Roads & Maritime

Abbotsford Wharf Upgrade

Review of environmental factors

September 2017

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Roads and Maritime Services

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Prepared by WSP Australia Pty Ltd and Roads and Maritime Services

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Executive summary

The proposal

Roads and Maritime Services (Roads and Maritime) propose to upgrade the existing wharf at Abbotsford (the proposal). The proposal includes:

- Removal of the existing wharf, retaining a three-metre section of the existing jetty.
- Construction of:
  - A new covered steel gangway extending north-west from the retained jetty section
  - A new floating steel covered and glass sided pontoon
  - Four new piles to secure the pontoon
  - Two new pivot poles to help with berthing.
- The following landside work:
  - A covered entry portal, of about six metres by three metres
  - New kiss-and-ride parking zone
  - Upgrade of the existing stairs and supporting hand rails.

The proposal would be built in the same position as the existing wharf.

A site compound of about 75 square-metres would be temporarily set up on the foreshore, next to the wharf, and would include site sheds and portable toilets. The final location would be confirmed before starting work in consultation with the City of Canada Bay Council.

Prefabricated wharf components, equipment and materials would be delivered to site on barges.

Construction of the proposal is anticipated to start in early 2018 and it would take about four months to complete the work. Construction work would not be continuous as it would rely on delivery schedules.

The wharf would be closed to the public while it is being upgraded and during this time commuters would be re-directed to existing alternative ferry and bus services. A temporary shuttle bus would operate between Abbotsford Wharf and Chiswick Shopping Centre for the duration of construction. Chiswick Shopping Centre is about a four-minute walk from the stop to Chiswick Wharf, where users could connect with Parramatta River services.

Need for the proposal

The need for the proposal was identified in response to Transport for NSW's Transport Access Program; an initiative to deliver accessible, modern, secure and integrated transport infrastructure. An assessment of Abbotsford Wharf in 2009 identified its lack of accessibility for passengers on and around the wharf.

Proposal objectives and development criteria

Objectives were developed to respond to the proposal's need. They included improving access, passenger amenity and the capacity of the ferry transport network, maintaining customer safety, reducing maintenance frequency and cost, and preventing unnecessary environmental and social impacts.

Options considered

The option of do nothing was initially considered. However, this was discounted as it would not meet the objectives of the proposal to improve accessibility, passenger comfort, capacity of the ferry network and reduce maintenance frequency and vandalism. Three options were then

considered to either upgrade the wharf in the existing location, or relocate it elsewhere along the Parramatta River in Abbotsford.

The preferred option was to replace the existing wharf in the existing location. This option was considered to have the least social and environmental impacts.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 permits development on any land for the purpose of wharf or boating facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a wharf and boating facility and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and subject to consideration of objects and provisions of clause 111 of the above Act, and the factors set out in clause 228(2) of the supporting NSW Environmental Planning and Assessment Regulation 2000.). Development consent is not required.

Community and stakeholder consultation

Consultation with Foreshore and Waterways Planning and Development Advisory Committee, Port Authority, relevant water and utility providers and the City of Canada Bay Council has been carried out. Additionally, a community information session was held on 25 May 2017. A key issue raised by the community was the removal of weather protection from the preferred concept, which included an uncovered gangway to minimise visual impact. The preferred design was updated in response to community feedback to include a covered gangway and entry portal.

Stakeholder consultation would continue following the completion of detailed design and during the construction phase of the proposal.

Beneficial impacts

The proposal is expected to deliver the following benefits:

- Provision of a modernised accessible wharf that is consistent in its design with the recent upgrade of the wharves on the network
- Improved passenger comfort through weather protection, ample seating, customer information and quick berthing, embarking and disembarking times
- Preservation of the locally heritage wharf location for the next 50 years
- A resilient wharf design that includes tolerances to allow for future sea level rise and more extreme weather events
- Decrease in operational costs through reducing maintenance in the long-term.

Environmental impacts

The main environmental impacts of the proposal and the safeguards and management measures to address the impacts are summarised below.

Physical marine environment

There would be localised sediment disturbance during construction from installing and removing piles, which would be limited to a small area around each pile. A safeguard has been proposed to install a silt boom and curtain around the construction area for the duration of the work, minimising sediment disturbance to the proposal area only.

Biodiversity

There would be direct impacts to about 171 square-metres of key fish habitat from installation and removal of piles, including habitat formed on existing piles, although habitat would re-establish over time on the upgraded wharf.

The new pontoon and gangway would shade part of the seabed floor which forms part of the key fish habitat, while equally exposing part of seabed floor by removing the existing wharf and pontoon. A permit to harm marine vegetation under the *Fisheries Management Act* would not be required for the proposal.

The main safeguards to minimise the impact of construction on aquatic biodiversity include:

- Reducing vessel speeds in the construction area to minimise wash and disturbance to aquatic flora
- No anchoring or mooring of construction vessels in shallow habitat areas
- Further safeguards are described in the *Abbotsford Wharf Aquatic Ecology Assessment* included as Appendix D.

Noise and vibration

A Noise and Vibration Impact Assessment report concluded there would be exceedances of the noise criteria during certain construction activities. These exceedances and the mitigation proposed include:

- Up to 13 dB(A) for private residential buildings in Abbotsford during the demolition of the existing structure and removal of existing piles. This work would be undertaken during standard hours between 7am and 6pm with the noisiest activity of concrete floor removal undertaken intermittently, over a period of one week
- Up to 26 dB(A) for private residential properties in Abbotsford, 4 dB(A) for private residential properties within Chiswick, 11 dB(A) for private residential properties within Henley and Bedlam Bay, 16 dB(A) for private residential properties within Gladesville and Looking Glass Point, and 5 dB(A) for private residential properties within Cabarita during pile installation (drilling) which is required to be undertaken overnight between 11pm and 7am due to the requirement for calm water conditions. This activity would require about fifteen shifts over three weeks. To minimise impacts, work would occur intermittently within this time period, which would allow for respite periods to occur as part of the pile installation process
- Up to 32 dB(A) for private residential properties in Abbotsford, 10 dB(A) for private residential properties within Chiswick, 17 dB(A) for private residential properties within Henley and Bedlam Bay, 22 dB(A) for private residential properties within Gladesville and Looking Glass Point, and 11 dB(A) for private residential properties within Cabarita during pile hammering which is required to be undertaken overnight due to the requirement for calm water conditions to fix the drilled piles into position. Pile hammering has been restricted to the last two hours of the night-time period (5am to 7am). About five shifts of hammering would be required and it is anticipated that each pile would be hammered for one minute (about ten hits with a hammer within one minute). For each pile this activity is likely to occur about five times over a period of one hour.
- In addition to noise, additional mitigation has been adopted to mitigate potential vibration impacts during pile hammering close to the locally heritage listed Abbotsford Point Boatshed.
- The community would be kept informed of construction activities at least five days before they are undertaken, with a community information email and phone line provided to take enquiries and follow up on complaints. About 3,900 residences would be individually informed of construction activities (indicated by the yellow line in the figure below), and about 300 of these residences would be contacted directly prior to work being undertaken at night (indicated by the red line in the figure below).

- Further safeguards to further minimise the impact of construction have been proposed in accordance with the *Abbotsford Construction Noise and Vibration Impact Assessment* (Appendix E). A Noise and Vibration Construction Management Plan would be prepared prior to construction and implemented during the construction period.

Landscape character and visual amenity

The proposal would have a low to moderate impact on landscape character, with long-term impact minimised through retaining the wharf in its existing location.

The proposal design would have a moderate visual impact, with the new structure in contrast to the existing structure. However, this view would be minimised by existing topography and vegetation.

A temporary impact to visual amenity would occur for residents of Abbotsford, Werrell Reserve users, and wider users of Sydney Harbour and the Parramatta River during construction, due to the closure of the wharf and a small section of Werrell Reserve. The visual impact of construction would be minimised by erecting hoarding around the construction site, with the construction area maintained in good order throughout the upgrade

The visual impact of the proposal would be minimised further through safeguards proposed in accordance with the Landscape and Character Visual Impact Assessment included as Appendix F.

Heritage

The proposal would have a neutral impact on the heritage values of the Abbotsford Wharf and heritage items in the vicinity, including the locally heritage listed Abbotsford Point Boatshed. The heritage significance of Abbotsford Wharf would continue to be respected by maintaining its function as a wharf.

Heritage items adjacent to the proposal location, including the Abbotsford Point Boatshed and sandstone kerbing on Great North Road, would be communicated to site personnel to avoid any potential impacts.

Further heritage safeguards would be implemented as described in the Statement of Heritage Impact report included as Appendix G.

Socioeconomic, traffic and transport

Minor impact to surrounding businesses and ferry users would occur for up to four months during construction, due to the closure of the wharf impacting on ferry user journeys.

This impact would be minimised through the provision of a temporary shuttle bus which would provide access between Abbotsford Wharf and Chiswick Wharf for ferry users. Detail of alternative transport would be publicised prior to construction commencing, with regular updates provided to businesses, ferry users and the wider community as construction progresses.

Establishing the construction area and maritime exclusion zone during construction would impact surrounding land uses including the Abbotsford Point Boatshed and 2nd Abbotsford Sea Scouts. However, landside and waterside access would be maintained.

There is potential for increased road traffic on Great North Road as a result of the wharf closure, with ferry users and construction personnel using Great North Road during construction. This is not considered to be significant and able to be absorbed by the existing road network without causing any significant disruption. Use of Great North Road by construction vehicles may cause minor temporary disruption to residents and commercial premises. A Traffic Management Plan would be prepared to manage any impacts from the use of Great North Road.

This use of delivering plant and materials via barge would increase waterside vessel movements around and within the proposal area however the impact of this would be minimised through the production of a Marine Traffic Management Plan. This plan would include detail of vessel movements and how the waterside construction area would be demarcated.

Justification and conclusion

The need for the proposal was justified under the Transport Access Program on account of the lack of accessible pathway for passengers on and around the wharf. The assessment of the environmental and social impacts has determined the proposal is not likely to have a significant impact and therefore assessment under Part 5.1 of EP&A Act is not needed.

Contents

Contents (continued)

Tables

Tables (continued)

Figures

Appendices

1 Introduction

This Chapter introduces the proposal and provides the context of the environmental assessment. The development history is outlined along with the purpose of this report.

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) proposes to upgrade the existing wharf at Abbotsford (the proposal) as part of the NSW Government's Transport Access Program (TAP, https://www.transport.nsw.gov.au/projects/tap, refer to section 2.1).

The wharf is located at the northern end of Great North Road, within the City of Canada Bay local government area (refer to Figure 1-1). The wharf is part of the F3 Ferry Service that operates between Circular Quay and Parramatta.

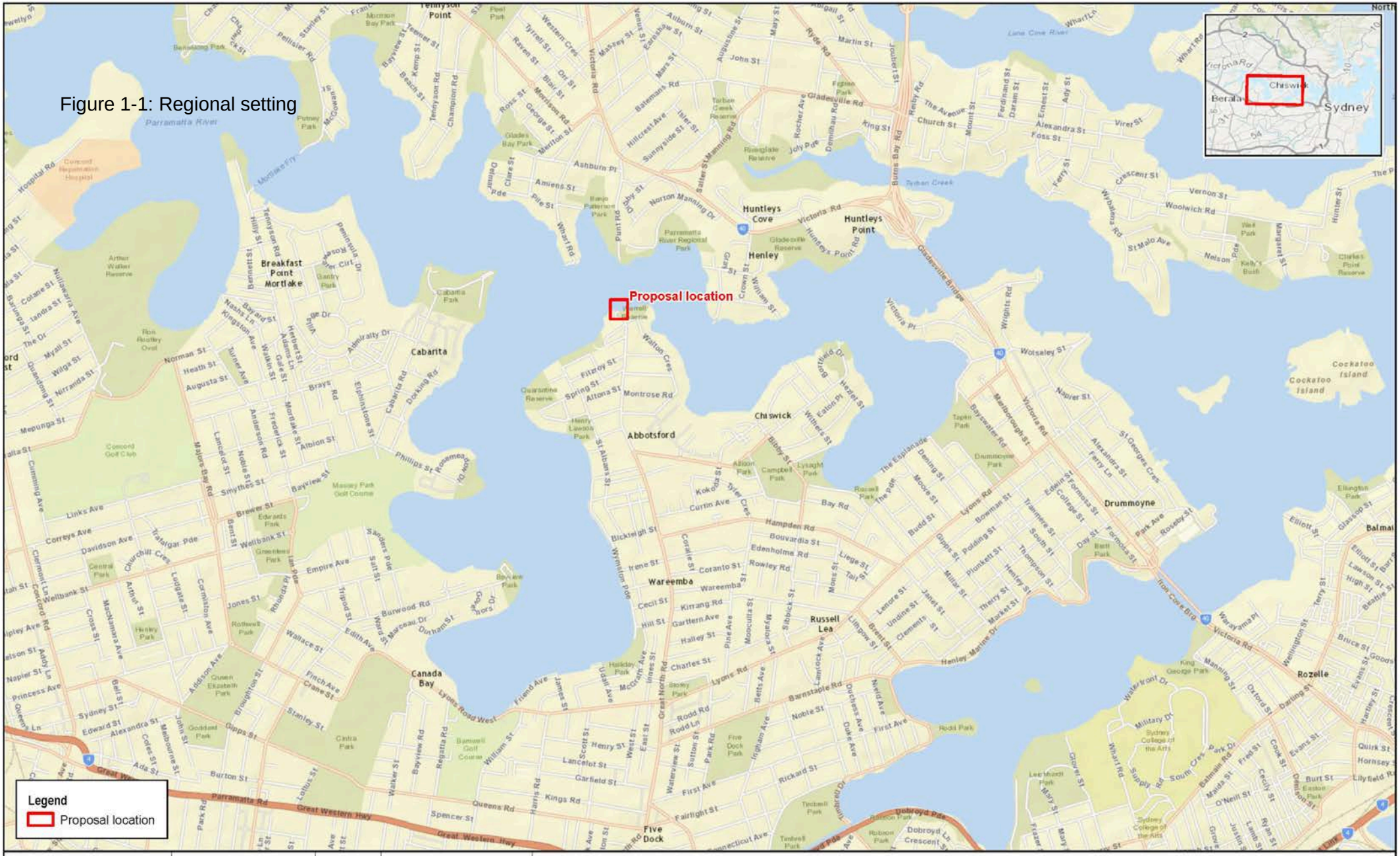
The proposal is to improve access to the wharf, upgrade the existing jetty (walkway out from the shoreline) to install a gangway and floating pontoon to allow for more efficient passenger services. The proposal's key features are (refer to Figure 1-3):

- Removal of:
  - The existing jetty, retaining a three-metre section from the foreshore
  - The existing waiting area/shelter, gangway and entry portal
- Installation of a new curved-roof, glass-panelled floating pontoon and covered gangway
- Provision of new wayfinding signage
- Relocation of existing bicycle racks
- Provision of kiss-and-ride zone
- Upgrade of the existing stairs.

The proposal is located within the Inner West region of Sydney. Locally, the proposal is located at the northern end of a short peninsula within the Parramatta River. Figure 1-1 and Figure 1-2 show the regional and local setting respectively.

The key features of the proposal, as discussed above, are shown in Figure 1-3.

Figure 1-1: Regional setting



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Date: 14/09/2017	Approved by: -		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

Data source: -
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Abbotsford Wharf Upgrade Review of Environmental Factors

Figure 1.1
Regional setting

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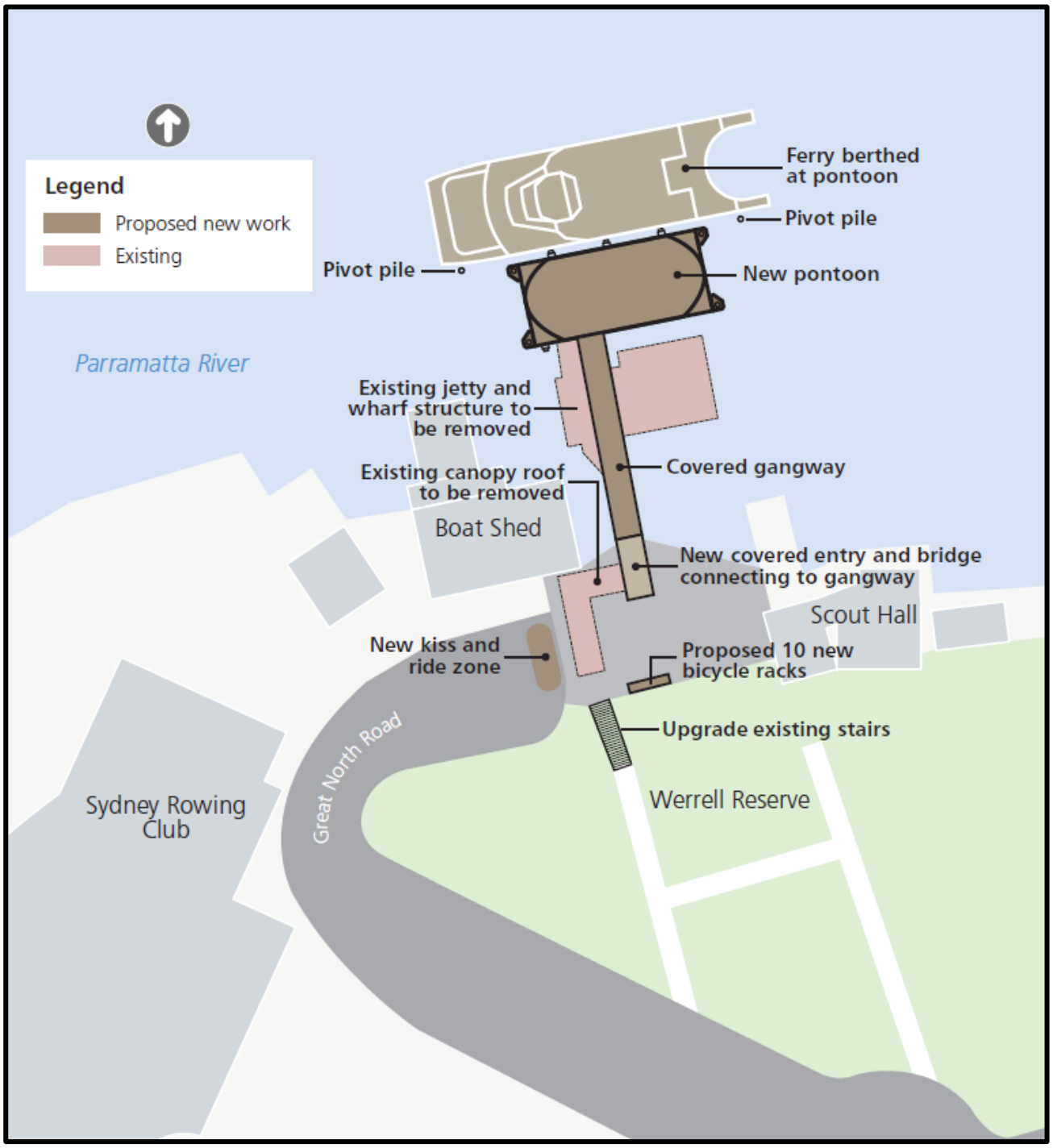
Figure 1-2: Local setting



Source: Roads and Maritime

Figure 1-3: Key features of the proposal

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by WSP Australia Pty Ltd on behalf of Roads and Maritime. For the purposes of the work, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the proposed work and its associated environmental impacts have been undertaken in the context of Clause 228 of the Environmental Planning and Assessment Regulation 2000, Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979 (Is an EIS required? guidelines, Department of Urban Affairs and Planning, DUAP, 1995/1996), the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, as required under Section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The potential for the proposal to significantly impact any matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment and Energy on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

This Chapter describes the proposal's strategic and operational need. It identifies the various options considered in selecting the preferred option.

2.1 Strategic need for the proposal

The Transport Access Program (TAP) is an ongoing "*initiative to deliver modern, safe and accessible transport infrastructure*" in New South Wales (NSW, Transport for NSW, 2015). The focus of the program is improving access to the transport network for less mobile passengers. As a result, Roads and Maritime assessed the condition of all ferry wharves across the transport network in 2009 in terms of:

- Safety and structural integrity
- Access for less mobile and disabled passengers
- Existing and predicted future patronage and use.

The Disability Standards for Accessible Public Transport 2002 (DSAPT) and *Disability (Access to Premises – Buildings) Standards (2010)* (Disability Standards 2010) made under the *Disability Discrimination Act 1992* (DDA), require all public transport infrastructure, including wharves, to have fully compliant disability access by 2022.

It was concluded that the Abbotsford Wharf needed upgrading or relocating due to its lack of accessible pathway for passengers on and around the wharf.

The proposal was also developed to respond to the objectives of various Government policies as described below.

2.1.1 Transport access program

The aims behind the above objective of the TAP are:

- Improve the accessibility for passengers
- Building facilities for all transport modes to meet the needs of a growing population
- Providing an effective and seamless interchange that supports an integrated transport network
- Delivering safety and signage improvements to help with the customer user experience
- Providing other aesthetic improvements.

Ferry wharf upgrade program

The ferry wharf upgrade program forms part of TAP. Its objectives are to:

- Improve access for less mobile people
- Improve passenger amenity
- Improve passenger embarking/disembarking times
- Develop an iconic design across the commuting wharf network
- Cater for current and future passenger numbers
- Minimise customer and wharf operator impacts during any refurbishment and upgrade work
- Minimise ownership and maintenance costs
- Ensure the design complies with current safety laws
- Discourage inappropriate activities on public wharves
- Aim to comply with the DDA by 2022.

This proposal has been developed to respond to, and comply with, these objectives.

2.1.2 Sydney's Ferry Future

Published in 2013, the Sydney's Ferry Future plan acknowledges, and builds on, TAP and the ferry wharf upgrade program by outlining the short and long term initiatives for getting the most out of the "ferry network today while investing in the infrastructure and services to attract more passengers in the future" (TfNSW, 2013). The plan:

- Focuses on short term timetable, service and infrastructure improvements and the long-term expansion of the network
- Reinforces the need to upgrade wharf infrastructure and make it more accessible in line with TAP.

The proposal directly responds to this by analysing how improvements could be made to best achieve the objectives of this plan in relation to the wharf facilities at Abbotsford.

2.1.3 NSW Long Term Transport Master Plan

The Long Term Transport Master Plan provides the framework for delivering an integrated, modern transport system across NSW over the next 20 years. It identifies transport actions and investment priorities over the short, medium and long term that have emerged in response to six identified transport challenges. The master plan is clear in identifying the need to:

- Cater for a 31 per cent increase in people travelling into and out of Sydney city centre during peak periods by 2031 from 2021
- Provide improvements in public transport services and accessibility across the network to cater for the expected increase in the commuting population.

Upgrading and expanding the ferry wharf network are two recognised ways that support meeting the above objectives. As such, the proposal directly responds to this by providing improved and safer access for ferry passengers at Abbotsford.

2.1.4 Supporting NSW strategies and policies

The proposal is also supported under the policies, goals, objectives and targets of a number of other strategic planning documents as summarised in Table 2-1.

Table 2-1: Supporting NSW strategies and policies

NSW State Infrastructure Strategy
The strategy identifies the need to make public transport infrastructure improvements across Sydney's network, as this is the means by which 80 per cent of people travel into the city centre every day. As passenger numbers are expected to notably increase in the future, this proposal responds to the above by improving the wharf infrastructure and access provisions at Abbotsford.
Disability standards
The Disability Standards for Accessible Public Transport (DSAPT, 2002) and Disability (Access to Premises – Buildings) Standards (2010) form part of the DDA. Each prescribe the minimum accessibility standards for disabled access to public transport services and infrastructure, including a timetable for implementation. The proposal meets the above requirements within the timeframes specified in both standards by providing suitable access for people with a disability.
A Plan for Growing Sydney
Focussed on the concept of growth centres and transit corridors, the above Plan realises the need to strengthen transport connections into and out of central Sydney. A key action of the Plan is to deliver a vision for Sydney Harbour including enabling opportunities to improve ferry services. The proposal therefore responds to this action.

State Priorities: Making it Happen
The proposal would: • Improve the existing transport infrastructure, consistent with the *building infrastructure* priority • Be built and would operate under a number of environmental safeguards and management measures to avoid and minimise environmental impacts consistent with the *keeping our environment clean* priority.

2.2 Existing infrastructure

The wharf is currently operating, facilitating a passenger service between Circular Quay and Parramatta. Table 2-2 summarises the existing wharf elements and descriptions of current infrastructure, which are shown in Figure 2-1.

Table 2-2: Existing wharf infrastructure

Element	Description
Existing infrastructure	• Covered waiting area adjacent to Great North Road • A covered walkway leading to a shelter supported by concrete piles • A covered gangway supported by steel dolphins • Mooring piles.
Operation	• Abbotsford operates as part of the F3 Parramatta River ferry route and as a water taxi stop • Ferry services typically operate every 15-30 minutes during the commuter peak periods in the peak direction and every 30-60 minutes at other times in both directions • Used by up to 800 passengers per day.
Ancillary services	• Located about 100 metres from the nearest bus stop (bus routes 438 and L38) • On-street parking • Great North Road is a marked bicycle-friendly route to Werrell Reserve.
Land Ownership	Public owned land and assets include the following: • The following infrastructure maintained by Roads and Maritime: - The existing concrete wharf pontoon and ancillary structures, including the existing landside shelter. • The following infrastructure maintained by City of Canada Bay Council: - Great North Road - Werrell Reserve, including existing concrete stairs which provide access through the park to the foreshore area. • Minister for Lands: - Part of foreshore land to the east of the wharf. Private property includes the Sydney Rowing Club, Abbotsford 12ft Sailing Club, 2nd Abbotsford Sea Scouts and residential properties along Great North Road.

Source: Hansen Yuncken

Figure 2-1: Existing infrastructure of Abbotsford Wharf

2.3 Proposal objectives and development criteria

This section lists the proposal's objectives and development criteria.

2.3.1 Proposal objectives

The proposal's objectives are to:

- Improve:
  - Low-mobility access
  - Passenger comfort and shelter from the wind, rain and sun
  - Seating and waiting areas
  - Capacity of the ferry transport network
  - Boarding and disembarking times, queueing and walking distances.
- Maintain:
  - Customer safety
  - Passenger amenity and enjoyment, and harbour views
  - Timetable reliability.
- Reduce:
  - Maintenance frequency and cost through materials selection that allows for easy cleaning
  - Vandalism through the appropriate use of materials, surfaces and designs.
- Prevent:
  - Unauthorised and inappropriate use of the wharf
  - Unnecessary environmental and social impacts.

2.3.2 Development criteria

The proposal has been developed against the following themes and principles for transport interchange design (Making Interchange Places, Transport for NSW, 2012). Table 2-3 outlines the relevant development criteria used to help design the proposed wharf and select a preferred option.

Table 2-3: Development criteria for this proposal

Theme	Relevant principles
Meet customer needs and improve the transport experience	Provide: • Safe, efficient and convenient passenger access • A comfortable, enjoyable and positive customer experience.
Optimise public transport access	Provide: • Access to employment, services, recreation and education • Seamless interchange • Connection into existing and future transport networks.
Integrate with interchange investment and land use plans	Embrace cultural and heritage values.
Anticipate growth and changes in demand	Safeguard future extension opportunities based on predicted growth.
Ensure sustainability and future public transport network performance	Deliver sustainable solutions that minimise environmental and community impacts that are adaptable to climate change and include new technologies.

The proposal has also been developed against the following priorities (Ferry Wharf Upgrade Program: Business Requirements Specification, Transport Access Program, 2014):

- Pedestrian access
- Bicycle access and storage
- Bus access
- Taxi access
- Private car
  - Drop off and pick-up
  - Park and ride, with accessibility priority.

2.3.3 Urban design objectives

The proposal's urban design objectives include:

- Minimise:
  - Clutter and visual impacts by selecting materials that respond to the amenity of the adjacent parklands, and value of the neighbourhood character
  - Interruption to views and impacts on the public domain and realm.
- Respect the wharf's place in the local neighbourhood.
- Retain and enhance:
  - Pedestrian infrastructure and access
  - Connectivity with active (walking and cycling) and public transport modes and provisions
  - Setting and relationship to Werrell Reserve in terms of the public domain and the integration of the steps into landscape and parkscape.

2.4 Alternatives and options considered

This section describes the alternatives and options considered to deliver the proposal.

The initial phase of the ferry wharf upgrade program was to confirm infrastructure upgrade priorities, which included the options of doing nothing, or upgrading or replacing the Abbotsford Wharf.

2.4.1 Preliminary considerations

Do nothing

The option of 'do nothing' would be to limit the scope of work to carrying out regular maintenance activities consistent with current operations.

Although it would present the lowest initial capital cost and environmental impact, the 'do nothing option' was discounted as it would not meet the objectives of the proposal to improve accessibility, passenger comfort, capacity of the ferry network and reduce maintenance frequency and vandalism.

Upgrade or replacement of the wharf

After discontinuing the 'do nothing' option, consideration was then given to either upgrading the wharf in its existing position or installing a new wharf in an alternative location. This decision was documented in a business case where it was confirmed that the existing wharf design:

- Had limited access for low mobility passengers
- Precluded two vessels berthing at the same time
- Made it difficult for people to efficiently embark and disembark at high and low tide.

Upgrading the existing wharf was subsequently discounted because the current wharf design did not allow for it to meet all of the proposal objectives.

The following section describes the detail of the options considered to replace the wharf.

2.4.2 Methodology for selection of preferred option

The method by which Roads and Maritime developed options for replacing the wharf considered:

- Existing and future:
  - Passenger use
  - Service demand
- Engineering design requirements and current structural integrity
- Passenger safety
- Environmental and social constraints
- Build cost
- Stakeholder feedback.

2.4.3 Identified options

Through the above process, two new ferry wharf locations in Abbotsford were identified and compared against the option of replacing the wharf in the existing location. Table 2-4 describes the main differences between the options identified and investigated by Roads and Maritime. Figure 2-2 shows the location of the three options. In all options, the material design was similar and consistent with the upgrades across the rest of the wharves along the route.

Table 2-4: Identified options

Replace / demolish the existing wharf	Location proposed	Access method
Option 1: Wharf in existing position		
Replace	Existing location	• Wharf would be accessed via Great North Road by vehicles, cyclists and pedestrians • Refurbished stairs through Werrell Reserve.
Option 2: Relocate wharf		
Demolish	About 40 metres east	• Install a lift or build a ramp through Werrell Reserve, providing access for pedestrians only.
Option 3: Relocate wharf		
Demolish	About 90 metres east	• Increase the Teviot Avenue cul-de-sac to allow vehicles, cyclists and pedestrians to access the new wharf. This would also provide an opportunity to add a bus stop for the wharf, enhancing the interchange • Build a new accessible ramp through Abbotsford Point headland to the wharf providing access for pedestrians.

Figure 2-2: Option locations

Map: 2271407A_GIS_F002_A1	Author: mitchellem		1:1,000
Date: 14/09/2017	Approved by: -		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

Data source: -
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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Abbotsford Wharf Upgrade Review of Environmental Factors

Figure 2.2
Option locations

NSW Roads and Maritime Services

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2.4.4 Analysis of options

In many cases, all the proposed options would equally achieve the proposal objectives outlined in section 2.3.1, and satisfy its need, without one option achieving a better outcome than another. In summary, all options would equally:

- Involve a concept design that would improve low-mobility access, passenger comfort, provide additional shelter, meet customer needs and deliver a consistent level of amenity
- Require development within and/or adjacent to item(s) of heritage significance, including Werrell Reserve, and an area of wetland protection, listed under the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (Sydney Harbour SREP)
- Include customer safety, passenger amenity and timetable reliability improvements
- Reduce maintenance costs through construction of a new wharf largely formed of marine grade steel, aluminium, zinc, and concrete to reduce ongoing maintenance requirements while also minimising clutter and visual impacts
- Reduce the risk of vandalism and unauthorised/inappropriate use of the wharf
- Cater for future passenger numbers.

The only differences between the options are:

- Their ability to minimise environmental and social impacts
- How they achieve certain development and urban design objectives
- Operational public transport interchange and vessel movement impacts.

Table 2-5 compares the differences between options against the proposal's objectives which relate to these above differences.

Table 2-5: Options analysis

Objective	Benefit	Impact
Proposal objectives: environmental impacts		
Minimise environmental and social impacts	Option 1 - Replace the wharf in the existing location	
	• Retains the social association of there being a wharf in this location • Ability to reduce environmental impact through reuse of elements and materials and retain components of the existing infrastructure • Remaining impacts would largely be contained to the disturbance footprint of the existing wharf.	• Loss of passenger services during construction through closure requirements.
	Option 2 - Relocate the wharf about 40 metres east	
	• Would allow the existing wharf to remain open during construction.	• May result in potential marine impacts through installing additional infrastructure in the harbour • Potential landside options to provide access would require infrastructure to be built within Werrell Reserve, potentially resulting in additional environmental and social impacts • Would cause amenity, access, visual and use and function impacts for businesses in the area through installing infrastructure closer to their harbour frontages • Property acquisition, including relocation of the 2nd Abbotsford Scout Hall, would be required resulting in social impacts • Relocation of ferry route and wharf may potentially impact on boating activity, including rowing lanes.

Objective	Benefit	Impact
	Option 3 - Relocate the wharf about 90 metres east	
	• Would allow for potential social benefits through opportunity to provide a bus stop closer to the wharf.	• May result in potential marine impacts through installing additional infrastructure in the harbour • Potential landside options to provide access would require additional infrastructure within the Abbotsford Point headland, potentially resulting in additional environmental and social impacts • Property acquisition would be required • Relocation of ferry route and wharf may potentially impact on boating activity, including rowing lanes.
Urban design objectives		
Respect the heritage setting and place in the local neighbourhood	Option 1 - Replace the wharf in the existing location	
	• Retains the setting of the existing wharf within the context of the local neighbourhood and adjacent Werrell Reserve.	• Additional amenity impacts through installing a new wharf structure, including visual impacts to the adjacent heritage listed Abbotsford Point boatshed • Limited amenity impacts on Werrell Reserve through upgrade of the existing stairs.
	Option 2 - Relocate the wharf about 40 metres east	
	• Minimal benefit identified. The wharf would be located close to the existing location. However, the setting would be altered compared to Option 1.	• Disassociation with the existing wharf in its current position, which is of local heritage significance • Additional amenity impacts through installing a wharf structure in a new location, including visual impacts to the heritage listed Abbotsford Point boatshed and Werrell Reserve.

Objective	Benefit	Impact
	Option 3 - Relocate the wharf about 90 metres east	
	• Nil to minimal benefit identified. Option 3 would result in a new wharf being located further than Option 2 with the setting of existing wharf greatly altered.	• Disassociation with the existing wharf in its current position, which is of local heritage significance. • Additional amenity impacts through installing a wharf structure and landside infrastructure in a new location, including impacts to the amenity of Werrell Reserve, a heritage item of local significance.
Retain/enhance pedestrian infrastructure and access	Option 1 - Replace the wharf in the existing location	
	• Existing pedestrian infrastructure would be retained • Upgrades to the stairs and provision of a kiss and ride zone would enhance access to the wharf.	• Temporary impacts for ferry passengers during construction due to the requirement to close the wharf.
	Option 2 - Relocate the wharf about 40 metres east	
	• Minimal potential benefit identified, as lesser or equal pedestrian access would be provided in comparison to the existing.	• DDA compliant access would require a new accessible ramp to be installed through Werrell Reserve to the wharf, which would impact on amenity values.
	Option 3 - Relocate the wharf about 90 metres east	
	• Potential for improving pedestrian access through providing a bus stop closer to the wharf.	• Existing pedestrian infrastructure to the wharf would not be retained through relocation of access to Teviot Avenue • DDA compliant access would require a new accessible ramp to be installed through the headland to the wharf, which would impact on amenity values.

Objective	Benefit	Impact
Effective transport interchange	Option 1 - Replace the wharf in the existing location	
	• Would retain existing connectivity to public transport, however the existing wharf is not considered to be an interchange • Potential improvements to access by providing additional parking spaces.	• Temporary impacts for ferry passengers during construction due to the requirement to close the wharf.
	Option 2 - Relocate the wharf about 40 metres east	
	• No potential benefit identified, as no improvement to transport interchange at the wharf would be provided in comparison to the existing.	• Minor impact to existing connectivity to public transport as the wharf interchange would be located further from the existing bus stop.
	Option 3 - Relocate the wharf about 90 metres east	
	• Potential for the wharf interchange to include bus services, through creation of a bus stop closer to the new wharf.	• Would require relocation of existing bus stop to Teviot Avenue • May impact ferry and bus timetables due to changes in the route (although noted to be likely minor).

2.5 Preferred option

While all three options equally achieve many of the proposal's objectives through consistent options for design of the wharf, Roads and Maritime concluded that the preferred option would be to replace the wharf in its current location (ie Option 1) due to:

- The reduced environmental impacts of upgrading an existing facility compared to demolishing existing structures and building new structures in a new area
- It retaining the positive social and amenity association of there being a wharf at the existing location.

The principles of ecologically sustainable development (ESD) were also considered in selecting the preferred option, with Option 1 providing:

- A simple cost-effective design that makes use of an existing wharf
- For the ongoing operation of a ferry wharf service at Abbotsford over the next 50 years
- A solution that would that avoids property acquisition and therefore reduces construction program risks and minimise social and community impacts on the people that live in the area.

Section 8.2 further considers the proposal and the principles of ESD.

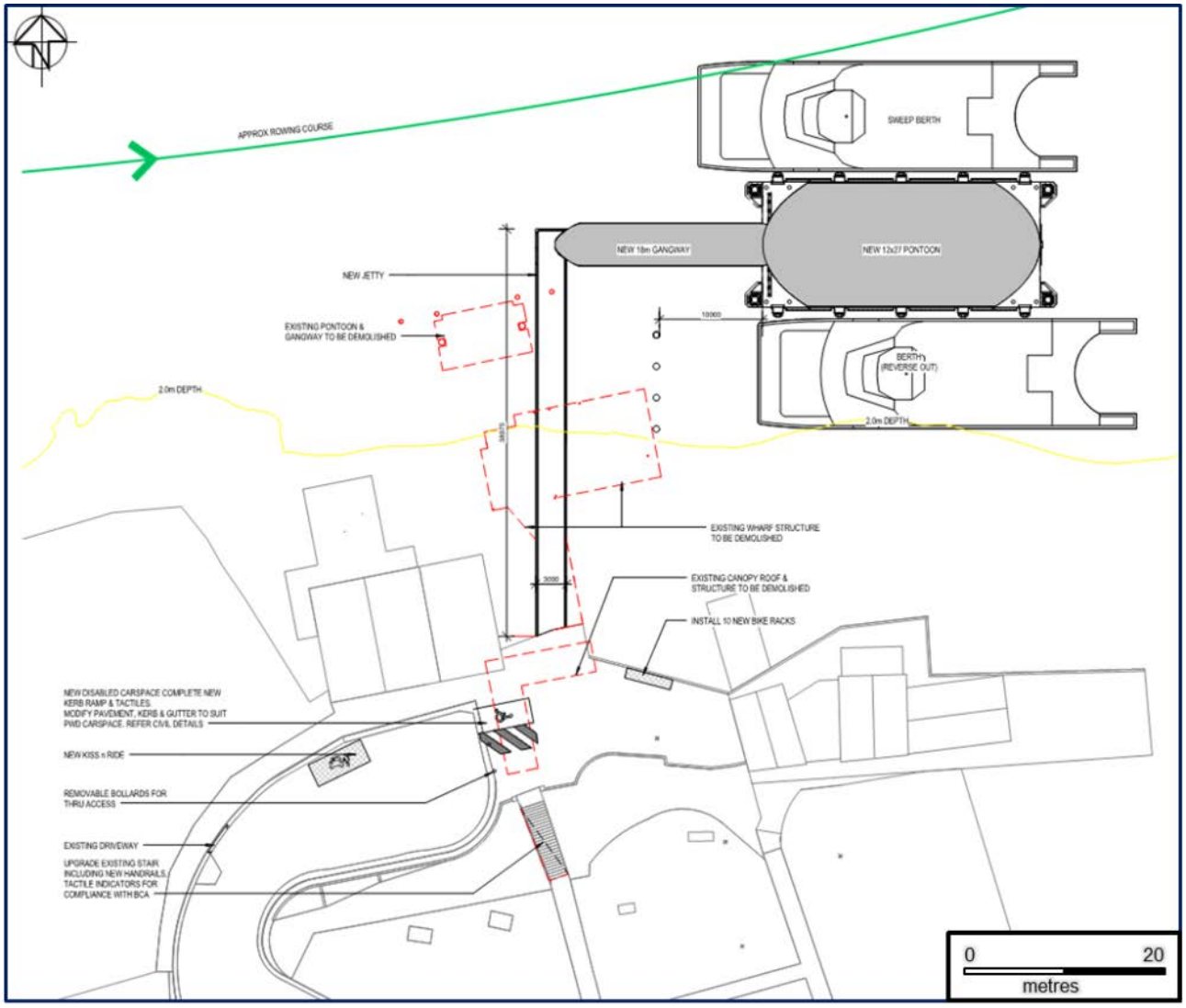
The preferred waterside design was selected based on the proposal objectives outlined in section 2.3. This lead to a preferred option comprising:

- A 39-metre long by three-metre wide uncovered jetty
- An 18-metre long by three-metre wide uncovered gangway connected to a 27-metre long by 12-metre wide covered pontoon
- The pontoon would include seating and an information kiosk, and provide capacity for ferries to berth on both northern and southern faces (dual berthing), increasing the capacity of the ferry network.

Landside elements for Option 1 to provide access to the wharf were also selected based on the proposal objectives outlined in section 2.3. The preferred landside design includes:

- One accessible parking space at the end of Great North Road
- Removable bollards, to maintain access to the 2nd Abbotsford Sea Scouts
- Kiss and ride zone on Great North Road, close to the wharf
- Bicycle racks
- Wayfinding signage.

Figure 2-3 shows the preferred concept design.



Source: Hansen Yuncken

Figure 2-3: Original preferred concept design

2.6 Design refinements

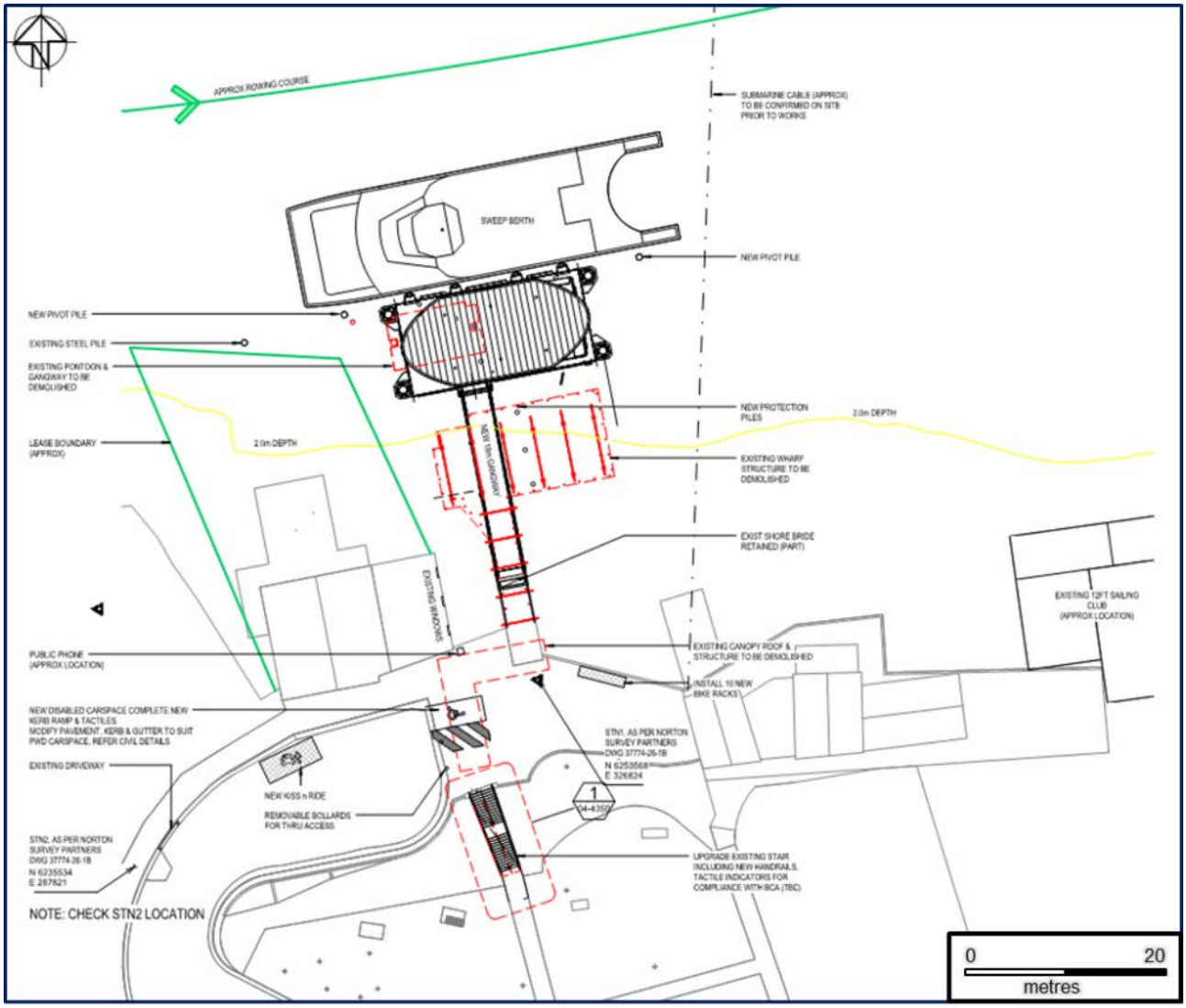
Once the preferred option was selected, its design was refined in the areas described below.

2.6.1 Berthing Options

The preferred design included a dual berth pontoon, however during consultation with key stakeholder's concerns were raised about the changes to how ferries would operate in the area to access the inside face of the pontoon. Due to the potential impact to existing businesses, Roads and Maritime reviewed the need for dual berthing with Transport for NSW and Harbour City Ferries. The review identified that current and potential future services at the wharf could be accommodated with a single berthing arrangement. Following the review, Roads and Maritime revised the design to include a single-sided pontoon.

This revision enabled the pontoon size to be reduced to 18-metre long by nine-metre long and the gangway reorientated to remove the jetty, reducing the potential visual impact of the new wharf structure.

Figure 2-4 shows the revised preferred design.



Source: Hansen Yuncken

Figure 2-4: Revised preferred concept design

2.6.2 Further refinement based on community and council feedback

Following the revision of the concept design to a single-berth option, the preferred option was issued to the wider community and City of Canada Bay Council for feedback.

Feedback from the community was categorised into two areas, summarised as the uncovered gangway and jetty, and removal of the existing wharf. Feedback from City of Canada Bay Council related to the provision of accessible private parking at the wharf.

Covered gangway and jetty

The removal of the landside canopy and inclusion of an uncovered jetty and gangway was received negatively by the community, who perceived these aspects of the proposal as a reduction in amenity which would impact customer experience. In response to this feedback, the proposal design was refined to include a covered gangway and a six-metre long by three-metre wide entry portal canopy for the jetty. This enables ferry users to wait to be picked up undercover, as they do currently.

Removal of the entire wharf structure

The community also questioned whether it was necessary to remove the entire wharf structure. This was reassessed, and it was determined that about three metres of the existing jetty could be retained. The concept design was subsequently refined to allow for this.

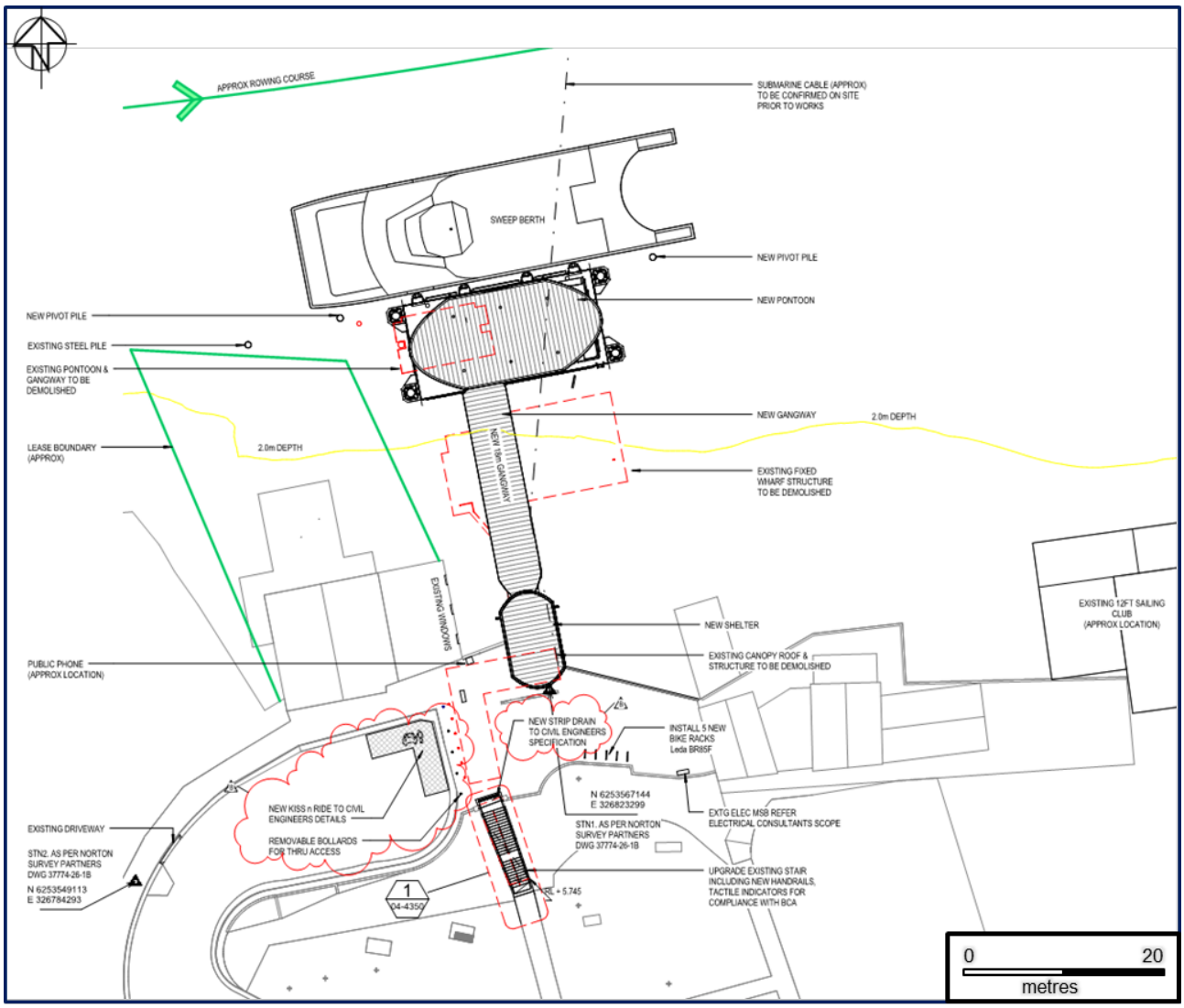
Accessible parking

The City of Canada Bay Council raised concerns with the provision of an accessible parking space. The concerns raised included potential impacts on pedestrian movements and emergency access to the wharf. Council also objected to the provision of private parking spaces which did not complement Council's parking strategy for the area, due to historic issues with anti-social behaviour which had reduced when private parking was removed.

Council confirmed a kiss-and-ride zone would be preferred in place of one accessible parking space, as this would provide access to the wharf for a greater number of people and better align Council's parking strategy.

Following this feedback the design was revised again, removing the accessible parking space and providing a kiss-and-ride zone close to the wharf entrance.

Figure 2-5 shows the final concept design.



Source: Hansen Yuncken

Figure 2-5: Final concept design

3 Description of the proposal

This Chapter describes the proposal, its design and the construction methods that would be used to build it.

3.1 The proposal

The proposal is to upgrade the Abbotsford Wharf as part of the Transport Access Program (TAP). Its key features would include:

- Removal of the existing wharf and piles, including landside canopy
- Retention of a three-metre section of the existing jetty
- An 18-metre long by three-metre wide covered aluminium gangway extending north west from retained jetty section
- An 18-metre long by nine-metre wide floating covered and glazed steel pontoon, held in position by four piles
- Two new piled pivot piles to help with berthing
- A covered entry portal, of about six metres by three metres in dimensions
- New kiss-and-ride parking zone
- Upgrade of the existing stairs and supporting hand rails.

Figure 3-1 shows the proposal's construction footprint, and the location of the supporting ancillary facilities (ie site compounds, refer to section 3.4), which comprises the indicative assessment area.

Figure 3-1: Construction footprint

Map: 2271407A_GIS_F004_A1	Author: mitchellem		1:500
Date: 14/09/2017	Approved by: -		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

Data source: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community © Land and Property Information 2015

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Abbotsford Wharf Upgrade Review of Environmental Factors

Figure 3.1
Construction footprint

NSW Roads and Maritime Services

www.wsp.com

3.2 Design

This section describes the proposal's concept design.

3.2.1 Design criteria

The proposal has been designed to NSW and Australian maritime engineering and safety standards developed by:

- Roads and Maritime: Guidelines for the Assessment of Public Ferry Wharf Safety 2016
- Building Code of Australia: landside and superstructure
- Australian Maritime Safety Authority (ASMA): navigation and safety
- Standards Australia: AS4997: 2005 Guidelines for the Design of Maritime Structures
- Disability Discrimination Act 1992.

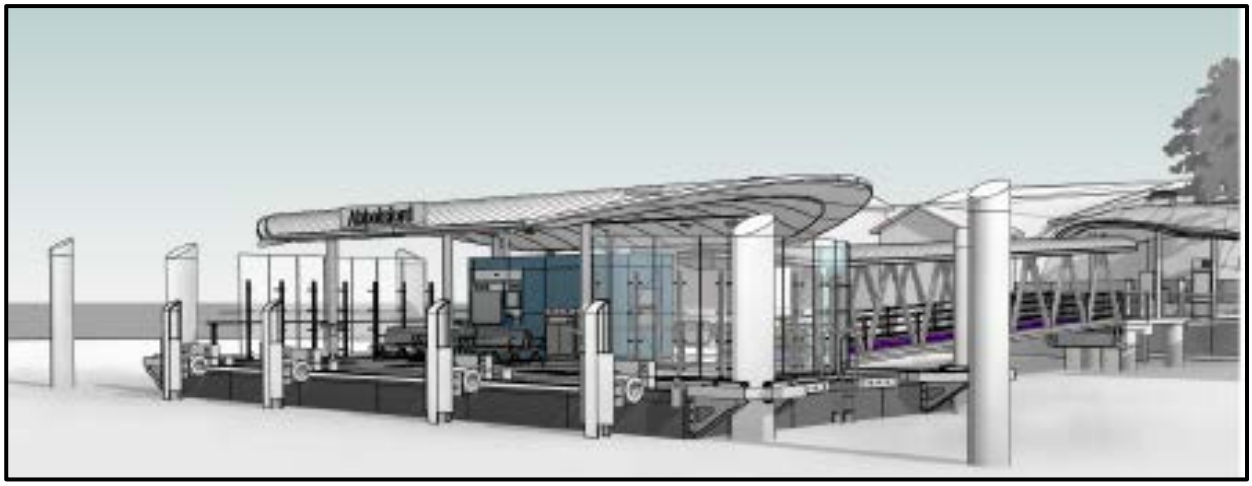
These standards describe the criteria that should be adopted when building specific maritime structures by providing detail on:

- Overall height above the water to allow operation during extreme low and high tide, while additionally allowing for climate change adaptation in the future
- Access and safety requirements
- Operation and stability during extreme storms, accounting for wind, wave and current conditions
- Sufficient water depths at extreme low tide to allow ferries to safely berth without the risk of either grounding or causing notable sediment disturbance and scour from propeller wash
- Appropriate materials selection and durability to support the operational design life of the wharf
- Additional safety and security measures consistent with the provisions of Crime Prevention through Environmental Design (DP&E, 2001).

Overall, the wharf has been designed:

- With a 50-year design life
- To cater for low mobility passengers and expected passenger growth in the future
- To operate in all states of the tide over its life
- To be regarded as an attractive, safe and secure piece of public transport infrastructure.

Figure 3-2 shows a three-dimensional montage of the proposal. Figure 3-3 and Figure 3-4 show artists impression of the proposal.



Source: Hansen Yuncken

Figure 3-2: 3D representation

Source: Roads and Maritime

Figure 3-3: Artist's Impression (side view)

Source: Roads and Maritime

Figure 3-4: Artist's impression (end view)

3.2.2 Engineering constraints

Table 3-1 lists the main constraints to development and discusses how they have been addressed in the concept design.

Table 3-1: Engineering and development constraints

Constraint	Concept design provision
Major submarine cable near the wharf	• Consult with the utility services providers to identify the owners of the cable, whether it is in use, and identify any safety clearance zones • Ensure the design responds to these requirements.
Rock face and steep gradient down to the wharf	• Develop a design that provides sufficient access to support low mobility passengers • Deliver a DDA compliant design, to ensure a DDA compliant interchange is provided at Abbotsford Wharf.
Wind, wave, current and climate change	• Develop a design that allows the wharf to be used in all tidal 'states' (ie HAT and LAT, with an additional allowance for climate change adaptation).
Heritage values	• Ensure the design is sensitive to the area's heritage values • Respect the Aboriginal heritage values associated with Werrell Reserve.

3.2.3 Major design features

This section describes the proposals main design features.

Pontoon wharf

The pontoon would be built about 20 metres from shore. It would comprise an 18-metre wide and nine-metre long steel floating pontoon and canopy shelter, which would include a waiting area, seating and information kiosk. The wharf would have one berthing face on the northern (harbour) side for ferries and other smaller vessels.

A curved zinc canopy roof would be built over the pontoon that would be supported on steel columns. The pontoon would be surrounded by a mixture of glass and stainless steel balustrades.

The floating pontoon would be attached to, and held in place by, four steel piles that would be drilled and subsequently hammered to refusal in the underlying sandstone bedrock. The pontoon height would vary relative to the landfall depending on the state of the tide. The floating pontoon would be built from pre-fabricated units delivered to site.

Gangway

The wharf pontoon would be accessed by an 18-metre long by three-metre wide covered lightweight aluminium gangway. The gangway would be built to be 90 degrees to the foreshore. The gangway would be held in place by a pivot that would be attached to steel piles founded in the bedrock. The gangway gradient would vary relative to the landfall depending on the state of the tide. It would allow for disabled and low mobility for most of the time except during extreme high and low tide, which is consistent with the TfNSW Guideline for the Assessment of Public Ferry Wharf Safety (TfNSW, 2016). The gangway would be built from pre-fabricated units delivered in sections to site.

Jetty

The gangway would attach to a three-metre section of existing jetty which would be retained.

Entry portal

A six-metre by three-metre entry portal would be built at the entry to the jetty. The entry portal would be constructed with curved zinc canopy roof supported by steel columns, and would be built off site and delivered as one unit to site.

Steps

The existing 33 access steps from Werrell Reserve to the wharf would be upgraded to comply with AS1428.2:1992. This would involve:

- Removing the existing hand rail
- Installing new prefabricated supporting handrails
- Installing tactile ground surface indicators, and antiskid material.

Supporting infrastructure

While the details of the supporting infrastructure, lighting, signage, and furniture would be confirmed during the detailed design, they would be consistent with the provisions included on the other wharfs on the network. It would therefore include:

- Safety and security lighting on the step approaches, in the shelter and on the pontoon wharf
- Passenger information boards, notices, and (electronic and display board) timetables
- Safety ladders around the walkway and wharf pontoon
- Strung cabling and ducting to provide power and communications
- Closed circuit television (CCTV)
- Passenger facilities
- Tactile flooring
- Revision to the existing parking arrangements to create a ‘kiss and ride’ zone
- New signage to assist with information and navigation (wayfinding)
- Provision of five new bicycle racks.

The above would be developed in accordance with Roads and Maritime design specifications.

3.3 Construction activities

The appointed contractor would confirm the final construction activities in discussion with Roads and Maritime. As such, this section only indicates a likely method and work plan as it may vary due to the identification of additional constraints before work starts, detailed design refinements, community and stakeholder consultation feedback, and contractor requirements/limitations. Should the work method differ from what is proposed in this REF then the contractor would consult Roads and Maritime to determine if additional assessment and are needed. Some additional land would be needed temporarily to support construction, as described in section 3.4.

3.3.1 Work methodology

The proposal would be built under Roads and Maritime specifications as managed by a contractor under a construction environmental management plan (CEMP). These specifications cover environmental performance and management supplemented by aspects such as materials storage and management, and erosion and sediment control. The proposal would likely comprise a sequence of work activities like that summarised in Table 3-2.

Table 3-2: Construction activities

Activity	Associated work
1. Site establishment and wharf closure	• Obtain leases and licences (refer to section 7.3) • Notify the public, public transport companies, local council and other stakeholders before work starts (refer to section 5.7) • Carry out pre-work inspections, pre-condition noise surveys (refer to Chapter 7), and other investigation work • Set out, mark and establish a maritime navigation exclusion zone in the harbour and no-go zones on land • Establish the site compound and temporary access route(s) • Provide public notices of the wharf closure and the nearest alternatives • Install temporary drainage controls (where needed).
2. Demolition and removal of components of the existing ferry wharf	• Dismantle and demolish the existing superstructure (pontoon, gangway and part of the jetty) • Dismantle and demolish the existing canopy shelter.
3. Pile removal	• Remove (either fully or cut and cap) the existing piles.
4. Build the new wharf substructure	4a: substructure work: • Drill the new piles for the wharf concrete bridge, pivot, gangway, and floating pontoon, and hammer to refusal using equipment mounted to a barge. 4b: superstructure work: • Install the build out the prefabricated sections of gangway • Install the prefabricated pontoon, using a barge mounted crane • Install the supporting infrastructure including barriers and handrails, safety and security facilities, cabling and ducting, lighting, CCTV, ladders, lifebuoys, glass shelter weather screens, and tactile flooring. 4c: stair upgrade • Form and pour new concrete stairs over the existing stair structure to provide a BCA compliant solution • Install handrails and other safety measures including antiskid surfacing and drainage. 4d: land side work • Install new covered entry portal • Install prefabricated bicycle racks • Install new signs and information boards • Install new kiss and ride zone • Note: this work would be carried out at the same time as the main wharf upgrade.

Activity	Associated work
5. Site clean-up and opening the upgraded wharf	5a: testing and commissioning • Connect power and communications • Re-install Opal card readers and television timetable screens • Test and commission all infrastructure. 5b: demobilisation • Demobilise the site compounds and remove temporary: - Maritime navigation exclusion and no-go zones - Footpath restrictions/closures - Environmental and safety controls (refer to Chapter 7).

3.3.2 Construction hours and duration

This section describes the time it would take to build the proposal and the working hours.

Start date and length of construction

The proposal would be built over about four months starting in late 2018. Construction may not be continuous as it would rely on materials delivery and the manufacture of the prefabricated components. The construction program would also be affected by the need to coordinate with Port Authority of NSW, City of Canada Bay Council, residents, and other key stakeholders (refer to Chapter 5).

Working hours

The work would take place within standard working hours:

- Monday to Friday, 7am to 6pm
- Saturday, 8am to 1pm.

The exception would be piling, lifting and concrete work in the harbour. For safety reasons, this would need to take place at night when the water is calm and still and the harbour is least busy. It would take about three weeks of night work to carry out the piling. During piling activities, the following work schedule would be adopted:

- Drilling of piles
  - Setup: 11pm to 12am
  - Drilling: 12am to 6am
  - Pack up: generally, 6am to 7am.
- Hammering of piles:
  - Setup: 4am to 5am
  - Hammering: 5am to 7am.

Pile drilling or hammering would take place intermittently during the above periods. On average, a pile would be drilled or hammered for about 10 minutes followed by a relatively quiet period for the next 30 minutes or more before the next stage is progressed.

Due to the requirement for calm water conditions, the new pontoon and gangway would be lifted into position by a barge-mounted crane between 11pm and 7am.

3.3.3 Workforce

While about 25 people would be needed to carry out the main construction activities, it is expected that there would be about 10-15 people onsite at any time on average.

3.3.4 Plant and equipment

The plant and equipment needed to build the proposal would be typical to any construction site. It would vary depending on the construction activity. The largest and most complex equipment needed would be to lift and install the prefabricated units and undertake the piling work. Table 3-3 indicates the plant and equipment that would be likely used to build the proposal, however this would be confirmed by the contractor.

Table 3-3: Indicative plant and equipment

Equipment	Equipment
Angle grinders*	#Piling rig (drilling)
*Barge mounted crane	#Piling rig (hammering)
*Barge/boat	#Daymaker
*Generator	*Hand tools (electric)
Compressor*	Light and heavy vehicles

Notes:
* Used for during the day and at night
only used at night

3.3.5 Earthworks

There would be limited earthworks associated with the proposal. A small amount of riverbed sediment would be either disturbed or collected during the piling work. These materials would be collected for testing and waste classification. Where possible, the materials would be reused under an exception, unless they classify as a non-exempt waste, in which case they would be shipped (barged) offsite for collection and disposal at a licenced waste management facility.

3.3.6 Source and quantity of materials

Various standard construction materials that are readily available across the Sydney Metropolitan region would be needed to build the proposal. They would be either transported or shipped (barged) to site as prefabricated units ready for installation, or delivered in small quantities for use as needed (refer to section 3.4). The main materials needed to build the proposal would comprise:

- Marine-grade steel, aluminium and zinc for the superstructure (floating pontoon and wharf, barriers and roof), substructure (piles) and land side work (stairs)
- Precast concrete
- Prefabricated signage, light fittings, barriers and fencing
- Prefabricated glazing units
- Electrical cabling and other electronic infrastructure
- Additional materials such as relatively small quantities of paint, oils, fuels and other materials.

The one exception is the pre-fabricated pontoon that would be built in Port Macquarie and sailed down the coast into the harbour.

3.4 Ancillary facilities

Given the limited space and road access, the preference would be to ship any major machinery, equipment and prefabricated units to site, potentially making use of an offshore storage barge. However, it is also likely that a small 75 m^2 site compound (to be confirmed by the contractor) would be needed within the proposal footprint to store equipment, machinery and some limited materials. While the specific requirements for this site would be confirmed by the contractor, it would most likely comprise a shipping container with a supporting site office and toilet.

Roads and Maritime's preference is to select ancillary facilities that are consistent with the following criteria:

- Away from biodiversity and heritage values
- Outside of flood prone land
- At least 40 metres from a watercourse
- On previously disturbed areas
- More than 100 metres from residential property
- Outside the drip line of trees and on level ground wherever possible.

While the nature of the work means that any site would be located within 40 metres of Sydney Harbour, the limited available space on land means that the ancillary facility would also need to be:

- Located close to, or within, Werrell Reserve, which has a heritage and amenity value
- On previously undisturbed land
- Within 100 metres of residential properties
- Potentially within the drip line of various trees.

As such, potential impacts and additional controls and safeguards have been considered in Chapter 6 and Chapter 7 respectively.

3.4.1 Traffic management and access

Maritime and road traffic management would be required while certain elements of the proposal are being built and installed. This may involve:

- Creation of a maritime navigation exclusion zone around the proposal footprint for most of the construction work to prevent both commercial and recreational traffic entering the area
- Temporary closure of the Great North Road cul-de-sac, with implementation of a Traffic Management Plan
- Temporary traffic lights or stop-go provisions on Great North Road and adjacent roads while major deliveries take place.

Private property access would be maintained during construction. As needed, property owners would be consulted and access would be likely managed using traffic controllers to guide people into and out of businesses and residences close to the proposal footprint. No parking is permitted on Great North Road at the wharf by the City of Canada Bay Council. Whilst parking would be typically avoided, it is possible that this area may be used for short periods to set down equipment and machinery. This would be confirmed by the contractor and subject to City of Canada Bay Council's agreement, as discussed further in section 6.8.

Construction traffic

As noted above, where feasible, materials and equipment would be shipped (barged) into and out of the area to limit any impact on Great North Road. The amount of materials shipped to site, over being delivered by road, would only be confirmed during the detailed design. Construction workers would also be likely prevented from driving along Great North Road in favour of promoting travelling to site via barge where feasible or people meeting at a staging point elsewhere in Abbotsford to then be dropped off onsite. Table 3-4 summarises the expected construction traffic associated with building the proposal.

Table 3-4: Construction traffic (daily average)

Vehicle type and association	Vehicle number (per week)		Typical travel patterns and limitations
	Average	Maximum	
Assuming that no materials or equipment is shipped to site			
Construction traffic: heavy vehicles	2	5	Regular movements throughout the day
Deliveries: light and heavy vehicles	4	10	
Assuming that the majority of materials and equipment is shipped to site			
Construction traffic: heavy vehicles	1	2	Regular movements throughout the day
Deliveries: light and heavy vehicles	1	2	
Shipped materials	1	2	

3.5 Public utility adjustment

No utilities would need adjusting, relocating or installing under the proposal. However, the submarine cable located on the western side of the existing wharf would require protection during construction. Final protection requirements would be confirmed during the detailed design.

3.6 Property acquisition

No property would be acquired under the proposal. The additional land needed to support construction would be either leased from, or used under agreement with the City of Canada Bay Council.

4 Statutory and planning framework

This Chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant environmental planning instruments.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State environmental planning policies

State Environmental Planning Policy (Infrastructure) 2007

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

Clause 68(4A) of ISEPP permits the development of public ferry wharves to be carried out by or on behalf of a public authority without consent. However, such development may only be carried out on land reserved under the *National Parks and Wildlife Act 1974* if the development is authorised by or under that Act.

As the proposal is for the purpose of a wharf or boating facility and is to be carried out by Roads and Maritime, it can be determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from Council is not required. The proposal is not located on land reserved under the National Parks and Wildlife Act 1974.

The proposal does not affect land or development affected by State Environmental Planning Policy No. 14 – Coastal Wetlands, State Environmental Planning Policy No. 26 – Littoral Rainforests or State Environmental Planning Policy (Major Development) 2005.

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) identifies State significant infrastructure and critical State significant infrastructure.

Clause 14(1) of the SRD SEPP declares a development to be State significant infrastructure if it is, by the operation of a State environmental planning policy, permissible without development consent and is specified in schedule 3 of the SEPP.

Schedule 3 specifies that proposed port and wharf facilities or boating facilities (not including marinas) delivered by or on behalf of a public authority that has a capital investment value of more than $30 million is State significant infrastructure.

The proposal has a capital investment value of less than $30 million so does not become State significant infrastructure as declared by the SRD SEPP.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The proposal is located within the Sydney Harbour Catchment and is subject to the Sydney Regional Environmental Plan (SREP, Sydney Harbour Catchment) 2005, which is a deemed SEPP, meaning its policies are still relevant and treated in the same way as a SEPP.

The aims of the SREP

Table 4-1 considers the aims of Clause 2 the Sydney Harbour SREP.

Table 4-1: Aims of the Sydney Harbour SREP

Aim	Comment
Clause 2 (1a): to ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained: (i) As an outstanding natural asset (ii) As a public asset of national and heritage significance, for existing and future generations.	Chapter 7 of this REF includes safeguards to protect and maintain the area's natural and heritage values, including those associated with the existing wharf (refer to section 6.6). This would ensure the values of Sydney Harbour are recognised, protected, enhanced and maintained.
Clause 2 (1b): to ensure a healthy, sustainable environment on land and water.	Providing relevant standard controls are implemented and monitored, as set out in Roads and Maritime guidelines and quality assurance specifications (refer to section 7), the proposal's environmental impact are expected to be safeguarded and minimised thus affording protection to the land and water environments associated with the Harbour.
Clause 2 (1c): to achieve a high quality and ecologically sustainable urban environment.	The proposal's urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements. The design also provides thematic consistency across the entire network (refer to section 3). Both factors provide for a sustainable urban environment over its 50-year design life.
Clause 2 (1d): to ensure a prosperous working harbour and an effective transport corridor.	With a 50-year design life, the proposal would allow for the operation of a ferry wharf at Abbotsford for future generations. The work also forms part of a network-wide upgrade program to help sustain the ferry service in its role as part of an effective and integrated transport corridor and system. There would be some temporary impact to public transport during construction due to the wharf's closure. Passengers would be notified ahead of time about the wharf's closure and directed to alternative transport as detailed in section 6.8.
Clause 2 (1e): to encourage a culturally rich and vibrant place for people.	The upgrade would continue to provide Abbotsford residents with access to the ferry network and its interchange with other public transport provisions. This would sustain the neighbourhood as a vibrant place to live.

Aim	Comment
Clause 2 (1f): to ensure accessibility to and along Sydney Harbour and its foreshores.	The upgrade would ensure that Abbotsford residents and other users are provided with ongoing access to Sydney Harbour and its foreshore areas over the next 50 years. It would also improve access for low mobility passengers. There would be some temporary impact to public transport during construction. Passengers would be notified ahead of time about the wharf's closure and directed to alternative transport as detailed in section 6.8.
Clause 2 (1g): to ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity.	The proposal would have no significant impact on notable terrestrial or marine environments or values in the area. Additional standard controls would be implemented to prevent any indirect impact on the wider ecological environment from spills and sediment disturbance, mobilisation and smothering.
Clause 2 (1h): to provide a consolidated, simplified and updated legislative framework for future planning.	The proposal is being delivered under the relevant planning provisions covering waterfront and marine development set at a State and Commonwealth level.

The proposal has been considered in respect of the objectives from clause 17 of the SREP Sydney Harbour zone W5 Water Recreation objectives shown in Table 4-2.

Table 4-2: Zone W5 Maritime Waters objectives

Objective	Comment
(a) to give preference to and increase public water-dependent development so that people can enjoy and freely access the waters of Sydney Harbour and its tributaries	The proposal would upgrade the existing wharf at Abbotsford allowing for more effective and efficient public water transport for its 50-year design life. Minor disruption would be caused during construction, which would be communicated to water users before starting work
(b) to allow development only where it is demonstrated that the public use of waters in this zone is enhanced and will not be compromised now or in the future	The proposal would upgrade the existing wharf at Abbotsford. The upgraded wharf's operation would be the same as the existing wharf. It would therefore not adversely impact on vessels in the harbour. Minor disruption would be caused by temporarily closing the wharf during construction. Passengers would be notified ahead of time about the wharf's closure and directed to alternative transport as detailed in section 6.8.
(c) to minimise the number, scale and extent of artificial structures consistent with their function	The proposal includes upgrade of the existing wharf at Abbotsford, with a wharf of similar scale and extent.
(d) to allow commercial water-dependent development, but only where it is demonstrated that it meets a justified demand, provides benefits to the general and boating public and results in a visual outcome that harmonises with the planned character of the locality	The proposal includes upgrade of the existing wharf at Abbotsford, with a wharf of similar scale and extent, which is in keeping with the planned character of the locality.

Objective	Comment
(e) to minimise congestion of and conflict between people using waters in this zone and the foreshore	The proposal would not result in additional congestion of and conflict between people using waters in this zone and the foreshore.
(f) to protect and preserve beach environments and ensure they are free from artificial structures	The proposal includes upgrade of the existing wharf at Abbotsford, with a wharf of similar scale and extent, and would not result in any additional impacts to beach environments.
(g) to ensure that the scale and size of development are appropriate to the locality, and protect and improve the natural assets and natural and cultural scenic quality of the surrounding area, particularly when viewed from waters in this zone or from areas of public access	The proposal includes upgrade of the existing wharf at Abbotsford, with a wharf of similar scale and extent. No additional impacts to the natural and cultural scenic quality of the surrounding area are anticipated.

Under clause 18 of the Sydney Harbour SREP, the proposal is permissible with consent in the W5 zone. In any case, the development is permissible without development consent pursuant to the provisions of the ISEPP which override the zoning provisions of the Sydney Harbour SREP (see clause 7(5) of the Sydney Harbour SREP).

The matters for consideration

Clause 21 to Clause 27 of the SREP lists seven matters that Roads and Maritime is to consider before carrying out any activity determined under Part 5 of the EP&A Act.

Table 4-3: Clause 21 to Clause 27 matters

Division 2 matter	Comment
Clause 21: biodiversity, ecology and environment protection	Chapter 6 describes the terrestrial and marine impact associated with the proposal. In summary, there is not predicted to be any significant environmental impact within the meaning or definition of the *Fisheries Management Act 1994* or *Threatened Species Conservation Act 1995.*
Clause 22: public access to, and use of, foreshores and waterways	The existing wharf would be closed for about 4 months while it is being upgraded. Access to the foreshore would be restricted over this period (refer to section 3.4). The local community, park users and ferry passengers would be notified ahead of work starting that would affect the above areas.
Clause 23: maintenance of a working harbour	The upgrade would ensure that Abbotsford residents and other users would be provided with access to a ferry service (and public transport) over the next 50 years.
Clause 24: interrelationship of waterway and foreshore uses	The upgrade would allow the social and cultural association of there being a wharf in this location to be retained, including the relationship it provides for people between the harbour and foreshore.

Division 2 matter	Comment
Clause 25: foreshores and waterways scenic quality	Upgrading the wharf in its existing position would prevent the visual impact of introducing infrastructure in a new location, including any impact on areas zoned as 'scenic waters'. However, there would be an adverse visual impact from increasing the mass, scale, form, composition, design and structure of the wharf.
Clause 26: maintenance, protection and enhancement of views	Section 6.4 describes the landscape character and visual impacts associated with the proposal. As described above, the upgrade would have a visual impact for the surrounding properties that overlook this part of the harbour. However, the overall impact is likely to be less compared to building a new structure in a different location as people accept there being a wharf in its current location.
Clause 27: boat storage facilities	There is no boat storage work associated with, or impacted by, the proposal.

Clause 31 of the Sydney Harbour SREP contains provisions to consult with the Foreshore and Waterways Planning and Development Advisory Committee (the committee) and relevant utility companies where development is either listed in Schedule 2 or needs to connect into services such as water and sewerage. Section 5.5 discusses this further.

Heritage provisions

Part 5 of the Sydney Harbour SREP contains heritage provisions that are to be taken into account in respect of Part 5 activities. Heritage items within or in the vicinity of the proposal location include Abbotsford Jetty (Abbotsford Wharf), Abbotsford Point Boatshed, Werrell Park (Werrell Reserve), sandstone kerbing and Sydney Rowing Club – Boatshed. Heritage items are discussed further in section 6.7. The heritage objectives from the Sydney Harbour SREP in clauses 53(1) and (2) are considered in Table 4-4 below.

Table 4-4: Heritage objectives

Objective	Comment
Clause 53 (1a): to conserve the environmental heritage of the land to which this Part applies.	The proposal has been designed to be sympathetic to the areas heritage values. This includes building a wharf of similar scale and character in the location of the existing wharf. A statement of heritage impact (SOHI) prepared to support this REF concludes that the proposal would have neutral or lesser impact on heritage items (refer to section 6.7).
Clause 53 (1b): to conserve the heritage significance of existing significant fabric, relics, settings and views associated with the heritage significance of heritage items.	As above, the proposal has been designed so as to preserve the heritage and conservation values of surrounding heritage items including Werrell Reserve, Abbotsford Point Boatshed, Sydney Rowing Club Boatshed, sandstone curbing and tram lines.
Clause 53 (1c): to ensure that that archaeological sites and places of Aboriginal heritage significance are conserved.	There are no sites of Aboriginal heritage significance recorded near the proposal (refer to section 6.6). The SOHI concludes that the proposal would not impact on known archaeological sites or places of Aboriginal heritage (refer to Appendix G).

Objective	Comment
Clause 53 (1d): to allow for the protection of places which have the potential to have heritage significance but are not identified as heritage items.	The proposal does not include any land side excavation work. It therefore limits any potential archaeological impacts. The safeguards in Chapter 7 include provisions to protect the associated heritage values of construction footprint, while the marine work is not taking place in an area of heritage (or ship wreck) potential.
2(a) To establish a buffer zone around the Sydney Opera House so as to give added protection to its world heritage value	The proposal is not located within the Sydney Opera House buffer zone.
2(b) To recognise that views and vistas between the Sydney Opera House and other public places within that zone contribute to its world heritage value.	The proposal would not impact on the views and vistas from the Sydney Opera House.

Clause 54 to Clause 60 of the Sydney Harbour SREP provide for the protection of heritage items and places, including requirements for development consent. The SOHI for the proposal was prepared in accordance with Clause 54 to Clause 60 of the Sydney Harbour SREP. As noted above, the SOHI concludes that the proposal would have neutral or lesser impact on heritage items and it would not impact on would not impact on known archaeological sites or places of Aboriginal heritage. As such, there is no need to either seek permission or secure development consent for the work on heritage-related grounds.

Wetland protection

Part 6 of the Sydney Harbour SREP relates to wetlands protection. The site is identified as being located within a Wetland Protection Area under the SREP. The wetlands objectives from the Sydney Harbour SREP in clause 61 are considered in Table 4-5 below.

Table 4-5: Wetland objectives

Objective	Comment
Clause 61 (a): to preserve, protect and encourage the restoration and rehabilitation of wetlands.	The scale and nature of the work is not proposed to have any impact on water or the marine environment (refer to section 6.1) including its associated wetland values. Sediment disturbance would be localised to the work area limiting any potential for smothering or prolonged light preclusion. The condition of the wetlands is also unlikely to be impacted, notwithstanding the potential to encounter and mobilise residual contaminants (refer to section 6.1). As such, safeguards have been proposed to include a silt boom and curtain around the work area when undertaking the piling work and include pollution prevention controls when working in the marine environment. The piles and substructure have been designed to reduce any long-term scour and erosion risks in the wider marine environment, while the floating pontoon has been located offshore to ensure there are no associated propeller wash or scour impacts. Refer to section 6.2 for more information.

Objective	Comment
Clause 61 (b): to maintain and restore the health and viability of wetlands.	As described above, the design of the wharf and the safeguards proposed in Chapter 7 would allow the wetland values and health to be maintained. Also, providing relevant standard controls are implemented and monitored as set out in Roads and Maritime guidelines and quality assurance specifications (refer to section 7.2), the proposal's environmental impacts during construction are expected to be safeguarded and minimised thus affording protection of the wetlands in the local area.
Clause 61 (c): to prevent the fragmentation of wetlands.	The proposal would not fragment any of the wetlands.
Clause 61 (d): to preserve the scenic qualities of wetlands.	There would be some adverse visual impact from increasing the form, mass, location and scale of the wharf in its current location. However, as the wharf would be built farther offshore and at a maximum height far lower than the headland (ie there is a sharp increase in height form the wharf to Great North Road) the visual impact would be limited and contained. Further, the overall impact is likely to be less marked than building a new structure in a different location as people accept there being a wharf in its existing location.
Clause 61 (e): to ensure that wetlands continue to perform their natural ecological functions (such as the provision of wetland habitat, the preservation of water quality, the control of flooding and erosion).	As described above, the proposal's design in combination with the proposed safeguards described in Chapter 7 are aimed at protecting the ecological marine environment to ensure the wetland's ecological function is preserved. Many of these safeguards are being implemented as a matter of precaution to minimise impact risk as described further in section 7.2.

The matters to be considered for work within a wetland protection area from Clause 63(2) of the SREP are considered in Table 4-6.

Table 4-6: Clause 63 matters

Clause 63 matter	Comment
Clause 63 (2a): the development should have a neutral or beneficial effect on the quality of water entering the waterways.	The proposal would have a neutral effect if relevant standard safeguards in Roads and Maritime guidelines, and quality assurance specifications are implemented and monitored. The proposal's environmental impact is expected to minimised and protect the marine environment and water quality (refer to Chapter 7).

Clause 63 matter	Comment
Clause 63 (2b): the environmental effects of the development, including effects on:	
Clause 63 (2b) (i) the growth of native plant communities. Clause 63 (2b) (ii) the survival of native wildlife populations Clause 63 (2b) (iii) the provision and quality of habitats for both indigenous and migratory species	The aquatic and terrestrial ecology assessment carried out to support the REF concludes that any impacts would not significantly affect aquatic ecology. A small net loss in minimally sensitive fish habitat, subtidal bare soft silty-sand, would be caused from installing piles and shading parts of the harbour floor. This is assessed as being insufficient to impact on the ecological values of the area. Further, this would be offset by an estimated net gain of habitat during operation from exposing areas of the harbour floor by removing the existing wharf and the new piles and submerged portions of the pontoon providing a surface for the creation of artificial habitat. No impacts to terrestrial flora or fauna would occur because of the proposal. Refer to section 6.2 for further detail.
Clause 63 (2b) (iv) the surface and groundwater characteristics of the site on which the development is proposed to be carried out and of the surrounding areas, including salinity and water quality and whether the wetland ecosystems are groundwater dependent	As described above, providing the relevant safeguards described in Chapter 7 are implemented and monitored, the proposal's environmental impacts on the area's surface and groundwater quality are expected to be safeguarded and minimised.
Clause 63 (2c): whether adequate safeguards and rehabilitation measures have been, or will be, made to protect the environment.	Chapter 7 sets out the safeguards and monitoring requirements to protect the local environment. The chapter also includes post-construction measures, and corrective actions needed during an accident and emergency to manage any impacts and rehabilitate the environment because of any expected or unexpected outcomes.
Clause 63 (2d): whether carrying out the development would be consistent with the principles set out in The NSW Wetlands Management Policy	These principles focus on wetland management and preservation. Table 4-5 above describes how the proposal has been designed and environmental safeguards have been proposed to protect the sensitive wetland area in which the proposal would be built.
Clause 63 (2e): whether the development adequately preserves and enhances local native vegetation.	Refer to Clause 63 (2b)
Clause 63 (2f): whether the development adequately demonstrates:	
(i): how the direct and indirect impacts of the development will preserve and enhance wetlands	Section 6.2 and Table 4-5 describe how the proposal has been designed and environmental safeguards have been proposed to protect the sensitive wetland area in which the proposal would be built.

Clause 63 matter	Comment
(ii): how the development will preserve and enhance the continuity and integrity of the wetlands	Refer to Table 4-5.
(iii): how soil erosion and siltation will be minimised both while the development is being carried out and after completed,	The proposed piles and substructure components described in Chapter 3 have been designed to minimise scour, erosion or any sediment transport, hydrodynamic and/or physical impact on the marine environment. During construction work, a silt boom and curtain would be used to prevent any sediment dispersion and siltation, while additional erosion management controls have been identified in the safeguards in Chapter 7.
(iv): how appropriate onsite measures are to be implemented to ensure that the intertidal zone is kept free from pollutants arising from the development	Chapter 7 includes a range of standard pollution management controls that would be implemented and monitored during construction as set out in Roads and Maritime guidelines and quality assurance specifications (refer to Chapter 7). If implemented, then the proposal's environmental impact on the intertidal zone are expected to be safeguarded and minimised. As described in section 6.1, there would be restrictions on the use of pollutant-generating chemicals and materials such as biocides to maintain the wharf once upgraded.
(v): that the nutrient levels in the wetlands do not increase as a consequence of the development	The proposed standard pollutant management and sediment disturbance controls included in Chapter 7 help prevent any nutrient loading into the marine environment.
(vi): that stands of vegetation (both terrestrial and aquatic) are protected or rehabilitated	Refer to Clause 63 (2b)
(vii): that the development minimises physical damage to aquatic ecological communities	The proposal's footprint would be limited to the installation of nine piles. This would be insufficient to have any material physical impact on marine ecological communities and their supporting habitat. Also, as described in section 6.1, the operational wharf would not alter the hydrodynamic or physical environment, to the extent to indirectly impact on aquatic ecological values.
(viii): that the development does not cause physical damage to aquatic ecological communities.	As above.
Clause 63 (2g): whether conditions should be imposed on the carrying out of the development requiring the carrying out of works to preserve or enhance the value of any surrounding wetlands.	Chapter 7 includes safeguards that Roads and Maritime, and its contractor(s), would commit to implementing and monitoring during construction to prevent any impact on the surrounding wetland values. Table 4-5 describes this in more detail.

4.1.2 Local Environmental Plans

Canada Bay Local Environmental Plan 2013

The landside component of the proposal is located within the City of Canada Bay local government area (LGA). Local development control and land use zoning and planning in this LGA is currently governed under the City of Canada Bay local environmental plan 2013 (LEP).

As development without consent, the proposal is not subject to local environmental planning policy or development control. However, the LEP is useful in identifying the proposal's consistency with its land use and planning policy as described in Table 4-7.

Table 4-7: Relevant Leichhardt LEP land use zoning policies

Objective	Proposal consistency
RE1: public recreation: covering the wharf access stairs, waterfront and Werrell Reserve	
• Provide - Public recreational open space - A recreational setting, activities and compatible land uses • Protect and enhance the natural environment.	• No loss of recreational land • Short-term access restrictions when the wharf is being built. • Introduction of new wharf infrastructure within the setting of Werrell Reserve, leading to a change in visual amenity (refer to section 6.4).
RE2: private recreation: covering the Sydney Rowing Club and Abbotsford Point Boat Shed	
• Provide - Private recreational open space or recreational purposes - Recreational settings and activities, and compatible land uses • Protect and enhance the natural environment. • Conserve private open space that enhances the scenic and environmental quality of Canada Bay	• No loss of recreational land • Short-term access restrictions when the wharf is being upgraded. Additional temporary loss of the stairs within Werrell Reserve land (refer to section 3.4) • Introduction of new wharf infrastructure within the setting of Werrell Reserve, leading to a change in visual amenity (refer to section 6.4).
R1: general residential: housing along Great North Road	
• Provide - Housing needs for the community - A variety of housing types and densities • Enable other land uses the provide facilities/services for residents to meet their day-to-day needs.	• Has no direct impact on the area's residential function • Introduction of new wharf infrastructure into existing harbour views for a limited number of residents (refer to section 6.4) • Provides ongoing access to the ferry network for Abbotsford residents therefore meeting their day-to-day travel and community needs.

4.2 Other relevant NSW legislation

Table 4-8 lists the NSW legislation relevant to the proposal or the land on which the proposal would be built.

Table 4-8: Other relevant NSW legislation

Legislation and application	Relevance to the proposal and further requirements
National Parks and Wildlife Act 1974: provides for the protection of Aboriginal heritage values, national parks and ecological values. Makes it an offence to harm Aboriginal objects, places or sites without permission	An Aboriginal heritage due diligence assessment confirmed there were no registered sites within proximity to the wharf. An Aboriginal heritage impact permit (AHIP) from OEH under Part 6 of this Act is not required for the proposal. Section 6.6 provides further discussion.
Heritage Act 1977*:* provides for the protection of conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. Makes it an offence to harm any non-Aboriginal heritage values without permission	The proposal would: • Have no significant impacts on an item of local heritage value (refer to section 6.7) • Not take place close to any recorded wreck sites • Have a low potential of impacting on undiscovered archaeology. Approval for the proposal under the *Heritage Act 1977* is not required.
Roads Act 1993: provides for the construction and maintenance of public roads. Requires consent to dig up, erect a structure or carry out work in, on or over a road	The proposal may need to undertake some limited work on Great North Road that would require a (road occupancy) licence from City of Canada Bay Council.
Fisheries Management Act 1994: provides for the protection of fishery resources and values for current and future generations. Makes it an offence to harm fisheries and resources without an appropriate assessment, inclusion of safeguards and/or the appropriate permissions to carry out certain work.	The proposal would not result in a significant impact on critical marine flora and fauna habitat, or marine threatened species, populations and ecological communities and their habitat. As such, a species impact statement would not be required as per section 221 of this Act. This is supported by the aquatic and terrestrial ecology assessment (refer to section 6.2) carried out to support the REF, which concluded that any impacts would not significantly affect aquatic ecology.

Legislation and application	Relevance to the proposal and further requirements
Biodiversity Conservation Act 2016: replaced the *Threatened Species Conservation Act 1995*, *Native Vegetation Act 2003* and part of the *National Parks and Wildlife Act 1974* from 25 August 2017. The act provides for a strategic approach to conservation in NSW. It includes provisions risk-based assessment of native plant and animal impacts, including a Biodiversity Assessment Method (BAM) to assess the impact of actions on threatened species, threatened ecological communities and their habitats.	Transitional arrangements for the Act apply to existing projects. For projects assessed under Part 5 of the EP&A Act, such as the proposal, transitional arrangements apply if an environmental impact assessment of the activity began before the commencement of the Act (but only if the determining authority grants approval within 18 months of that commencement to the carrying out of the activity). Assessment of the proposal commenced prior to the 25 August 2017. An assessment of the requirements under the *Threatened Species and Conservation Act 1995* is provided below.
Threatened Species and Conservation Act 1995: provided for the protection of vulnerable and endangered flora, fauna, communities and populations and their associated habitat. Made it an offence to harm terrestrial critical flora and fauna habitat or terrestrial threatened species, populations and ecological communities and their habitat without an appropriate assessment, inclusion of safeguards and/or the appropriate permissions to carry out certain work.	The proposal would not result in loss of, or impact on, communities and species protected under this Act. Permission from the Office of Environment and Heritage (OEH) is not required. The impacts would not be significant, consistent with the assessment made in accordance with section 5A of the EP&A Act. There is no need to prepare a species impact statement as per section 109 to section 113 of the above Act.
Protection of the Environment Operations Act 1997: focuses on environmental protection and provisions for the reduction of water, noise and air pollution and the storage, treatment and disposal of waste. Introduces licencing provisions for scheduled activities that are of a nature and scale that have a potential to cause environmental pollution. Also, includes measures to limit pollution and manage waste.	The proposal would not involve undertaking or carrying out a scheduled activity; removing the need to work under an environmental protection licence. If all standard controls set out in Roads and Maritime guidelines and quality assurance specification are implemented and monitored, there is unlikely to be any material water, noise or air pollution impact (refer to Chapter 7). Appropriate waste management controls would be introduced to classify, store, transport, and dispose of all construction and work-generated waste.
Marine Pollution Act 2012: sets out provisions to prevent pollution in the marine environment.	The proposal is unlikely to result in any oil, noxious liquid, pollutant, sewage or garbage discharge as controlled under this Act, providing relevant standard controls are implemented and monitored (refer to Chapter 7).
Ports and Maritime Administration Regulations 2012: requires Harbour Master permission to alter any structure or disturb the harbour floor within Sydney Port.	The proposal is likely to disturb sediment (refer to Section 67ZN of the Regulation). The written permission of the Harbour Master is required before the proposal is started. Section 5 describes the detail of the consultation that has taken place to secure this permission.

Legislation and application	Relevance to the proposal and further requirements
Marine Safety Act 1998 and Marine Safety Regulation 2016: sets out the requirements for marine safety and the roles of the Harbour Master and marine pilots. Includes provisions relating to marine and navigational safety including: collision prevention, spill limits, no-wash zones, shipping operation restrictions, and controls on reckless, dangerous or negligent navigation.	As the proposal would involve being in the harbour (a navigable water under the terms of the Act), and would restrict its use by the public, it is subject to licencing under the terms of section 97 of the Regulation. Also, navigational exclusion zones would be installed while the work is taking place. This would include updating the Harbour Master and Ports Authority. Where required, nautical charts would be updated once the wharf is upgraded.

4.3 Commonwealth legislation

The following Commonwealth legislation is relevant to this proposal.

4.3.1 Disability Discrimination Act 1992

The above Act includes provisions to prevent discrimination based on disability, while also providing equal rights and access for all people. This was supplemented in 2002 by the Disabled Standards for Accessible Public Transport, which were introduced to allow public transport operators and providers to “remove discrimination from public transport services”. The standards provide detailed information on how transport infrastructure should be designed and built to provide disabled access. In NSW, this has been adopted as the Transport Access Program, with the proposal being designed to comply with the provisions of the above Act.

The proposal includes upgrading of the wharf to be DDA compliant.

4.3.2 Environment Protection and Biodiversity Conservation Act 1999

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

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

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a wharf and is being carried out by or on behalf of a public authority. Under Clause 68(4A) of the ISEPP, the proposal is permissible without consent. As the proposal is not State significant infrastructure, it can be determined as an activity under Part 5 of the EP&A Act. Accordingly, Roads and Maritime is the determining authority for the proposal, with this REF fulfilling the obligation under Clause 111 of the EP&A Act “to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity”.

5 Consultation

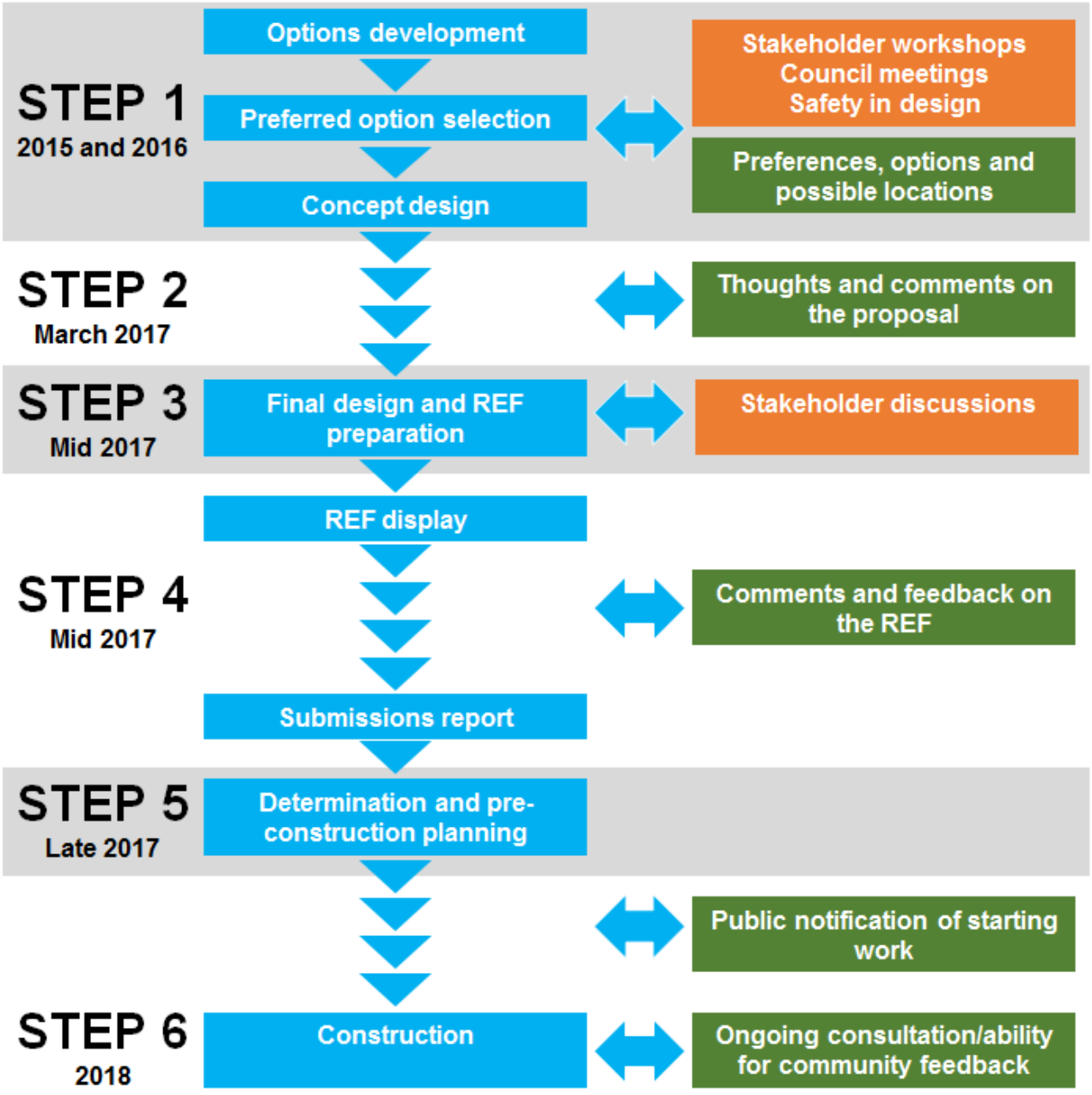
This Chapter discusses the consultation carried out to date and any future proposed consultation.

5.1 Consultation strategy

Roads and Maritime has prepared a community consultation and stakeholder engagement plan for the proposal in accordance with the International Association for Public Participation Spectrum (IAP2, 2007) and the Stakeholder Engagement Toolkit (Roads and Maritime, 2015). The plan's objectives are to:

- Advise directly-affected stakeholders and the community about the proposal, its potential impacts, and how they can obtain further information
- Brief parties (passengers, pedestrians, cyclists, road users, businesses, residents and other key user groups) affected by any temporary traffic management controls, navigation restrictions, and ferry service disruption
- Ensure issues relating to the proposal are identified and effectively managed
- Identify local issues to ensure the proposal aligns with community needs
- Inform and consult impacted and interested stakeholder groups
- Involve key Government agencies and stakeholders
- Receive comments from affected parties
- Record and respond to enquiries and concerns in an open, transparent and timely manner
- Seek community ideas for inclusion in the development of the detailed design.

Figure 5-1 shows the six main steps of the consultation process. The orange shaded boxes show where external stakeholders and Government agencies have been consulted and engaged with while the green shaded boxes show where community consultation has taken place.



Source: Hansen Yuncken

Figure 5-1: Consultation process

5.2 Community involvement

To date there have been two specific stages of community consultation (refer to Step 1 and Step 2 in Figure 5-1).

5.2.1 Step 1: help identify and develop options

In April and May 2015, Roads and Maritime first announced the proposed upgrade of Abbotsford Wharf, providing a community update and inviting the community to an information session that was held in May 2015 at the Sydney Rowing Club.

The purpose of the information session was to gain community feedback to help Roads and Maritime understand views about the existing facilities and priorities for improvement. It also allowed Roads and Maritime to explain the possible locations for replacing the wharf as well as the options for upgrading the existing facilities at the end of Great North Road. This process helped Roads and Maritime develop options, select a preferred option, and progress with the concept

design. A total of 12 submissions/feedback forms were received. A summary of issues raised by the community is provided Table 5-1 below.

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

Issue raised	Response and where addressed in the REF/concept design
Residents	
• Major upgrade is unnecessary and inconvenient due to the good condition of existing wharf	• The new wharf would provide DDA compliant access and would also increase the efficiency of ferries berthing, and access onto and off the ferries, with the wide area berthing face provided rather than a narrow gangway • The need for the proposal is addressed in section 2.3 of the REF.
• Access for 2nd Abbotsford Sea Scouts through construction and operation	• Access for the 2nd Abbotsford Sea Scouts would be maintained during construction. Where required, property owners would be consulted and access would be likely managed using traffic controllers to guide people into and out of businesses and residences close to the proposal footprint • Access is further addressed in section 3.4.1 of the REF.
• Better landside access is needed to the wharf; stairs are in poor condition and lighting is inadequate	• Due to the existing topography of the area, providing a DDA compliant pathway to the wharf would be very difficult to do without significant remodelling of the area or loss of Werrell Reserve. However, landside elements of the upgrade include upgrading existing stairs, and provision of a kiss and ride zone to improve access to the wharf • The design features of the proposal are addressed in Chapter 3 of the REF.
• Better parking facilities are required	• As agreed in consultation with City of Canada Bay Council, the proposal would include a kiss-and-ride zone to improve access to the wharf, in accordance with Council strategy for this area • The design features of the proposal are addressed in Chapter 3 of the REF.
• Werrell Reserve should be retained.	• The preferred option for the upgrade was chosen noting this would have the least impact on the existing Werrell Reserve • The environmental impacts of each preferred option is addressed in section2.4 of the REF.
• Better connection to bus stops, including advising bus times next to the wharf should be included.	• Due to the existing topography of the area, providing a connection to the existing bus stops would require significant remodelling of the area or loss of Werrell Reserve • However, landside elements of the upgrade include upgrading existing stairs, and provision of wayfinding signage to generally improve the existing connection • The design features of the proposal are addressed in Chapter 3 of the REF.

5.2.2 Step 2: response to the concept design

Between May and June 2017, Roads and Maritime publicly announced its concept design through the release of a community update that was sent out to 1,850 residents and published on its website.

The update (refer to Appendix C), included details of a community information and feedback session that was held on 25 May 2017 at the Sydney Rowing Club. The aim of the session was to update the community by describing how the preferred option was selected. It also provided a forum for Roads and Maritime to seek the community's thoughts and comments on the concept design. The opportunity to provide comment and feedback extended until the end of June 2017, by which time Roads and Maritime had received 25 individual responses.

Table 5-2 summarises the key comments raised during June 2017, and describes where and how they have been addressed in the REF and/or concept design.

Table 5-2: Summary of issues raised by the community

Issue raised	Response and where addressed in the REF/concept design
Community Issues	
• What is the purpose of upgrade if dual berthing isn't being provided and landside elements are not DDA compliant	• The new wharf is DDA compliant, and would also increase the efficiency of ferries berthing, and access onto and off the ferries, with the wide area berthing face provided rather than a narrow gangway • Due to the existing topography of the area, providing a DDA compliant pathway to the wharf would be very difficult to do without significant remodelling of the area or loss of the park. However, landside elements of the upgrade include upgrading existing set of stairs, and provision of a kiss and ride zone to improve access to the wharf • The design features of the proposal are addressed in Chapter 3 of the REF, with the need for the proposal detailed in section 2.1.
• An uncovered gangway is not wanted by the community, who prefer wharf upgrades which included covered gangways • Removal of the covered landside area is not wanted by the community, who use this infrastructure to wait for pick-ups and would now have to wait with no cover.	• An uncovered gangway and removal of the landside cover was proposed as the new pontoon provides adequate capacity for ferry users to wait undercover, and minimising canopy cover assists with minimising the visual impact of the proposal • Following feedback received Roads and Maritime have revised design to provide a covered gangway and entry portal., as addressed in section 2.6 of the REF.
• The community questioned the need for the pontoon as a waiting area, noting that queuing on the walkway is currently effective.	• The design of the new wharf includes a covered pontoon which provides adequate capacity for ferry users to wait undercover, close to the berthing face, which would increase the speed of users getting on to, and off, ferries. This design complies with the need for the proposal, which is detailed in section 2.1 of the REF.

Issue raised	Response and where addressed in the REF/concept design
• The stability of the proposed pontoon would be less than the existing fixed structure.	• The design of the new pontoon has been considered in through its design, as detailed in Chapter 3 of the REF, to ensure its suitability for customer use.
• If the proposal could be located further out in the river this could provide capacity for dual-berthing.	• Dual berthing was considered in the concept design, however was discounted due to stakeholder concerns on the movement of ferries accessing the inside face of the pontoon. Further review identified that dual-berthing is not required for Abbotsford Wharf, as addressed in section 2.6 of the REF.
• Bike racks should be located away from the existing beach as Scouts use this for sailing sometimes.	• The bike racks are to be relocated adjacent to the existing stairs, with drawings shown in Appendix A of the REF.
• If lighting is being upgraded this should be placed outside of the area of land leased by 2nd Abbotsford Sea Scouts.	• This is considered outside the scope of the REF which does not propose to upgrade landside lighting on City of Canada Bay Council owned land. The proposal description is provided in Chapter 3.
• Pathways through Werrell Reserve are in poor condition and should be upgraded.	• This is considered outside of the scope of the REF, however Roads and Maritime would communicate this comment back to the City of Canada Bay Council for consideration as the owners of this path to determine whether action would be taken.
• More parking spaces should be provided at the wharf; the original proposal only shows one accessible space being provided.	• The City of Canada Bay Council does not support private parking in the vicinity of Abbotsford Wharf • Based on community and Council feedback, Roads and Maritime have revised the proposal scope to provide a kiss-and-ride zone adjacent to the wharf entrance. The details of this revision addressed in section 2.6 of the REF.
• Would alternative transport be provided during construction.	• Abbotsford Wharf would be closed during construction. During this period an additional bus service would be provided. Details of alternative transport are provided in section 6.8 of the REF.
• Problems with anti-social behaviour and fishing.	• Fishing rules would remain the same for the new wharf. Fishing would be prohibited from 5 am to 10 am each day • The design of the wharf would include full-height glass panels, minimising open areas which could be used for fishing. Bins would be provided to encourage users to keep the wharves clean. Further details of how the socio-economic impact of the proposal are provided in section 6.5 of the REF.

Issue raised	Response and where addressed in the REF/concept design
• Environmental impact of increased passenger movements.	• Consideration of the potential impact of the proposal on a wide variety of environmental factors, including biodiversity and socio-economic impacts, is detailed in Chapter 6 of this REF • No significant impacts from increased passenger movements have been identified.
• Potential for damage to the seawall from ferry movements.	• The design of the proposal would maintain the position of the existing berthing face, enabling existing vessel movements to be maintained. No additional impact to the seawall is anticipated, as detailed in Chapter 6 of this REF.

5.3 Aboriginal community involvement

Aboriginal heritage impacts have been considered under the four-stage Procedure for Aboriginal Heritage Cultural Heritage Consultation and Investigation (PACHCI, Roads and Maritime, 2011). The PACHCI is outlined in Table 5-3 below.

Table 5-3: Summary of Roads and Maritime PACHCI stages

Stage and description	Consultation
Stage 1: initial assessment	An internal Roads and Maritime assessment to determine whether a project is likely to affect Aboriginal cultural heritage.
Stage 2: a preliminary external assessment	Including a site survey and further assessment to determine whether a project requires Part 6 approval from the NSW Office of Environment and Heritage under the National Parks and Wildlife Act *1974*.
Stage 3	If a Part 6 approval is required, Aboriginal community consultation and investigation is required. Preparation of cultural and archaeological assessments to be completed with the involvement of the Aboriginal community.
Stage 4	Implementation of the assessment recommendations.

Stage 1 of the PACHCI process was completed for the proposal, which confirmed that there is unlikely to be any effect on Aboriginal cultural heritage (refer to section 6.6).

Impacts to items of Aboriginal significance are not anticipated for the proposal (refer to section 6.6).

The Roads and Maritime Aboriginal Cultural Heritage Advisor (ACHA) has issued Stage 1 clearance letter for a Riverbed Pothole Investigation completed in June 2017 in accordance with PACHCI, included with Appendix H. The Pothole Investigation area incorporates the proposal location. An Aboriginal Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* is not required for the proposal.

5.4 ISEPP consultation

Under the provisions of Part 2 of ISEPP, Roads and Maritime is required to notify local councils and other relevant Government agencies where development has the potential to impact on assets or environmental values managed by these authorities. These issues are identified through the checklist included as Appendix C. In the case of the proposal, it triggers the notification requirements under Clause 13 and Clause 14 of ISEPP due to the following reasons, it:

- Would generate traffic that would place additional demand on the local road network
- May involve the temporary footpath closures along Great North Road
- Would require work to take place on Great North Road, which may cause road user disruption
- Potential impact on heritage items within the proposal area.

Roads and Maritime notified the City of Canada Bay Council in May2017, as part of the concept design consultation, with design refined in accordance with Council feedback and a formal ISEPP letter issued for the revised proposal in August 2017.

Further details of consultation with the City of Canada Bay Council is detailed in section 5.6.

5.5 Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 notification

Under the provisions of clause 31 of the Sydney Harbour SREP, Roads and Maritime is required to consult with the Foreshores and Waterways Planning and Development Advisory Committee (Department of Planning and Environment) and any relevant utility agencies. These issues are identified through the checklist as included in Appendix C.

In the case of the proposal, it triggers the consultation provisions of Part 3: Division 3, Clause 31 of the above Plan due to the following reasons, it:

- Involves the development of pubic water transport facilities (Schedule 2)
- Would require the provision of services in the form of electricity, as required by the existing wharf.

Accordingly, the Foreshores and Waterways Planning and Development Advisory Committee, Ausgrid and Sydney Water were consulted in regards to the proposal. Roads and Maritime notified the respective authorities in July 2017 in regards to the proposal, with no responses received at the time of publication.

5.6 Government agency and stakeholder involvement

As described in Figure 5-1, key Government agency and public authority consultation was used to develop the options and concept design. It was also used to scope the environmental assessment. This involved written correspondence, meetings and workshops. The following key stakeholders were consulted through this process:

- Transport for NSW
- Harbour City Ferries
- NSW Government
- City of Canada Bay Council
- Emergency services
- Community groups
- Port Authority NSW.

5.6.1 Step 1: help develop options and the concept design

At the same time the community was consulted (refer to section 5.2.1), Roads and Maritime also held a series of workshops and meetings to help develop options, select a preferred option, and progress with the concept design. Table 5-4 summarises the Government agency and stakeholder involvement carried out to date.

Table 5-4: Government agency and stakeholder involvement

Activity	Purpose	Date
Step 1: options development		
Workshop 1	Help Roads and Maritime review the proposed options	March 2015
Community Meeting 1	Help Roads and Maritime select a preferred option	May 2015
Workshop 2	Help Roads and Maritime select a preferred option	May 2015
Step 2: concept design		
Safety in design	Review the safety risks that could be reduced in the concept design.	June 2015
Workshop 3	Presentation of the concept design and provision of direction for the development of the design.	September 2015
Design review	Reviews were conducted during regular weekly design review meetings following selection of the preferred option, with meetings held with Government agencies on an as required basis.	Multiple dates
Community Meeting 2	Presentation and refinement of the concept design.	May 2017

Table 5-5 summarises the comments raised through stakeholder consultation.

Table 5-5: Issues raised through government agency and stakeholder consultation

Issue raised	Response and where addressed in the REF/concept design
City of Canada Bay Council	
• The previous proposal included provision of provide one accessible space close to the wharf entrance • This proposal was not supported due to Council strategy to remove all private parking from Abbotsford Wharf as a response to historical anti-social behaviour issues • The proposed location of the accessible space was also not supported, with Council confirming concerns with the interface between vehicles and pedestrians accessing the wharf, and access for emergency vehicles in this location.	• Roads and Maritime have revised the project scope to provide a kiss-and-ride zone adjacent to the wharf entrance, with details of this revision addressed in Chapter 2.6 of the REF.

5.7 Ongoing or future consultation

As per Table 5-2, step 2 and step 3 comprised completion of the final design and REF.

This section describes the ongoing and future consultation that would take place during the final steps in Figure 5-1.

5.7.1 Step 4: response to submissions

This REF would be placed on public display for comment by Government agencies, stakeholders and the community. Following the public display period, Roads and Maritime would collate and consider the submissions received then determine whether the proposal should proceed as described or whether any changes are needed are required. It would also decide if any additional environmental assessment, safeguards or management measures are needed.

A submissions report would be published, which would respond to the comments received. Roads and Maritime would notify those who made submissions and distribute a community update. The update would summarise the submissions report process and the actions Roads and Maritime took to address these comments. Roads and Maritime would also meet with affected residents, businesses and other stakeholders.

5.7.2 Step 5: detailed design and pre-construction consultation

If the proposal is built, the community consultation and stakeholder engagement plan would be updated to support the detailed design and pre-construction stages to ensure:

- There would be provision for emergency vehicle access while the proposal is being built
- Any necessary traffic management and maritime navigation controls would be developed reduce impacts
- Suitable and appropriate environmental safeguards and management measures are made to account for design changes and refinements
- The work is scheduled to avoid conflicts with other projects that are being developed in the area at the same time (refer to 6.12).

5.7.3 Step 6: construction consultation

The appointed work contractor(s) would also be required to consult with the local community before and while the proposal is being built. This process would be managed through the construction environmental management plan (CEMP, refer to section 3.3.1 and section 7.1). It would include:

- Issuing notices before starting work and relaying information on traffic management and maritime navigation controls, night work, temporary access restrictions, and planned noisy activities
- Undertaking door-knocking with affected residents
- Undertaking ongoing consultation with affected parties comprising meetings, letter-drops, posters and notifications.

In addition, Roads and Maritime would:

- Provide regular website updates
- Make a 24-hour project information line available while implementing its complaints handling and management process (refer to Chapter 7).

6 Environmental assessment

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

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines Is an EIS required? (Department of Urban Affairs and Planning, DUAP, now Department of Planning and Environment, 1995/1996) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000 and the Roads and Related Facilities EIS Guideline (DUAP, 1996, refer to Appendix B).

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

6.1 Physical environment

This section describes the hydrodynamic (the forces of tide and current) and physical environmental impacts on the aquatic environment associated with the proposal.

6.1.1 Methodology

Existing environment assessment

Aquatic Environment

Published mapping and data were used to define the hydrodynamic and physical characteristics of the aquatic environment. This included:

- Hydrographic (study of water bodies) and bathymetric (water depth) mapping and data, including admiralty (navigational) charts
- Bottom, middle and surface water current data (hydrodynamic modelling, Sydney Harbour Hydrodynamic Model)
- Water and surface temperate data (University of Sydney, 2013)
- Water salinity and chemistry (University of Sydney, 2013).

Terrestrial Environment

Published mapping and data were used to define physical characteristics of the terrestrial environment. This included review of:

- Sydney 1:100,000 Geological Series Sheet 9130 (NSW Department of Mineral Resources, 1983)
- City of Canada Bay local environmental plan acid sulfate soils mapping
- NSW EPA online contaminated land register
- Environmental Protection Licences (EPL) under the *Protection of the Environment Operations Act 199*7.

Construction assessment

The assessment considered how the proposed construction activities, work methods, and required management controls (refer to section 3.3) would temporarily affect the physical characteristics of the aquatic environment including localised sediment and pollutant disturbance and dispersion, and any secondary aquatic ecology impacts.

Operational assessment

The operational assessment considered how the final aquatic infrastructure would potentially result in hydrodynamic changes in terms of erosion and scour, water quality (chemistry) changes, and associated aquatic ecology impacts.

6.1.2 Existing environment

Aquatic Environment

Tides

The proposal is located on the Parramatta River, close to its interface with Sydney Harbour. Conditions on the Parramatta River are still tidally influenced at this point. Tidal cycles are semi-diurnal, meaning there is 12.5 hours between high tides. The closest location to the proposal footprint where the tidal heights are measured is at Fort Denison where the conditions are as follows:

- Mean spring tide is 1.23 metres above Australian Height Datum (AHD, which represents the measured average sea level between 1966 and 1968)
- Mean neap tide is 0.75 metres above AHD
- Mean high water is about 0.5 metres above AHD
- Mean low tide can be about one metre below AHD
- The highest-high tide that would occur once every 50 years is about 1.6 metres above AHD.

While there is likely to be variation between the tidal conditions at Fort Denison and the proposal location due to masking from river inflow, the above conditions are indicative and suitable for this assessment. The tidal range around the ferry wharf would be typically less than one metre over each cycle because of the riverine/tidal interface at this location. The tidal range affects how quickly the waters flow into and out of the area including around the proposal footprint (ie the current strength). Given the small tidal range, this means that the water flow in the area is typically low.

Bathymetry (water depths)

The natural riverbed has been heavily modified in locations through dredging of shipping and navigation channels. The area close to shore is about equal to ground level and exposed at low tide and periods when there is reduced river inflow (zero metres AHD). It gradually increases to about 5.5 metres below AHD at the limit of the wharf (as shown on the contours on Figure 6-2).

Currents and circulation

Two separate processes influence most water movement at the proposal location.

Tidally influenced water movement occurs in the main channel. Closer to the edge of the river, tidal generated current speeds reduce due to the shallower waters, and this gives way to greater influence from river inflow. As such, the water circulation and currents around the proposal footprint are very low (ie the waters are typically calm).

The second influence on water movement locally is the mixing of the freshwaters from the Parramatta River and the saline waters from Sydney Harbour. This can create localised water movement and disturbance at the surface. This is distinct from the regional tidal current patterns and river inflows described above.

The above conditions offer a degree of surface mixing in the local environment. However, the exchange of water due to tidal movement is limited. The result is that the river waters are likely to be locally mixed however unlikely to be regularly replaced (flushed).

Wind conditions

Three dominant wind patterns affect the Sydney Harbour region. While the strongest winds come from the south, the proposal footprint is relatively sheltered from these. The most common wind direction is from the north east. These winds occur for about 22 per cent of the time and are responsible for generating waves in the local area, which may be as high as one metre (Sydney Institute of Marine Science, 2016). The next most common wind direction is from the west, which occurs for about 17 per cent of the time mainly during the winter. These too affect the proposal footprint however to a lesser extent and they arrive side-on to the existing wharf. These potentially cause surface disturbance (similar to waves) that may be up to 0.5 metres in height (Sydney

Institute of Marine Science, 2016). More extreme winds (and therefore surface disturbance) occur during storm events. These may cause water to occasionally overtop (break across) the wharf.

Bow waves also intermittently impact the wharf, with vessels passing the proposal location along the Parramatta River.

Water exchange (flushing)

Under the current and circulation section above, there is less tidal water movement around the proposal footprint. The interaction of fresh/saline allows for localised surface mixing, however there is likely to be limited large scale water exchange (flushing). This mixing is however sufficient to allow the water to be aerated and oxygenated, thus preventing it from becoming stagnant.

Aquatic geology and sedimentology

Sydney Harbour and easterly areas of the Parramatta River form parts of a flooded river valley. There are three key aspects to the site's geology and sedimentology that define the site's ecology and to some extent its Aboriginal heritage value:

- Hawkesbury Sandstone lies under the harbour, outcropping to form the water's edge, as is evident through the exposed areas in the headland around Abbotsford Point and Werrell Reserve
- Up to about 10 metres from the shore line is an intertidal and subtidal area zone comprising areas of coarse sand, shell fragments and exposed sandstone (refer to section 6.2)
- Further away from the shore line this gives way to a layer of sub-benthic sediment.

Areas of the river close to shore with deposited sand and exposed sandstone have occurred as a result of the erosion of the headland over time and partial deposition of residual sands in shallow areas of the intertidal zone. Away from the shoreline, the waters become too deep that there is insufficient 'energy' from the fresh/saline water mixing to mobilise and transport (move) river sediments. This explains why sub-benthic sediment has settled and accumulated in this area.

Acid sulfate soils

Acid sulfate soil (ASS) occurs in areas rich in iron sulphide. These soils generate sulphuric acid if exposed to the air (oxygen). The acid is an issue as well as causing the mobilisation of metals (eg aluminium, iron, manganese). This can also have a detrimental environmental impact. ASS can also decrease the amount of dissolved oxygen in surface waters, leading to eutrophic conditions and fish kills.

ASS is widespread in estuarine environments such as mangroves tidal flats and low-lying swamp areas in NSW (Naylor *et al.*, 1998). While there is no available published information relating to the aquatic sediments, the land-based mapping and information on ASS is contradictory. The mapping in the City of Canada Bay LEP identifies there being a low risk of encountering ASS (Class 5), however only terrestrial soils are included in this mapping. In comparison, the Prospect/Parramatta 1:100,000 Acid Sulfate Soil Risk Map 9130-N3 suggests that there is a high probability of there being ASS in the area. For the purpose of adopting precaution, this assessment has assumed an ASS risk across aquatic areas of the proposal footprint.

Terrestrial environment

Geology and soils

A review of the Sydney 1:100,000 Geological Series Sheet 9130 (NSW Department of Mineral Resources, 1983) indicates the site is underlain by the Hawkesbury Sandstone Formation, comprising medium to coarse grained sandstone with very minor shale and laminate lenses.

Whilst investigation of soils has not been completed for the proposal, a review of previous investigations in the vicinity of the proposal location was completed in the Stage 1 Contamination Assessment (Coffey, 2015). Based on this information, soils at the proposal location are likely to comprise alluvial deposits (comprising sands, sandy clays and clayey sands) of variable depths overlying weathered sandstone.

Acid sulfate soils

The mapping in the City of Canada Bay LEP identifies there being a low risk of encountering ASS (Class 5) for terrestrial soils. This contradicts the potential for encountering ASS in aquatic areas, and it is considered likely that ASS could exist at depths below the standing water level (SWL).

Contaminated land

A search of public records completed during the Stage 1 Contamination Assessment (Coffey, 2015) identified:

- There are no notices issued by the NSW EPA under the *Contaminated Land Management Act 1997* for the site or immediate surrounds. The closest registered site as approximately 500 metres north of the proposal location, comprising the former AGL gasworks located on Wymston Parade, Abbotsford
- A search of licences held under the *Protection of the Environment (Operations) Act 1997* identified at d'Albora Marina, Cabarita Park (Ardent Leisure Limited).

It is considered unlikely that the above sites may have resulted in the contamination of terrestrial soils at the proposal location.

6.1.3 Potential impacts

Aquatic: construction

Hydrodynamic effects

The proposal involves activities that would cause physical disturbance to the aquatic environment. These include removal of the existing wharf structure, piling and the installation of the prefabricated superstructure elements using a barge mounted crane. If it is not possible to pull out piles, then they would be cut-off at the harbour floor. The scale of the disturbance would be minimal and insufficient to cause any dynamic changes in current speed, wave characteristics, saline/freshwater mixing or flushing.

Localised sediment disturbance and smothering

The proposal construction footprint is within an area of subtidal sand and sub-benthic sediment (refer to Figure 6-2). As such, the proposed pile removal, pile installation and use of temporary jack-ups/anchor moorings would cause limited sediment disturbance over a small area and this would only occur where work takes place over the sub-benthic sediment.

Locally, the distributed coarser sediments would settle out of suspension almost immediately while the finer sediments could mobilise over a greater area as they would remain buoyant in the water column.

As most of the sediment is expected to settle out of suspension within a few minutes there is expected to be no risk of turbidity. Also, the small amount of sediment generated under the proposal would mean there is no predicted or expected smothering impacts (refer to section 6.2.3). Any impacts would be further limited by the proposal to undertake the piling work at night under calm conditions, when there would be the least water movement in the harbour (refer to section 3.3.2). A silt boom and curtain would also be utilised during construction.

Accidental spills (sediment and pollutant discharge)

The materials required to upgrade the wharf would be generally inert and harmless except for the small quantities of welding materials, lubricants, solvents, fuels and oils. As such, there would be some potential for:

- Accidental spills, including:
    - Accidents during loading, unloading and installation work
    - Leaks and drips from poorly maintained machinery and equipment
    - The mismanaged storage of waste materials, including potential for debris to enter the water.
- These risks would be greater when undertaking work over, or in, the harbour namely:
    - Removing the existing structure
    - Drilling / hammering the piles
    - Transferring equipment and machinery
    - Installing the substructures and superstructures.

The principal impact from any spills would be pollution and water quality impacts on the aquatic environment. The impact would depend on the quantity and type of material spilt. However, providing relevant standard controls are implemented the impacts are expected to be minimised.

Erosion and scour

Any work taking place in the aquatic environment has the potential to cause erosion and scour impacts. This is caused from introducing new structures typically on, or close to, the river floor, as this may alter sediment transport patterns.

Under construction of the proposal, the temporary use of jack-ups/anchors during lifting and piling work and would be the only equipment that would impact on the harbour floor. However, the associated equipment would only be in place for a few weeks. Some localised impacts are expected within a few metres of where jack and/or anchor point would be temporarily installed, however this would be an insufficient amount of time to cause any material scour or erosional impacts. The number of jack-ups/anchors would be reduced to the minimum required, with the placement of these locations selected to avoid areas of sensitive habitat. With the introduction of this safeguard and the other standard safeguards described in section 6.1.4, it is concluded that any impacts and be avoided and/or minimised.

Acid sulphate soils

While there is the risk of acid sulphate soil there are no plans to remove any sediments or bring them to the surface. Any sediment attached to the extracted piles would be removed in the water. As such, there is no possibility for these sediments to dry and oxidise.

Localised pollutant disturbance

A stage 1 contamination assessment was carried out as part of the geotechnical investigations (Coffey, 2015). This assessed the potential for contamination within sediments that may be disturbed by the proposal. Information from this assessment has been used to inform the assessment of potential for localised pollutant disturbance.

Given the industrial use and history of the surrounding area, it is likely that contaminated sediments and poor water quality (particularly following storm events and runoff from the surrounding land) would be encountered within the proposal footprint. The main expected pollutants include:

- Surfactants, oils, fuels, diesels and metals due to stormwater runoff
- Hydrocarbons (and their derivatives) and heavy metals due to the operations at Gore Bay
- Pesticides from stormwater runoff from the surrounding areas
- Residual tributyltin (as described below).

Tributyltin forms a group of tin-derivatives that were used extensively in antifouling paint in the shipping industry until an international ban in 2003 prevented their application on vessels less than 25 metres in length. However, tributyltin has an exceptionally long residence time in the aquatic environment, and if disturbed, can still have water quality and ecotoxicology effects over many years.

A study of sediment quality in Sydney Harbour (Birch and Taylor, 2006) included sampling of sediment within Hen and Chicken Bay which identified elevated concentrations of copper, zinc and hexachlorobenzene (HCB) close to the proposal location.

Impacts would be minimal due to the limited disturbance of the harbour floor sediments, the distance from these sites, and the limited sediment depth on the harbour floor across the proposal footprint.

Also, the extent of disturbance would be consistent with the small-scale activities that routinely take place in the harbour, even including the propeller wash from the many ships in the area. As such, despite there being reasonable potential for pollutants and contaminants to be present locally, the scale of disturbance would mean that any impacts would be negligible.

Aquatic: operation

Erosion and scour

Under the proposal, up to eight piles would be installed to replace the 15 existing piles removed. As water flows around these structures there is the potential to create local scour and erosion. The conditions under which erosion and scour occur in the aquatic environment vary depending on local sediment conditions and hydrodynamics (ie the energy of the water environment). In this location, the only expected impacts would be limited to within a few metres of each pile given that:

- There is an existing wharf at the proposal location
- The low dynamic (energy) character close to the river floor around the piles located within the sub-benthic sediments
- The installation of fewer piles, which would reduce the eddy effects (water disturbance) across the area
- The limited amount of sediment substrate locally.

Accidental spills

There is always the potential for an accidental spill or discharge during operation. This would be most likely during berthing at the wharf. While this is the case, the same potential exists from the current operational wharf and would be managed under the standard controls already in place across the ferry network. As such, the impacts expected to be safeguarded against and therefore minimised.

Aquatic growth

Overtime, aquatic growth would take place on the piles, which would require a maintenance program to ensure the wharf continues to functionally operate. As the maintenance work would be limited to scrubbing and manual cleaning, there is not expected to be any potential associated impacts. There is also no proposal to use biocides or other chemicals to maintain the upgraded wharf.

Terrestrial

There are no significant earthworks proposed, with the extent of excavation limited to the installation of wayfinding signage and a new strip drain at the base of the stairs. As such, the potential for either causing soil, geology, erosion or sediment runoff impacts can be discounted as can the potential for encountering contaminants.

The only possible impact to terrestrial soils would be from accidental material spill within the ancillary facility from storing, handing and/or transferring the required small volumes of welding materials, lubricants, solvents, fuels, oils and diesels. Potential impacts would be mitigated through the appropriate management of the storage of such materials, and inclusion of spill kits as noted in the safeguards.

No impacts to terrestrial soils for operation of the proposal are anticipated, as no significant change to existing operations are proposed.

6.1.4 Safeguards and management measures

Table 6-1 lists the safeguards and management measures that would be implemented to protect the aquatic environment to account for the impacts identified in section 6.1.3.

Table 6-1: Aquatic environment safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Soil and water	A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks would be addressed during construction.	Contractor	Detailed design/ pre-construction	Core standard safeguard SW1
Soil and water	A site specific Erosion and Sediment Control Plan/s would be prepared and implemented as part of the Soil and Water Management Plan.	Contractor	Detailed design/ pre-construction	Core standard safeguard SW2
Soil and water	Weather forecasts would be regularly checked during construction. Where severe weather is forecast, all equipment and materials would be removed from the construction area, or secured.	Contractor	Construction	Additional safeguard SW3
Water Quality	A spill management plan would be developed and communicated to all staff working on site. Any aquatic spill (whether spill occurs on water on land and subsequently enters the water) is to be immediately reported to Roads and Maritime and Sydney Ports VTS and VHF Channel 13. Aquatic spill kits are to be kept on site during construction.	Contractor	Construction	Additional safeguard SW4

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Water quality	All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks.	Contractor	Construction	Additional safeguard SW5
Water quality	Any chemicals or fuels stored at the site or equipment barges would be stored in a bunded area to prevent chemical leaks or spills entering the water.	Contractor	Construction	Additional safeguard SW6
Water quality	A silt boom and curtain would be installed around the work area. The silt boom and curtain would extend from a minimum of 100 millimetres (mm) above the water line to a minimum of 2.5 metres below the water line before starting work.	Contractor	Construction	Additional safeguard SW7
Water quality	A silt boom and curtain would be used to control the movement of floating debris from the immediate work area, before being collected using a scoop. Debris below the surface would be retrieved via trained divers. Any debris would be removed from the water immediately.	Contractor	Construction	Additional safeguard SW8
Erosion and scour	The number of jack-ups/anchor points would be minimised where possible. The locations would be selected to avoid areas of sensitive habitat, as discussed further in section 6.2.	Contractor	Construction	Additional safeguard SW9
Erosion and scour	Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts.	Contractor	Construction	Additional Safeguard SW10

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Water quality	The silt boom and curtain would be inspected every day after ebbing tides, with an additional inspection to be carried out after storm events. If excessive turbidity of the water is observed during removal of the piles, a second, moveable silt curtain would be installed around the piles being removed during each day of operation. Results of the observations of the integrity of the silt curtain are required to be recorded and maintained specifically for the purpose. Records are required to be kept on the site and to be made available for inspection by persons authorised by Roads and Maritime.	Contractor	Construction	Additional safeguard SW11

6.2 Biodiversity

This section summarises the proposal's aquatic and terrestrial biodiversity. Appendix D contains supporting papers prepared by Eco Logical Australia and Biosphere Environmental Consultants. Appendix D also includes the terrestrial ecological database searches completed.

6.2.1 Methodology

The assessment included a desk review of published State and Commonwealth records, data and literature to confirm the likely presence of threatened flora, fauna and endangered communities in the local aquatic environment. This was followed by a site walkover of the terrestrial environment, and diver survey of the marine environment covering an area extending to about 20 metres from the harbour wall.

The following published records were reviewed:

- NSW Wildlife Atlas: containing information on State protected species
- NSW Fisheries species profiles, 'Primefact' publications and expected distribution maps
- Protected Matters Search Tool: containing information on Commonwealth protected species
- PlantNet Database: containing information on sensitive and rare plants
- BioNet Atlas of Wildlife: containing information on threatened and protected fish species
- List of Noxious Weeds: containing information on non-native plant species that are listed as noxious weeds
- Zoological Collections of Australian Museums: to search individual species and determine the potential for threatened species to be present locally.

The site walkover was used to confirm:

- Terrestrial and intertidal vegetation, habitat composition and condition
- The presence of native species with a moderate to high potential for occurring locally.

The diver survey was used to confirm subtidal vegetation, habitat composition and condition.

The impact assessment was prepared in accordance with Environmental Impact Assessment Practice Note: Biodiversity Assessment (EIA-N06, Roads and Maritime, 2016) with consideration of the:

- BioBanking Handbook for Local Government (DECCW, 2008)
- Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (Roads and Maritime, 2011)
- Guidelines for Biodiversity Offset (Roads and Maritime, 2011).

The impact assessment was prepared in accordance with Environmental Impact Assessment Practice Note: Biodiversity Assessment (EIA-N06, Roads and Maritime Services, 2016 (c)) with consideration of the:

- Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (Roads and Maritime, 2011)
- Guidelines for Biodiversity Offset (Roads and Maritime, 2011).

In accordance with Section 5A of the EP&A Act (refer to Table 4.3), State and Commonwealth listed threatened biota with a moderate to high likelihood of occurring locally were subject to assessments of significance under the corresponding legislation consistent with the requirements of the Threatened Species Assessment Guidelines: The Assessment of Significance (NSW DECCW, 2007) and the Significant Impact Guidelines 1.1: Matters of National Environmental Significance (Commonwealth Department of Environment and Energy, 2013).

6.2.2 Existing environment

Protected areas

The proposal is not located close to any nationally protected or important areas such as Ramsar (important wetland bird) sites. It is however located within a State protected ‘wetland protection area’ as provisioned under the Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 (Sydney Harbour SREP). Wetland protection areas cover distinct important habitat plus an additional buffer of 40 metres to “address movement, growth and seasonal variations”.

In the case of the proposal footprint, its values are protected on account that the proposal avoids substantial impact to subtidal sand and rock rubble with scattered macroalgae habitat.

Figure 6-1 shows the extent of the Wetland Protection Area as mapped within the Sydney Harbour SREP.

Source: NSW Government

Figure 6-1: Wetland Protection Area

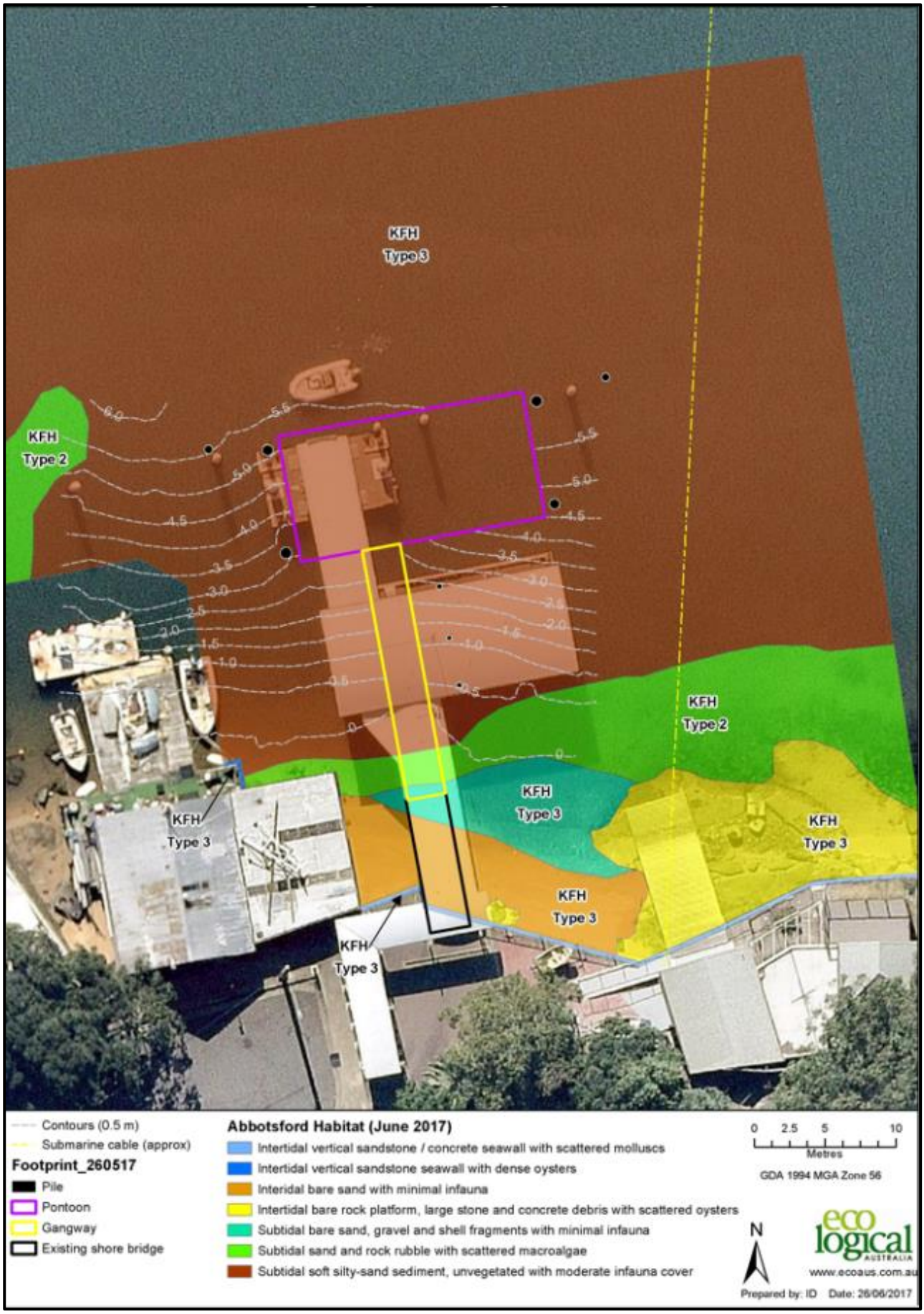
Aquatic habitat

Important Fish Habitat

There are three key fish habitat (KFH) types relevant to this proposal as defined by DPI Fisheries. Each type describes how sensitive the area is to development impacts and therefore it describes how it should be conserved and managed:

- Type 1 (highly sensitive aquatic habitat) – none present within the study area
- Type 2 (moderately sensitive key fish habitat) – habitat is represented onsite as subtidal sand and rock rubble with scattered macroalgae
- Type 3 (minimally sensitive key fish habitat) – habitat is represented onsite as intertidal seawall, intertidal bare rock platform, subtidal bare sand and subtidal soft silty-sand sediment.

Table 6-2 describes the six main habitats observed within the study area, the character of the habitat and the equivalent KFH type. The location of each habitat is shown in Figure 6-2 below.



Source: Eco Logical

Figure 6-2: Aquatic habitat map and key fish habitat

Table 6-2: Key aquatic habitats

Habitat	Character Description	Equivalent Key Fish Habitat (KFH) Type
Seawall, piles and other structures *Minimally sensitive key fish habitat*	Associated with the reclaimed foreshore. Characterised by: • Vertical sandstone seawall and existing structural piles and concrete pipe culvert • The seawall is generally bare, with a small number of barnacles and oysters • An area of sandstone harbour wall to the west of the proposal contains dense oyster growth • The partially exposed (intertidal) section of the existing wharf piles are partially bare, with patches of barnacles and oysters • The submerged (subtidal) section of the piles is covered by a dense covering of 'encrusting species' (such as bryozoa) • The pontoon section is also covered with turfing algae and *Ulva lactuca* (Sea Lettuce).	KFH Type 3
Intertidal bare rock platform *Minimally sensitive key fish habitat*	Partially covering the study area up to about 10 metres from the harbour wall, west of the proposal footprint: • Large stone and concrete debris • Sandstone bedrock with some fine green filamentous algae and sparse sessile aquatic fauna.	KFH Type 3
Intertidal bare sand *Minimally sensitive key fish habitat*	Up to about 5 metres from the harbour wall either side of the proposal footprint: • Unvegetated sand, with no infauna burrows identified.	KFH Type 3
Subtidal bare sand *Minimally sensitive key fish habitat*	Up to about 10 metres from the harbour wall to the west of the proposal footprint: • Coarse sediments and shell fragments • Some evidence from bioturbation.	KFH Type 3
Subtidal sand and rock rubble with scattered macroalgae *Moderately sensitive key fish habitat*	At depths from 0 to 0.75 metres: • Sand with larger sized rubble • Rock rubble provides hard substrate for brown macroalgae. • The area contains a moderate cover of crayweed and common kelp.	KFH Type 2

Habitat	Character Description	Equivalent Key Fish Habitat (KFH) Type
Subtidal bare soft silty - sand *Minimally sensitive key fish habitat*	Covering the area farther offshore to where the harbour floor sediments (substrate) reach depths of up to 6 metres. Characterised by: • Generally unvegetated, a layer of biofilm covers the sediment in most areas • Patchy bivalves and bioturbation burrows indicate infauna cover is moderate.	KFH Type 3

Aquatic: threatened biota

From database records, there are 108 aquatic-related threatened species within Sydney Harbour, including tidal areas of Parramatta River and Lane Cove River, as described in further detail below.

Flora

No threatened plant species were observed or recorded in the study area. Also, there is limited potential for any of the four threatened plant species recorded in the harbour (comprising two seagrass species and two saltmarsh species) to occur locally due to the lack of supporting habitat as described in section 2.4.1 of Appendix D. This is supplemented by a review of DPI: Fisheries mapping that shows the nearest such areas of seagrass to be 150 m south-west of the wharf, and the nearest mangroves 140 m east.

Fauna

No threatened animal species were observed or recorded in the study area during the site surveys described above. A number of species have been recorded in the harbour, with a full list provided in Appendix D.

The absence locally is due to the lack of suitable habitat around the proposal footprint as described further in Appendix D. Despite this, the nature of fauna in the aquatic environment means they may pass through the proposal footprint on occasion. Nonetheless, it can be concluded that any of the above species do not rely on the area for: primary habitat purposes, spawning, use as nursery grounds, and/or predatory/foraging purposes (ie providing a source of food).

Underwater noise sensitivity

Large megafauna and fish described are also sensitive to the impacts of underwater noise. While they can perceive piling generated noise up to 400 metres from its source, they typically avoid coming within 30 metres (Engell-Sorensen, 2000). If they do come within 30 metres of any piling work then they could be injured or harmed through hearing loss or in extreme instances they can be killed (a term known as acoustic shock).

Aquatic: pests

Aquatic pest species can reduce local aquatic habitat values and introduce toxins into the water column. Table 6-3 lists the aquatic pest species and pathogens that have a moderate to high potential of occurring locally.

Table 6-3: Aquatic pest species

Species	Association	Effect
Caulerpa taxifolia: seaweed	Ballast water and ship hull fouling	Leading to habitat degradation through outcompeting key habitats such as seagrass
Alexandrium sp.: dinoflagellate: aquatic plankton	Cysts carried in benthic sediment	Can introduce neurotoxins in the water column leading to fish kill and bioaccumulation in shellfish potentially affecting aquaculture

Terrestrial

Habitat within Werrell Reserve is noted to include remnant native trees such as blackbutt (*Eucalyptus Pilularis*), stringy bark (*Eucalyptus obliqua*), Port Jackson (*Ficus rubiginosa*), swamp oak (*Casuarina glauca*) as well as *Glochidion Fendinandi*, *Pittosporum undulatum*, *Kunzea* ambigua, and *Lomandra congildia* (refer to Appendix D). In addition to remnant native vegetation, planted exotic species such as exotic palms and brushbox are also noted along the roadside edge.

Areas surrounding Werrell Reserve are highly urbanised, with no significant vegetation present.

Werrell Reserve is therefore relatively isolated, and considered to have limited habitat potential. The only fauna likely to be present are hardy and resilient species adapted to urban contexts, however local trees and vegetation may provide a limited foraging resource. Overall, the available habitat is only likely to provide for native and introduced fauna species that are adapted to open environments and tolerant of major human disturbance.

Existing structures in the area such as the wharf structures and buildings may potentially serve as temporary roosting habitat for micro-bats. However, a survey of the existing ferry wharf did not identify the presence of microbats, refer to Appendix D.

Terrestrial: threatened species

A search of the NSW Wildlife Atlas identified records of 109 threatened species, and 22 threatened communities listed under the TSC Act within a 10-kilometre radius of the proposal location. However, no records were identified within the proposal location, or immediate surrounds.

A search of the EPBC Act Protected Matters Search Tool identified one wetland of international importance, 82 threatened species, 62 migratory species and eight threatened ecological communities within a 10-kilometre radius of the proposal area. However, no records were identified within the proposal location, or immediate surrounds.

Full species lists are included as Appendix D.

As discussed above, the proposal location and immediate surrounds is not considered likely to provide suitable habitat for any of the species identified. Threatened migratory species may occasionally utilise Werrell Reserve as a foraging resource.

6.2.3 Potential impacts

Aquatic: Construction

Protected areas

The proposed piling work, including removal of existing piles, and the installation of the prefabricated superstructure elements, which may require the use of jack-ups or temporary anchor moorings to stabilise the cranes and equipment, would directly impact on the harbour floor within the limits of the protected wetland area shown on Figure 6-1.

Despite the definition and limit of this wetland being mapped, its associated ecological value is limited as surveyed in the field. Importantly, no threatened species or habitat were identified in the footprint impacted by the above work, or across the wider proposal footprint and study area. As

such, there is assessed to be no direct impact on threatened or protected species, populations or communities associated with these wetland protected areas.

Direct loss of aquatic vegetation and habitat

The survey included an area of about 3,709 square-metres, as shown in Figure 6-2. As per Table 6-4 and Appendix D, the direct impact to habitat within the study area would be from the installation of eight new piles. Impacts from any jack-up/anchor points would be temporary with the habitat recovering over time with no quantifiable impacts anticipated. The removal of this habitat is generally not considered to be a significant impact, however, has been conservatively estimated in Table 6-4.

About 171.53 square-metres of habitat would be directly impacted. This includes impact through removal of an estimated 15 existing piles.

Table 6-4: Habitat loss

Habitat	Direct Loss (square-metres)
Intertidal harbour wall *Minimally sensitive Type 3 key fish habitat*	0
Existing piles (15 removed) *Minimally sensitive Type 3 key fish habitat*	89.35
Existing pontoon *Minimally sensitive Type 3 key fish habitat*	78.5
Intertidal bare rock platform *Minimally sensitive Type 3 key fish habitat*	0
Intertidal bare sand *Minimally sensitive Type 3 key fish habitat*	0
Subtidal bare sand *Minimally sensitive Type 3 key fish habitat*	0
Subtidal sand and rock rubble with scattered macroalgae *Moderately sensitive Type 2 key fish habitat*	0.57
Subtidal bare soft silty - sand *Minimally sensitive Type 3 key fish habitat*	3.11
Total	**171.53**

As noted in section 6.2.2, the above habitat has limited ecological value and the impact would affect all but a small percentage of habitat other than the artificial habitat that has formed around the existing piles and pontoon. The impact on the natural environment would have no quantifiable impact on ecological viability or health across the area. In the case of the piles and pontoon, this habitat would be reinstated, albeit it would take time to re-establish. The footprint impacts described above may also cause some localised mortality or disturbance as described in the corresponding heading below.

The minor impact to moderately sensitive (Type 2) fish habitat would be insufficient to affect the survival of any fish species in the area as they would still be able to inhabit the remaining areas.

Injury and mortality

As described in the previous section, the absence of any threatened flora or fauna local to the proposal footprint reduces the potential for associated impacts on ecologically significant species. However, as the potential for certain larger types of fauna to occasionally pass through the local area cannot be fully discounted, there is still the potential for injury risks from propeller or ship strikes. Whilst there would be a small increase of boat movements over the four months when the work is taking place, a similar risk currently exists from the movement of ferries and other boats in the area. This is due to the daily movement of one or two boats and barges in the area, as described in section 3.4.1. Providing standard measures are introduced while the wharf is being upgraded, any impacts are expected to be safeguarded and minimised.

There is also the potential for any non-threatened immobile or semi-mobile species that occur locally to be killed or disturbed as a result of the piling work and/or use of jack-ups and anchors. This would be limited to the encrusting species, algae and sponges that are found in habitat within the proposal area. The other non-threatened fish species recorded in the area (section 6.2.2) would likely avoid the area during any piling activity. Potential for injury and mortality during construction would be minimal, and would be managed through safeguards and management detailed in section 6.2.4. Providing these safeguards and the other standard measures are implemented and remain effective, then any associated impacts would be avoided or minimised.

Entrapment and impingement

A silt curtain would be used to prevent sediment dispersion. As such, there is the potential for aquatic/marine mammals and fish to become entrapped in the curtain. However, providing standard measures are introduced, any impacts are expected to be minimised.

Underwater noise

The potential for underwater noise impacts is low due to the following reasons:

- There is only a remote potential for aquatic megafauna to pass through the area and they would likely avoid any piling activities
- Despite there being fish present in the area, they too would be likely to avoid any underwater noise sources
- Piling activities would occur intermittently over a three-week period (on average). Typically pile hammering occurs for a 10-minute period followed by a relatively quiet period for the next 30 minutes.

The most likely impact would be any startled response caused from starting up the piling work. This can be avoided by adopting a slow start up (gradually increasing the piling rate). As this would be likely done to help minimise noise impacts on terrestrial receivers (refer to section 6.3), then there is not expected to be any risk to or impact on fish (or megafauna) in the area.

Indirect and secondary impacts

As described in section 6.1.3 there is the potential for sediment discharge, accidental spills and/or localised scour and erosion to occur while the proposal is being built. However, by including standard safeguards it is concluded that such impacts could be minimised to the point of having no material indirect impact on aquatic or inter-tidal habitat.

Pest species

The introduction of pest species could occur through ship movements into and out of the local area. However, providing relevant standard controls are implemented and monitored, the impacts are expected to be minimised.

Terrestrial: construction

Loss of vegetation and habitat

There is no proposal to remove or prune any trees in Werrell Reserve for access. Also, the ancillary facility (refer to section 3.4) would not impact on the vegetation of the park. As such, there is expected to be no terrestrial habitat loss or impact under the proposal.

Injury and mortality

The avoidance of any vegetation or habitat removal therefore avoids any direct injury or mortality impacts. This extends to the loss of any foraging habitat in the area.

Noise, vibration and lighting

Adverse noise, temporary vibration and increased light levels would be introduced while the proposal is being built (refer to section 6.3 and section 6.4). However, this is unlikely to affect any native species due to the highly disturbed nature of the existing environment and the fact the area is already lit. Standard safeguards and management measures would be implemented to reduce impacts from noise and vibration, and lighting detailed in section 6.34 and section 6.4.4 respectively. Providing these are implemented and remain effective then impacts would be avoided and/or minimised.

Threatened biota

As there is no proposed vegetation loss or tree removal then there are not expected impacts on threatened species listed under the TSC Act and/or EPBC Act.

Weed invasion

There is minimal potential for the proposal to introduce weeds into the area, as there are no significant landside earthworks planned and/or vegetation clearance work.

Aquatic: Operation

The following impacts may occur once the proposal is operational:

- Habitat loss, loss of habitat quality, and/or impacts on community and species health from accidental spills, litter and/or engine leaks
- Disturbance to the shoreline habitat from boat wash, which is likely limited by the harbour wall
- Localised sediment disturbance form propeller wash affecting the subtidal shallow rocky reef and coarse bare sediment habitat and its supporting values and species.

The current wharf operates with the potential for the above impacts to occur. Once the wharf is upgraded, these potential impacts could still occur. However, consistent with current wharf operations, providing the existing standard management controls are adopted, then the impacts would be safeguarded and minimised.

As described above, the replacement piles would allow an artificial habitat to re-establish that would be likely characteristic of the existing habitat described in section 6.2.2.

The only potential impacts expected from the proposal would be:

- An increase in ambient light across the harbour
- A change in shadowing impacts on the harbour floor from the new wharf structure.

Introduced light

The proposed wharf is in a different position to the existing layout. Removal of the existing structure would improve light availability to the existing shaded subtidal habitat. Excluding the new structure, the removal would provide increased light to 50 m^2 of habitat, mostly subtidal soft silty-sand sediment, unvegetated with moderate infauna cover.

Shadowing impacts

The installation of the gangway and pontoon would introduce partial to full shading to an area of about 115 square-metres from introduction of the new pontoon and gangway, with the remaining area already shaded by the existing wharf. This would cross the subtidal soft silty-sand sediment (KFH Type 3). The orientation of the new superstructure (walkway and pontoon) would allow light to reach the shallow harbour floor during the morning and afternoon. However, across the middle of the day, the shadow cast by the superstructure would prevent light penetration. It is also likely that a small area of the harbour floor in the middle of the pontoon would receive little or no light for parts of the day.

This loss would have no material ecological impact. Also, as described above, by removing the existing wharf structure, this would expose (un-shade) about 50 square-metres of the seabed, which would then start to receive light. As a result, its habitat value may improve with habitat re-establishing over time.

Terrestrial: operation

As there is not expected to be any change passenger numbers or operational activities around the wharf there is limited potential for any operational terrestrial ecology impacts.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened terrestrial or aquatic species, populations or ecological communities or their habitats, within the meaning of the TSC Act or the FM Act and therefore a species impact statement (SIS) is not needed.

The proposal is also not likely to significantly impact threatened terrestrial or aquatic species, populations, ecological communities or migratory species, within the meaning of the EPBC Act. A referral to the Australian Department of the Environment and Energy is therefore not required for biodiversity matters.

6.2.4 Safeguards and management measures

Table 6-5 lists the terrestrial and aquatic biodiversity safeguards and management measures that would be implemented to account for the impacts identified in section 6.2.3.

Table 6-5: Biodiversity safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Aquatic biodiversity	A Marine Ecology Management Plan would be prepared as part of the CEMP. This would include, but not be limited to, measures relating to the following activities to minimise the risk for pollution: • Sediment and rock debris control • Spills from concrete pour • Oil/fuel/chemical storage and spill management • Machinery and engine maintenance schedule to reduce oil/fuel leakage • Low impact barge positioning to prevent propeller scouring and thrust wash onto sensitive habitats • Minimise footprint and establish no-go zones in sensitive habitats • Accidental waste/material overboard response (eg construction materials dropped into the harbour) • Biological hygiene (eg prevent spread of noxious species on and off the site) • Aquatic fauna management.	Contractor	Pre-construction	Additional Safeguard B1

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Biodiversity	No-go zones would be established to avoid damage to all terrestrial and nearby aquatic habitats. No-go zones should be marked on a map and displayed inside the construction barge and office. All staff responsible for manoeuvring the barge should check the map before selecting a new position. For most of the construction period, the no-go zone generally includes the base of the stone seawall in the intertidal zone and nearshore rocky macroalgae habitat. This habitat should be avoided as much as practical but may temporarily exclude those areas for one off drilling or piling when no alternative barge position is feasible. Construction vessels should also avoid beaching on the shallow subtidal sand, rubble and macroalgae habitat area.	Contractor	Pre-construction	Additional Safeguard B2
Aquatic Biodiversity	No anchors or mooring blocks/lines should be placed on the shallow rocky macroalgae habitat. All lines should be suspended off the seafloor to minimise drag across benthic communities.	Contractor	Pre-construction	Additional Safeguard B4
Biodiversity	If previously unidentified threatened species are observed in the construction area, work would cease and Roads and Maritime would be contacted.	Contractor	Construction	Additional Safeguard B5
Aquatic Biodiversity	The silt boom and curtain should be wrapped from shore to shore around the construction area and regularly inspected for entrainment and impingement of aquatic/marine wildlife.	Contractor	Construction	Additional Safeguard B6

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Biodiversity	Vessel speeds would be minimised within the construction area to minimise wash and risk of injury to aquatic/marine fauna. All staff working on the site would be advised of the location of habitats within the construction footprint. Care should be taken in the placement of jack-ups and/or anchors to avoid areas of aquatic habitat.	Contractor	Construction	Additional Safeguard B7
Biodiversity	Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts.	Contractor	Construction	Additional Safeguard B8
Biodiversity	Gentle start-up of piling hammering would be completed to allow undetected aquatic fauna to leave the area.	Contractor	Construction	Additional Safeguard B9
Biodiversity	Construction activities would avoid impact to trees within Werrell Reserve, including the use of tree guards where required.	Contractor	Construction	Additional Safeguard B10
Pest species	Regular inspections of all equipment, machinery and materials would be completed to prevent the importation of pests and weeds to the area, including the noxious marine alga *Caulerpa taxifolia.* Good housekeeping of the aquatic construction area would be maintained.	Contractor	Construction	Additional Safeguard B11
Biodiversity	Work would stop if large aquatic fauna are observed nearby.	Contractor	Construction	Additional Safeguard B12

6.3 Noise and vibration

This section summarises the proposal's noise and vibration impacts. Appendix E contains a supporting technical paper prepared by WSP.

6.3.1 Methodology

Construction assessment

The construction assessment reviewed how the proposed activities, methods and scheduling described in Chapter 3 would affect noise and vibration sensitive receivers in the local area. The assessment was completed in accordance with the Construction Noise and Vibration Guideline (CNVG, Roads and Maritime, 2016a). Noise levels from construction works were predicted using the Roads and Maritime Construction Noise Estimator (Roads and Maritime, 2016d).

Operational assessment

The operational assessment was limited to a qualified consideration of any amenity noise change from using the upgraded wharf in its current location.

6.3.2 Existing environment

Ambient noise levels

The wharf is located in an area of relatively low ambient noise (ie it is typically quiet). The main activities and sources that contribute to the ambient noise in the area are:

- Harbour-related activities such as boat noise, ferry movements, and major shipping movements
- Residential and some commercial activities, including traffic, in the suburbs surrounding the river
- Wider and intermittent sources such as planes passing overhead.

Table 6-6 reflects the above by showing background noise levels within Abbotsford and Gladesville to be relatively low, discussed further in Appendix E. The table also details the noise monitoring locations.

Table 6-6: Ambient noise levels

Monitoring location	Measured noise levels dBA rated background level RBL (L_{90})		
	Day	Evening	Night
Abbotsford (NM01)	37	35	31
Gladesville (NM02)	37	36	31

Notes:
1. Reference noise levels: 30 dB: whisper, 40 dB: computer, 50 dB: light traffic/refrigerator, 60 dB: conversation/air conditioning unit, 70 dB: shower/dishwasher.
2. Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening: 6pm to 10pm; Night: 10pm to 7am Monday to Saturday, 10pm to 8am Sunday.

Sensitive receivers

The proposal would be built within close to Werrell Reserve and the residential suburb of Abbotsford, both of which are noise sensitive. Also, given that work would take place across open water and at night, it has the potential to travel long distances. As such, it may affect surrounding residential areas such as Gladesville.

One heritage structure, the Abbotsford Point Boatshed, is located close to the proposal location. The sensitivity of structures classified as of heritage significance is generally considered on a case

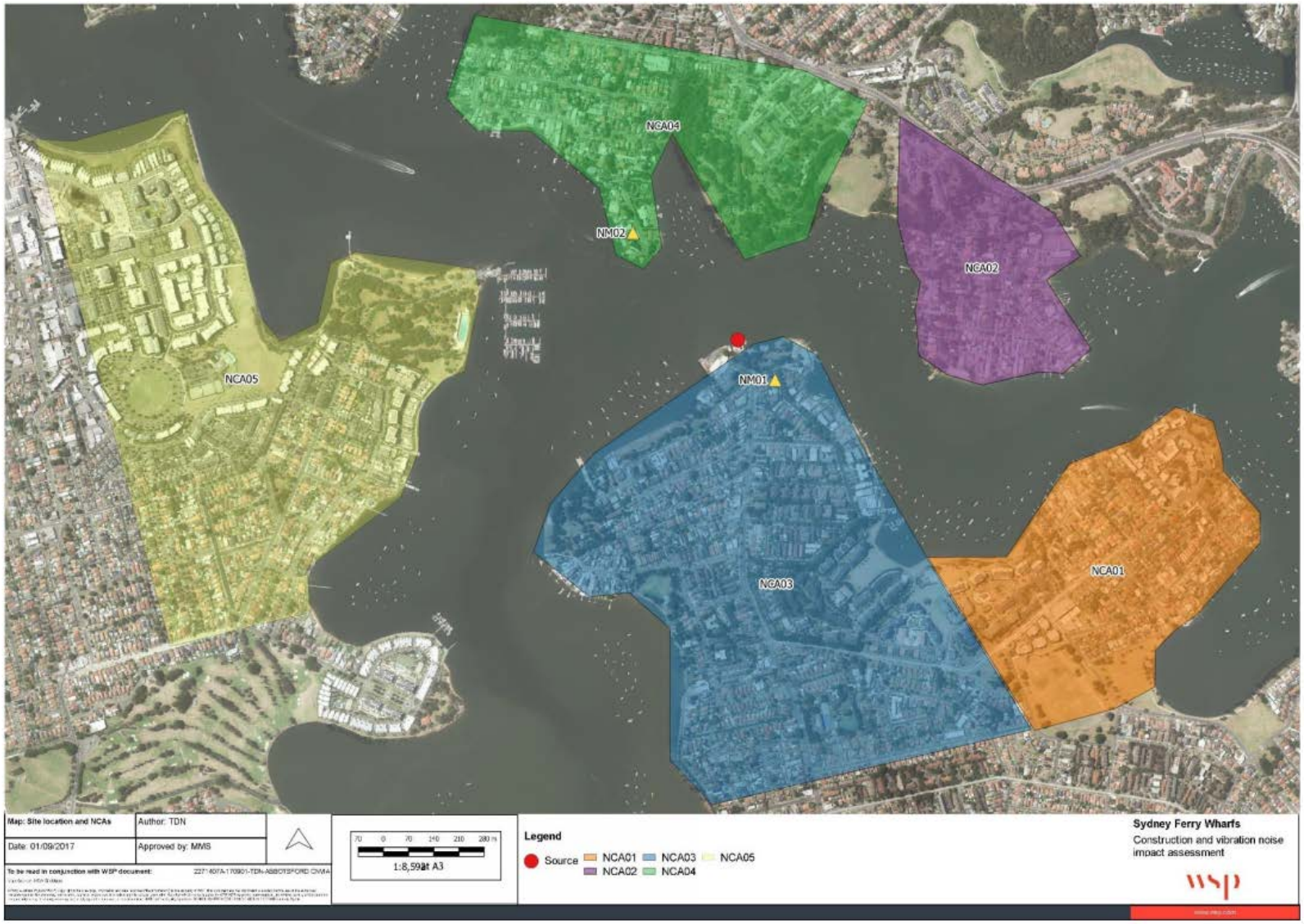
by case basis, as the sensitivity would largely vary with the structural integrity of the building. Whilst a structural assessment has not been completed for the boatshed, a conservative vibration screening level has been adopted to determine the minimum safe working distance for this structure.

Other heritage structures in the area are located outside of the minimum distances discussed in section 6.3.3 and have not been considered further.

As the sensitive receivers are confined to several distinct areas, they have been split into catchments. These noise catchment areas (NCAs) contain similar key receivers as summarised in Table 6-7. As shown in the table, there are also specific single non-residential receivers that are located within, however do not form part of, each NCA. Figure 6-3 shows the receivers and NCAs.

Table 6-7: Noise catchment areas and separate receivers

NCA	NCAs and individual receivers	Minimum distance and direction from the proposal location
NCA01	Residential:	950
	Commercial:	1,000
NCA02	Residential:	520
	Education:	830
	Community centre:	900
NCA03	Residential:	100
	Commercial:	40
	Heritage structure (Abbotsford Point Boatshed)	10
	Community Centre:	33
	Educational:	1,000
NCA04	Residential:	830
	Commercial:	750
NCA05	Residential:	830
	Commercial:	750



Source: WSP

Figure 6-3: Noise monitoring locations and noise catchment areas (NCAs)

6.3.3 Criteria

Appendix E describes the detail of the noise and vibration assessment criteria used in this assessment. Table 6-8 and Table 6-9 summarise the key criteria.

Table 6-8: Construction noise assessment criteria

Aspect	Criteria		Standard
Work activity noise Note: measured externally RBL: rating background level	Relative increase criteria (noise management levels)		
	Residents: standard hours	Rating background level (RBL) + 10 dB $L_{eq(15\ min)}$	1 and 2
	Residents: out of hours	RBL + 5 dB $L_{eq(15\ min)}$	
	Residents: sleep disturbance	L_{max} 65 dBA (external)	
	Threshold exceedance limits		
	Residents: standard hours	75 dBA $L_{eq(15\ min)}$	1 and 2
	Active Recreation	65 dBA $L_{eq(15\ min)}$	
	Education Institutions	55 dBA $L_{eq(15\ min)}$	
	Commercial Properties	70 dBA $L_{eq(15\ min)}$	
	Hospitals	65 dBA $L_{eq(15\ min)}$	
	Community Centres	55 dBA $L_{eq(15\ min)}$	

Notes:
1: Construction Noise and Vibration Guidelines (CNVG, Roads and Maritime, 2016)
2: Interim Construction Noise Guidelines (ICNG, EPA, 2009).

Table 6-9: Construction vibration assessment criteria

Aspect	Criteria (metres)	Standard
Cosmetic building damage	Vibration velocities translated into safe working distances (see below)	Note 1
Amenity (human comfort)	Vibration dose values translated into safe working distances (see below)	Note 2

Aspect	Criteria (metres)				Standard
Safe working distances (metres) Note: more stringent conditions may apply to heritage and sensitive structures (as defined under reference 2)	Equipment	Cosmetic damage[1,3]	Amenity impacts[2]	Heritage structures	-
	Pile drilling	2	4	10	
	Pile hammering	20	30 - 50	25	

Notes:
1: BS 7385-2: 1993: Evaluation and Measurement of Vibration in Buildings (British Standard, 1993)
2: Assessing Vibration: A Technical Guideline (NSW DEC, 2006)
3: Referred to 15mm/s vibration limit
4: Reference driven piling taken from FTA Noise and vibration manual.

6.3.4 Potential impacts

Construction

Activity based noise

While the construction staging would be confirmed during detailed design, each of the main design features would involve the use of different types of equipment in each area at various times of the day. Table 6-10. Lists the types of equipment and relevant sound power levels that would be used during construction.

Table 6-10: Construction equipment and sound power levels

Equipment	Sound Power Level dB(A)
Angle grinders[1, 2]	114
Barge[3]	95
Boat[3]	100
Compressor[4]	109
Crane[2]	104
Daymaker[4]	98
Generator[3]	103
Hand tools (electric)[2]	110
Piling rig (Boring)[4]	111
Piling rig (Impact)[1,3]	115

Notes:
1: To account for the annoying characteristics of the plant, a +5 dB correction has been added to the overall scenario noise level in accordance with the ICNG.
2: Noise level extracted from Australian Standard 2436-2010 “Guide to noise and vibration control on construction, demolition and maintenance sites”
3: Noise levels provided based on a previous study of the proposal and approved by Roads and Maritime
4: Noise level extracted from Noise estimator calculator provided by Roads and Maritime.

This information has been used to define the combined noise output (sound power level) generated in each location at a given time. Table 6-11 lists these scenarios with further detail provided in Appendix E.

Table 6-11: Construction activities and periods

Scenario and adopted sound power level	Activity	Equipment	Period
S01: 111 dBA	General construction and demobilisation	Boat, compressor, generator, hand tools (electric).	Standard hours
S02: 117 dBA	Demolition and removal of piles	Angle grinders, barge, boat, crane, generator, hand tools (electric).	

Scenario and adopted sound power level	Activity	Equipment	Period
S03: 113 dBA	Pile installation (drilling)	Boat, crane, daymaker, generator, piling rig (drilling)	Night time for three weeks (11pm - 7am)
S04: 119 dBA	Pile installation (hammering)	Boat, crane, daymaker, generator, piling rig (hammering)	
S05: 112 dBA	Lifting pre-fabricated units including the pontoon and gangway	Boat, compressor, crane, daymaker, generator, hand tools (electric)	Night time periodically over four months (11pm - 7am)

Each scenario is based on a combination of various equipment operating at the same time, at its maximum output, at the nearest location to the closest sensitive receiver(s) in the NCA. As such, they provide a worst-case view of potential noise impacts as there would be no real probability of these conditions happening onsite. Nonetheless, it adopts the precautionary principle to account for variability in modelling predictions and uncertainty in the construction staging.

Activity based noise impact

Table 6-12 summarises the exceedances detailed in the assessment in Chapter 6 of Appendix E. The table shows the impacts from undertaking construction activities during the day and the out-of-hours impacts from undertaking the piling work at night. The night work only considers impacts to residents as the other receivers would not be in use or occupied when this work takes place. Specifically:

- Positive numbers (red text) are above the NMLs
- No highly noise affected exceedances (ie exceedances of the 75-dBA limit) were identified.

The results also confirm the predicted noise impacts at the ancillary facilities listed in section 3.4.

Table 6-12: Noise impact summary: work taking place during the day

Construction activities as per Table 6-12	Receiver	dB (Standard hours[1])	dB (Out of hours[2])
1: General construction	Residential	13	N/A
	Educational Institution	5	
2: Demolition and removal of piles	Residential	19	N/A
	Educational Institution	11	
	Active recreation	1	
3: Pile installation (drilling)	Residential	N/A	26
4: Pile installation (hammering)	Residential		32
5: Lifting pre-fabricated units including the pontoon and gangway	Residential		25

Notes:
1: Standard hours - Monday to Friday – 7am to 6pm, Saturday – 8am to 1pm, Sunday/Public Holiday – Nil\
2: Out of hours - Monday to Friday – 11pm to 7am
N/A: Not applicable.

More specifically, the information in Chapter 6 of Appendix E indicates Abbotsford residents (NCA03) would we worst affected where noise would be:

- Up to 13 dB and 19 dB above the day-time NMLs when carrying out general construction work and during demolition and removal of piles, respectively
- Up to 26 dB and 32 dB above the night-time NMLs when installing the piles via drilling and hammering, respectively
- Other predicted night time exceedances are 25 dB above the limits when lifting pre-fabricated units.

An assessment for sleep disturbance has been carried out based on the maximum noise (L_{max} dBA) from construction plant. The maximum noise level from the equipment was assumed to be 5 dB more than the $L_{eq,15min}$ noise level based on previous observations. Chapter 6 of Appendix E indicates sleep disturbance could occur for Abbotsford residents (NCA03) during installing the piles via drilling and hammering, and lifting pre-fabricated units.

In summary, exceedances of NMLs are generally expected for receivers next to the works. Multi-storey receivers with a partially obstructed line of sight to the work site on Great North Road and surrounding streets, are likely to have the highest impacts from the proposed construction work.

The construction scenario with the highest predicted exceedances is for the installation of new piles (hammering, S04). This is due to use of high noise level plant being during the night period, when background noise levels are lowest.

Because of the predicted exceedances, noise mitigation and management measures have been outlined in section 6.3.5 to reduce the noise impact. A summary of noise mitigation is provided below.

Activity based vibration impact

Construction vibration assessment criteria are outlined in Table 6-9. The minimum safe working distances for cosmetic damage vary based on the activity undertaken. Piling (hammering) is the activity with the highest vibration levels. For this activity, a minimum safe working distance of 20 metres has been applied. One receiver, Abbotsford Point Boatshed, is located within this safe working distance, about 10 metres from the closest pile. All other receivers are located outside of the minimum safe working distance for all activities.

The results detailed in Appendix E indicate that without implementation of further controls, piling (hammering) might have the potential to cause cosmetic damage including the heritage Abbotsford Point Boatshed. Mitigation for construction vibration to remove the potential for damage is discussed further below and in section 6.3.5.

Mitigation summary

Mitigation for construction noise and vibration includes mitigation incorporated into the design of the proposal and construction methodology, as well as additional mitigation for both noise and vibration where exceedances of criteria are predicted.

Potential noise impacts have been minimised through the design of the proposal which involves undertaking as much construction work as possible at a contactors off-site facility rather than at site, including assemblage of pre-fabricated components.

Piling work for the proposal has an estimated duration of about three weeks to complete (about fifteen nights in total) toward the beginning of the construction period. Installation of the piles would require calm environmental conditions (still water and minimal wind) so that the floating barge used for the piling can remain still for the piles to be installed accurately. Calm conditions are also required to provide safe conditions for the construction crew. The waterway is usually calmer early in the morning, with wind and wind chop increasing throughout the day. The conditions required for piling usually occur during this early morning period.

Substituting areas of the piling method to minimise the noise impact was previously considered, installing piles involves drilling pile cases to required depths, before undertaking hammering (the noisiest activity) to secure the piles into bedrock until refusal. By substituting hammering for drilling,

except for when required for the final placement, the level of noise generated for piling as a task has reduced, with only the noisy activity of hammering piles requiring further mitigation.

Timings for piling activities are noted below, with the noisiest activity – hammering the piles- restricted to the last two hours of the night-time period to minimise the impact. During these hammering activities, it is anticipated that each pile would be hammered for one minute (about 10 hits with the hammer within one minute). For each pile the activity is likely to occur about five times over a period of one hour. Of the fifteen nights of piling work, about five of these would be used for hammering in piles.

The hours of night works for piling drilling activities would occur as follows:

1. Setup for drilling from 12am to 1am
1. Drilling of piles from 1am to 6am
2. Pack up generally 6am to 7am.

The hours of night work for piling hammering activities would occur as follows:

1. Setup for hammering from 4am to 5am
2. Hammering of piles from 5am to 7am.

Further minimisation of noise is provided through reviewing plant and equipment to be used on site, to ensure everything is in good working order and not emitting excessive noise levels. Quieter plant and equipment would be selected for noisy tasks wherever possible, reviewing the optimal power and size required to most efficiently perform the required task.

Additional noise mitigation measures

Undertaking the control measures noted above would reduce the impact of noisy activities on the proposal's residential receivers. However, to further minimise the noise impact of construction activities, including night-time work, the additional mitigation measures are taken from RMS Construction Noise and Vibration Guideline (Roads and Maritime 2016b), and detailed in the following sections.

Verification (V)

Verification would include measurements of the background noise level already captured as part of the Noise and Vibration Impact Assessment report, and actual construction noise levels monitored using hand-held devices during periods associated with high noise impacts.

Notification (N), specific notification (SN), phone calls (PC), individual briefings (IB)

Notification of all potentially affected receivers would be undertaken at least five days prior to the each of the proposed activities detailed above. The area for this notification is shown in Figure 6-4 below, with properties within the red area receiving letter notification (N), and properties within the yellow area receiving direct notification in the form of individual briefings undertaken via a door knocking exercise, with contact details provided for properties where contact by a door knock is not possible.

Respite

Respite Period 2 (RP2)

Where possible, high noise generating works shall be completed before 11pm, however due to the location of Abbotsford Wharf, and the requirement for calm environmental conditions (calm water and minimal wind), some activities are required to be carried out during the night-time period of between 11pm and 7am, when the waterway is at its calmest.

In accordance with the tables and CNVG respite periods would be provided for all night-time construction activities, with each activity limited to two consecutive nights in a row.

Respite Offers (RO)

In addition to RP2, Respite Offers would also be required for activity SO4, hammering piles, which is the noisiest activity to be undertaken. Respite Offers prevent continuous blocks of noise from exceeding 3 hours, with a minimum respite period of one hour between each block.

Pile hammering has been restricted to the last two hours of the night-time period (5am to 7am). About five shifts of hammering would be required and it is anticipated that each pile would be hammered for one minute (about ten hits with a hammer within one minute). For each pile this activity is likely to occur about five times over a period of one hour, therefore meeting the criteria.

Construction road traffic and shipping

As confirmed in Table 3-4, there would be few construction vehicles or ships operating in the area daily. This is not anticipated to have any noise impact on sensitive receivers as this would generate less than the 2 dB criterion described in Table 6-8.

Application of additional noise mitigation

The mitigation measures required during the construction scenarios for the proposal are detailed in Table 6-13 below.

Table 6-13: Additional noise mitigation measures

NCA	Additional Mitigation Measures (Airborne)					
	Construction Scenarios (standard hours)		Construction Scenarios (out of hours)			
	S01	S02	S03	S04	S05	S06
NCA01	-	-	N	V, N, R2, DR	N	-
NCA02	-	-	V, N, R2, DR	V, IB, N, PC, SN, R2, DR	V, N, R2, DR	-
NCA03	N, V	N, V	V, IB, N, PC, SN, R2, DR	V, IB, N, PC, SN, R2, DR	V, IB, N, PC, SN, R2, DR	N, V
NCA04	-	-	V, IB, N, PC, SN, R2, DR	V, IB, N, PC, SN, R2, DR	V, IB, N, PC, SN, R2, DR	-
NCA05	-	-	V, N, R2, DR	V, N, R2, DR	N	-

Notes:
1: No additional mitigation is required for exceedance of below 10 dB during standard hours.

As notification of the proposed construction activities would be undertaken prior to activities commencing, this advance warning would provide opportunity for residences to undertake precautions to further reduce noise such as closing windows. Notification areas for the proposal based on construction noise impacts is shown in Figure 6-4 below.

Source: Google

Figure 6-4: Proposed notification areas

Additional vibration mitigation

Vibration mitigation would be required to ensure the works are completed without the risk for cosmetic building damage to the heritage listed Abbotsford Point Boatshed. In additional to mitigation included in the construction methodology detailed above, the following mitigation is recommended.

A building condition survey of the Abbotsford Point Boatshed should be completed before construction to identify the sensitivity of the structure and existing damage. A subsequent building condition survey should also be completed after the completion of construction of the proposal to validate the implementation of mitigation measures.

A vibration trial should be undertaken with the commencement of the piling works. To complete the vibration trial, piling works should be started at the pile located the furthest distance from the Abbotsford Point Boatshed, before moving to closer piles progressively. Attended monitoring would be completed during this stage to establish an accurate site law and acceptable working distances specific to the construction plant and site conditions; these working distances would be more accurate than the 20m guide included in Table 6-10 which has been developed based on conservative assumptions. The measured vibration levels would also be used to confirm the safe working distances for the activity.

Where the trial indicates that construction work is required within the revised safe working distances confirmed as a result of the measures described above, additional vibration mitigation measures would be implemented as outlined in Table 6-14.

Table 6-14: Additional vibration mitigation measures

NCA	Additional Vibration Mitigation Measures					
	S01	S02	S03	S04	S05	S06
NCA01	-	-	-	-	-	-
NCA02	-	-	-	-	-	-
NCA03	-	-	-	IB, N, PC, RP2, SN, VM,	-	-
NCA04	-	-	-	-	-	-
NCA05	-	-	-	-	-	-

Methodology for individual briefings (IB), notification (N), phone calls (PC), respite periods (RP) and specific notification (SN) is detailed in the additional noise mitigation sections above. Vibration monitoring (VM) would as also be undertaken, discussed further below.

Vibration monitoring (VM)

A vibration monitoring system should be installed with set warning and halt levels to notify plant operators during work activity (via flashing light, audible alarm, SMS, etc) to ensure that levels remain below the nominated control vibration levels. Vibration monitoring should be undertaken at the closest point on the structure to the works. Where exceedances are detected, the relevant works would stop and alternative methods and/or mitigation measures would be investigated.

Operation

The upgraded wharf would service a similar patronage as currently uses the F3 Ferry Service, about 750 people per day. It is also expected that the ferries would still operate at between 30 and 60 minute intervals (refer to section 6.8). As such, there is not expected to be any change in amenity noise under the proposal. Also, no noise-generating equipment would be installed under the upgrade. Further, no change in operational traffic is anticipated.

6.3.5 Safeguards and management measures

Table 6-15 lists the noise and vibration safeguards and management measures that would be implemented to account for the impacts identified in section 6.3.4.

Table 6-15: Noise and vibration safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	A Noise and Vibration Management Plan (NVMP) would be prepared and implemented as part of the CEMP. The NVMP would generally follow the approach in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented • A monitoring program to assess performance against relevant noise and vibration criteria Arrangements for consultation 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.	Contactor	Pre-construction	Core standard safeguard NV1

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	All sensitive receivers (eg schools, residents) likely to be affected would be notified at least five days before starting any work with an associated activity that may have an adverse noise or vibration impact. The notification would provide details of: • The proposal • The construction period and construction hours • Contact information for project management staff • Details of complaint and incident reporting • How to obtain further information. Receivers where noise management levels may be exceeded would receive letter notification. Highly noise affected receivers would receive direct notification through a door knock.	Roads and Maritime.	Pre-construction	Core standard safeguard NV2
Noise and vibration	The following work schedule would be adopted: Drilling of piles: • Setup: 11pm to 12am • Drilling: 12am to 6am • Pack up: generally, 6am to 7am. Hammering of piles: • Setup: 4am to 5am • Hammering: 5am to 7am. Large prefabricated equipment would be installed by barge between 11pm and 7am.	Contactor	Pre-construction	Additional safeguard NV3

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	Other than piling and the installation of the prefabricated elements of the structure that needs to take place during periods of calm water, all work would be carried out during standard construction hours identified in the Interim Construction Noise Guideline (DECC, 2009) unless Roads and Maritime approval has been granted.	Contactor	Pre-construction	Additional safeguard NV4
Noise and vibration	All construction personnel would be notified of the location of sensitive receivers, and the need to minimise noise and vibration from the work, during the site induction.	Contactor	Pre-construction	Additional safeguard NV5
Noise and vibration	Plant and equipment would be in good working order to prevent excess noise generation.	Contactor	Pre-construction	Additional safeguard NV6
Noise and vibration	Verification measures would be carried out to confirm background noise levels already captured as part of the Noise and Vibration Impact Assessment report, and actual construction noise levels monitored using hand-held devices during periods associated with high noise impacts. This would apply to the following NCAs and scenarios described in Table 6-11: • NCA01: S04 • NCA02: S03 to S05 • NCA03: During all construction scenarios • NCA04: S03 to S05 • NCA05: S03 to S04	Contractor	Pre-construction/ construction	Additional safeguard NV7

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	Where possible, high noise generating works shall be completed before 11pm, however due to the location of the Abbotsford Wharf, and the requirement for calm environmental conditions (calm water and minimal wind), some activities are required to be carried out between 11pm and 7am, when the waterway is at its calmest. Respite periods (RP) would be provided for all night-time construction activities, with each activity limited to two consecutive nights in a row. This would apply to the following NCAs and scenarios described in Table 6-11: • NCA01: S04 • NCA02: S03 to S05 • NCA03: S03 to S05 • NCA04: S03 to S05 • NCA05: S03 to S04.	Contractor	Pre-construction/ construction	Additional safeguard NV8
Noise and vibration	Respite offers (RO) would also be needed when undertaking the hammering piling (S04). These would prevent continuous blocks of noise from exceeding three hours, with a minimum respite period of one hour between each block.	Contractor	Pre-construction/ construction	Additional safeguard NV9
Vibration	No work with the potential to cause cosmetic damage to property (due to vibration or otherwise) will be undertaken.	Contractor	Construction	Additional safeguard NV10
Vibration	A structural condition survey of the Abbotsford Point Boatshed would be completed both before and after the construction work.	Contractor	Pre and post-construction	Additional safeguard NV11

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Vibration	A vibration trial should be completed with piling works started at the pile located the furthest distance from the Abbotsford Point Boatshed, outside of the safe working distances confirmed in Table 6-10. Attended monitoring would be completed during this period to confirm whether the safe working distance assumed in this Noise and Vibration Impact Assessment could be reduced based on actual data.	Contractor / Roads and Maritime	Construction	Additional safeguard NV12
Vibration	Attended vibration monitoring, with set alarm (via flashing light, audible alarm, SMS, etc), should be carried out at the Abbotsford Point Boatshed throughout piling installation, to ensure that levels remain below the threshold. Where vibration levels approach the threshold, relevant work would stop and Roads and Maritime would be contacted. Further assessment would be undertaken with alternative methods and/or mitigation measures put in place prior to restarting.	Contractor / Roads and Maritime	Construction	Additional safeguard NV13
Noise and vibration	Any change in methodology would require the process for Out of Hours Work to be followed.	Contractor	Construction	Additional safeguard NV14

6.4 Landscape character and visual impact

This section summarises the proposal's landscape character and visual impacts. Appendix F contains a supporting paper (landscape and visual impact assessment, LCVIA) prepared by Jane Irwin Landscape Architecture (JILA).

6.4.1 Methodology

Environmental Impact Assessment Practice Note: the Guidelines for Landscape Character and Visual Impact Assessment (EIA-N04, Roads and Maritime, 2013) guided preparing the LCVIA. This included:

- Establishing/clarifying the existing character and sensitivity of the landscape/streetscape within and surrounding the proposal footprint

- Defining the theoretical area where it would be possible to see the proposal; termed the visual envelope (VE) or zone of visual influence (ZVI), which was also taken as the study area
- Considering how building and operating the proposal would impact on the area's sensitive landscape values, residents, workers and other sensitive users in the ZVI and other sensitive locations around the harbour.

The LCVIA used the impact ratings outlined in the above guidance to determine:

- The sensitivity of each landscape character zone (LCZ) and representative viewpoint to changes in the form, setting, composition of the landscape through the introduction or removal of components (ie removal of trees or introduction of buildings)
- The scale of change in the landscape and to people's views that would be introduced in building and operating the proposal.

The grading matrix from EIA-N04 is shown in Figure 6-5 below.

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Source: Roads and Maritime

Figure 6-5: Landscape character and visual impact grading matrix.

Potential light spill impacts were also considered.

6.4.2 Existing environment

Landscape character and context

The existing wharf is located at the northern end of Abbotsford Point, a relatively short peninsula, among many headlands and bays within Sydney Harbour and easterly areas of the Parramatta River. The waterfront at the wharf is framed by the heritage listed Abbotsford Point Boatshed, Abbotsford Scout Hall and Abbotsford Sailing Club.

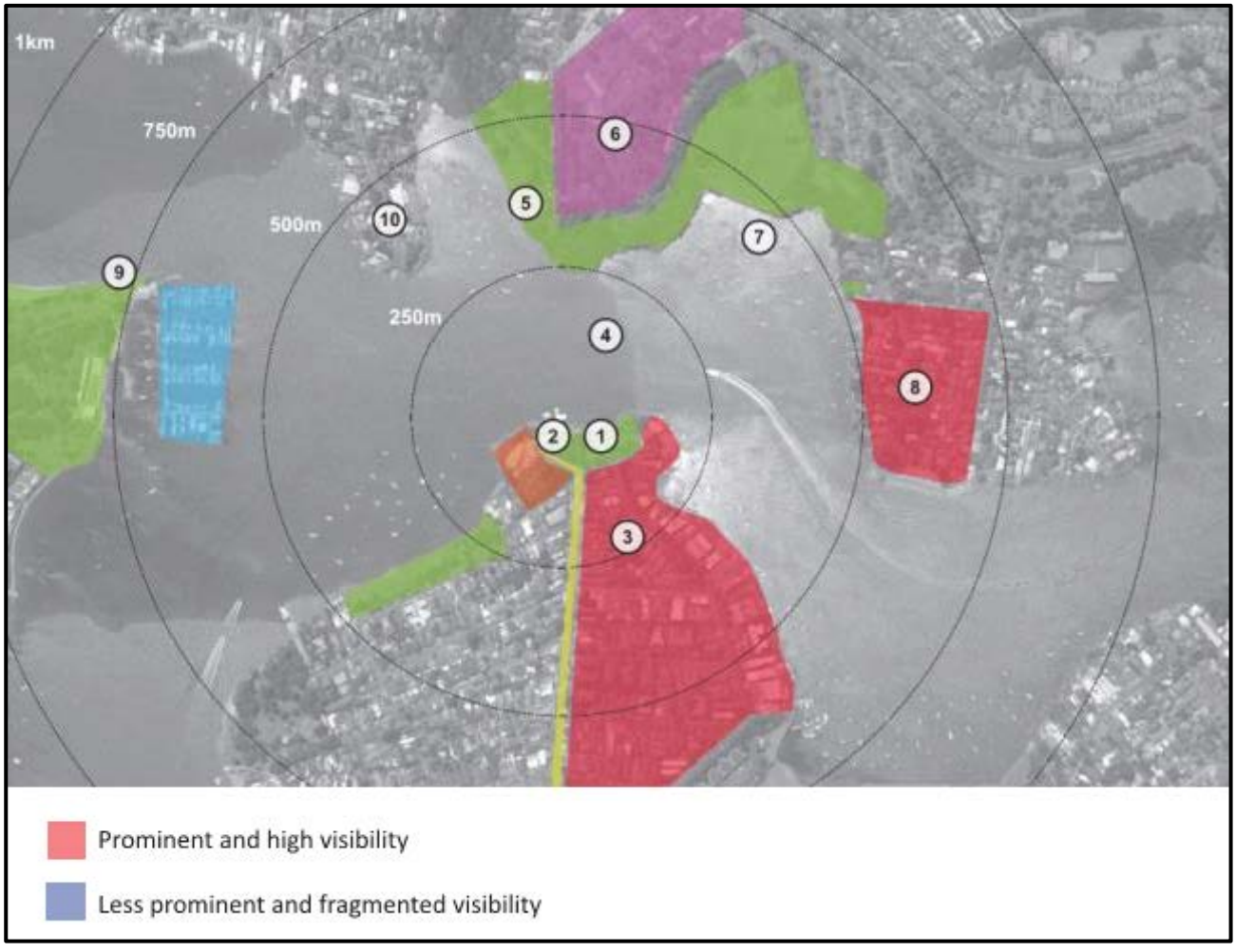
Werrell Reserve sits at higher elevation and is viewed above the wharf with houses and public infrastructure along the ridgeline which forms the peninsula to the south. Werrell Reserve is encircled by Great North Road and Teviot Avenue. The area's character transitions into a residential setting, with generally large houses of federation and other mixed styles. The terrain is generally steep, and provides fragmented views to the water through the houses and trees which line the waterfront.

To characterise these differences the landscape can be divided into 10 zones that have distinct and recognisable components and patterns. Table 6-16 describes the key LCZs in the local area along with their characteristics, quality and sensitivity to change. Figure 6-6 shows the location of each LCZ. The LCZs not included in the table are either of low sensitivity to change or they are located too far from the proposal footprint for there to be any feasible or reasonable impacts. Appendix F provides detail on all the zones.

Table 6-16: Landscape character zones

Zone	Land use characteristics	Sensitivity to change
LCZ1: Werrell Reserve	• Forms the backdrop to the wharf and includes the pedestrian access to the wharf • Characteristic of a complementing composition of built and natural components including sandstone walls, natural outcrops, open grassland and planted amenity vegetation • Sandstone outcrops form natural walls and create a sense of enclosure at the entrance to the wharf • Provides amenity reference for people locally and replicates the theme across the harbour of retaining green space and parkland at the water's edge • Certain elements of the wharf and other maritime buildings along the foreshore area detract from the park's landscape amenity value however they provide context to the area's history.	**High sensitivity** to change given the unique value it provides locally and regionally.
LCZ2: Great North Road and Waterside Buildings	• Provides wider reference and frames the park and approach to the wharf • Characteristic of low density housing, in a garden setting • Adjacent to Werrell Reserve, houses continue the developed gardens and sandstone elements of the park, contributing to the park like character at the end of the peninsula • Waterside buildings at the end of Great North Road, including the locally heritage listed Abbotsford Point Boatshed, define the character of the foreshore.	**High sensitivity** to change given the natural and heritage character of this zone around the wharf
LCZ4 Parramatta River	• Characteristic of a large mass of open water with key views and vantage points as framed by steep ridged peninsulas, which are often formed of park land, and a high density of mixed level housing with views that overlook the harbour • Views from this location include multiple wharfs and headlands projecting into the river, including the existing Abbotsford Wharf.	**Moderate sensitivity** to change, largely because the views would relate well to existing other existing elements.
LCZ7: Bedlam Bay	• Includes a discrete body of water within Bedlam Bay, with multiple moorings for private use boats • Characteristic of complementing rocky waterfront and small sandy beach, with recreational area including a cricket oval.	**Moderate sensitivity** to change, largely because the views would relate well to existing other existing elements.

Zone	Land use characteristics	Sensitivity to change
LCZ9: Cabarita Point	• Characteristics of open parkland, with wooded areas, playground and swimming centre setback from the water's edge • The waterfront is partially developed including a marina on the eastern side, and Cabarita ferry wharf.	**Moderate sensitivity** to change, largely because the views would relate well to existing other existing elements.
LCZ10: Looking Glass Point	• Characteristic of a narrow peninsula, with waterfront residential houses providing a dominant feature • The southern tip contains a vegetated area along the water's edge.	**Moderate sensitivity** to change, as views of the wharf are partially screened, with views established across the body of water upon descending to the water's edge.



Source: JILA

Figure 6-6: Landscape character zones

Visual amenity

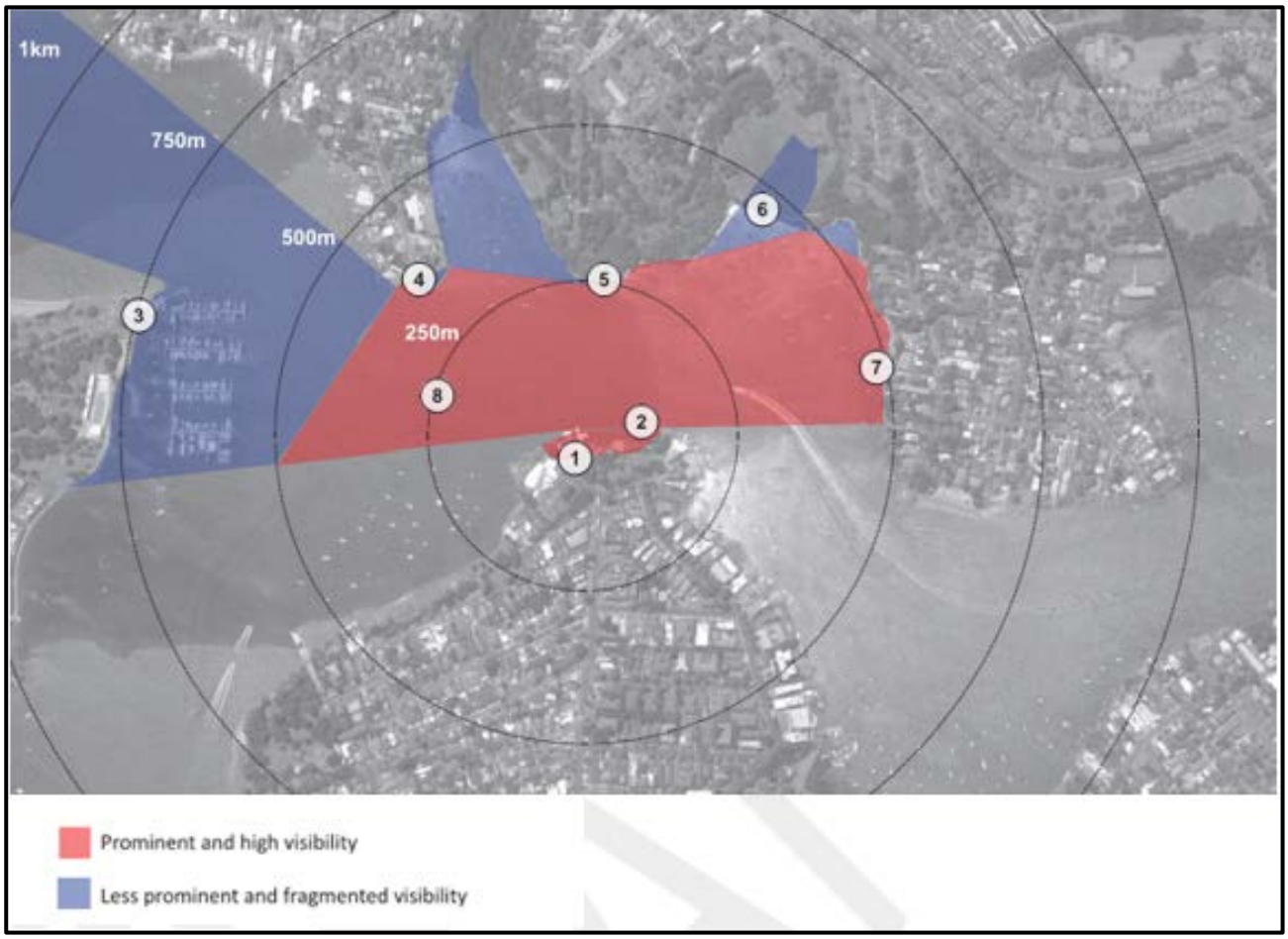
Table 6-16 defines the area's visual amenity. The existing environment is characterised by the distinction of the modern and historic built form of the residential and commercial components in the local area (LCZ2, LCZ9 and LCZ10) against the natural components (LCZ1, LCZ4, and LCZ7). This provides areas of moderate to high amenity and quality in the local area.

Viewpoints and receivers

Figure 6-7 shows the zone of visual influence (ZVI) around the around the proposal footprint, which is defined by the area's topography and the barrier effects of other natural and artificial features, as described further in Appendix F. The ZVI is divided into zones that characterise:

- The foreground, where the proposal forms a key, distinct or dominant component of people's views, typically up to 250 metres from the limit of the proposal footprint
- The middle ground, where the proposal forms a key part of people's views however it does not necessarily dominate, typically between 250 metres and 500 metres from the proposal footprint
- The background, where the proposal is a small component, potentially indistinguishable in people's views, typically more than 500 metres from the proposal footprint.

The proposal would see the replacement of the existing wharf in its landscape setting, which while similar in character, would involve the introduction of several new distinct components (refer to Chapter 3). Also, given the wharf's location on the harbour, it is visible across a large area to the north, north-west and north-east, while the views are limited to the south due to the surrounding landform, as captured in Figure 6-7.



Source: JILA

Figure 6-7: Zone of visual influence

The figure confirms that views of the proposal would be predominantly constrained to:

- People involved in harbour and harbour side activities, such as ferry passengers and tourists
- Users of Werrell Reserve, Abbotsford Point East, Bedlam Point and the Kelly Street Picnic Area.

Seven viewpoints were selected to represent the above receivers as shown Figure 6-7, which are summarised in Table 6-17. Appendix F provides additional detail on each viewpoint.

Table 6-17: Visual receivers (viewpoints)

Viewpoint	Location
VP1	Werrell Reserve
VP2	Abbotsford Point East
VP3	Cabarita Point
VP4	Looking Glass Point
VP5	Bedlam Point
VP6	Bedlam Bay
VP7	Kelly Street Picnic Area
VP8	Parramatta River

Views from each viewpoint (excluding Parramatta River (VP8)) are shown in Figure 6-8 to Figure 6-14 below.

Source: JILA

Figure 6-8: View to the proposal location from VP1

Source: JILA

Figure 6-9: View to the proposal location from VP2

Source: JILA

Figure 6-10: View to the proposal location from VP3

Source: JILA

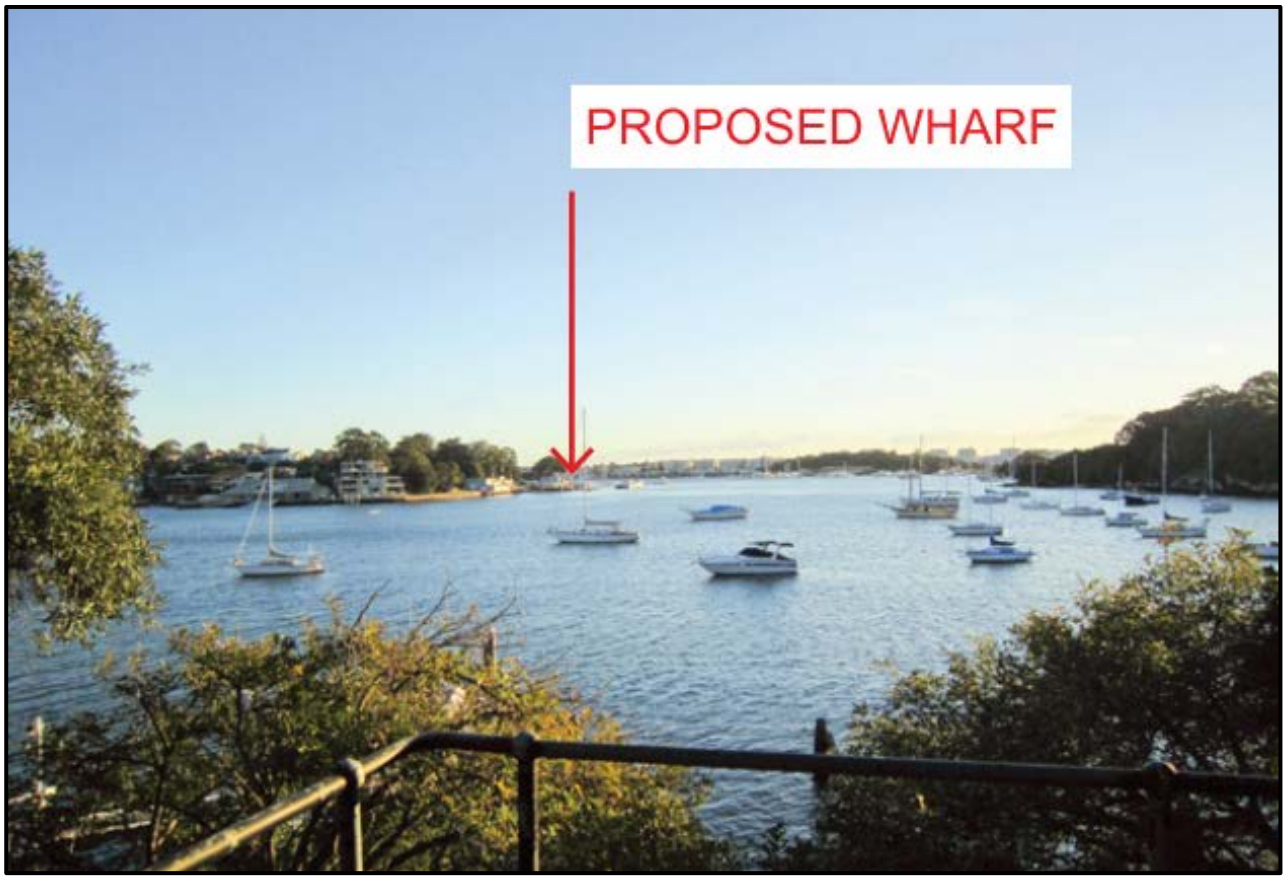
Figure 6-11: View to the proposal location from VP4

Source: JILA

Figure 6-12: View to the proposal location from VP5

Source: JILA

Figure 6-13: View to the proposal location from VP6



Source: JILA

Figure 6-14: View to the proposal location from VP7

6.4.3 Potential impacts

Construction

Landscape character and visual amenity

Certain landscape character and visual impacts would first take place when the proposal is built as a result of the introduction and use of:

- Introduction and use of equipment, barges, piling equipment and other boats around the wharf
- Introduction and use of the ancillary facility in and around Werrell Reserve
- Removal of the existing wharf structure, including the temporary removal of the locally listed entrance shelter.

This work would have the greatest impact on the values associated with Werrell Reserve (LCZ1) where the effects would be:

- Change in the composition and setting of the wharf by its removal
- Temporary introduction of equipment into the landscape, affecting overall amenity and setting.

It would also affect the visual amenity of:

- Recreational users of Werrell Reserve (VP2) and Abbotsford Point East (VP2)
- Users on the Parramatta River (VP8).

The scale of the impact on river users would depend on how people use and relate to the river. It would be expected that people who occasionally use the river would be unlikely affected by the work whereas regular commuters would be more sensitive to these temporary changes. Standard safeguards are proposed to manage the proposal's visual impacts during construction (refer to section 6.4.4). Providing these are introduced and remain effective then the impacts should be safeguarded and minimised.

Light spill and night time work

As described in section 3.3.2, it is expected that out of hours work would be needed to undertake the piling work and deliver certain equipment to site. As such, security, safety and site lighting would be needed to carry out this work. This may cause light spill affecting residents in Looking Glass Point (VP4). Until the lighting configuration and specification is confirmed it is not possible to confirm the scale, nature and extent of any impact. However, stationary site and securing lighting on the barges can be directionally controlled to limit its impacts, including any reflective impacts from the water. With the implementation of safeguards and management measures in section 6.4.4, the light spill impacts are expected to be minimised.

Operation

Once the work is complete, the wharf would be reinstated. Operational impacts are outlined below.

Landscape character

Table 6-18 summarises the landscape impact assessment on the key zones described in Table 6-16, with more detail provided in Appendix F.

Table 6-18: Landscape character assessment

Zone	Sensitivity	Magnitude	Impact
LCZ1: Werrell Reserve *The form and fabric of the proposed wharf, while consistent with that across the network, would be inconsistent with the form and fabric of the current wharf in its historic landscape setting. However, the gangway would separate the main modern components of the new wharf against the retained history of the park.*	High	Low	Moderate
LCZ2: Great North Road *The wharf's design would contrast to the character of the surrounding structures and sea wall at the end of Great North Road.*	High	Moderate	High-moderate
LCZ4: Parramatta River *The wharf is designed to be consistent in appearance to the rest of the ferry infrastructure across the network. It therefore provides design and reference continuity across this zone.*	Moderate	Negligible	Negligible
LCZ7: Bedlam Bay *Despite some retained relationship between the wharf and this zone, the distance means that it would have no material effect on this zones character or setting.*	Low	Negligible	Negligible
LCZ9: Cabarita Point *The wharf's design is consistent in appearance to the to the existing ferry infrastructure at Cabarita Point. It therefore provides design and reference continuity across this zone.*	Moderate	Negligible	Negligible
LCZ10: Looking Glass Point *Despite some retained relationship between the wharf and this zone, the distance means that it would have limited material effect on this zones character or setting.*	Moderate	Low	Low

The proposal is generally of an insufficient mass and scale to have any material impact on landscape character other than immediately next to the wharf. Despite the form and fabric of the proposed wharf contrasting with the built form and structure of the water side buildings at the end of Great North Road, it is consistent with a wider proposal to modernise the ferry infrastructure across the network by adopting design and material consistency.

Visual impacts

Visual impact from each key viewpoint is established through an assessment of the sensitivity of the view combined with the magnitude of the proposal within that viewpoint. Table 6-19 summarises the visual impact assessment, with more detail provided in Appendix F.

Table 6-19: Visual impact assessment

Viewpoint	Sensitivity	Magnitude	Impact
Prominent and high visibility			
VP1: Werrell Reserve	High	Moderate	High-Moderate
VP2: Abbotsford Point East	High	Moderate	High-Moderate
VP5: Bedlam Point	Moderate	Low	Moderate-Low
VP7: Kelly Street Picnic Area	Low	Low	Low
VP8: Parramatta River	Moderate	Low	Moderate-Low
Less prominent, fragmented visibility			
VP3: Cabarita Point	High	Low	Moderate
VP4: Looking Glass Point	Moderate	Low	Moderate-Low
VP6: Bedlam Bay	Moderate	Low	Moderate-Low

From the above summary, it can be concluded that:

- The design and form of the new wharf would be sufficiently in contrast to the existing wharf that the visual impact would be most notable for Werrell Reserve, and land uses next to the wharf
- Providing a covered gangway would impede views across the immediate foreshore, which would detract from the connection between the existing maritime structures. This element was included in the proposal at the request of the community, discussed further in section 2.6
- The wharf is seen from the vantage points within the visual catchment, against the sloping sandstone backdrop, dense vegetation of Werrell Reserve and other maritime objects. These views are mitigated by distance, and barely visible from most vantage points.

Light spill

While the security and safety lighting specifications would be confirmed during the detailed design, requirements would involve a contemporary design that may direct more of the light onto the wharf infrastructure. This would reduce light spill, back scatter and up scatter, which is likely to reduce any impact on adjacent receivers. The only receivers that may be impacted would be the residents of Looking Glass Point who have views overlooking the upgraded wharf and already experience some light spill from the range of activities on the river and harbour, including the existing wharf. As the proposal includes an 18-metre covered gangway, and covered pontoon, lighting levels would be consistent with the existing wharf, with the canopies eliminating the impact of additional lighting.

6.4.4 Safeguards and management measures

Table 6-20 lists the Landscape character and visual amenity safeguards and management measures that would be implemented to account for the impacts identified in section 6.4.3.

Table 6-20: Landscape character and visual amenity safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Landscape and visual impact	Urban design principles would be integrated throughout the detailed design and construction of the proposal, including: • Material selection location of services, and a standardised family of elements. • Gangway is not covered to allow clear views to the shoreline • Covered pontoon and protection screens include transparent elements • Existing landscape elements are retained • Colour of paint and materials are consistent with other recently wharves along Sydney Harbour • No infrastructure would be installed directly on the sea wall.	Roads and Maritime	Detailed design and pre-construction	Additional safeguard UD1
Light spill impacts	Lighting would be directionally controlled to limit impacts from light spill from surrounding receivers, including residential properties. Lighting direction would also include consideration of any reflective impacts from the harbour.	Contractor	Construction	Additional safeguard UD2
Visual impacts	Hoarding would be erected around the construction compound where possible, to reduce visibility.	Contractor	Construction	Additional safeguard UD3
Landscape and Visual impacts	The construction area would be kept clean and clear of rubbish.	Contractor	Construction	Additional safeguard UD4

6.5 Socioeconomic

This section describes the proposal's socioeconomic impacts.

6.5.1 Methodology

The assessment considered the community, business and industry impacts and benefits from building and operating the proposal. Specifically, it considered impacts on:

- The local community in terms of its adoption or opposition to the proposal based on its characteristics and profile
- Social amenity and infrastructure in the area
- The community's values such as amenity, character, health and safety, cohesion, environment, sense of place, fears and aspirations
- Local and regional business, including the aquatic based companies that use the harbour and ferry passenger services.

This involved reviewing published Census data, council information and records, literature, as well as community and stakeholder feedback received for the proposal (refer to Chapter 5). The output from other assessments included in the REF containing relevant socioeconomic themes was also reviewed, namely:

- Noise and vibration
- Non-Aboriginal heritage
- Landscape character and visual impacts.

A basic level of assessment was carried out in accordance with Environmental Impact Assessment Practice Note: Socio-Economic Assessment (EIA-N05, Roads and Maritime, 2014). Unless otherwise stated, the referenced Census data covered in Abbotsford State Suburb, as shown on Figure 6-15.

Source: www.abs.gov.au

Figure 6-15: Abbotsford State Suburb

6.5.2 Existing environment

Demographic and socioeconomic profile

The proposal is situated within the suburb of Abbotsford. Table 6-21 summarises the key social and economic characteristics of the people that live in Abbotsford, and how this has changed over the past five years.

Table 6-21: Statistical Data for Abbotsford State Suburb

Demographic Indicator	2011		2016		% Change
Population	5,112		5,373		+5 %
Population by age bracket	0-19	981 (19.2 %)	0-19	1,061 (19.8 %)	+8.2 %
	20-34	1,025 (20.1 %)	20-34	843 (15.8 %)	-17.8 %
	35-49	1,176 (23 %)	35-49	1,213 (22.6 %)	-3.2 %
	50-64	1,050 (20.6 %)	50-64	1,105 (20.6 %)	+5.2 %
	65+	883 (17.3 %)	65+	1,147 (21.4 %)	+29.9 %
Method of travel to work	Car	60.6 %	N/A		-
	Bus	10.6 %	N/A		-
	Ferry	4.5 %	N/A		-
	Walked	1.4 %	N/A		-
Weekly household income	$1,727		$2,006		16.2 %
Home ownership/rentals	Home owners	59.8 %	N/A		-
	Home renters	37.7 %			-
	Other	2.5 %			-

Notes: N/A – data not available.

It was concluded from the above information that:

- Abbotsford is a moderately affluent suburb, with the highest increase in population within the 65+ age bracket (29 %), indicating it has an aging population
- The 0 - 19-year age bracket has increased over the past few years, indicating an increase in the number of families/single parents
- Residents of the area are predominantly home owners (59.8 %), which based on aerial imagery, covers a mix of low-rise apartments, larger single dwellings and large properties split into individual dwellings
- Most people work outside of Abbotsford and they mainly drive to work (60.6 %), with the wharf being used by a small percentage (4.5 %) of the areas working population.

Community values

Community values are those socioeconomic aspects that people hold important to their quality of life and wellbeing. They include physical assets, such as parks and recreational areas, as well as social factors such as a sense of safety and wellbeing, belonging and community diversity. Accordingly, there is considered to be a high level of community value associated with the existing wharf, adjacent boat shed, and Werrell Reserve. These values relate to the area's landscape and heritage values and listings, and setting within a conservation area.

Community values are likely dominated by people who live in the area. These values likely include:

- Retained local character defined by the ease of access to facilities
- Local amenity and a sense of place, as provided by Werrell Reserve and the setting of Abbotsford Point against the harbour
- Liveability due to harbour access and waterfront living.

Social infrastructure

Social infrastructure refers to the community facilities, services and networks that help individuals, families, groups and communities meet their social needs, maximise their potential for development, and enhance their community well-being. It includes such things as: educational facilities; health, emergency and aged-care services; sports, recreational and cultural facilities; community support services; and transport facilities.

The social infrastructure associated with the proposal includes:

- Werrell Reserve, due to its recreational and amenity use. It also provides a key vantage point across the harbour
- The existing ferry wharf, which provides a means for local residents to travel between key locations in Sydney Harbour
- Adjacent land uses including Abbotsford Sailing Club, Scout Hall, Abbotsford Point Boat Shed, and Sydney Rowing Club
- The actual harbourside and water, which are used by a wide range of people for various activities such as:
  - Recreational boating
  - Tourism
  - Economic purposes
  - Recreational and competitive fishing
  - Sailing and diving
  - Water sports, including rowing and sailing.
- Local businesses close to the wharf, including:
  - Sydney Rowing Club
  - Abbotsford Point Boat Shed
  - The Outterside Centre.

6.5.3 Potential impacts

Construction

Temporary impacts to ferry passengers would be caused by the requirement to close the wharf during construction for up to four months. This would result in temporary journey interruption and inconvenience for up to about 750 (average weekday) passengers and patrons of private water taxi services to the wharf. Passengers would be directed to alternative transport options, discussed further in section 6.8. Minor inconvenience through increased travel times and potential requirements to change transportation modes would be caused by the proposal, however this would not be considered to have significant socioeconomic impacts.

Land uses and businesses immediately adjacent to the wharf would be directly impacted during construction due to the establishment of a construction area at the wharf. This includes the Abbotsford Point Boat Shed, Scout Hall, and Sailing Club. Access to these businesses would be maintained, however minor disruption is anticipated for short periods during construction. Access to the foreshore would be constrained throughout construction, with access to the stairs within Werrell Reserve prevented. Pedestrian access to businesses would be maintained throughout the construction period. Access for vessels to the Abbotsford Point Boatshed, 2nd Abbotsford Sea Scouts or the Abbotsford 12ft Sailing Club would be maintained. Access is discussed further in section 6.9.

Indirect impacts to local businesses in the broader area, including the Sydney Rowing Club may occur. This may occur through temporary loss of revenue from disruption to customer journeys and patrons less likely to utilise alternative transport options. This is anticipated to be minor with the implementation of safeguards and management measures, which would include notifying all local businesses in advance of the commencement of construction, and directing passengers to alternative transportation options.

There would be temporary loss of amenity in the area surrounding the wharf due to the construction compound, maritime exclusion zone and presence of barge mounted cranes and other plant and equipment. Noise from construction activities would also disrupt the amenity of the area, as discussed in section 6.3. This would impact residents and visitors accessing the foreshore, river and Werrell Reserve for the range of purposes outlined in section 6.5.2 above. The temporary loss of amenity may discourage use of these areas in the vicinity of wharf during construction. However, views to the wharf from Werrell Reserve are limited to a small area, as discussed in section 6.4, and would not disrupt use of the remaining areas of the park. Hoarding would be erected around the construction area to minimise views into the construction area, discussed in section 6.4.

Operation

Socioeconomic impacts can occur through loss in passenger experience and/or impact to the character and place of an area.

Benefits to passenger experience would be provided by the proposal through design of the wharf that includes:

- Quicker and more effective embarking and disembarking
- Improved access to the ferry network for passengers, including low mobility passengers through a wharf design that provides disabled and low-mobility access
- A covered entry portal, gangway and pontoon, enabling passengers to wait close to ferries in an area with weather protection, ample seating and customer information
- Improved access to the wharf through Werrell Reserve through upgrade of the stairs
- Improved access to the wharf via Great North Road through providing a ‘kiss and ride’ zone at the wharf.

The above benefits would be in context of the limited loss in character and sense of place at the end of Great North Road from introducing new infrastructure. Visual impacts during operation of the proposal are moderate to negligible, as discussed in section 6.4, and may result in a minor loss to character and place. This impact would be minimised through design of the proposal, which includes provision of a covered entry portal and gangway consistent with the existing wharf. The design of the wharf is also consistent with other recently upgraded wharves across the network. The minor visual impact is not anticipated to result in any socioeconomic impacts.

The new wharf structure would sit within the footprint of the existing structure and therefore any impact on aquatic businesses and water users is assessed as being negligible.

6.5.4 Safeguards and management measures

Table 6-22 lists the socioeconomic safeguards and management measures that would be implemented to account for the impacts identified in section 6.5.3.

Table 6-22: Socioeconomic safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
General socio-economic impacts	A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to stakeholders during construction. The CP would include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changed traffic and access conditions • Contact name and number for complaints. • The CP would be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Pre-construction	Core standard safeguard SE1
General socio-economic impacts	An internet site and free-call number would be established for enquiries regarding the proposal for the entirety of construction. Contact details would be clearly displayed at the entrance to the site. All enquiries and complaints would be tracked through a tracking system, and acknowledged within 24 hours of being received.	Roads and Maritime	Pre-construction	Additional safeguard SE2
Social impacts	The construction area would be secured at all times. Lighting would be positioned to minimise light spill into neighbouring residences.	Contractor	Construction	Additional safeguard SE3

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Social impacts	Access to neighbouring businesses would be maintained during construction, any temporary constraints to access would be communicated ahead of time.	Contractor	Construction	safeguard SE4
Socio-economic impacts	A temporary shuttle bus between Abbotsford Wharf and Chiswick Wharf would be maintained for the duration of construction. All alternative transport arrangements, including the temporary shuttle bus, would be communicated to ferry passengers.	Contractor	Construction	safeguard SE5
Socio-economic impacts	The construction period would be minimised to the four months detailed in this REF to minimise impacts from wharf closure. The construction period would be scheduled outside of during school holiday periods to avoid additional social impact.	Contractor	Construction	safeguard SE6
Socio-economic impacts	The maritime exclusion zone would be clearly defined to delineate access for surrounding water users.	Contractor	Construction	safeguard SE7

6.6 Aboriginal heritage

This section summarises the proposal's Aboriginal heritage impacts. Appendix G contains a supporting technical paper (as reported under the statement of heritage impact, SOHI) prepared under stage one of the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) by City Plan. The Roads and Maritime Aboriginal Cultural Heritage Advisor (ACHA) has issued a Stage 1 clearance letter for the proposal in accordance with PACHCI, included with Appendix H. An Aboriginal Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* is not needed for the proposal.

6.6.1 Methodology

The assessment included a desk review of published records, data and literature, including a records search of the Aboriginal heritage information management system (AHIMS) to confirm the (likely) presence of values in the local area. This was followed by a site visit in 2017 that was used to confirm Aboriginal heritage value and potential.

The PACHCI assessment also referred to the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011), the Code of Practice for the Protection of Aboriginal Objects (DECCW, 2010), and the Code of Practice of Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010).

6.6.2 Existing environment

Aboriginal history

Aboriginal peoples have been active in the local area for the past 30,000 years as evidenced through radiocarbon dating (refer to Appendix G). The peoples that lived on the Cumberland Plain (the landform of Sydney Harbour) spoke the Darug dialect and used the land for its resources. There were 29 clan groups in total across the metropolitan area, collectively known as the Eora Nation. The Eora was the name given to the coastal Aboriginal peoples around Sydney. Aboriginal people had a long and sustained association with the Canada Bay area, which is discussed further in Appendix G.

Recorded items and artefacts

The most recent major Aboriginal heritage investigation of Abbotsford took place in 2006 (refer to Appendix G). The study's aim was to record and map previously identified sites, while also establishing guidelines on the management and conversation of existing sites. This data provides the most recent information in relation to Aboriginal heritage local to the proposal footprint by confirming one recorded Aboriginal heritage site close to the proposal location.

A search of the AHIMS captured only the above recorded site.

Importantly, there are no recorded sites within the proposal footprint or the immediate surrounding area, including Werrell Reserve. The nearest site is located on land south-west of the proposal location. Table 6-23 summarises the AHIMS records in the local area.

Table 6-23: Aboriginal heritage items

Site identification	General character and location
45-6-0567	Burial/shell midden *A recorded artefact located south-west of the proposal location, near Fitzroy Street.*

The nature and location of the above sites reflects the past use of the area by Aboriginal peoples. In summary, human activity locally is sufficient to regard the area as 'disturbed land' as defined under the due diligence practice codes listed in section 6.6.1. This means its Aboriginal heritage value is limited.

Archaeology

Despite the known Aboriginal history of the local area, there is sufficient evidence that the proposal footprint and surrounding area, focused on Abbotsford point, has been subject to disturbance from historic ship building activities (refer to section 6.7) and public park development.

6.6.3 Potential impacts

No impacts to Aboriginal heritage during construction or operation of the proposal are anticipated. This conclusion is discussed through assessment of material impacts and archaeology in the following sections.

Material impacts

No recorded Aboriginal heritage was identified within proximity the proposal footprint, with the nearest site located a substantial distance from the proposal location. The proposal location has been subject to extensive disturbance through past development and there is considered to be no expected potential for encountering undiscovered finds. Given the extent of research carried out across the area, including extensive mapping and analysis, there are no impacts anticipated. This extends to the harbour based work.

There are no planned operational changes once the wharf is upgraded, such as ferry route or mooring arrangements, which would potentially affect the two recorded sites within the harbour.

Archaeology

The development of Abbotsford Point reduces the archaeological potential across much of the local area. Also, as there is no major excavation work planned on the approach to the stairs, there is no potential for disturbing any subsurface archaeology. Final locations of ancillary work in this area, including the installation of wayfinding signage, are to be confirmed however would most likely take place within previously disturbed areas, eg existing footpath, therefore avoiding potential impacts on undiscovered archaeology.

6.6.4 Safeguards and management measures

Table 6-24 lists the Aboriginal heritage safeguards and management measures that would be implemented to account for the impacts identified in section 6.6.3.

Table 6-24: Aboriginal heritage safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard/ additional safeguard
Unexpected heritage finds	The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) would be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Roads and Maritime does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work would only restart once the requirements of that procedure have been satisfied.	Contractor	Construction	Core standard safeguard AH1
Aboriginal Heritage	Areas of Aboriginal heritage would be included in the CEMP and communicated to site personnel as no-go zones.	Contractor	Construction	Additional safeguard AH2

6.7 Non-Aboriginal heritage

This section summarises the proposal's non-Aboriginal heritage impacts. Appendix G contains a supporting technical paper (statement of heritage impact, SOHI) prepared by City Plan.

6.7.1 Methodology

The assessment included a desk review of published records, data and literature, in the form of local, State, national and world heritage registers, to confirm the likely presence of non-Aboriginal heritage values in the local area (as shown on Figure 6-18). This was followed by a site visit in 2017 that was used to confirm the non-Aboriginal heritage value and potential by searching for evidence of surface items and relics, intact natural deposits, and soil disturbance.

The assessment also referred to: Assessing Heritage Significance (NSW Heritage Office, 2001), Statements of Heritage Impact (NSW Heritage Office and DUAP, 2002), Assessing Significance for Historical Archaeological Sites and Relics (NSW Heritage Division, 2009) and the NSW Heritage Manual (Heritage Office and DUAP, 1996).

6.7.2 Existing environment

European history

Appendix G details the European settlement history of the area as comprising:

- Original grant of the land as part of Five Dock Farm, a 1,500-acre area of land, granted to Surgeon John Harris in 1806
- Survey of Great North Road by Surveyor-General Sir Thomas Mitchell in 1828
- Subdivision of Five Dock Farm into 133 allotments in 1837, ranging from 2 to 60 acres in size, prior to progressive sale of the lots in the coming years
- Construction of Abbotsford House in 1878, leading to naming of the suburb
- Commencement of operation of a punt between Abbotsford Point and Bedlam Point in 1832 until 1881 when construction of the Gladesville Bridge made it obsolete
- Reservation of land to the west of the wharf in 1872 for the Sydney Rowing Club, also the location of the Red Horse Inn, which was destroyed by fire in 1931
- Invitations for tender for "erection of a cottage residence and wharf at Abbotsford" in 1877
- Grant of special least for a 'jetty and shed' in 1894 to Alfred Charles Bailey, however it is not confirmed if this was an early form of the wharf or if it related to one attached to his boatshed
- First evidence of a wharf at the location in 1903 in the form of a photograph
- Construction of a booth or shelter on the wharf by 1908
- Construction of a new rowing shed for the Sydney Rowing Club in 1920
- Official opening of the wharf in 1998, although ferries had serviced the wharf since the early 1900s.
- Replacement of the wharf which a concrete jetty and pontoon in 2001.

Source: City of Canada Bay Council: Local Studies online archives

Figure 6-16: Alfred Charles bailey's boat shed and Abbotsford ferry wharf (c.1908)

Source: City of Canada Bay Council: Local Studies online archives

Figure 6-17: Abbotsford ferry wharf as viewed from Parramatta River (c.1990)

Maritime heritage

Abbotsford Point has a long maritime history, extending from the early 1800's to original use of the area as a punt service. The heritage listed Abbotsford Point Boatshed commenced boat hire and storage operations from the late 1800's. The proposal location has contained a ferry wharf from at least the early 1900's.

There is also a range of maritime heritage located across the harbour and easterly areas of the Parramatta River, including a range of subsurface structure, features on the edge of the harbour (such as the Abbotsford Point Boatshed), and around 30 known shipwreck sites inland of Sydney Heads. Despite this, there are no shipwrecks recorded around Abbotsford, as confirmed by reviewing OEH records. The closest wrecks comprise an unidentified wreck near Looking Glass Bay (about 250 metres north-west of the proposal location) and an unidentified wreck west of Henley Peninsula (about 250 metres north-east of the proposal location).

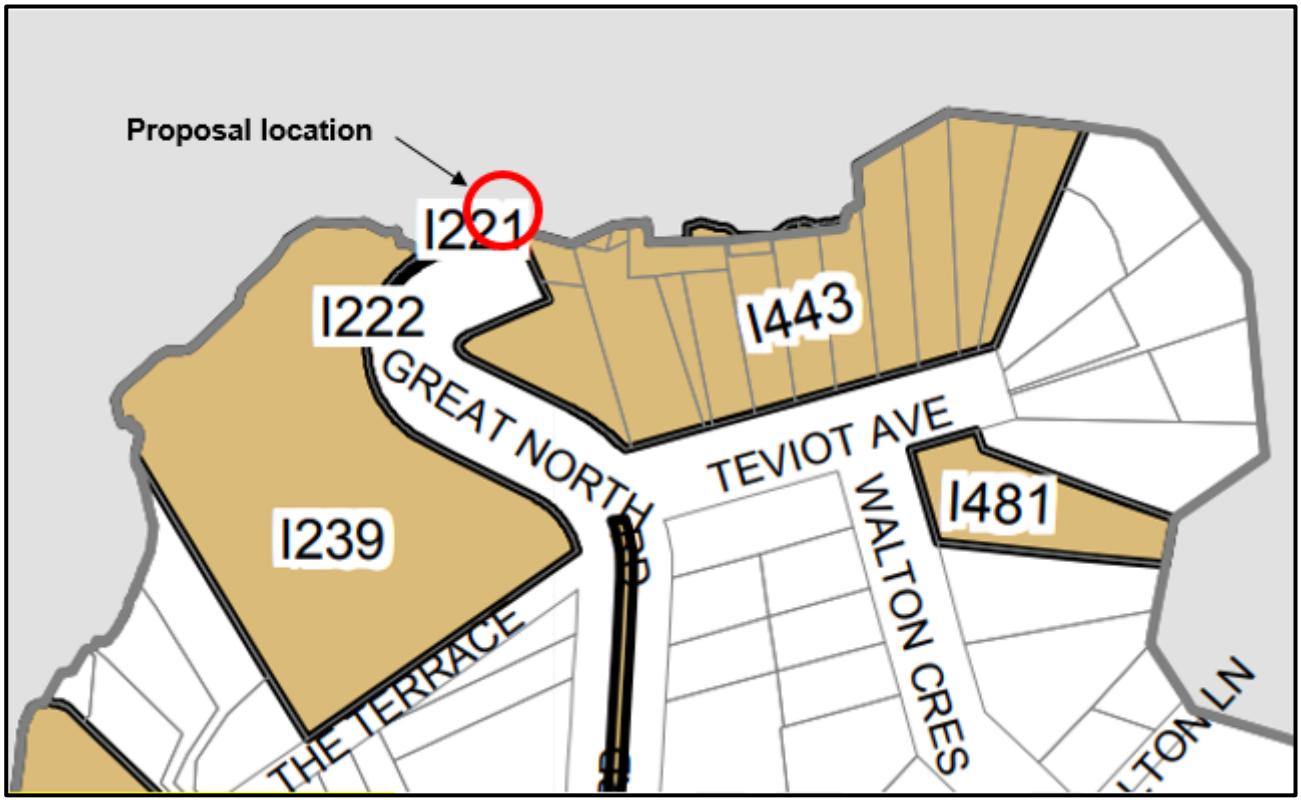
The ferry crossing between Bedlam Point and the proposal location is also listed as a maritime heritage item.

Built heritage

Table 6-25 lists the five recorded items in the local area, which reflect its history as described above. The location of the items is shown on Figure 6-18. Several other heritage items located further from the proposal location are shown in Figure 6-18, but have not been considered further as no potential impact would occur.

Table 6-25: Built non-Aboriginal heritage items within the study area

Item	Value and designation
Abbotsford Jetty *Locally listed (Sydney Harbour SREP #24)*	Covers the proposal footprint • Captures an importance crossing point across the Parramatta River • Significance primarily associated with its location, physical wharf is of low research potential
Abbotsford Point Boatshed *Locally listed (I221)*	Located adjacent to the western side of the proposal, captures the Abbotsford Point Boatshed, and skillion lean-to Recognised for being a good example of a simple boatshed, and a positive influence on the surrounding area as a landmark.
Werrell Reserve *Locally listed (I443)*	Covers the access stairs to the wharf: • Retains natural and early manmade features • Evidence of convict construction of Great North Road. • Recognised as being of significant significance to early transport routes, the Bedlam Ferry, Abbotsford ferry wharf, Great North Road, the cableway across the river, and recreational use.
Sandstone kerbing *Locally listed (I222)*	Covers the location of the compliant kiss-and-ride parking zone, realignment of existing paved area. Listed as an important remnant or early road construction, which gives character and context to the surrounding structures.
Sydney Rowing Club – Boatshed *Locally listed (I239)*	Located west of the proposal: • Contains the site of one of the municipality's first buildings, The Red Horse Inn • Notable example of inter-war rowing shed • Important landmark on the water.



Source: City of Canada Bay Local Environmental Plan 2013

Figure 6-18: Recorded non-Aboriginal heritage items: local listing

Archaeology

Despite there being a wharf onsite since 1903 its size and form has changed including:

- Various parts of the structure have been replaced or updated as its use has changed
- Piles and components have needed replacing
- It was upgraded to its existing form and structure in 2001.

As such, there is the potential for remnant artefacts associated with wharf to be found in the proposal footprint as supplemented by possible artefacts relating to the area's shipbuilding history.

6.7.3 Potential impacts

Construction

Heritage items within the proposal footprint include the Abbotsford Jetty and sandstone kerbing. The wharf's heritage value focuses on its operational history, and the proposal would allow for this to continue for another 50 years. No significant impacts from construction are anticipated. Works in the vicinity of the sandstone kerbing are limited to line markings for the 'kiss and ride' zone. No direct impacts are anticipated. Appropriate measures would be implemented during construction to ensure that no accidental damage to the sandstone kerbing occurs.

No impacts to the context and setting of the landscape heritage value of surrounding heritage listed items, including Werrell Reserve, the Abbotsford Point Boatshed, and Sydney Rowing Club would occur.

The Abbotsford Point Boatshed is located adjacent to the proposal location. To safeguard against impacts to this heritage item, the maritime exclusion zone would demarcate the lease boundary, as shown in Figure 3-1. The area would be communicated as a 'no-go zone' to site personnel.

However, with implementation of the safeguards and management measures detailed in section 6.7.4, no significant impacts are anticipated.

Archaeology

While there are no archaeological records in the area, there is the possibility of encountering subsurface archaeology within the aquatic section of the proposal footprint. In terms of the landside, as there is no planned major excavation work on the approach to the stairs, then there is no likely potential for encountering and disturbing any subsurface archaeology. Waterside construction of the proposal has the potential to impact historical archaeological resources, including those associated with previous wharves at the site, however should they remain, they would not be of significance.

Operation

The proposal would result in a change in the form and structure of the wharf site, which is associated primarily with its location and function. Historical research has shown that the wharf has been replaced and refurbished at least two times since its earliest installation. Therefore, the fabric of the wharf is not of heritage significance. Replacement of the wharf would ensure its continued operation for the next 50 years, conserving its primary heritage values.

With implementation of the safeguards and management measures outlined in section 6.7.4, the proposal would have a neutral impact on the heritage values of the area.

6.7.4 Safeguards and management measures

Table 6-26 lists the non-Aboriginal heritage safeguards and management measures that would be implemented to account for the impacts identified in section 6.7.3.

Table 6-26: Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard/ additional safeguard
Non-Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) would be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work would only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design/ pre-construction	Core standard safeguard H1
Non-Aboriginal heritage	Detailed design should avoid impacts the heritage listed sandstone kerbing on the northern side of Great North Road.	Roads and Maritime	Construction/ Post-construction	Additional safeguard H2
Non-Aboriginal heritage	The construction footprint would avoid the Abbotsford Point Boatshed lease area. This area would be communicated as a ‘no go zone’ to site personnel.	Roads and Maritime	Construction/ Post-construction	Additional safeguard H3

Impact	Environmental safeguard	Responsibility	Timing	Standard/ additional safeguard
Non-Aboriginal heritage	An RMS Heritage Officer should be nominated to amend the RMS S170 Register entry to include all modifications to the Wharf as soon as the works have been completed.	Roads and Maritime	Post-construction	Additional safeguard H4

6.8 Transport, traffic and access

This section describes the land and maritime based traffic, transport and access impacts associated with the proposal.

6.8.1 Methodology

Construction assessment

The assessment considered how the proposed activities, work methods, program, expected vehicle movements, and required management controls (refer to section 3.3) would temporarily impact the following within the study area:

- Traffic network performance on the key roads in the area described in section 6.8.2
- All modes of public, private and active transport
- Public road and private property access
- Maritime commercial, public and recreational traffic
- Ferry services and timetables.

Operational assessment

The operational assessment considered how the upgraded wharf would:

- Support passenger numbers now and in the future
- Integrate with and/or impact on wider ferry services and timetables.

6.8.2 Existing environment

Land transport and parking

The proposal is located within Abbotsford, at the northern end of Great North Road. Great North Road is a local road that travels in a north-south direction from Parramatta Road, in the south, through the residential suburbs of Five Dock, Wareemba and Abbotsford before terminating at the proposal location in the north. Great North Road supports traffic flow in both directions, with an informal turning circle at the end of the road, adjacent to the wharf. Vehicles accessing the road at the proposal location comprise ferry users accessing the wharf, visitors to Werrell Reserve and adjacent commercial businesses.

The road network within the vicinity of the wharf is characterised by residential streets which are single lane in each direction with on-street and off-street parking. Speed limits in the area are generally 50 kilometres per hour in the vicinity of the proposal area.

No parking is permitted at the wharf by City of Canada Bay Council. Short-term on-street parking near the wharf is provided along Great North Road and Teviot Avenue. Parking controls in the vicinity of the proposal location include:

- Four-hour parking restrictions between 8:30am – 6:00pm on Monday – Friday located on the eastern side of Great North Road (north of Teviot Avenue)

- Unrestricted parking along the western kerb of Great North Road (north of Teviot Avenue)
- Unrestricted parking is also provided along both sides of Great North Road, south of Teviot Avenue.

Sydney Rowing Club maintains a private car park close to the wharf, which is reserved for patrons of the rowing club and associated restaurant(s).

Public transport to the wharf includes a bus stop located about 250 metres south of the wharf. This bus stop is serviced by bus routes 438 and L38, operating between Abbotsford and Martin Place.

Cycling infrastructure to the wharf includes lane separated cycleways on Great North Road south of Teviot Avenue. No cycling markings are provided north of Teviot Avenue. Existing bike racks are provided at the wharf.

Pedestrian access to the wharf is provided through:

- A footpath along Great North Road, through Werrell Reserve and down stairs to the proposal location
- A footpath along Great North Road, following a relatively steep grade to the wharf.

A review of access mode share to the wharf was carried out during the concept design stage through completing video surveys. The video survey was completed over the following periods:

- Weekday (Wednesday 12 March 2015); morning period (6:00am – 9:00am), midday period (10:00am – 1:00pm), and afternoon period (4:00pm – 7:00pm)
- Weekend (Saturday 18 April and Sunday 19 April 2015); day period (10:00am – 4:00pm).

The mode share profile assessed for the wharf is shown in Table 6-27 below.

Table 6-27: Access mode share

Transport Mode	Mode Share
Walking	84 %
Cycling	1 %
Kiss and ride	9 %
Park and ride	6 %

Maritime transport

Ferry service and frequency

Abbotsford Wharf is serviced by the F3 Parramatta River route, which operates between Circular Quay and Parramatta. The ferry route also services wharves at Rydalmere, Meadowbank, Kissing Point, Cabarita, Chiswick, Huntleys Point, Drummoyne, Barangaroo, Cockatoo Island, Woolwich, Greenwich, Birchgrove, Balmain, McMahons Point, and Milsons Point.

The F3 Parramatta River route operates at Abbotsford between about 6 am and 12 am daily. About 82 services depart from Abbotsford Wharf each day between Monday and Friday. Ferry services typically operate every 15-30 minutes per direction during the commuter peak periods in the peak direction and every 30-60 minutes at other times in both directions.

A review of wharf statistics completed during the concept design stage indicated the average weekday patronage for Abbotsford is about 750 passengers. Patronage data indicates that the use of the wharf is highest during weekday off-peak and weekend patronage periods.

Commercial activity

Commercial aquatic businesses in the vicinity of the wharf include Sydney Rowing Club and Abbotsford Point Boat Shed on the western side of the proposal location. The 2nd Abbotsford Scout Hall and Abbotsford 12Ft Sailing Club are located on the eastern side of the proposal location. The

2nd Abbotsford Sea Scouts have a right of access across the paved foreshore adjacent to the existing wharf entrance.

Commercial vessels operate throughout the harbour and sections of the Parramatta River, including commercial shipping lanes adjacent to the wharf. The closest commercial wharf is Abbotsford Point Boatshed, located adjacent to the proposal location, which is a small heritage listed boat shed and attached wharf. The boatshed is used to service and repair small to medium sized recreational vessels.

D'Albora Marina is located on the eastern side of Cabarita Point, to the west of the proposal location, with multiple other smaller commercial docks located in the vicinity of Abbotsford.

Private water taxi services and commercial recreational vessels also utilise the wharf temporarily between ferry services. Use of the wharf is prioritised to Harbour City Ferries, with other uses subject to timetabling availability.

Recreational activity

Abbotsford Point provides moorings for recreational boats and larger commercial vessels. However, no moorings are located within the vicinity of the proposal location. The closest mooring is about 200 metres away, on the western side of Abbotsford Point.

The river and harbour near the proposal location is utilised for various recreational activities such as recreational boating, tourism, recreational and competitive fishing, sailing, diving, rowing and other water sports.

6.8.3 Potential impacts

Construction

Land transport

The proposal would result in a minor increase in traffic volumes during construction due to the need for temporary closure of the wharf.

A potential increase in commuter traffic may be generated by the proposal. Based on available patronage data, this would be on average 750 people per day. Ferry passengers would be directed to alternative transportation options, such as bus services from near the wharf and/or private vehicle use. A temporary shuttle bus would operate between Abbotsford ferry Wharf and Chiswick Shopping Centre, with a four-minute walk from the stop to Chiswick Wharf, enabling users to connect with Parramatta River services. Any additional commuter traffic would be absorbed by the existing road network, and no significant impacts are anticipated.

No parking on Great North Road is permitted at the wharf by City of Canada Bay Council. No impacts to parking are anticipated for construction of the proposal.

Maritime transport

Ferry services and private water taxi services utilising the wharf would be disrupted during construction. The F3 Parramatta River route would continue to operate as normal during construction, removing Abbotsford from its timetable. Ferry patrons would be advised of the temporary shuttle and Chiswick Wharf as the closest alternative wharf. No significant disruption or change to ferry timetabling for other wharves is anticipated during construction. Private water taxis would need to utilise alternative moorings during construction.

Construction of the proposal would require a maritime navigation exclusion zone to be set up around the wharf. However, this would not adversely impact on commercial or recreational vessel movements within the harbour, with the area staying outside of the ten-metre depth zone which is used by tugs for swinging ships.

Disruption to recreational uses of the river may occur, such as the use of rowing lanes, and vessels manoeuvring from the Abbotsford Point Boatshed, 2nd Abbotsford Sea Scouts and Abbotsford 12Ft Sailing Club. Surrounding land users would be notified of potential disruptions prior to the

commencement of construction. Vessels in the vicinity would be directed away from the exclusion zone. The maritime exclusion zone would not prevent access to the Abbotsford Point Boatshed, 2nd Abbotsford Sea Scouts or the Abbotsford 12ft Sailing Club.

Construction of the proposal would result in up to four vessels travelling between an off-site facility and the wharf each day. The minor increase in vessel movements within the harbour is not considered to be significant in the context of the harbour and Parramatta River.

Operation

Land transport

Ferry services would be resumed at the wharf during operation. It is anticipated that pre-construction patronage levels would return with recommencement of ferry services from the wharf, with no direct impact on land based transport.

The proposal would result in the improvement of efficiency and user experience of ferry services from the wharf. This may result in the increased patronage of the wharf and ferry service, and additional commuter traffic travelling to the wharf. However, this is not considered to be significant based on the existing patronage of the wharf, and would reduce traffic in other areas of the network. Improvements to existing parking provision is not included as part of the proposal, however a 'kiss and ride' zone would be provided at the wharf.

Maritime transport

Ferry services to the wharf would resume during operation, with no change in current vessel movements as a result of the proposal. The proposal would enable the continuation of a ferry service for the period of its 50-year operation life, and would also improve the efficiency and user experience of the wharf.

6.8.4 Safeguards and management measures

Table 6-28 lists the traffic, transport and access safeguards and management measures that would be implemented to account for the impacts identified in section 6.8.3.

Table 6-28: Traffic, transport and access safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Land transport and parking	A traffic control plan would be prepared and implemented in accordance with the 'Traffic control at work sites manual' (RTA, 2010a) and Australian Standard 1742.3 (Manual of uniform traffic control devices) and would include such things as appropriate wayfinding signage to be installed advising of alternative transport options where necessary.	Contractor	Pre-construction / construction	Core standard safeguard TT1

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Land transport and parking	The traffic control plan would be developed in consultation with City of Canada Bay Council.	Contractor	Pre-construction / construction	Additional safeguard: TT2
Land and water transport	Transport of equipment and materials to site via boat and barge would be utilised over land transport to limit impacts to the local road network.	Contractor	construction	Additional safeguard: TT3
Water transport	All services which use the wharf would be notified prior to the closure of the wharf.	Roads and Maritime	Pre-construction	Additional safeguard: TT4
Water transport	A maritime navigation exclusion zone would be established during construction to prevent unauthorised vessels entering the area.	Contractor	Pre-construction / construction	Additional safeguard: TT5
Water transport	Access for vessels to the Abbotsford Point Boatshed, 2nd Abbotsford Sea Scouts or the Abbotsford 12ft Sailing Club would be maintained.	Contractor	Construction	Additional safeguard TT6

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Water transport	A Maritime Traffic Management Plan would be prepared and implemented during the water based construction work. The Maritime Traffic Management Plan would be prepared consultation with NSW Maritime and approved by the Harbourmaster. In addition, the proposal would: • Not interfere with any vessel movements. • Not lace buoys in or adjacent to shipping channels • Fit all buoys with lights • Prepare Response Plans for emergencies and spills for all construction vessels • Fit at least one vessel with an Automatic Identification System (AIS) • Retrieve any material associated with the construction of the development that enters the water to prevent the obstruction of vessel movements • Prepare a Communications Plan for implementation during the work which must include 24/7 contact details, protocols for enquiries, complaints and emergencies. Any variation to the above would be agreed in advance with the Harbourmaster.	Contractor	Pre-construction / construction	Additional safeguard: TT7
Land transport	A temporary shuttle bus between Abbotsford Wharf and Chiswick Wharf would be maintained for the duration of construction.	Roads and Maritime	Construction	Additional safeguard: TT8
Land transport	Alternative transport arrangements, including the temporary shuttle bus, would be communicated to ferry passengers.	Roads and Maritime	Construction	Additional safeguard: TT9

6.9 Waste management and resource use

This section describes the proposal's waste management and resource use impacts.

6.9.1 Methodology

The assessment considered the impacts associated with:

- Resource use and materials management during construction
- Waste generation, management and disposal during construction
- The proposal's ability to respond to waste management and resource conservation plans, policies and guidelines.

The basis of assessment was to consider the hierarchy of avoiding waste generation and primary resource use in favour of reduction, reuse and recycling, consistent with the NSW *Waste Avoidance and Resource Recovery Act 2001.*

6.9.2 Existing environment

Existing waste management measures in the local area include:

- The council collection of rubbish from a number of public bins in Werrell Reserve
- Rubbish is also collected from the wharf by Roads and Maritime as part of the maintenance and operation of the existing structure.

No other waste generating activities are associated with the wharf or ferry service.

In terms of resource use, the wharf has required ongoing maintenance, repair and upgrade over time. This has required the use of small quantities of replacement materials such as timber and metal.

6.9.3 Potential impacts

Construction

Resource use

Roads and Maritime adopts a resource reduction strategy based on using:

- Alternative low-energy, high recycled content materials where they are cost and performance competitive and comparable in environmental performance
- Locally sourced materials, noting that most of the materials needed to build the proposal are widely available and typically in abundant supply in the local market
- Alternative forms of material sourcing to reduce the distances or methods travelled to supply materials.

Waste generation and management

The proposal would generate low waste volumes across few waste streams. The main waste would come from decommissioning and dismantling the existing wharf, which would include:

- Concrete and scrap metal that could be reused depending on its condition
- Ancillary equipment such as signs, lighting, notice boards, and electronic display boards, some of which may be reusable either on the upgraded wharf or elsewhere depending on its age and condition.

The other wastes generated in building the proposal would be typical to any construction site. They would include:

- Material offcuts (eg glass, wood, metal) that could be reused or recycled
- Inert unrestricted packaging waste (eg plastic, paper, wood) that could be recycled
- Potential restricted wastes (eg oily rags, empty paint tins, used lubricant tube) that would need collecting and transferring offsite to a licenced facility
- Food waste, which would be collected.

Landside ancillary facilities would be contained within a small compound, and include a portable toilet and small shipping container/shed. No landside storage of materials is anticipated. Materials would be barged to site, including fuels, oils and other required liquids which would be stored in bunded containers. All waste removed from the site would be transferred by a licenced contractor to a licenced receiving facility.

There is no planned need to manage and dispose of any excavated material from site, including dredging any materials. Any sediment would be removed from the existing piles whilst in the water to prevent a risk of ASS generation.

Operation

The waste generation and resource use associated with the operational wharf would be broadly consistent with the current wharf including small amounts of passenger litter and maintenance materials.

As part of the proposal two garbage bins would be provided on the pontoon, with one dedicated for recycling materials, increasing the potential to recycle waste and reducing resource use although the amount would be negligible given the low patronage in this area. Waste collection and management would be managed by Roads and Maritime.

As noted in the previous section, the expectation is that the amount of ongoing resources needed to maintain the wharf would reduce due to its more durable design.

6.9.4 Safeguards and management measures

Table 6-29 lists the waste management and resource use safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.9.3.

Table 6-29: Waste and resource safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Waste	Waste management, littering and general tidiness would be monitored during routine site inspections.	Contractor	Construction	Additional safeguard: W1
Waste	Appropriate measures to avoid and minimise waste associated with the project should be investigated and implemented where possible	Contractor	Construction	Additional safeguard: W2
Waste	Waste would be classified before being disposed offset to an appropriately licenced facility in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (DECCW 2014). Where necessary, this would include sampling and analysis.	Contractor	Construction	Additional safeguard: W3

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Resource minimisation	Recycled, durable, and low embodied energy products would be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (eg where quality control specifications allow).	Contractor	Design	Additional safeguard: W4

6.10 Hazards and risks

This section describes the proposal's impacts to hazards and risks.

6.10.1 Methodology

The assessment considered the impacts associated with potential hazards and risks during construction and operation of the proposal.

6.10.2 Existing environment

The existing wharf may pose a safety risk for ferry users in high and low tides due to the gradient of the gangway.

Submarine cables are close to the existing wharf location, providing a general hazard for wharf maintenance and operation.

6.10.3 Potential impacts

Construction

The following hazards and risks would be associated with the proposal during construction:

- Construction materials, wastes and/or other objects have the potential to fall from the landside construction area into the Parramatta River causing water pollution and risk to human health
- Construction materials, waste and/or objects have the potential to fall from the construction barge or other construction vessels into the Parramatta River causing water pollution and risk to human health
- Physical injury to construction workers due to various hazards and risks associated with the construction activities
- Physical injury to public due to various hazards and risks associated with the construction activities
- Risk to human health or the environment from spillage of materials and/or wastes into the water
- Interaction with the submarine cable located adjacent to the existing wharf.

Operation

The new wharf has been designed to comply with relevant standards, minimising risks to passenger welfare during operation of the wharf, and improving accessibility.

The installation of protection and manoeuvring piles would reduce the potential risks associated with the berthing of ferries and other vessels at the wharf.

Vessel movements to the wharf would continue to be managed through standard maritime procedures.

Submarine cables would continue to provide a general hazard for wharf maintenance and operation; however no increased hazard would be present.

6.10.4 Safeguards and management measures

Table 6-30 lists the hazard and risk safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.10.3.

Table 6-30: Hazard and risk safeguards and management measures

Environmental factor	Environmental safeguard	Responsibility	Timing	Standard/ additional safeguard
Hazards and risks	Marine spill kits would be kept within the construction area.	Contractor	Construction	Additional safeguard HAZ1
Hazards and risks	Appropriate emergency equipment such as flotation devices and first aid kits would be kept within the construction area.	Contractor	Construction	Additional safeguard HAZ2
Hazards and risks	All utilities within and adjacent to the proposal location would be located prior to the start of the works.	Contractor	Construction	Additional safeguard HAZ3
Hazards and risks	Safe work method statements or similar would be implemented to manage health and safety risks for the works.	Contractor	Construction	Additional safeguard HAZ4
Hazards and risks	Consent from property owners would be received prior to any works on third party land, eg City of Canada Bay Council.	Roads and Maritime	Pre-construction	Additional safeguard HAZ5

6.11 Other impacts

The proposal is expected to have a negligible to minor impact in relation to:

- Air quality
- Greenhouse gas
- Climate change adaptation
- Terrestrial soils and geology.

6.11.1 Existing environment and potential impacts

This section describes existing environment and potential impacts associated with the other environmental aspects where there is expected to be a negligible to minor impact. These are outlined in Table 6-31 below.

Table 6-31: Other impacts

Environmental factor	Existing environment	Potential impacts
Air quality	The nearest OEH air monitoring site to the proposal location is Rozelle, which forms part of the Sydney central-east monitoring network. A review of air quality data for the month of July 2017 indicates air quality is generally categorised as fair-to-good based on an Air Quality Index (AQI) of 34-99 (OEH, 2017).	• Temporary impacts may occur during construction, including minor amounts of construction generated dust, and plant, equipment and construction vehicle emissions • No additional impacts are anticipated for operation of the proposal with the management of storage and inclusion of spill kits as noted in the safeguards below.
Greenhouse gas	Operation of the existing wharf would contribute in a continuation in the emission of greenhouse gasses such as carbon dioxide, due to ongoing maintenance and operation of the wharf.	• Building the proposal would result in a minor greenhouse gases emissions through material consumption (including embodied emissions in the production of materials), and using associated plant and equipment • The ferry wharf is designed to operate for 50 years by adopting a low maintenance design. As such, the greenhouse gas emissions expected during maintenance would be lower due to the greater maintenance requirements associated with the wharf in its current condition.

Environmental factor	Existing environment	Potential impacts
Climate change adaptation	Operation of the wharf would continue for its 50-year design life, during periods of predicted sea level rise.	The wharf includes climate change adaptation in its design including: • Enough clearance above the water to allow for a sea level rise • Shading and shelter provisions to protect passengers during extreme weather events • A streamlined design, enabling the wharf to withstand high winds during extreme weather events.

6.11.2 Safeguards and management measures

Table 6-32 lists the additional safeguards and management measures that would be implemented to account for the impacts identified in section 6.10.2.

Table 6-32: Other safeguards and management measures

Environmental factor	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Air quality	Air quality during construction would be considered and addressed within the CEMP and would include methods to manage work during strong winds or other adverse weather conditions as required	Contractor	Detailed design/ pre-construction	Core standard safeguard AQ1

6.12 Cumulative impacts

Cumulative impact relates to any combined impact resulting from multiple individual sources. These sources can occur in the past, present or future in comparison to the construction and operation of the proposal. The consideration of cumulative impacts is required to assess this combined impact in the context of the region.

The proposal is part of a broader program of work to upgrade the commuter ferry wharves in Sydney, referred to as the Ferry Wharf Upgrade Program (FWUP). Further consideration of potential cumulative impacts associated with the proposal and upgrade of other wharves as part of the FWUP is provided in Table 6-33.

6.12.1 Study area

Significant development surrounding the proposal area, including the residential suburb of Abbotsford, were included in the study area. Potential development within Sydney Harbour was also considered within about 500 metres of the proposal location.

The timing (temporal) boundaries considered to be the duration of any potential impacts identified in section 6.1 to section 6.11.

6.12.2 Past, present and future projects

A search of the following databases was completed to identify any projects which might result in a cumulative impact with the proposal:

- Department of Planning and Environment – major project register
- Sydney Central Joint Regional Planning Panel Development and Planning Register
- City of Canada Bay Council development application register.

Multiple residential projects within Abbotsford, including construction of new homes, alterations and additions, in various stages of completion are listed on the City of Canada Bay Council development application register. No significant construction related traffic would be generated for these projects outside of light vehicles travelling to the site and minor deliveries of equipment and materials. No cumulative impacts would be generated, as such, no further consideration of these projects has been completed.

Potential impacts from the construction and operation of identified past, present and future projects are summarised in Table 6-33.

Table 6-33: Past, present and future projects

Project	Construction impacts	Operational impacts
Ferry Wharf Upgrade Program (FWUP) The FWUP includes upgrades to wharves across Sydney. The proposal is located at Abbotsford, which is part of the F3 Parramatta River ferry route. The FWUP includes planned upgrades to multiple wharves which service the F3 Parramatta River ferry route, including Cockatoo Island, Chiswick, Birchgrove, Cabarita, Meadowbank, Rydalmere and Parramatta. At the time of writing, the planned schedule for construction of the Birchgrove and Cabarita Wharf Upgrades may occur at the same time as the proposal. The proposed upgrade of the Birchgrove Wharf would require closure of the wharf during construction.	Whilst temporary impacts to passengers utilising Abbotsford and Birchgrove wharves are anticipated during construction; cumulative impacts are not anticipated as the respective location of each wharf indicates commuters would originate from different catchment areas and not use either wharf as an alternative. Minor disruption to patrons who use the ferry service to travel between these two locations may occur, however this is not considered to be significant based on patronage data for both wharves. There may be some minor increased pressure on the respective local road networks during this time, however it is not expected to have a significant impact on the existing road network.	No operational impacts are anticipated. The FWUP would have a beneficial cumulative impact through improved passenger amenity and consistent ferry wharf design across the network.

6.12.3 Potential impacts

Table 6-34 outlines the possible cumulative impacts.

Table 6-34: Potential cumulative impacts

Environmental factor	Construction impacts	Operational impacts
Socio-economic	Cumulative impacts to patrons of the F3 Parramatta River ferry service due to closure of the Abbotsford and Birchgrove ferry wharves concurrently.	No operational impacts are anticipated.
Traffic and transport	Minor increase in construction related traffic, and commuters.	No operational impacts are anticipated.

6.12.4 Safeguards and management measures

Table 6-35 lists the cumulative impact safeguards and management measures that would be implemented to account for the impacts identified in section 6.12.4.

Table 6-35: Cumulative impact safeguards and management measures

Impact	Environmental safeguard	Responsibility	Timing	Standard / additional safeguard
Cumulative construction impacts	• Consultation would include notification prior to the start of the works. • Notification would include directions to alternative public transport to be used during the construction period. • Updates on any delays or changes to the construction period would also be communicated.	Roads and Maritime	Pre-construction / construction	C1

Other safeguards and management measures that would address cumulative impacts are identified in section 7.2.

7 Environmental management

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

7.1 Environmental management plans

A number of 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 Roads and Maritime Environment Officer, Greater Sydney Program Office prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would 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 work on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of site specific environmental safeguards

No	Impact	Environmental safeguards	Responsibility	Timing
1	Soil and water	A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks would be addressed during construction.	Contractor	Detailed design / pre-construction
2	Soil and water	A site specific Erosion and Sediment Control Plan/s would be prepared and implemented as part of the Soil and Water Management Plan	Contractor	Detailed design / pre-construction
3	Soil and water	Weather forecasts would be regularly checked during construction. Where severe weather is forecast, all equipment and materials would be removed from the construction area, or secured.	Contractor	Construction
4	Water Quality	A spill management plan would be developed and communicated to all staff working on site. Any aquatic spill (whether spill occurs on water on land and subsequently enters the water) is to be immediately reported to Roads and Maritime and Sydney Ports VTS and VHF Channel 13. Aquatic spill kits are to be kept on site during construction.	Contractor	Construction
5	Water quality	All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
6	Water quality	Any chemicals or fuels stored at the site or equipment barges would be stored in a bunded area to prevent chemical leaks or spills entering the water.	Contractor	Construction
7	Water quality	A silt boom and curtain would be installed around the work area. The silt boom and curtain would extend from a minimum of 100 millimetres (mm) above the water line to a minimum of 2.5 metres below the water line before starting work.	Contractor	Construction
8	Water quality	A silt boom and curtain would be used to control the movement of floating debris from the immediate work area, before being collected using a scoop. Debris below the surface would be retrieved via trained divers. Any debris would be removed from the water immediately.	Contractor	Construction
9	Erosion and scour	The number of jack-ups/anchor points would be minimised where possible. The locations would be selected to avoid areas of sensitive habitat, as discussed further in section 6.2.	Contractor	Construction
10	Erosion and scour	Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts.	Contractor	Construction
11	Water quality	The silt boom and curtain would be inspected every day after ebbing tides, with an additional inspection to be carried out after storm events. If excessive turbidity of the water is observed during removal of the piles, a second, moveable silt curtain would be installed around the piles being removed during each day of operation. Results of the observations of the integrity of the silt curtain are required to be recorded and maintained specifically for the purpose. Records are required to be kept on the site and to be made available for inspection by persons authorised by Roads and Maritime.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
12	Aquatic biodiversity	A Marine Ecology Management Plan would be prepared as part of the CEMP. This would include, but not be limited to, measures relating to the following activities to minimise the risk for pollution: • Sediment and rock debris control • Spills from concrete pour • Oil/fuel/chemical storage and spill management • Machinery and engine maintenance schedule to reduce oil/fuel leakage • Low impact barge positioning to prevent propeller scouring and thrust wash onto sensitive habitats • Minimise footprint and establish no-go zones in sensitive habitats • Accidental waste/material overboard response (eg construction materials dropped into the harbour) • Biological hygiene (eg prevent spread of noxious species on and off the site) • Aquatic fauna management.	Contractor	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
13	Biodiversity	No-go zones would be established to avoid damage to all terrestrial and nearby aquatic habitats. No-go zones should be marked on a map and displayed inside the construction barge and office. All staff responsible for manoeuvring the barge should check the map before selecting a new position. For most of the construction period, the no-go zone generally includes the base of the stone seawall in the intertidal zone and nearshore rocky macroalgae habitat. This habitat should be avoided as much as practical but may temporarily exclude those areas for one off drilling or piling when no alternative barge position is feasible. Construction vessels should also avoid beaching on the shallow subtidal sand, rubble and macroalgae habitat area	Contractor	Pre-construction
14	Aquatic Biodiversity	No anchors or mooring blocks/lines should be placed on the shallow rocky macroalgae habitat. All lines should be suspended off the seafloor to minimise drag across benthic communities	Contractor	Pre-construction
15	Biodiversity	If previously unidentified threatened species are observed in the construction area, work would cease and Roads and Maritime would be contacted	Contractor	Construction
16	Aquatic Biodiversity	The silt boom and curtain should be wrapped from shore to shore around the construction area and regularly inspected for entrainment and impingement of aquatic/marine wildlife.	Contractor	Construction
17	Biodiversity	Vessel speeds would be minimised within the construction area to minimise wash and risk of injury to aquatic/marine fauna. All staff working on the site would be advised of the location of habitats within the construction footprint. Care should be taken in the placement of jack-ups and/or anchors to avoid areas of aquatic habitat.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
18	Biodiversity	Work positioning barges, drilling and pile driving should occur during calm conditions to prevent excessive scouring and other impacts.	Contractor	Construction
19	Biodiversity	Gentle start-up of piling hammering would be completed to allow undetected aquatic fauna to leave the area.	Contractor	Construction
20	Biodiversity	Construction activities would avoid impact to trees within Werrell Reserve, including the use of tree guards where required.	Contractor	Construction
21	Pest species	Regular inspections of all equipment, machinery and materials would be completed to prevent the importation of pests and weeds to the area, including the noxious marine alga *Caulerpa taxifolia.* Good housekeeping of the aquatic construction area would be maintained.	Contractor	Construction
22	Biodiversity	Work would stop if large aquatic fauna are observed nearby.	Contractor	Construction
23	Noise and vibration	A Noise and Vibration Management Plan (NVMP) would be prepared and implemented as part of the CEMP. The NVMP would generally follow the approach in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented • A monitoring program to assess performance against relevant noise and vibration criteria Arrangements for consultation 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.	Contactor	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
24	Noise and vibration	All sensitive receivers (eg schools, residents) likely to be affected would be notified at least five days before starting any work with an associated activity that may have an adverse noise or vibration impact. The notification would provide details of: • The proposal • The construction period and construction hours • Contact information for project management staff • Details of complaint and incident reporting • How to obtain further information. Receivers where noise management levels may be exceeded would receive letter notification. Highly noise affected receivers would receive direct notification through a door knock.	Roads and Maritime	Pre-construction
25	Noise and vibration	The following work schedule would be adopted: Drilling of piles: • Setup: 11pm to 12am • Drilling: 12am to 6am • Pack up: generally, 6am to 7am. Hammering of piles: • Setup: 4am to 5am • Hammering: 5am to 7am. Large prefabricated equipment would be installed by barge between 11pm and 7am.	Contactor	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
26	Noise and vibration	Other than piling and the installation of the prefabricated elements of the structure that needs to take place during periods of calm water, all work would be carried out during standard construction hours identified in the Interim Construction Noise Guideline (DECC, 2009) unless Roads and Maritime approval has been granted.	Contactor	Pre-construction
27	Noise and vibration	All construction personnel would be notified of the location of sensitive receivers, and the need to minimise noise and vibration from the work, during the site induction.	Contactor	Pre-construction
28	Noise and vibration	Plant and equipment would be in good working order to prevent excess noise generation.	Contactor	Pre-construction
29	Noise and vibration	Verification measures would be carried out to confirm background noise levels already captured as part of the Noise and Vibration Impact Assessment report, and actual construction noise levels monitored using hand-held devices during periods associated with high noise impacts. This would apply to the following NCAs and scenarios described in Table 6-11: • NCA01: S04 • NCA02: S03 to S05 • NCA03: During all construction scenarios • NCA04: S03 to S05 • NCA05: S03 to S04	Contractor	Pre-construction/ construction

No	Impact	Environmental safeguards	Responsibility	Timing
30	Noise and vibration	Where possible, high noise generating works shall be completed before 11pm, however due to the location of the Abbotsford Wharf, and the requirement for calm environmental conditions (calm water and minimal wind), some activities are required to be carried out between 11pm and 7am, when the waterway is at its calmest. Respite periods (RP) would be provided for all night-time construction activities, with each activity limited to two consecutive nights in a row. This would apply to the following NCAs and scenarios described in Table 6-12: • NCA01: S04 • NCA02: S03 to S05 • NCA03: S03 to S05 • NCA04: S03 to S05 • NCA05: S03 to S04.	Contractor	Pre-construction/ construction
31	Noise and vibration	Respite offers (RO) would also be needed when undertaking the hammering piling (S04). These would prevent continuous blocks of noise from exceeding three hours, with a minimum respite period of one hour between each block.	Contractor	Pre-construction/ construction
32	Vibration	No work with the potential to cause cosmetic damage to property (due to vibration or otherwise) will be undertaken.	Contractor	Construction
33	Vibration	A structural condition survey of the Abbotsford Point Boatshed would be completed both before and after the construction work.	Contractor	Pre and post construction

No	Impact	Environmental safeguards	Responsibility	Timing
34	Vibration	A vibration trial should be completed with piling works started at the pile located the furthest distance from the Abbotsford Point Boatshed, outside of the safe working distances confirmed in Table 6-10. Attended monitoring would be completed during this period to confirm whether the safe working distance assumed in this Noise and Vibration Impact Assessment could be reduced based on actual data.	Contractor / Roads and Maritime	Construction
35	Vibration	Attended vibration monitoring, with set alarm (via flashing light, audible alarm, SMS, etc), should be carried out at the Abbotsford Point Boatshed throuhgout piling installation, to ensure that levels remain below the threshold. Where vibration levels approach the threshold, relevant work would stop and Roads and Maritime would be contacted. Further assessment would be undertaken with alternative methods and/or mitigation measures put in place prior to restarting.	Contractor / Roads and Maritime	Construction
36	Noise and vibration	Any change in methodology would require the process for Out of Hours Work to be followed.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
37	Landscape and visual impact	Urban design principles would be integrated throughout the detailed design and construction of the proposal, including: • Material selection location of services, and a standardised family of elements. • Gangway is not covered to allow clear views to the shoreline • Covered pontoon and protection screens include transparent elements • Existing landscape elements are retained • Colour of paint and materials are consistent with other recently wharves along Sydney Harbour • No infrastructure would be installed directly on the sea wall.	Roads and Maritime	Detailed design and pre-construction
38	Light spill impacts	Lighting would be directionally controlled to limit impacts from light spill from surrounding receivers, including residential properties. Lighting direction would also include consideration of any reflective impacts from the harbour.	Contractor	Construction
39	Visual impacts	Hoarding would be erected around the construction compound where possible, to reduce visibility.	Contractor	Construction
40	Landscape and Visual impacts	The construction area would be kept clean and clear of rubbish.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
41	General socio-economic impacts	A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to stakeholders during construction. The CP would include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changed traffic and access conditions • Contact name and number for complaints. The CP would be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Pre-construction
42	General socio-economic impacts	An internet site and free-call number would be established for enquiries regarding the proposal for the entirety of construction. Contact details would be clearly displayed at the entrance to the site. All enquiries and complaints would be tracked through a tracking system, and acknowledged within 24 hours of being received.	Roads and Maritime	Pre-construction
43	Social impacts	The construction area would be secured at all times. Lighting would be positioned to minimise light spill into neighbouring residences.	Contractor	Construction
44	Social impacts	Access to neighbouring businesses would be maintained during construction, any temporary constraints to access would be communicated ahead of time.	Contractor	Construction
45	Socio-economic impacts	A temporary shuttle bus between Abbotsford Wharf and Chiswick Wharf would be maintained for the duration of construction. All alternative transport arrangements, including the temporary shuttle bus, would be communicated to ferry passengers.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
46	Socio-economic impacts	The construction period would be minimised to the four months detailed in this REF to minimise impacts from wharf closure. The construction period would be scheduled outside of during school holiday periods to avoid additional social impact.	Contractor	Construction
47	Socio-economic impacts	The maritime exclusion zone would be clearly defined to delineate access for surrounding water users.	Contractor	Construction
48	Unexpected heritage finds	The Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) would be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Roads and Maritime does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work would only restart once the requirements of that procedure have been satisfied.	Contractor	Construction
49	Aboriginal Heritage	Areas of Aboriginal heritage would be included in the CEMP and communicated to site personnel as no-go zones.	Contractor	Construction
50	Non-Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) would be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work would only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / pre-construction
51	Non-Aboriginal heritage	Detailed design should avoid impacts the heritage listed sandstone kerbing on the northern side of Great North Road.	Roads and Maritime	Construction / Post-construction
52	Non-Aboriginal heritage	The construction footprint would avoid the Abbotsford Point Boatshed lease area. This area would be communicated as a ‘no go zone’ to site personnel.	Roads and Maritime	Construction / Post-construction

No	Impact	Environmental safeguards	Responsibility	Timing
53	Non-Aboriginal heritage	An RMS Heritage Officer should be nominated to amend the RMS S170 Register entry to include all modifications to the Wharf as soon as the works have been completed.	Roads and Maritime	Post-construction
54	Land transport and parking.	A traffic control plan would be prepared and implemented in accordance with the 'Traffic control at work sites manual' (RTA, 2010a) and Australian Standard 1742.3 (Manual of uniform traffic control devices) and would include such things as appropriate wayfinding signage to be installed advising of alternative transport options where necessary.	Contractor	Pre-construction / construction
55	Land transport and parking.	The traffic control plan would be developed in consultation with City of Canada Bay Council.	Contractor	Pre-construction / construction
56	Land and water transport	Transport of equipment and materials to site via boat and barge would be utilised over land transport to limit impacts to the local road network.	Contractor	construction
57	Water transport	All services which use the wharf would be notified prior to the closure of the wharf.	Roads and Maritime	Pre-construction
58	Water transport	A maritime navigation exclusion zone would be established during construction to prevent unauthorised vessels entering the area.	Contractor	Pre-construction / construction
59	Water transport	Access for vessels to the Abbotsford Point Boatshed, 2nd Abbotsford Sea Scouts or the Abbotsford 12ft Sailing Club would be maintained.	Contractor	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
60	Water transport	A Maritime Traffic Management Plan would be prepared and implemented during the water based construction work. The Maritime Traffic Management Plan would be prepared consultation with NSW Maritime and approved by the Harbourmaster. In addition, the proposal would: • Not interfere with any vessel movements. • Not lace buoys in or adjacent to shipping channels • Fit all buoys with lights • Prepare Response Plans for emergencies and spills for all construction vessels • Fit at least one vessel with an Automatic Identification System (AIS) • Retrieve any material associated with the construction of the development that enters the water to prevent the obstruction of vessel movements • Prepare a Communications Plan for implementation during the work which must include 24/7 contact details, protocols for enquiries, complaints and emergencies. Any variation to the above would be agreed in advance with the Harbourmaster.	Contractor	Pre-construction / construction
61	Land transport	A temporary shuttle bus between Abbotsford Wharf and Chiswick Wharf would be maintained for the duration of construction.	Roads and Maritime	Construction
62	Land transport	Alternative transport arrangements, including the temporary shuttle bus, would be communicated to ferry passengers.	Roads and Maritime	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
63	Waste	Waste management, littering and general tidiness would be monitored during routine site inspections.	Contractor	Construction
64	Waste	Appropriate measures to avoid and minimise waste associated with the project should be investigated and implemented where possible.	Contractor	Construction
65	Waste	Waste would be classified before being disposed offset to an appropriately licenced facility in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (DECCW 2014). Where necessary, this would include sampling and analysis.	Contractor	Construction
66	Resource minimisation	Recycled, durable, and low embodied energy products would be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (eg where quality control specifications allow).	Contractor	Design
67	Hazards and risks	Marine spill kits would be kept within the construction area.	Contractor	Construction
68	Hazards and risks	Appropriate emergency equipment such as flotation devices and first aid kits would be kept within the construction area.	Contractor	Construction
69	Hazards and risks	All utilities within and adjacent to the proposal location would be located prior to the start of the works.	Contractor	Construction
70	Hazards and risks	Safe work method statements or similar would be implemented to manage health and safety risks for the works.	Contractor	Construction
71	Hazards and risks	Consent from property owners would be received prior to any works on third party land, eg City of Canada Bay Council.	Roads and Maritime	Pre-construction
72	Air quality	Air quality during construction would be considered and addressed within the CEMP and would include methods to manage work during strong winds or other adverse weather conditions as required	Contractor	Detailed design/ pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
73	Cumulative construction impacts	• Consultation would include notification prior to the start of the works. • Notification would include directions to alternative public transport to be used during the construction period. • Updates on any delays or changes to the construction period would also be communicated.	Roads and Maritime	Pre-construction / construction

7.3 Licensing and approvals

A summary of licenses and approvals required (or to be obtained) is provided in Table 7-2.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Approval from the Deputy Harbour Master	Approval from the Deputy Harbour Master for any work that disturb the seafloor.	Prior to the commencement of any works that disturb the seafloor.
Road occupancy permit	Approval from the City of Canada Bay Council required prior to any works impacting Great North Road.	Prior to the commencement of any works impacting Great North Road.

8 Justification and 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 Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

8.1 Justification

The proposal forms part of the TAP, which is an ongoing "initiative to deliver modern, safe and accessible transport infrastructure" in New South Wales (NSW, Transport for NSW, 2015). As part of the TAP, Roads and Maritime assessed the condition of all ferry wharves across the transport network in 2009 in terms of:

- Safety and structural integrity
- Access for less mobile and disabled passengers
- Existing and predicted future patronage and use.

Initial justification for the proposal was provided through an assessment of the existing wharf, which was identified as needing upgrading or relocating due to its lack of accessible pathway for passengers on and around the wharf.

Consideration of alternatives and options was then carried out, with the preferred design of the proposal selected to best achieve the objectives outlined in section 2.3, which include providing improvements in access, user experience including passenger comfort and amenity, and safety through meeting the objectives. This was compared to the option of doing nothing and other options to relocate the wharf.

Potential environmental and social impacts resulting from construction and operation of the proposal have been minimised through the safeguards and management measures outlined in Chapter 7.

The following sub-headings provide justification through considering the impacts and benefits of the proposal.

8.1.1 Social factors

The proposal would result in temporary social impacts whilst being built. Notably, this would include disruption to ferry users due to the requirement to close the wharf. Minor disruption to surrounding land uses would also occur. Noise and visual impacts would also be generated. However, all construction related impacts would be appropriately managed prior to and during construction.

Operation of the proposal provides justification over the above temporary impacts, as it would benefit the community through improving passenger amenity, safety and overall user experience. It is anticipated that the proposal would also have indirect wider community benefits, through ensuring continuation of the wharf for its expected lifespan (50 years). This extends to the cultural and amenity benefit of continuing to operate a wharf in this location, and the preservation of the heritage wharf.

8.1.2 Biophysical factors

As discussed in Chapter 6, no significant impacts have been identified. Minor impacts would be managed through the safeguards and management measures outlined in these sections.

The design of the proposal includes tolerances to allow for sea level rise and extreme weather events, which would ensure the wharf continues to be operational throughout its 50-year design life.

8.1.3 Economic factors

Upgrade of the wharf would generate economic benefits over the next 50 years, with the wharf being an attractor for people to live in the area due to the quick and reliable access it provides to the city centre.

Design of the wharf has also incorporated measures to decrease the maintenance required for operation which are standardised across all newly constructed wharves. The implementation of these measures would result in cost savings for the ongoing operation of the ferry network.

8.2 Objects of the EP&A Act

Table 8-1: Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	Through the assessment in chapter 6, it has been identified that the proposal would not significantly impact on any natural or artificial resources. The proposal would result in community benefits through facilitation of a safe and reliable ferry service to Abbotsford for the next 50 years.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal includes continuation of the use of the proposal location as a ferry wharf.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	Consultation with the relevant utility providers has been carried out. No impact to communication or utility services is proposed. Appropriate measures to protect the submarine cable next to the wharf would be implemented during construction.
5(a)(iv) To encourage the provision of land for public purposes.	The proposal includes continuation of the use for the land as a ferry wharf, which is a public use.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The proposal would allow the continuation of ferry services from the wharf for its 50-year lifespan.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	An aquatic ecology assessment has been prepared for the project, which is summarised in section 6.2. The proposal would impact on about 170 square-metres of minimally sensitive and 0.57 square-metres of moderately sensitive fish habitat. This would be offset by replacement piles, which would allow an artificial habitat to re-establish, and removal of the existing structure, which would reintroduce light. The assessment concluded that no significant impact to aquatic ecology would be caused by the proposal.

Object	Comment
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	The provision and maintenance of affordable housing is not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Consultation with the relevant government agencies is detailed in section 5.6.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Community consultation has been carried out throughout development of the proposal, as detailed in Chapter 5. Community consultation would be continued prior to and throughout the construction phase.

8.2.1 The precautionary principle

The precautionary principle includes the premise that full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

Through the assessment of the potential impacts of the proposal in Chapter 6, it has been demonstrated that threats of serious or irreversible environmental damage do not exist for the proposal.

Notwithstanding, to account for the subjectivity of professional judgement applied in environmental assessment and modelling uncertainty, worst-case assumptions have been incorporated into the assessment, including the following:

- Specialist assessments of noise and vibration, aquatic ecology, landscape character and visual impact have been completed
- The worst-case assumption of all noise generating construction equipment operating at the same time, at its maximum output, at a location closest to the nearest of the sensitive receivers.
- Assessing impacts and including safeguards for impacts which are exceptionally unlikely to happen such as major spills
- Undertaking verification monitoring to validate results and allow modification of safeguards and mitigation controls accordingly.

8.2.2 Intergenerational equity

To achieve intergenerational equity, the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The proposal would result in benefit to the community through improvements to passenger amenity, safety and overall user experience of the ferry wharf for the next 50 years.

No potential impacts to future generations would be generated by the proposal.

8.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been considered through the assessment of aquatic ecology provided in section 6.2, and Appendix D.

Providing the safeguard measures are implemented, the proposal would not have a material or significant impact on biological diversity and ecological integrity within the proposal footprint or surrounds.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle includes integrating long-term and short-term economic, environmental, social and fairness considerations into decision-making. This principle requires that environmental resources should be appropriately valued.

Environmental, economic and social issues were considered in the rationale for the proposal and design options. Construction planning for the proposal would also be progressed in the most cost effective way.

Safeguards and management measures detailed in Chapter 6, including avoiding, reusing, recycling, managing waste during construction and operation, would be implemented.

8.3 Conclusion

The proposed Abbotsford Wharf Upgrade is subject to assessment under Part 5 of the EP&A Act. The REF has examined and considered 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, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in some impacts on noise, water quality, aquatic ecology, traffic and transport and landscape character and visual impact. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would better commuter experience through improvements to passenger amenity, safety and overall user experience of the ferry wharf for the next 50 years, as well as contributing to unifying and standardising wharves in Sydney Harbour and the Parramatta River. On balance, the proposal is considered justified and the following conclusions are made.

8.3.1 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 and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

8.3.2 Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment is not required.

9 Certification

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

Philip Burns
Environmental Planner
WSP

Date: 15/09/2017

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.

Bob Rimac
Senior Project Manager
Greater Sydney Program Office, Roads and Maritime Services

Date: 18/09/2017

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Terms and acronyms

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AHIMS	Aboriginal heritage information management service
AS	Australian Standard
ASS	Acid sulfate soil
ASMA	Australian Maritime Safety Authority
BCA	Building Code of Australia
Berthing	A place for a vessel to dock
CCTV	Close circuit television
CEMP	Construction environmental management plan
DDA	Disability Discrimination Act 1992
DPE	NSW Department of Planning and Environment
DSAPT	Disability Standards for Accessible Public Transport 2002
EIS	Environmental impact statement
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 that 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
Fetch	An area where ocean waves are being generated by the wind
FM Act	Fisheries Management Act 1994 (NSW)
FWUP	Ferry Wharf Upgrade Program
Gangway	A landing used by passengers to board or exit ships/vessels
Heritage Act	Heritage Act 1977 (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
Jetty	A structure extending into the harbour as part of a wharf
KFH	Key Fish Habitat types as defined by NSW Fisheries
LALC	Local Aboriginal Land Council

Term / Acronym	Description
LCVIA	Landscape Character and Visual Impact Assessment
LGA	Local Government Area
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers
MHWM	Mean high water mark
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
Noxious Weeds Act	Noxious Weeds Act 1993 (NSW)
NPW Act	National Parks and Wildlife Act 1974 (NSW)
OEH	NSW Office of Environment and Heritage
PACHCI	Roads and Maritime procedure for Aboriginal Heritage Cultural Heritage Consultation and Investigation
Piles	Foundations used to support marine structures and offshore platforms
Pontoon	A floating structure serving as a dock
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act
SEPP 14	State Environmental Planning Policy No.14 – Coastal Wetlands
SIS	Species impact statement
SOHI	Statement of Heritage Impact
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
Sydney Harbour SREP	Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
Transport for NSW	Transport for New South Wales
TAP	NSW Government's Transport Access Program
TSC Act	Threatened Species Conservation Act 1995 (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services
Wharf	A landing place or pier where ships may tie up and load or unload
ZFDTG	Zero of Fort Denison Tide Gauge