation will be to minimise long-term impacts on the visual amenity of the items by recreating a sympathetic environment.	Pre-construction / Construction	Additional safeguard NAH13
NAH14	Non-Aboriginal heritage	A heritage induction will be prepared for the proposal and delivered to all staff working on the proposal.	Construction	Additional safeguard NAH14
NAH15	Non-Aboriginal heritage	Operating plant (swinging, reversing, moving etc.) will adhere to standard setbacks and clearances from heritage structures and items which are not identified to be impacted.	Construction	Additional safeguard NAH15
NAH16	Non-Aboriginal heritage	Temporary hording and signage will be placed around heritage buildings and structures to be avoided during works and will include interpretative signage or artwork on the hording to reduce the visual impacts during construction.	Construction	Additional safeguard NAH16
NAH17	Non-Aboriginal heritage	Vibration monitoring will be carried out throughout construction to ensure no indirect impacts occur to heritage items and the public domain.	Construction	Additional safeguard NAH17
LV1	Landscape character and visual impact	An Urban Design Plan will be prepared to support the final detailed proposal design and implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and bike rider elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage • Tree replacement requirements as identified in the Tree Hollow Replacement Plan • Procedures for monitoring and maintaining landscaped or rehabilitated areas. The Urban Design Plan will be prepared in accordance with relevant guidelines, including: • Beyond the Pavement urban design policy, process and principles (Transport for NSW, 2020c) • Landscape Design Guideline (Roads and Maritime Services, 2018b) • Bridge Aesthetics (Transport for NSW, 2019a) • Noise Wall Design Guidelines (Transport for NSW, 2019b)	Detailed design / pre-construction	Core standard safeguard LV1 Beyond the Pavement urban design policy, process and principles (Transport for NSW, 2020c) Landscape Design Guideline (Roads and Maritime Services, 2018b) Bridge Aesthetics (Transport for NSW, 2019) Noise Wall Design Guidelines (Transport for NSW, 2019) Shotcrete Design Guideline (Roads and Maritime Services, 2016a)

No.	Impact	Environmental safeguards	Timing	Reference
		• Shotcrete Design Guideline (Roads and Maritime Services, 2016a) • All lighting will be managed in accordance with AS4282:2019 *Control of the obtrusive effects of lighting*.		
LV2	Landscape character and visual impact	The following design elements will be considered in detailed design: • Ensure the width of the ramp piers are slender to minimise their visual mass and scale • Use of visually light-weight materials and a neutral colour palette to reduce the visual prominence of the ramp • Contemporary materials and design to differentiate the structure from the heritage features and minimise the impact on the landscape character of the bridge and its setting • Bridge alignment to minimise the obstruction to the visual features of the bridge including the Milsons Point Station entry, including the cartouche where possible • Minimise the height of the ramp so that it does not rise substantially above the Sydney Harbour Bridge walls • Minimise the removal of trees and vegetation where possible • Where vegetation removal is necessary, avoid trees that contribute to the symmetry and integrity of the station entrance plaza design where possible • Ensure line markings are sympathetic to the character of the station entrance plaza and heritage values of the setting • Minimise any visual clutter created by lighting, signage, CCTV and any other aboveground infrastructure within the visual setting of the Sydney Harbour Bridge • Relocate or provide new table tennis in another location in the local area to replace the removed table from within Bradfield Park.	Detailed design	Additional safeguard LV2
LV3	Wayfinding	Temporary access arrangements will be well signed and provide a visually legible route for bike riders and pedestrians.	Construction	Additional safeguard LV3
LV4	Public access	Construction staging will ensure public access to recreational areas of the station entrance plaza are maintained where possible and reduced access to these facilities is minimised.	Pre-Construction/ Construction	Additional safeguard LV4
LV5	Hoarding	High quality hoarding will be used and incorporate artwork prepared in consultation with stakeholders.	Construction	Additional safeguard LV5
LV6	Public spaces	Construction equipment and activity will be consolidated to maximise the area of useable public realm where possible.	Construction	Additional safeguard LV6
NV1	Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim Construction Noise Guideline (ICNG) (DECC, 2009) and identify:	Detailed design / Pre-construction	Section 4.6 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Timing	Reference
		• All potential substantial noise and vibration generating activities • Feasible and reasonable mitigation measures to be implemented to avoid and minimise noise impacts • A monitoring program to assess performance against relevant noise and vibration criteria • A communications plan with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.		
NV2	Noise	Noise mitigation measures that will be adopted in the NVMP will include: • Selection of less noisy and less vibration emitting construction methods/plant and equipment, where feasible and reasonable • The noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the criteria in Appendix H of the Construction Noise and Vibration Guideline (Transport for NSW, 2016) • Maximising the offset distance between noisy plant and adjacent sensitive receivers • Avoiding simultaneous operation of noisy plant, where feasible • Planning construction traffic flow, parking and loading/unloading areas to minimise reversing movements • Selecting site access points and delivery locations as far as possible from sensitive receivers.	Construction	Additional safeguard NV2
NV3	Vibration	Vibration mitigation measures that will be adopted in the NVMP include: • Undertaking a plant and vibration assessment to identify potential vibration risks to human comfort and cosmetic and structural damage • Where identified as being required, undertaking a pre-construction building surveys for structures prior to commencement of activities with the potential to cause property damage • Conducting vibration monitoring at high-risk receptors during construction • Consideration of feasible alternative construction methodologies or equipment where vibration intensive equipment is expected to exceed the criteria.	Pre-construction/ Construction	Additional safeguard NV3
NV4	Noise and vibration	All sensitive receivers (e.g. schools and local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The proposal • The construction period and construction hours	Detailed design / Pre-construction	Standard safeguard NV4

No.	Impact	Environmental safeguards	Timing	Reference
		• Contact information for project management staff • Complaint and incident reporting • How to obtain further information.		
NV5	Noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All project specific and relevant standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures.	Pre-construction, construction, operation or other as required	Standard safeguard NV5
NV6	Construction hours	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. If the work cannot be undertaken during the day, it should be completed before 11 pm. Where work is to be carried out outside of recommended working hours, all affected receivers will be notified of all relevant details of the proposed activities.	Construction	Additional safeguard NV6
NV7	Construction hours	Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations, whether at an institution or within a residence, such as before or during Higher School Certificate and at the end of higher education semesters.	Construction	Additional safeguard NV7
NV8	OOHW	OOHW during evening and night periods will managed in accordance with Transport's Construction Noise and Vibration Strategy to provide respite from construction noise. High noise activities, such as saw cutting and jack hammering, would be completed prior to midnight.	Construction	Additional safeguard NV8
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport *Traffic Control at Work Sites Manual* (Transport, 2022) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2008). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties	Detailed design / Pre-construction	Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Timing	Reference
		• Site-specific traffic control measures (including signage such as portable and static variable message signs) to manage and regulate traffic movement • Measures to maintain pedestrian and bike rider access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • Designated areas within the proposal area for heavy vehicle turning movements, parking, loading and unloading • On-site parking arrangements for construction, supervisory and management personnel • Sequence for implementing traffic works and traffic management devices • Safety principles for construction activities, such as speed limits around the site and procedures for specific activities • Induction requirements for construction, supervisory and management personnel • Procedures for inspections and record keeping for maintaining traffic control measures • Contact details of key proposal personnel • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.		
TT2	Traffic and transport	Further traffic modelling will be carried out to confirm the impacts of the raised pedestrian and cyclist priority crossing on Alfred Street South and its impacts on the road network. This would include obtaining traffic counts and queue data for intersections in the vicinity of the proposal and assessing the impacts of the proposal.	Detailed design	Additional safeguard TT2
TT3	Pedestrians and bike riders	Appropriate signage and wayfinding facilities relating to changes to pedestrian and bike rider access during construction will be developed and implemented.	Pre-construction, construction	Additional safeguard TT3
TT4	Pedestrians and bike riders	The TMP will provide details on managing active transport movements near the construction site. The following key principles will guide the development safe active transport arrangements: • Pedestrians and bike riders will be kept clear of work sites at all times. Construction areas will be defined by temporary pedestrian fencing or more substantial fencing in urban or shopping areas	Detailed design / construction	Additional safeguard TT4

No.	Impact	Environmental safeguards	Timing	Reference
		• Temporary footpaths will be adequately signposted to indicate the direction of the footpath, be of all-weather standard, consist of equivalent material and performance to adjacent footpath and have an unobstructed width at local constrictions no less than one metre (elsewhere at least two metres) • Crossing facilities and associated signs will be maintained where possible. If access to an existing crossing cannot be provided, alternative facilities as close as possible to the established crossing are to be provided • Traffic management in the form of lowered speed limits will be implemented to facilitate a safer environment for pedestrians who may have been displaced from the footpath as a result of construction work • Where traffic is flowing temporarily in the opposite direction from normal, medians, refuges or other physical devices are required to separate lanes • The installation of construction barriers along the side of the road may result in some reduction in lane width for vehicles and bicycles alike, increasing the risk of collision. The speed limit on Alfred Street South will therefore be reduced to minimise potential conflicts between bike riders and vehicles • Bike rider needs and visibility will need to be considered in providing lighting at night • Roadworks signs will be positioned above the head height of bike riders • Barrier boards will not be placed so that they direct bike riders away from allocated cycle paths • Adjacent to the work site, pavement surfaces will be maintained in a clean smooth state to ensure bike rider comfort and safety. The edges of temporary surfaces will be 'feathered' to remove any hazardous edges.		
TT5	Parking	Parking spaces identified for removal will be removed progressively as construction works dictate, and works will be optimised to limit the impact on vehicle spaces outside of the necessary construction zone.	Pre-construction, construction	Additional safeguard TT5
TT6	Parking	Construction works will be staged to minimise the loss of parking at any one time during construction.	Pre-construction, construction	Additional safeguard TT6
TT7	Parking	Consultation with Council will be undertaken from an early stage of design to enable the proposed temporary reductions in metered parking arrangements throughout the construction period and for any permanent changes to metered parking.	Pre-construction	Additional safeguard TT7
TT8	Parking	Construction workers will be encouraged to use public transport to access the proposal.	Construction	Additional safeguard TT8
TT9	Public transport	If any additional bus stop relocations are required during the construction period, consultation and coordination with affected bus operators, Council, other stakeholders and appropriate Transport staff will be undertaken in conjunction with any temporary bus stop relocations, in addition to the provision of signage to assist in wayfinding.	Pre-construction, construction	Additional safeguard TT9
TT10	Public transport	Wayfinding tools such as sign posting will be implemented in the event that pedestrians are required to be diverted from the Alfred Street South Milsons Point Station access. A detailed construction traffic and access	Pre-construction, construction	Additional safeguard TT10

No.	Impact	Environmental safeguards	Timing	Reference
		assessment will be carried out before construction when the detailed staging and work methodology has been developed.		
TT11	Traffic and ancillary facilities access management	For each stage of construction, detailed TGSs (Traffic Guidance Scheme) will be prepared and implemented in accordance with the Traffic control at work sites, version 6.1 (TfNSW, 2022) by suitably qualified personnel.	Pre-construction, construction	Additional safeguard TT11
TT12	Traffic and ancillary facilities access management	For each stage of construction, access will be maintained to the La Capaninna restaurant. For the duration of construction works where direct access is unavailable, an alternative route will be provided via a driveway through the bowling green of Alfred Street South.	Pre-construction, construction	Additional safeguard TT12
TT13	Traffic and ancillary facilities access management	Dilapidation surveys of roads around the proposal will be undertaken prior to their use for construction as well as after construction is complete. Any damage to roads resulting from construction of the proposal will be repaired.	Pre-construction, construction	Additional safeguard TT13
TT14	Traffic and ancillary facilities access management	Direct access at the frontages of the ancillary facility will be provided with adequate sight distances relating to the posted road speed. This will allow vehicles on the main road to see vehicles emerging from the construction compound and will allow ample room to slow down and stop if necessary. Similarly, it will allow vehicles waiting to emerge from the site access, adequate sight distance to see approaching vehicles and determine acceptable gaps for them to enter the main road traffic.		Additional safeguard TT14
TT15	Traffic and ancillary facilities access management	The ancillary facility will generally have traffic control at the site access to manage the vehicular traffic into and out of the ancillary facility and to manage pedestrian movement across the access.	Construction	Additional safeguard TT15
TT16	Traffic and ancillary facilities access management	All vehicles accessing the construction site for the purpose of material delivery and construction works will be fitted with safety flashing lights located on the top of the vehicle and functioning reverse beepers. All operators will be licensed for the particular item of plant/ equipment, and will demonstrate competence in the use of the plant/ equipment as part of the site management and safety plan.	Construction	Additional safeguard TT16
TT17	Traffic and ancillary facilities access management	All vehicles accessing the construction site will be sized adequately to address clearance constraints such as the clearance over the Burton Street underpass, and powerlines and trees.	Construction	Additional safeguard TT17
TT18	Traffic and ancillary facilities access management	Routes used for access and haulage during construction will be developed in consultation with relevant stakeholders upon confirmation of material source and disposal locations and will be outlined in the TMP.	Construction	Additional safeguard TT18

No.	Impact	Environmental safeguards	Timing	Reference
TT19	Traffic and ancillary facilities access management	Appropriate construction speed limits will be implemented in consultation with Transport to facilitate safety of road users and construction personnel during construction.	Construction	Additional safeguard TT19
TT20	Traffic and ancillary facilities access management	Traffic management plans will specifically address night works safety issues to protect motorists and construction personnel.	Pre-construction, construction	Additional safeguard TT20
TT21	Traffic and ancillary facilities access management	Temporary accesses, entrances and exits, road works and other traffic management measures will be designed and operated to conform with relevant road safety and Transport requirements and will not impact upon the safety of the users of the existing road network.	Pre-construction, construction	Additional safeguard TT21
TT22	Load and delivery	Pedestrian and vehicle access to adjoining properties will be maintained throughout the duration of the work, where possible.	Pre-construction, construction	Additional safeguard TT22
TT23	Access	Properties impacted during construction, such as the businesses located along the western side of Alfred Street South, will be notified prior to the commencement of construction and advised to schedule deliveries outside of work hours. Store owners will additionally be consulted regarding temporary access arrangements to their properties.	Pre-construction	Additional safeguard TT23
TT24	Pedestrian and bike rider safety	Appropriate signage will be installed warning bike riders of potential conflict points and the need for lowered speeds. Barricades will be installed as required by the ROLs and TMP. This will avoid pedestrians and bike riders following desire line through the roundabout.	Construction	Additional safeguard TT24
TT25	Pedestrian safety	Detailed design will consider the potential for safety issues resulting from reduced visibility for eastbound drivers to pedestrians waiting to cross on the northern side of Lavender Street when a bus is stopped at the Lavender Street opposite Cliff Street bus stop. Consultation with stakeholders with reference to relevant bus stop design guidelines should be undertaken to ensure the safety of the pedestrian crossing will be maintained.	Detailed design	Additional safeguard TT25
TT26	Pedestrian safety	Pedestrian fencing will be installed along Alfred Street South near the location of the existing pedestrian refuge to deter unsafe crossings near the roundabout after the completion of the raised pedestrian crossing	Construction	Additional safeguard TT26
TT27	Cyclist safety	Potential conflict points between cyclists and vehicles that may result from the widening of the shared path at the corner of Lavender Street and Alfred Street South, consideration for cyclist safety across this connection will be included in further design development.	Detailed design	Additional safeguard TT27
TT28	Parking	The operational impact of the removal of about 15 parking spaces will be managed through consultation with impacted stakeholders, including Council and adjacent property occupiers.	Construction	Additional safeguard TT28

No.	Impact	Environmental safeguards	Timing	Reference
TT29	Road Safety Audit	A Road Safety Audit will be conducted of the proposed cycleway upgrade and impacts on the surrounding road network by an independent party at each stage of design and implementation (concept design, detailed design, temporary works arrangement and pre-opening). Any potential safety issues identified through these audits will be addressed prior to progressing to the next stage of design or prior to opening the facility.	Concept design. Detailed design/Pre-construction	Additional safeguard TT29
C1	Unexpected contamination exposure	An Unexpected Finds Protocol will be developed to be implemented during onsite soil disturbance works in the event of the identification of any unforeseen contaminated land evidence.	Pre-construction	Additional safeguard C1
C2	Contamination exposure	A targeted site investigation in accordance with the requirements of NEPM 2013 will be undertaken at the proposal boundary before the start of construction to assess contamination status. This will include an in-situ waste classification of soils as disposal of soils will require classification prior to excavation and removal from the proposal boundary.	Pre-construction	Waste Classification Guidelines-Part 1: Classifying Waste (NSW EPA, 2014)
C3	Contamination exposure	The findings of the targeted site investigation and in-situ waste classification will inform the appropriate management, handling and/or disposal of excess soils.	Construction	Additional safeguard C3
SE1	Property acquisition	All property acquisition will be carried out in accordance with the *Property Acquisition Process (IP-001-PS V1.0* (Transport for NSW, 2021a) and the *Land Acquisition (Just Terms Compensation) Act 1991*.	Pre-construction/ Construction	Core standard safeguard SE1
SE2	Socio-economic	A Community Liaison Management Plan (CLMP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CLMP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. The CLMP will be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008).	Detailed design/Pre-construction	Core standard safeguard SE2
SE3	Major events	Coordination with North Sydney Council and key stakeholders including Kirribilli markets operator will be undertaken to minimise impacts on major events.	Pre-construction/ Construction	Additional safeguard SE3
B1	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Transport's Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects (RMS, 2011), Transport's Tree and hollow replacement guidelines (2022) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in requirements set out in the Landscape Guideline (RMS, 2008) • Pre-clearing survey requirements	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Timing	Reference
		• Procedures for unexpected threatened species finds and fauna handling • Protocols to manage weeds and pathogens • Identify the process to be followed should additional tree trimming be required as part of the construction activities, in accordance with Transport's environmental management systems.		
B2	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.	Detailed design / pre-construction	Additional safeguard B2
B3	Biodiversity	A 3D cloud point survey will be undertaken to accurately record the dimensions of the trees and ensure adequate clearance is provided to the trees to be retained. The potential movement of the trees' trunks and crown in high winds and minimum vertical clearances below their crowns will be considered during the design process.	Detailed design / pre-construction	Review of Potential Tree Impacts report (Tree iQ, May2022) (Appendix I – Preliminary aboricultural report)
B4	Biodiversity	An Arboricultural Impact Assessment and Tree Protection Plan will be prepared by an Arborist (AQF Level 5) during detailed design to examine the potential impact of the proposal on trees and provide recommendations for tree sensitive methods and tree protection measures.	Detailed design / pre-construction	Review of Potential Tree Impacts report (Tree iQ, May 2022) (Appendix I – Preliminary aboricultural report)
B5	Biodiversity	A suitably qualified ecologist will supervise the removal of all required trees to observe for fauna welfare in case of injury during tree removal.	Construction	Additional safeguard B5
B6	Biodiversity	Tree removal and pruning shall be undertaken by a Contracting Arborist with minimum AQF Level 3 Arboricultural Qualifications and will comply with the NSW Work Cover Code of Practice for the Amenity Tree Industry.	Construction	Additional safeguard B6
B7	Biodiversity	A Tree and Hollow Replacement Plan will be prepared by professional suitably qualified in rehabilitation and restoration techniques, in accordance with Transport's Tree and hollow replacement guidelines (2022) and implemented as part of the CEMP. The Tree Hollow Replacement Plan will form part of the Urban Design and Landscape Plan that will be developed for the proposal. It will include, but not be limited to: • A site prioritisation and identification, including tenure, current zoning and management arrangements • Soil/site preparation requirements • Planting strategy and maintenance • Reporting.	Detailed design / pre-construction	Transport's *Tree and hollow replacement guidelines* (2022)
SW1	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 proposal.	Detailed design / pre-construction	Additional safeguard SW1

No.	Impact	Environmental safeguards	Timing	Reference
SW2	Surface run off	During construction site water will be managed locally with appropriate erosion and sediment controls. Off site water will be diverted around and away from the area of disturbance within the proposal boundary to avoid generating sediment laden water on site.	Pre-construction and Construction	Additional safeguard SW2
SW3	Mobilisation and discharge of sediment 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.	Pre-construction and Construction	Section 2.1 of QA G38 Soil and Water Management
SW4	Mobilisation and discharge of sediment during construction	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.	Pre-construction and Construction	Section 2.2 of QA G38 Soil and Water Management
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Stage 1 Procedure for Aboriginal cultural heritage consultation and investigation (Transport, 2012) and Unexpected Heritage Items Procedure (Transport for NSW, 2022d) and implemented as part of the CEMP. It will provide specific drafting guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Detailed design / Pre-construction	Section 4.9 of QA G36 Environment Protection
AH2	Aboriginal heritage	The nearest AHIMS site (AHIMS ID 45-6-1271) will be marked on all construction plans, ensuring impacts are avoided.	/Pre-construction/ Construction	Additional safeguard AH2
AH3	Aboriginal heritage	Aboriginal social, cultural and contemporary value would be considered through: • Consultation with the Aboriginal community • Preparation of an interpretive plan for Aboriginal cultural heritage values.	Detailed design/Pre-construction	Additional safeguard AH3
AH4	Aboriginal heritage	Unexpected Heritage Items Procedure (Transport for NSW, 2022d) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport 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.	Pre-construction/Construction	Section 4.9 of QA G36 Environment Protection
GGCC1	Greenhouse gas emissions	• The procurement strategy developed for the construction phase will demonstrate value for money and consideration for opportunities to procure goods and services: • From local suppliers • That are energy efficient or have low embodied energy • That minimise the generation of waste • That make use of recycled materials.	Construction	Additional safeguard GGCC1

No.	Impact	Environmental safeguards	Timing	Reference
GGCC2	Climate change	• Undertake a detailed climate change risk assessment prior to detailed design	Detailed design	Additional safeguard GGCC2
GGCC3	Greenhouse gas emissions	As the proposal will be targeting a Silver rating under SDGv.4, the following compulsory requirements will be prioritised for delivery across the proposal, including: • Carbon Estimate Reporting Tool to be used to reduce emissions across the proposal by a minimum of 10 per cent • Air emissions workbook completed • Compliance with the Transport's *Biodiversity Policy 2022* • Sustainable procurement requirement included in supply chain assessments.	Detailed design / Pre-construction	Additional safeguard SSMP
AQ1	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: • Potential sources of air pollution • Air quality management objectives consistent with any relevant published EPA and/or Office of Environment and Heritage (OEH) guidelines • Mitigation and suppression measures to be implemented • Methods to manage work during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces.	Pre-construction / Construction	Section 4.4 of *QA G36 Environment Protection*
W1	Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • Measures to avoid and minimise waste associated with the proposal • Classification of wastes and management options (re-use, recycle, stockpile, disposal) • Statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • Monitoring, record keeping and reporting. The WMP will align with the Environmental Procedure - Management of Wastes on Transport for NSW Land (Transport, 2014) and relevant Transport Waste fact sheets.	Detailed design / Pre-construction	Section 4.2 of QA G36 Environment Protection
W2	Waste	The Sustainability Strategic Management Plan (SSMP) has allocated the following targets for landfill diversion: • 100 per cent of soil spoil volume	Detailed design / Pre-construction	Additional safeguard SSMP

No.	Impact	Environmental safeguards	Timing	Reference
		• Over 90 per cent of inert and non-hazardous waste volume • Over 60 per cent of office waste material volume.		
CI1	Cumulative visual	Out of hours works would be coordinated with the Sydney Harbour Bridge Deck Upgrade to minimise light spill at night.	Construction	Additional safeguard CI1
CI2	Cumulative 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.	Pre-construction/ construction	Additional safeguard CI2
CI3	Cumulative 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 Transport projects being constructed at the same time.	Pre-construction/ construction	Additional safeguard CI3

7.3 Licensing and approvals

Table 7-2 identifies the permits and licences that would be required to construct the proposal.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Heritage Act 1977 (s60)	Permit to carry out activities to an item listed on the State Heritage Register or to which an interim heritage order applies from the Heritage Council of NSW.	Prior to start of the activity.
Heritage Act 1977 (s57)	Exemption notification for Standard Exemptions for Works Requiring Heritage Council Approval (Heritage NSW, 2020) or in accordance with agency specific exemptions to an item on the State Heritage Register from the Director OEH.	Prior to start of the activity impacting a State Heritage Listed item, not subject to a s60 approval.
Heritage Act 1977 (s139(4))	Exemption notification for exemption for requirement for an excavation permit for prescribed circumstances and activities.	Prior to start of an activity outside of SHR listings.
Roads Act 1993 (s138)	Road occupancy licence to carry out works that would impact on the operational efficiency of the road network.	Prior to works on public roads.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site 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 Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

The Sydney Harbour Bridge Cycleway provides the only cycling link between Sydney CBD and North Sydney CBD, which are the largest and third largest commercial centres respectively in NSW. It provides a vital connection between the existing Kent Street cycleway in Sydney CBD and the lower north shore. The rolling average of weekday cycle trips over a ten-year period is just below 2,000. Around 25 per cent of bike trips take place in peak periods, with approximately 380 bike riders recorded in both the morning and evening peak.

Access at the northern end of the Sydney Harbour Bridge Cycleway is currently via 55 steps that connect with Bradfield Park at Milsons Point. This means that bike riders must dismount at Burton Street and carry their bikes up and down the existing cycleway steps to continue on the cycleway. The steps create a bottleneck, present a safety hazard and deter people from cycling.

Currently there is also limited separation of bike riders, pedestrians and motorists on Alfred Street South. The proposal is consistent and would help to fulfil the goals and objectives of numerous strategic planning instruments, as outlined in Table 8-1.

Table 8-1: Strategic goals / objectives aligned with the proposal

Strategic planning and policy framework	Goals and objectives that are aligned with the proposal
Future Transport Strategy – Our vision for NSW (Transport for NSW, 2022a)	• Connect customers and communities • Promote a safe, reliable, sustainable and integrated transport system • Optimise existing infrastructure and promote behaviour change by making public transport, walking and cycling more attractive • Improve transport solutions for customers, such as cycling • Enable healthier life styles.
Strategic Cycleway Corridors for Eastern Harbour City Overview (Transport for NSW, 2022b)	• Provide a safe and connected cycleway network within the Eastern Harbour City, which includes the lower north shore and the Sydney CBD corridor • Improve safety for all ages and abilities • Progressively expand and fill gaps to create and connected network • Make bike riding an attractive choice for customers.
Connecting to the future: Our 10 Year Blueprint (Transport for NSW, 2018)	• Improve mobility and create vibrant places • Connect customers • Promote quality of life via transport investments and solutions.
NSW Infrastructure Strategy 2022-2042 (Infrastructure NSW, 2022)	• Develop off-road cycling networks and walkways • Connect popular destinations and link major strategic centres • Enhance the existing active transport infrastructure and ensure residents / customers can access most services and facilities by walking or cycling

Strategic planning and policy framework	Goals and objectives that are aligned with the proposal
	• Promote safe and enjoyable cycling infrastructure • Improve physical and mental health.
Transport Sustainability Plan 2021 (Transport for NSW, 2020)	• Promote a sustainable transport system • Empower customers to make sustainable choices and encourage people to reduce their private car use • Improve safety and a healthier community.
Premier's Priorities (NSW Government, 2020)	• Enhance quality of life of the people of NSW • Connect communities with quality local environments / improve connectivity • Build infrastructure and improve road travel reliability • Improve accessibility for a broader range of customers.
Directions for a Greater Sydney 2017-2056 (Greater Sydney Commission, 2017)	• Promote liveable and sustainable cities • Improve connectivity between Sydney's local centres.
Greater Sydney Region Plan – A Metropolis of Three Cities (Greater Sydney Commission, 2018)	The principles of the Plan are mirrored in the Directions for a Greater Sydney above.
Sydney City Centre Access Strategy (Transport for NSW, 2013a)	• Reduce congestions and improve customer experience • Promote an integrated cycleway network within the city centre • Promote safe and directed cycleway connections in all directions of the Sydney CBD • Support the continued growth in cycling within the city centre • Provide the infrastructure needed for the increasing number of people who are choosing to ride a bike between Sydney CBD and its surrounding suburbs.
Transport for NSW Customer Value Propositions for Walking and Cycling (Transport for NSW, 2013)	• Encourage customers in NSW to cycle or walk • Improve safety for bike riders • Support the 45 per cent of the population who are less confident riding a bike but would consider riding a bike more and/or further if they felt increased safety and confidence from safe separation from cars, and direct, connected routes to get to their destination.
Road User Space Allocation Policy (Transport for NSW, 2021a)	Allocation of road user space safely and equitably to support the movement of people and goods and place objectives. Planning consideration is given to establish primary road function, and the following order of road user space: • Walking, including equitable access for all abilities • Cycling, including larger legal micro-mobility devices.
Sydney Harbour Bridge Conservation Management Plan (GML Heritage, 2021)	• Investigate access opportunities for the Sydney Harbour Bridge Northern cycleway such as inclusion of a ramp at the northern end of the cycleway • Resolve inherent dangers associated with a wide range of riders sharing the cycleway (and possibly their carers) • Recognise opportunities to link the existing cycle paths and footpaths.

Strategic planning and policy framework	Goals and objectives that are aligned with the proposal
Infrastructure Priority List (Infrastructure Australia, 2020)	Promote an active transport access to Sydney CBD.
North District Plan (Greater Sydney Commission, 2018)	• Maximise the use of existing infrastructure and efficient connection to Sydney CBD • Provide greater accessibility to the Sydney Harbour Bridge Cycleway and improve liveability • Promote active transport, such as walking and cycling, and support healthy lifestyles • Improve safety for pedestrians, bike riders and other road users • Improve Sydney's connectivity to local centres • Provide greater accessibility for a wider range of customers • Reduce carbon emissions by encouraging and increasing walking and cycling.
North Sydney Environmental Sustainability Strategy 2030	• Promote a more sustainable transport network and shift to travel modes that produce less greenhouse gas emissions • Encourage active transport and support cycling as an alternative mode of transport • Construct footpaths, cycleways and shared paths.
North Sydney Integrated Cycling Strategy (North Sydney Council, 2013)	• Deliver and accessible, safe and connected cycle network • Make cycling and attractive choice for short trips.
North Sydney Transport Strategy (North Sydney Council, 2017)	• Prioritise improvements to walking and cycling infrastructure • Promote sustainable transport options.
North Sydney Vision 2040 Community Strategic Plan (2020)	Encourage sustainable transport by improving road safety and prioritising walking and cycling.
North Sydney Local Strategic Planning Statement (North Sydney Council, 2020b)	Support the development of cycling projects that assists in improving safety, enjoyability and convenience of cycling as a sustainable option.

Table 8-2 outlines the existing limitation to the infrastructure and consequent proposal need, including how the proposal would address the need identified.

Table 8-2: How the proposal has addressed the limitation to existing infrastructure and strategic needs

Limitation to existing infrastructure / proposal need	How the proposal would address it
The existing 55 steps to access the northern entry of the Sydney Harbour Bridge Cycleway are a barrier to safe and equitable access for riders. The steps are particularly a deterrent, for less experienced bike riders and e-bike riders who may avoid the cycleway as it can be difficult to navigate with a heavier bike. The stairs are not easily accessible for all bike riders. The stairs also create a barrier for less skilled riders, families and people living with a disability.	The implementation of the proposal would allow greater accessibility for a wider range of customers to use the existing cycleway by improving access for a greater number of customer groups, such as less skilled riders, families and people living with disabilities, and commuters using e-bikes which would be encouraged to use a more sustainable mode of transportation.
The safety barrier located above the stairs only allows a single user at a time, creating a bottleneck where two-way flow is not possible to enter/exit the Sydney Harbour Bridge Cycleway.	The proposal would eliminate the existing bottleneck and queues created by the current stairs and cater to increased cycling demand projected for the future.
Alfred Street South requires improvements to address the forecast long term growth in cyclists using the SHB.	The implementation of the proposal would improve safety for pedestrians, bike riders and road users on Alfred Street

Limitation to existing infrastructure / proposal need	How the proposal would address it
The existing pedestrian refuge crossing on Alfred Street South near Lavender Street requires upgrade to meet current road safety standards.	South and the cycling and pedestrian facilities provided would be compliant with current road safety standards.

An explanation of how the proposal would achieve each proposal objective is outlined in Table 8-3.

Table 8-3: How the proposal objectives have been achieved

Proposal objective	Response
Improve access to the Sydney Harbour Bridge Cycleway	Access at the northern end of the Sydney Harbour Bridge is currently via 55 steps that connect with Bradfield Park at Milson Point. The existing steps create a bottleneck and deter people from cycling. The steps are particularly a deterrent for less experienced bike riders and e-bike riders who may avoid the cycleway as it can be difficult to navigate with a heavier bike. The stairs are not easily accessible for all bike riders. The stairs also create a barrier for less skilled bike riders, families and people living with a disability. The new elevated linear bike ramp would improve access to the Sydney Harbour Bridge Cycleway for cyclists of all abilities.
Release potential capacity on the Sydney Harbour Bridge Cycleway	The existing cycleway from the northern end of the Sydney Harbour Bridge connects to the existing Milsons Point shared path and local bike network. Bike riders must dismount at Burton Street and carry their bikes up and down the existing cycleway steps (55 step access) to continue on the cycleway, which creates a bottleneck to traffic flow. The safety barrier only allows a single user at a time. The new three-metre-wide elevated linear bike ramp would remove this bottleneck and in doing so quadruple the capacity of the Sydney Harbour Bridge Cycleway. Future growth in bike riders travelling between the Sydney CBD and the lower north shore would be supported through providing a ramp that caters for less capable bike riders than currently are able to use the Bridge.
Improve safety for bike riders, pedestrians and motorists	The existing cycling and pedestrian facilities pose the following hazards: • The existing steps create a safety hazard • There is a long term need to separate cyclists and pedestrians on Alfred Street South as cycling demand grows. • The existing pedestrian refuge crossing on Alfred Street South near Lavender Street requires upgrades to meet current road safety standards. Proposal would improve safety for bike riders, pedestrians and motorists as the proposal has been designed to meet current road safety standards for motorists, cyclists and walkers and would provide an alternative to the existing step access to the Sydney Harbour Bridge Cycleway. The new elevated linear bike ramp would remove the safety hazard created by the existing stairs. The following upgrades to Alfred Street South would improve safety for bike riders, pedestrians and motorists:

Proposal objective	Response
	• New 2.5 metre-wide two-way cycle from the ramp landing, linking to the existing bike network in Middlemiss Street • Replacement of the existing pedestrian refuge crossing at the north end of Alfred Street South with a pedestrian and bike rider crossing located at 110 Alfred Street • Upgrade to the pedestrian crossing at Lavender Street • Low speed shared path and verge widening on the north side of Lavender Street.
Improve connectivity between Sydney CBD and lower north shore	The Sydney Harbour Bridge Cycleway provides the only cycling link between Sydney CBD and the lower north shore, which are the largest commercial centres in NSW. It provides a vital connection between the existing Kent Street cycleway in Sydney CBD and the lower north shore. The new three-metre-wide elevated linear bike ramp would and the upgrades on Alfred Street South would improve connectivity between Sydney CBD and lower north shore.
Support future growth in bike riders travelling between the Sydney CBD and lower north shore	In accordance with the Sydney City Centre Access Strategy, walking and cycling trips to the city centre in the morning peak hour has more than doubled in just ten years (from 5,000 to 11,000 trips), and significant future growth is anticipated. The proposal would allow for more bike riders to access the Sydney CBD via the lower north shore by providing access to the Sydney Harbour Bridge Cycleway for cyclists of all abilities and providing an alternative to the existing stairs and safety barrier.
Provide a cycleway facility that sensitively fits in with the: • Context of the location including the potential visibility of the structure • Heritage values of the area • Architectural qualities of the Sydney Harbour Bridge.	The proposal has been designed to maximise the retention of the existing relationship between Bradfield Park North and the Sydney Harbour Bridge. The proposal: • Retains and respects the key views towards the Sydney Harbour Bridge and its northern approaches • Strengthens active transport links between the CBD and the north side of the Harbour • Improves accessibility for cyclists to the Sydney Harbour Bridge and the experience of making this crossing • Does not connect with or affect the fabric of Sydney Harbour Bridge except at southern connection point • Aligns itself and relates closely to the curvature of the bridge approach and does not detract from or intrude on the visual power of this engineering masterpiece • Enhances the accessibility of active transport to and across the bridge and strengthen its social value • Combines functionality with simple, refined and elegant structure consistent with the original design intent for the Sydney Harbour Bridge • Retains and respects the landscape, configuration and open space of Bradfield Park with its uninterrupted views of the sky and the curved approach viaduct to the Sydney Harbour Bridge

Proposal objective	Response
	• Respects the Bradfield Park archaeological site with minimal impact • The bike ramp touches down lightly with a natural sense of belonging on the alignment of the former Willoughby Street within Bradfield Park.
The proposal design objectives are to maintain and respect the heritage significance, enhance the built and natural environment, improve customer experience, and so far as practicable, protect and enhance key spaces, places, views, vistas, civic and community destinations.	The design, configuration and alignment of the elevated bike ramp will retain and respect the significant cultural heritage values of the Sydney Harbour Bridge and its immediate context and setting and actually enhance its significant function and potentially its social value. The design has sought to achieve minimal intrusion on views to the Sydney Harbour Bridge for most users of Bradfield Park, residents, commuters, and visitors. This has been achieved by allowing the bike ramp to follow the proposal boundary's topography and alignment of the Sydney Harbour Bridge viaduct and keeping the structure as light as possible. The proposal seeks to reduce impacts on the heritage setting of Bradfield Park as much as practical, while providing a safe pedestrian and cyclist environment and embracing Country-led design opportunities. Cyclists and pedestrians would be clearly separated wherever possible to reduce conflicts.

8.1.1 Social factors

The social benefits of the proposal compared to retaining the existing infrastructure would include:

- Improving safety and access for bike riders of all skill levels, pedestrians and motorists
- Increased health and wellbeing benefits
- Increased journey accessibility, ambience and amenity
- Environmental value in the form of residual asset value.

8.1.2 Biophysical factors

The biophysical benefit of the proposal compared to retaining the existing infrastructure would include improved amenity and minimal vegetation clearance.

8.1.3 Economic factors

The economic benefits of undertaking the proposal compared to retaining the existing infrastructure, would primarily be improved safety and travel time savings and reliability which would facilitate safer and improved access to the Sydney Harbour Bridge Cycleway.

8.1.4 Public interest

The public interest benefits of undertaking the proposal compared to retaining the existing infrastructure would be similar to the social factors including improving access and safety for bike riders, pedestrians and motorists. The proposal would also support the future growth in the number of bike riders travelling between the lower north shore, North Sydney CBD and Sydney's CBD.

8.2 Objects of the EP&A Act

The objects of the EP&A Act provide a framework within which the justification of the proposal can be considered. A summary of this assessment is provided in Table 8-4.

Table 8-4: Objects of the Environmental Planning and Assessment Act 1979

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would improve safety and ease of access for a broader range of customer groups and decrease congestion between the Sydney Harbour Bridge Cycleway and the Milsons Point bike network. A range of safeguards and management measures have been identified to minimise environmental impacts associated with the proposal.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development has been considered in Section 8.2.1. The proposal design and environmental assessment has used the best available technical information, environmental standards and measures to minimise environmental risks. Additionally, safeguards have been developed to minimise potential impacts and will be implemented during construction and operation of the proposal. The proposal would not result in any impacts that are likely to adversely impact the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by improving safety and ease of access for a broader range of customer groups and decreasing congestion.
1.3(c) To promote the orderly and economic use and development of land.	The purpose of the proposal is to upgrade the existing cycleway connection between the Sydney Harbour Bridge Cycleway and the Milsons Point bike network. It will increase safety and accessibility for a wider range of customers and decrease congestion. This would improve connectivity between North Sydney and Sydney CBD.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Potential impacts on biodiversity are discussed in Section 6.7 The removal of vegetation would be required in some areas; however, impacts would be minimised through the safeguards and management measures for the proposal.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Potential impacts on Aboriginal and non-Aboriginal heritage are discussed in Section 6.10 and Section 6.1, respectively. No Aboriginal archaeological sensitivity was identified within the study area. Impacts to non-Aboriginal heritage would be minimised where possible through the design process. The proposal would require a S60 permit and ongoing consultation with Heritage NSW is planned.
1.3(g) To promote good design and amenity of the built environment.	The proposal would moderately impact the landscape character and visual amenity during the construction phase. During operation the main features of Bradfield Park would be retained, with design features incorporated to minimise the visual bulk and scale of the structure, as outlined in Chapter 2. The urban design for the proposal has been carried out with reference to a set of design objectives that reflect the visual amenity values of the local area. A number of urban design and landscape strategies are proposed to minimise potential landscape and visual impacts of the proposal.

Instrument	Requirement
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Note relevant to the proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation with the community and relevant government agencies has been ongoing, as described in Chapter 5. Transport for NSW would continue to identify and manage issues of interest or concern to the community and other stakeholders throughout the proposal life cycle.

8.2.1 Ecologically sustainable development

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

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

The precautionary principle

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

This principle was considered during route options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures.

The precautionary principle has guided the assessment of environmental impacts for this REF and the development of safeguards and management measures (Chapter 7). This includes the selection of a preferred option that minimises heritage impacts, visual impacts and vegetation clearance.

Specialist studies were incorporated to gain a detailed understanding of the existing environment, and issues that may cause serious or irreversible environmental damage as a result of the proposal have been identified. The proposal design and environmental assessment has used the best available technical information, environmental standards and measures to minimise environmental risks.

Safeguards have been developed to minimise potential impacts and would be implemented during construction and operation of the proposal. In particular, a construction environmental management plan would be prepared prior to construction. This would ensure the proposal achieves a high level of environmental performance.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by improving safety and accessibility that would have a positive benefit for all pedestrians, bike riders of all skill levels and road users.

Heritage assessments were carried out to avoid or minimise the potential for irreparable damage to occur to any heritage items during construction.

Should the proposal not proceed, future generations would continue to experience a lower level of service associated with the existing infrastructure.

Conservation of biological diversity and ecological integrity

This principle is concerned with maintaining and improving the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong. An assessment of Section 171 of the *Environmental Planning and Assessment Regulation 2021* in Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land of this REF notes 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.

Improved valuation, pricing and incentive mechanisms

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

Transport 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.

8.3 Conclusion

The proposed construction of an elevated linear ramp for bike riders to access the Sydney Harbour Bridge Cycleway, and a separated connection on Alfred Street South from Burton Street to the existing bike network on Middlemiss Street at Milsons Point is subject to assessment under Division 5.1 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.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species 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 EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal's approach to Design Excellence, with significant input and review by design experts and stakeholders as well as adoption of a design-led approach, has ensured the highest standards of design quality, and this level of review and engagement will continue during the design development process.

The proposal, as described in this REF, best meets the proposal objectives but would still result in some impacts on heritage, noise and vibration, landscape and visual amenity, traffic and access, and socio-economic factors. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would help to fulfil goals and objectives of state level strategic planning instruments (as outlined in Table 8-1) and promote benefits such as providing a sustainable and integrated transport system, connecting popular destinations, linking major strategic centres and empowering customers to make more sustainable choices.

On balance, the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Transport has determined a referral to the Australian Department of Climate Change, the Environment and

Water is not required, however Transport would consider referring the proposal to ensure all Commonwealth assessment requirements have been met.

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.

Name:	Shannon Blackmore
Position:	Principal Environmental Consultant
Company name:	Arcadis
Date:	November 2022

I certify that I have reviewed and endorsed the contents of this REF and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading. I accept it on behalf of Transport for NSW.

Name:	Lyndall Thornhill
Position:	Senior Manager Environment and Sustainability
Transport region/program:	Transport for NSW
Date:	November 2022

10. EP&A Regulation publication requirement

Table 10-1: EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	Yes

11. References

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Terms and acronyms used in this REF

Table 11-1: Terms and acronyms used in this REF

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHMP	Aboriginal Heritage Management Plan
ASS	Acid sulfate soils
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	*Biodiversity Conservation Act 2016 (NSW)*
BoM	Bureau of Meteorology
CBD	Central business distict
CCG	Client Control Group
CCTV	Closed circuit television
CEMP	Construction environmental management plan
CHL	Commonwealth Heritage List
CLMP	Community Liaison Management Plan
CLP	Community Liaison Plan
CPTED	Crime Prevention Through Environmental Design
CRA	Climate Risk Assessment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSM	Conceptual Site Model
DAWE	Department of Agriculture, Water and the Environment
dB(A)	A-weighted decibel
DBH	Diameter at breast height
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DIP	Design Integrity Panel
DPE	Department of Planning and Environment
DPE EES	Department of Planning and Environment, Environment, Energy and Science Division
EIA	Environmental impact assessment
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979 (NSW).* Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*. Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process

ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994 (NSW)*
GNLVA	Guidance Note for Landscape and Visual Impact Assessment
Heritage Act	*Heritage Act 1977 (NSW)*
HIS	Heritage Interpretation Strategy
HNA	Highly noise affected
ICNG	*Interim Construction Noise Guideline*
ISCA	Infrastructure Sustainability Council of Australia
KNC	Kirribilli Neighbourhood Centre
kPa	Kilopascal
LALC	Local Aboriginal Land Council
LCVIA	Landscape Character and Visual Impact Assessment
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers
LPCTCC	Local Pedestrian, Cycling and Traffic Calming Committee
MNES	Matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
NAHMP	Non-Aboriginal Heritage Management Plan
NCA	Noise catchment area
NHL	National Heritage List
NML	Noise management level
North Sydney LEP	North Sydney Local Environment Plan 2013
NPfI	*Noise Pollution for Industry*
NPW Act	*National Parks and Wildlife Act 1974 (NSW)*
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
OOHW	Out of hours work
PCT	Plant community type
PEA Act	*Protection of the Environment Administration Act 1991.*
PMST	Protected Matters Search Tool
Proposal boundary	Includes the area of direct impact and an appropriate buffer for construction of the proposal, including the ancillary facility
PSI	Preliminary Site Investigation
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RBL	Rating background level
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services, now Transport for NSW
Roads Act	*Roads Act 1993*

SDRP	State Design Review Panel
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Planning Systems)	State Environmental Planning Policy (Planning Systems) 2021
SEPP (Precincts – Central River City)	State Environmental Planning Policy (Precincts – Central River City) 2021
SEPP (Precincts – Eastern Harbour City)	State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021
SEPP (Precincts – Regional)	State Environmental Planning Policy (Precincts – Regional) 2021
SEPP (Resilience and Hazards)	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
SHFA Act	Sydney Harbour Foreshore Authority Act 1998
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
SPR	Source-Pathway-Receptor
SSMP	Sustainability Strategic Management Plan
SWMP	Soil and Water Management Plan
TEC	Threatened ecological community
TMP	Traffic Management Plan
ToS	Test of Significance
Transport	Transport for NSW
VDV	Vibration dose value
V_{rms}	Vibration velocity levels
WHL	World Heritage List