



Manly Wharf 3 Upgrade

Review of Environmental Factors

Transport for NSW

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Transport for NSW | November 2022


Prepared by GHD Pty Ltd and Transport for NSW

ISBN: 978-1-922875-54-9

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Document controls

Approval and authorisation

Title	Manly Wharf 3 Upgrade review of environmental factors
Accepted on behalf of Transport for NSW by:	Bob Rimalc Senior Project Manager
Signed:	
Dated:	22 November 2022

Document status

Document status	Date	Prepared by	Reviewed by
Draft 1	29/07/2022	E. Packett	B. Crichton J. McKinney S. Fallon
Final Draft 2	7/9/2022	E. Packett	B. Crichton J. McKinney S. Verity
Final	18/11/2022	E. Packett	J. McKinney S. Fallon

Executive summary

The proposal

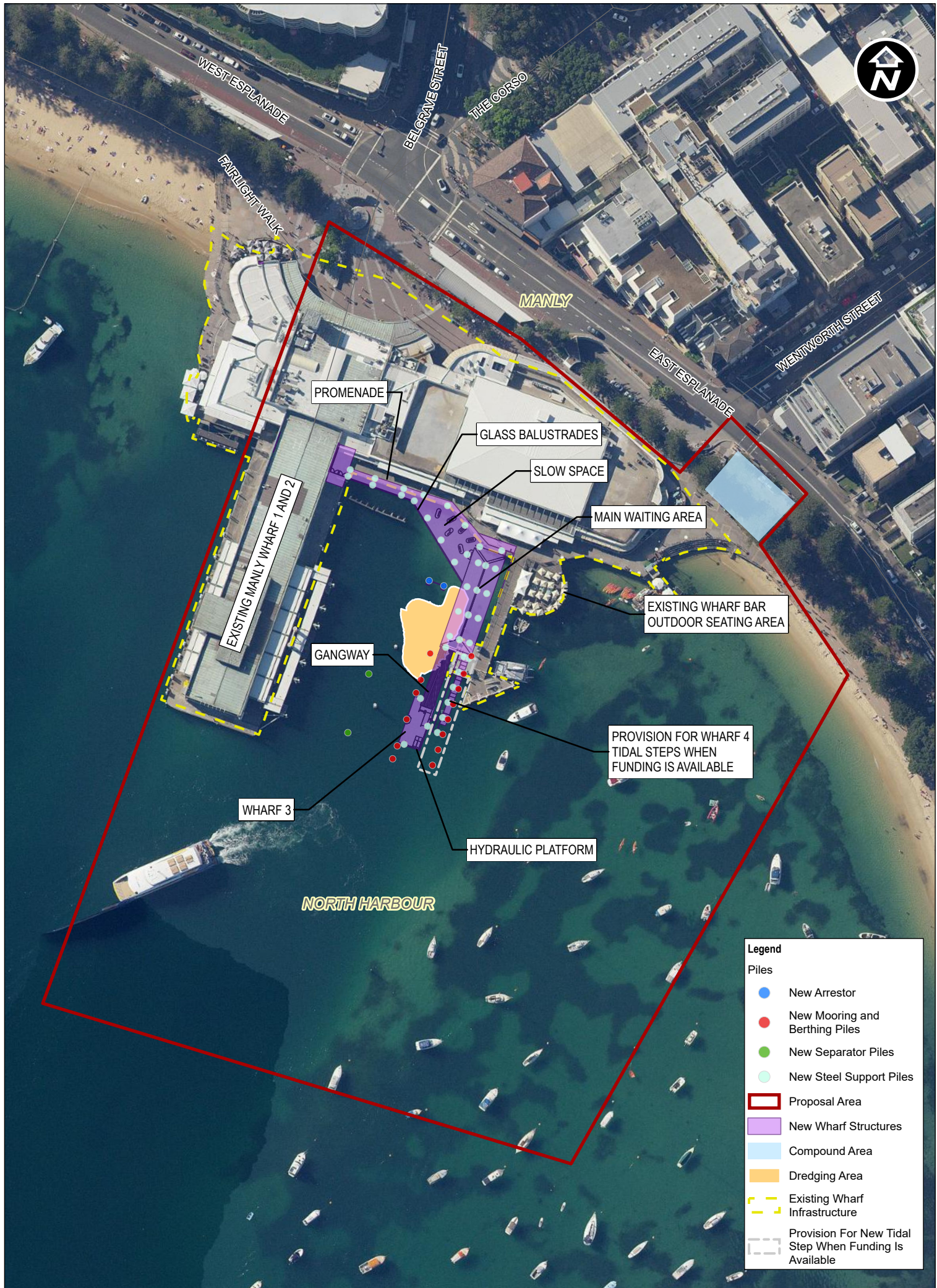
Transport for NSW (Transport) proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). Key features of the proposal include:

- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- retention of the existing Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the new hydraulic wharf platform at Wharf 3
- installation of a new public seating space / rest 'slow space' within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Manly Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- staged delivery of a fixed structure (Wharf 4). Wharf 4 would be supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels.
- construction of a new vessel arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- provision for a wharf booking information system
- providing conduits for Opal readers to be installed in the future if required.

The key features of the proposal are shown in Figure E-1.

Construction of the proposal would be staged to ensure there are two operational wharves at all times, reducing impacts to commuters and other users of Manly Wharf.

Wharf 3 would be constructed first, with staged delivery of Wharf 4. Construction is expected to commence in late 2023 / early 2024 and would take up to eight months to complete, depending on maritime and weather conditions.



- Legend**
- Piles**
- New Arrestor
 - New Mooring and Berthing Piles
 - New Separator Piles
 - New Steel Support Piles
 - Proposal Area
 - New Wharf Structures
 - Compound Area
 - Dredging Area
 - Existing Wharf Infrastructure
 - Provision For New Tidal Step When Funding Is Available

0 25 50 75 100
Metres

Figure E.1 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHQ makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unstable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by metrida

Need for the proposal

The existing wharf at Manly Wharf 3 is a simple wooden jetty with tidal steps.

As an operator of public transport under the *Disability Discrimination Act 1992* (DDA), Transport is required to upgrade the public transport precincts to ensure equitable access is provided for all customers under the Transport Access Program (TAP).

Transport is committed to improving public transport services and providing a world-class transport system people want to use. This includes delivering modern, safe and accessible transport infrastructure across the Sydney Ferry Network.

Manly Wharf 3 is being upgraded to provide a safe, comfortable and accessible facility.

The primary objective of the TAP is to achieve DSAPT compliance for all assets, access paths and transport services within the wharf interchange.

The DSAPT and DDA standards require all public transport infrastructure, including wharves, to have fully compliant disabled access.

Proposal objectives

The objectives of the proposal are to provide:

- facilities that are accessible to the disabled, ageing and parents with prams
- a reliable and durable ferry wharf that is suitable for ferry operations in this location
- provision for an additional fixed stepped wharf to service smaller commercial and recreational vessels to be constructed when funding becomes available
- comfortable and protected environments for customers from sunny, wet and windy weather while accessing and waiting for transport services
- service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

Options considered

The following options were considered:

- Do-nothing – no upgrade and not accessible; regular maintenance would continue
- Option 1 – two boarding platforms (two berths)
- Option 2 – one shared boarding platform (two berths)
- Option 3 – one berth in current location (minimum required to replace current capacity).

Although it would present the lowest initial capital cost and least environmental impact, the Do-nothing option was discounted as it would not meet the objectives of the proposal to improve accessibility, passenger safety and comfort for future patronage.

Advantages and disadvantages of Options 1, 2 and 3 were presented to key stakeholders at a workshop on 9 July 2021 and their relative performance was assessed using a multi-criterion analysis (MCA) process. Following the MCA and design refinement, Option 1 was selected as the preferred option. Option 1 was further developed to address stakeholder

feedback and reduce environmental impact, including substantial reduction of dredging requirements. A refined concept design was then developed.

A detailed description of the options considered is included in Chapter 2.

Statutory and planning framework

The proposed facility is a wharf or boating facility within the meaning of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP).

The proposal is for a wharf and is to be carried out by Transport and can therefore be assessed under Division 5.1 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* (NPW Act).

A number of permits and notifications would be required prior to the commencement of construction under the provisions of the *Heritage Act 1977*, the *Fisheries Management Act 1994*, the *Roads Act 1993*, and the *Ports and Maritime Administration Regulations 2021*.

The proposed compound site is located on Crown Land. Transport would consult with Department for Planning and Environment – Crown Lands to identify what, if any, permits are required under the *Crown Lands Management Act 2016*.

The statutory context of the proposal is discussed in detail in Chapter 4.

Community and stakeholder consultation

Community and stakeholders were invited to provide feedback on the proposal's concept design between 15 December 2021 to 28 January 2022. Community consultation included community drop-in sessions, community updates, social media posts, posts on the web online portal, phone calls and emails.

Consultation with directly affected businesses, the Metropolitan Local Aboriginal Land Council (MLALC), Northern Beaches Council, NSW Department of Industry (DPI) Fisheries and Heritage Council NSW was carried out during the development of the concept design. Feedback received from the consultation has been addressed in this REF.

Consultation will continue during the public display of the REF to capture community feedback. Should the proposal proceed to construction, consultation with the community and stakeholders would continue throughout the construction phase.

Environment impacts

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

Non-Aboriginal heritage

A Statement of Heritage Impact (SOHI) and a Maritime Archaeology Assessment (MAA) have been prepared to assess the potential impacts to listed heritage items and potential archaeological remains as a result of the proposal.

The Manly Wharf precinct is a heritage listed item on the *State Environmental Planning Policy (Biodiversity & Conservation) 2021* (item no. 18), State Heritage Register (item no. 01434) and *Manly Local Environmental Plan 2013* (Manly LEP; item no. I145). Manly Pier (Wharf 3) is part of the Manly Wharf precinct which is listed as a separate item on the Manly LEP (item no. I146). In addition, there are number of other listed heritage items in the vicinity of the proposal.

The SOHI concluded the proposed works would have a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and Wharves 1 and 2) and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures. Overall, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.

The MAA concluded the proposed works have the potential to disturb the seabed, such as through dredging, removal, and installation of structures, and piling works, which would have a moderate potential to encounter relics from operation of the previous Cargo Wharf (1895 to 1927).

The design of the proposal has been developed to reduce non-Aboriginal heritage impacts by using heritage-specific design criteria. Non-Aboriginal impacts would be reduced further by using conservation best practice while undertaking construction work, selecting heritage sympathetic materials and design, conducting an archaeological dive inspection and excavations, and obtaining relevant permits under the *Heritage Act 1977* prior to work commencing.

Biodiversity

A biodiversity assessment has been prepared which investigates the existing environment within the study area to assess impacts to biodiversity as a result of the construction and operation of the proposal.

The proposal would not require the removal of any terrestrial vegetation (trees and shrubs). However, removal of the wharf and existing piles could result in removal of potential roosting habitat and / or direct impacts to microbats. Pre-clearance surveys and other mitigation measure would ensure these species are not significantly impacted by the proposal.

Dredging, piling and removal of the existing wharf, would have a direct impact on less than 0.01 hectares mixed Halophila and Zostera seagrass (Type 1 Key Fish Habitat (KFH)), less than 0.01 hectares of macroalgae (Type 2 KFH), less than 0.01 hectares of macroalgae on piles (Type 2 KFH) and about 0.03 hectares of subtidal soft sediment (Type 3 KFH). Indirect impacts as a result of shading from new structures and scour from ferry operations are also anticipated. Overall, these areas are a very small proportion of available habitat and works would not impact on the larger meadows of seagrass in the area or the endangered population of *Posidonia australis*, located east and south-east of the proposal.

Other impacts to aquatic flora and fauna during the construction could result from increases in turbidity from sediment mobilisation and underwater noise during construction. Whilst seagrass and communities of other flora and fauna that occur on the seabed may be impacted by increased turbidity, they have also evolved to survive in conditions with fluctuating levels of turbidity (from ferries) and sediment mobilisation and so would have some resilience to the potential impacts. Underwater noise impacts would vary depending on species and distance from the noise source. Impacts from underwater noise would be managed through the installation of buffer distances and other mitigation measures to reduce noise.

The proposal is unlikely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation 2016* (BC Act) or the *Fisheries Management Act 1994* (FM Act) and therefore a Species Impact Statement is not required.

Offsets for the residual loss of macroalgae and seagrass would be considered in accordance with the *Guideline for Biodiversity Offsets* (NSW Roads and Maritime Services, 2016), *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013), and in consultation with NSW DPI Fisheries.

The proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A referral to the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) is therefore not required for biodiversity matters.

Land surface and coastal processes

A land and coastal processes assessment was carried out to assess impacts to land surface and coastal processes as a result of construction and operation of the proposal.

Dredging of 290 cubic metres from the proposed berth pocket, piling works, operation of construction vessels, and installation and removal of structures has the potential to mobilise soft sediments, resulting in a temporary increase in turbidity and suspended sediments loads. This could potentially impact on water quality and adjacent seagrasses. Locally, the distributed coarser sediments would settle out of suspension almost immediately. Sediment transport of finer sediments is expected to be short-term and minimal given currents near the proposal are generally calm, sediment in the dredge pocket is likely to be largely made up of coarser material, and sediment control measures such as silt curtains and a moon pool curtain would be used.

Elevated levels of tributyltin (TBT) have been identified in marine sediment near the proposed dredging and piling footprints. There is potential that construction works could mobilise material containing TBT. As TBT has low solubility in water it is unlikely to dissolve into seawater and disperse aqueously and can be controlled through the management of mobilised sediment. Dredged material will be disposed of onshore to remove this material from the environment in accordance with the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014)

Changing in the location of fast ferry berthing could cause a new zone of scouring and sediment transport between the new Wharf 3 and Wharf 2. However, there would likely also be a significant reduction in scouring on the eastern side of the wharf (where fast ferries previously berthed). It is expected that over time sediment mobilisation from propeller wash would be reduced as the seabed settles into an adjusted bathymetry.

With the implementation of measures such as a construction soil and water management plan, sediment boom and curtain and implementing industry best practice work methodology for dredging, no significant impacts to the terrestrial land surface or coastal processes are anticipated during construction or operation of the proposal.

Landscape character and visual impact

A Landscape Character and Visual Impact Assessment (LCVIA) has been prepared to identify the overall impact of the proposed work on each of the Landscape Character Zones (LCZ) and to identify the visual changes and impacts on the site and its surroundings when viewed from key vantage points.

The landscape character impact of the proposal is considered to be negligible apart from on the Manly foreshore and cove area. Moderate impacts on the Manly foreshore and cove area are expected due to the sensitivity of this landscape character related to its international significance and heritage value.

The visual impact of the proposal is considered negligible to moderate, apart from some viewpoints from within the Manly Wharf precinct which would have moderate to high impacts. The proposed infrastructure would involve the removal of some heritage fabric which would reduce the visual amenity of the Manly Wharf. There would also be a partial loss of view for some viewpoints within the Manly Wharf precinct. Overall, the proposal would be within the character of the existing wharf.

The design of the proposal has been developed to reduce impacts to landscape character and visual amenity, including removing some proposed roofing. Visual impacts could further be minimised in detailed design through consideration of sympathetic colours, materials, and design form.

Airborne noise and vibration

An airborne noise and vibration impact assessment has been prepared to predict construction and operational noise impacts on nearby sensitive receivers.

Construction noise was assessed in accordance with applicable guidelines including the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and *Construction Noise and Vibration Guideline* (CNVG) (Transport, 2016). The assessment concluded that:

- construction noise levels are predicted to exceed management levels during the site establishment, construction compound operation, and piling scenarios during standard hours.
- the most likely source of potential sleep disturbance from 'non-standard' hours of work would occur during the impact piling scenario, if this was to occur. Impact piling is predicted to result in a large number of receivers experiencing noise levels above the noise management levels (NMLs) during any night works. However, no sensitive receivers are expected to perceive highly intrusive levels greater than 25 dBA above the NMLs during these times.
- there are no noise impacts expected for Little Penguins in the nearby Little Penguin habitat.
- there are no anticipated noise impacts from construction traffic, or during operation of the proposal.
- There is potential for vibration impacts to heritage structures within close proximity to the works if impact piling was to occur. A dilapidation survey of heritage structures within 45 metres would be required prior impact piling occurring to determine their structural integrity. If heritage structures are found to be structurally unsound a vibration warning system will be installed to monitor vibration levels and reduce risk of cosmetic damage to these structures.

A construction noise and vibration management plan (CNVMP) would be prepared prior to construction and implemented throughout the construction period. The CNVMP would incorporate the best practice mitigation measures outlined in Chapter 7 of this REF.

Works are to occur within standard daytime hours, with the exception of piling and dredging works which, for safety reasons may be required to be carried out late at night and / or early in the morning when the water is calmer. Should operations be required outside of standard hours, a justification and an approval process would be required as well as communications requirements and management measures.

Justification and conclusion

The need for the proposal was justified under the TAP as the existing structure does not provide access that complies with DDA and DSAPT standards. The assessment of the environmental and social impacts has determined the proposal is not likely to have a significant impact and therefore assessment under Division 5.2 of the EP&A Act is not required.

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1 Introduction

This chapter introduces the proposal and provides the context of the environmental assessment.

1.1 Proposal identification

Transport proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre. Figure 1.1 shows the regional setting of the proposal area.

Figure 1.2 shows the local setting and features of the existing Manly Wharf 3. The existing wharf is located at the eastern end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes two ferry terminals (Wharves 1 and 2) a third tidal step wharf (Wharf 3) and a restaurant and retail section. It also supports a transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

The objectives of the proposal are to provide:

- facilities that are accessible to the disabled, ageing and parents with prams
- a reliable and durable ferry wharf that is suitable for ferry operations in this location
- provision for an additional fixed stepped wharf to service smaller commercial and recreational vessels to be constructed when funding becomes available
- comfortable and protected environments for customers from sunny, wet and windy weather while accessing and waiting for transport services
- service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- safety features including extra lighting, help points, fences, closed circuit television (CCTV) coverage and other security measures for passenger safety
- efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

To achieve the above objectives, the proposal would involve the following key features:

- removal of the existing Wharf 3 timber wharf structure, piles and triangular platform
- retention of the existing Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk

- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the new hydraulic wharf platform at Wharf 3
- installation of a new public seating space / rest 'slow space' within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- staged delivery of a fixed structure (Wharf 4). Wharf 4 would be supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels.
- construction of a new vessel arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- provision for a wharf booking information system
- providing conduits for Opal readers to be installed in the future if required.

The key features of the proposal are shown in Figure 1.3. Chapter 3 describes the proposal in more detail.

Wharf 3 would be constructed first. The delivery of Wharf 4 would be staged.

It is anticipated construction of the proposal would take up to eight months depending on weather and maritime conditions, commencing in late 2023 / early 2024.

Construction of some elements of the proposal would require closures of the existing wharves. This is discussed further in Chapter 3.



0 250 500 750 1,000
Metres

Legend
 Proposal area

Figure 1.1 - Regional Setting

Whilst every care has been taken to generate the structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
 World Street Map, Woolahra Municipal Council, Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Data source: Mapbox, The Service, Created by mfrade



Figure 1.2 - Local Setting



- Legend**
- Piles**
- New Arrestor
 - New Mooring and Berthing Piles
 - New Separator Piles
 - New Steel Support Piles
 - Proposal Area
 - New Wharf Structures
 - Compound Area
 - Dredging Area
 - Existing Wharf Infrastructure
 - Provision For New Tidal Step When Funding Is Available

Figure 1.3 - Key features of the proposal

0 25 50 75 100
Metres

Whilst every care has been taken to generate wharf structures, GHQ makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unstable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by inroads

Data source: publicNSW, Imagery: © Department of Customer Service 2020

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1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by GHD Pty Ltd on behalf of Transport. For the purposes of this work, Transport is the proponent and the determining authority under Division 5.1 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 mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been carried out in the context of section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), and the Marinas and Related Facilities EIS Guideline (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Transport examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- the significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- the 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 Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

The Transport Access Program (TAP) is an ongoing initiative to ‘deliver modern, safe and accessible transport infrastructure in NSW’ (Transport, 2015). The focus of the program is improving access to the transport network for less mobile passengers. As a result, Roads and Maritime Services (now Transport) 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.

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. The proposal is contained under Tranche 3 of the TAP which include works from 2019 to 2023 (Transport, n.d.).

It was concluded that the Wharf 3 needed upgrading due to its lack of accessibility. DDA / DSAPT compliance issues identified at the existing Manly Wharf included:

- the existing Wharf 3 boarding platform is only accessible via stairs, therefore a wheelchair or mobility challenged user cannot be accommodated without assistance, and as a result the existing Wharf 3 is not DSAPT compliant
- the existing Wharf 3 boarding platform is at a fixed height, which precludes it from accommodating different vessels with varying freeboard heights and tide levels in a way that allows for DSAPT compliant gangplank gradients
- the existing timber finish to the pier is not DSAPT compliant
- the existing staircase does not have suitable handrails, contrasting nosing strips, and Tactile Ground Surface Indicators (TGSIs) to achieve compliance with AS1428.1 (2009) and AS1428.4.1 (2009).
- existing boardwalks to Wharves 2 and 3 have areas of non-complying gradients.
- lighting levels along the pedestrian route to Wharf 3 are inadequate to meet DSAPT requirements.

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

2.1.1 Transport Access Program (TAP)

The TAP aims to provide the following benefits:

- improve the accessibility for passengers who use wheelchairs and prams by levelling footpaths, removing stairs and supplying ramps
- build facilities for all transport modes to meet the needs of a growing population
- provide an effective and seamless interchange that supports an integrated transport network
- deliver safety and signage improvements to help with the customer user experience
- provide other aesthetic improvements.

2.1.2 Ferry Wharf Upgrade Program

The Ferry Wharf Upgrade Program (FWUP) forms part of the TAP. The specific objectives of the FWUP are to:

- achieve 100% DSAPT compliance for all assets, access paths and transport services within the wharf interchange
- increase the rate at which passengers embark and disembark
- make the wharf safer for passengers to embark and disembark
- meet current demand and enable future growth
- enhance the efficiency of the interchange
- improve passenger amenities and waiting areas
- minimise construction impacts to customers and wharf operations
- minimise the cost of ownership and maintenance
- develop a functional, distinctive, and iconic design theme that will unify and identify Sydney Harbour commuter wharves
- discourage inappropriate activities at the wharves.

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

2.1.3 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' (Transport, 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 Wharf 3.

2.1.4 Future Transport Strategy 2056

The *Future Transport Strategy 2056* (Transport, 2018) is an update of the *Long Term Transport Master Plan for NSW* (Transport, 2012). It is a 40-year strategy, supported by plans for Greater Sydney and Regional NSW, which sets the vision, directions and outcomes for customer mobility. The *Future Transport Strategy 2056* sets six state-wide outcomes to guide investment, policy and reform and service provision, which includes:

- a customer focus
- successful places
- a strong economy
- safety and performance
- accessible services
- economic and environmental sustainability.

The upgrading and expanding of the ferry wharf network, as part of the FWUP, would support meeting the above objectives of this Strategy.

Transport has a key role in working towards economic and environmental sustainability. Addressing the environmental sustainability of the transport system is essential to minimise direct and indirect impacts on the natural environment. To minimise the impacts, all investments across the transport cluster will improve the resilience of the network in a changing climate and support the NSW Governments aspirational target of achieve net-zero greenhouse gas emission by 2050.

The design and construction of the proposal would comply with the Transport 'Sustainability Design Guidelines version 4.0' (Transport, 2017a) supporting environmental sustainability, reducing emissions and mitigating for significant weather events. Refer sections 6.15 and 6.16 for further information.

2.1.5 Supporting NSW strategies and policies

The proposal is also supported under the policies, goals, objectives and targets of several other strategic planning documents as summarised in Table 2.1.

Table 2.1 Supporting NSW strategies and policies

Strategy / Policy	Description
<i>State Infrastructure Strategy 2018 - 2038</i> (INSW, 2018)	The strategy identifies the NSW Government's infrastructure vision for the state over the next 20 years, across all sectors. It is supported by the <i>Future Transport Strategy 2056</i> (Transport, 2018). As passenger numbers are expected to increase in the future. This proposal responds to the above by improving the wharf infrastructure and access provisions at Manly Wharf.
<i>Disability Inclusion Action Plan 2018-2022</i> (Transport, 2017b)	The <i>Disability Inclusion Action Plan 2018–2022</i> (Transport, 2017b) is Transport's plan for delivering high quality services to all customers including those with disability, including compliance with the disability standards outlined below.

Strategy / Policy	Description
<p>Disability Standards</p>	<p>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.</p> <p>The proposal seeks to rectify existing compliance issues by doing the following:</p> <ul style="list-style-type: none"> • provide hydraulic platform and gangway that facilitate different freeboard heights and tide levels in a way that allows for DSAPT compliant gangway gradients on Wharf 3 • provide floor finishes that are DSAPT compliant • where staircases are provided, provide suitable handrails, contrasting nosing strips, and TGSIs for compliance with AS1428.1 (2009) and AS1428.4.1 (2009) • modify gradients to the DSAPT compliant routes along existing boardwalks to Wharves 2 and 3, so that they are compliant throughout and tie in seamlessly with the new proposed elements • upgrade lighting along the DSAPT compliant route to meet the necessary lighting level requirements. <p>It is noted that the proposed Wharf 4 is not DSAPT compliant. However, the proposed Wharf 4 provides a ramp for assisted access to and from vessels berthing at the wharf.</p>
<p>State Priorities: Making it Happen 2015</p>	<p><i>NSW Making it Happen</i> is the NSW Government’s plan for making NSW a better place to live. Thirty priorities are identified to grow the economy, deliver infrastructure and improve health, education and other services.</p> <p>The proposal would:</p> <ul style="list-style-type: none"> • improve the existing transport infrastructure, consistent with the building infrastructure priority • be built and would operate under environmental safeguards and management measures to avoid and minimise environmental impacts consistent with the keeping our environment clean priority.

Strategy / Policy	Description
<p><i>A Metropolis of Three Cities – The Greater Sydney Region Plan</i> (Greater Sydney Commission, 2018a)</p>	<p><i>A Metropolis of Three Cities – The Greater Sydney Region Plan</i> (Greater Sydney Commission, 2018a) is the NSW Government's regional plan for Greater Sydney which provides key directions and actions to rebalance growth and deliver its benefits equally to residents across Greater Sydney. The plan coordinates with the <i>Future Transport Strategy 2056</i> (Transport, 2018) and <i>State Infrastructure Strategy 2018-2038</i> (INSW, 2018) to align land use, transport and infrastructure planning to establish Greater Sydney as three distinct but connected cities.</p> <p>The proposal would directly address the following directions outlined by the plan:</p> <ul style="list-style-type: none"> • infrastructure use is optimised • infrastructure aligns with forecast growth • services and infrastructure meet communities' changing needs • integrated land use and transport creates walkable and 30-minute cities. <p>The NSW Government has prepared five district plans that guide the implementation of <i>A Metropolis of Three Cities – The Greater Sydney Region Plan</i>. The district plans outline objectives and actions for the future development of the relevant district and are structured around the strategies for infrastructure and collaboration, liveability, productivity, sustainability and implementation.</p> <p>The <i>North District Plan</i> is the relevant district plan for the Northern Beaches LGA.</p>
<p><i>North District Plan</i> (Greater Sydney Commission, 2018b)</p>	<p>The <i>North District Plan</i> covers Hornsby, Hunter's Hill, Ku-ring-gai, Lane Cove, Mosman, North Sydney, Northern Beaches, Ryde and Willoughby LGAs. The North District Plan is a 20--year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision for Greater Sydney. It contains the planning priorities and actions for implementing <i>A Metropolis of Three Cities – The Greater Sydney Region Plan</i> (Greater Sydney Commission, 2018a) at a district level and is a bridge between regional and local planning. Planning priorities that are relevant to the upgrade include:</p> <ul style="list-style-type: none"> • priority E1: Planning for a city supported by infrastructure (particularly prioritising infrastructure investment to support the vision of 'A Metropolis of Three Cities') • priority E3: Providing services and social infrastructure to meet people's changing needs (particularly in relation to accessibility, inclusion and safety).

Strategy / Policy	Description
	<p>The proposal would support these priorities by providing improved ferry facilities, with a design that provides efficient embarking and disembarking. One of the objectives of the proposal is also to provide DSAPT compliance.</p>
<p><i>Northern Beaches – Towards 2040</i> (Northern Beaches Council, 2020)</p>	<p>Northern Beaches Council’s <i>Towards 2040 – Draft Local Strategic Planning Statement</i> (Northern Beaches Council, 2019) provides a 20-year strategic direction for the LGA. The proposal would support the following goals:</p> <ul style="list-style-type: none"> • priority 8 Greater community resilience to natural hazard and climate change • priority 9 Infrastructure delivered with employment and housing growth • priority 12 An inclusive, healthy, safe and socially connected community • priority 19 Frequent and efficient regional public transport connections • priority 26 Manly as Sydney’s premier seaside destination.
<p><i>Manly Ferry Wharf Conservation Management Plan</i> (Architectural Projects, 2011)</p>	<p>The <i>Manly Ferry Wharf Conservation Management Plan</i> (Architectural Project, 2011) sets out conservation policies for management of heritage at the Manly Wharf. The design process for the proposal has taken these policies into account. The Statement of Heritage Impact (SOHI) (refer section 6.1) assesses the proposal against the Conservation Management Plan.</p>
<p><i>Protect. Create. Live – Northern Beaches Environment and Climate Change Strategy 2040</i> (Northern Beaches Council, 2018a)</p>	<p><i>Protect. Create. Live – Northern Beaches Environment and Climate Change Strategy 2040</i> (Northern Beaches Council, 2018a) defines key strategies for how to achieve a healthy and diverse natural environment in the built and natural environment. A key goal of this strategy is ensuring ‘the built environment, especially critical infrastructure, is resilient to natural disasters and climate change influences’.</p> <p>The proposal would increase the resilience of Wharf 3 to natural disaster and climate change influence by accounting for sea level rise in the design.</p>
<p><i>Move – Northern Beaches Transport Strategy 2038</i> (Northern Beaches Council, 2018b)</p>	<p><i>Move – Northern Beaches Transport Strategy 2038</i> (Northern Beaches Council, 2018b) sets Northern Beaches Council’s policy directions for improving transport during the next 20 years. The vision underlying this strategy is to, ‘...enable freedom of movement to, from and within the Northern Beaches using a safe, smart, efficient, integrated and sustainable transport network’.</p> <p>The proposal would support this vision by increasing the efficiency, resilience and safety of Wharf 3 and the public transport services it provides.</p>

2.2 Existing infrastructure

Manly Wharf consists of a broad wharf supported on timber piers and with a concrete platform (refer Figure 1.2). The superstructure is constructed of steel and timber. Manly Wharf includes three platforms that can be accessed by marine vessels.

Manly Wharf services a significant population, with 3.3 million Manly Ferry Trips occurring annually (Northern Beaches Council, 2018) and an average of 306,111 patrons on the F1 Manly route per month over the last five years (Transport Performance and Analytics, 2022).

Manly Wharves 1 and 2 are directly south-west of the Manly Wharf interchange. They are concrete paved and are separated by a building. Manly wharves 1 and 2 are staffed by Transdev Sydney Ferries and Manly Fast Ferry staff. Both operators have ticketing booths for the sale of ferry tickets. Wharves 1 and 2 also have a staff toilet.

Wharf 3 is to the east of Wharves 1 and 2 and consists of a timber structure and triangular platform. Wharf 3 is a fixed jetty with several berths and tidal steps. It is unmanned. Wharf 3 is not DSAPT compliant. Key non-compliances at Wharf 3 include:

- the existing boarding platform is only accessible via stairs
- the existing boarding platform is at a fixed height, which means it is not accessible with gangplanks at compliant gradients for some vessels and tide levels
- the existing timber finish to the pier is not compliant.

Wharves 1 and 2 each have a timber arrestor next to the wharf to mitigate the risk of vessels overshooting the ferry berth and causing damage. The water pocket between Wharves 2 and 3 also features separator piles to assist with vessel navigation.

Access from Wharves 1 and 2 to Wharf 3 is via an outdoor boardwalk with checkerboard concrete paving. The existing boardwalk does not currently meet the DSAPT or DDA requirements, as it does not have suitable lighting, surface, handrails, and access.

Manly Wharf also features a range of hospitality and retail businesses. The Manly Wharf Bar is located east of Wharf 3. Manly Wharf Bar has an outdoor seating area. Other businesses are contained within the double storey Manly Wharf Interchange building.

Manly Wharf currently enables a range of ferry services including:

- Transdev Sydney Ferries service to Circular Quay from Wharf 1
- Manly Fast Ferry service to Circular Quay from Wharf 2
- Captain Cook Cruise off-peak time Hop-On Hop-Off service to Watsons Bay, Shark Island, Taronga Zoo, Circular Quay and King Street from Wharf 3
- Manly Fast Ferry service to Pyrmont then Darling Harbour from Wharf 3.

Manly Wharf also facilities other commercial, recreational and tourism vessel services and connects marine transport users to connecting bus services.

Table 2.2 summarises the existing wharf elements and descriptions of current infrastructure.

Table 2.2 Existing wharf infrastructure

Element	Description
<p>Existing infrastructure</p>	<p>Three existing wharves, comprising:</p> <ul style="list-style-type: none"> • sheltered concrete Wharves 1 and 2 • Wharf 3 unsheltered timber structure and triangular platform <p>Water based infrastructure including:</p> <ul style="list-style-type: none"> • arrestors at Wharves 1 and 2 • separator piles. <p>Infrastructure to assist with navigation through Manly Wharf, including:</p> <ul style="list-style-type: none"> • pile supported timber boardwalk and fencing. <p>Commercial hospitality services, including:</p> <ul style="list-style-type: none"> • Manly Wharf Bar and Restaurant with outdoor seating area adjacent to Wharf 3 • other Manly Wharf Interchange retail and hospitality businesses.
<p>Operation</p>	<p>Manly Wharf 1 provides Transdev F1 ferry services to Circular Quay. This service:</p> <ul style="list-style-type: none"> • runs three times per hour in the weekday morning and afternoon peaks and on Sundays • takes around 22 minutes from Circular Quay. <p>Manly Wharf 2 provides Manly Fast Ferry services to Circular Quay. This service:</p> <ul style="list-style-type: none"> • runs 6 times per hour during the weekday morning and afternoon peaks, and 3 times per hour on Sundays • takes around 18 minutes from Circular Quay. <p>Manly Wharf 3 provides Captains Cook Cruises services to Circular Quay via Watsons Bay and a Hop-On, Hop-Off service. These services:</p> <ul style="list-style-type: none"> • run once per hour during the weekday morning peak, and twice per hour during the weekday afternoon peak and on Sundays • take around 30 minutes from Circular Quay • Manly Wharf 3 also provides a Manly Fast Ferry service to Pymont and then Darling Harbour. This service: runs three times per hour during the weekday morning peak and twice per hour during the weekday afternoon peak. • note that a Captain Cook Cruises service from Wharf 3 to Barangaroo was removed in 2019. This service may be reinstated in the future.

Element	Description
<p>Ancillary services</p>	<p>Parking is provided near to Manly Wharf including:</p> <ul style="list-style-type: none"> • underneath Manly Wharf interchange via vehicular ramp access (6:00am to 12:00am, includes accessible parking) • on-street at West and East Esplanade (2-hour parking from 8:00am to 6:00pm, doesn't include accessible parking). <p>Two taxi ranks nearby at:</p> <ul style="list-style-type: none"> • Belgrave Street, in front of the Manly Town Hall building • North Steyne opposite Raglan Street. <p>Bus routes 141, 142, 144, 161, 162, 166, 167, 199, 144N, 150X and 170X can be accessed from the Manly Wharf Interchange. Bus stops are located near to the Manly Wharf entrance on:</p> <ul style="list-style-type: none"> • East Esplanade – Stand C • West Esplanade – Stand A, B and D • Belgrave Street – Stand E, F, G and H • West Promenade – Stand J. <p>Pedestrian access to the wharf comprises of the following main access paths:</p> <ul style="list-style-type: none"> • access from the Manly Beach area via the Corso • access from pedestrian footpaths along East and West Esplanade to the wharf entrance. <p>An on-road cycle path is provided on the northern side of Wentworth Street, while bike logos are provided on the southern side of Wentworth Street. Shared paths along the Manly Cove frontage and the Corso can also be used for cycles.</p> <p>Bicycle parking is provided at the near the Manly Wharf Interchange (refer Figure 1.2).</p> <p>There is also a Kiss and Ride space on Belgrave Street within a short walk of the Manly Wharf building.</p>
<p>Land ownership</p>	<ul style="list-style-type: none"> • Manly Wharf is owned by Transport including Wharves 1 and 2 (2/DP1170245), Wharf 3 (3/DP1170245) and the seabed of Manly Cove below the mean high-water mark. • Some assets at Manly Wharf are leased from Transport and / or operated privately, such as the: Manly Wharf Interchange, boardwalk, restaurant and bar areas (1/DP1170245) which is leased by TMG Developments Pty Ltd. This lot is covered by a leasehold estate which allows numerous leases and sub-leases within the shopping complex. • East Esplanade Park (7011/DP1074608), where the compound is proposed to be located, is Crown land which is held the Department of Planning and Environment – Crown land.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- facilities that are accessible to the disabled, ageing and parents with prams
- a reliable and durable ferry wharf that is suitable for ferry operations in this location
- provision for an additional fixed stepped wharf to service smaller commercial and recreational vessels to be constructed when funding becomes available
- comfortable and protected environments for customers from sunny, wet and windy weather while accessing and waiting for transport services
- service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

2.3.2 Development criteria

The development criteria for the proposal include:

- consider pedestrian access
- consider connection to other ferry services
- consider connection to bus facilities
- use Kit-of-Parts (standardised design) elements in designing the wharf, where feasible
- ensure compliance with functional and operational requirements
- balance core operations and customer needs
- design all elements for easy maintenance optimised for human use
- maintain elegant simplicity in architectural planning and detailing
- sympathetic to surrounding structures, responding sensitively to current and likely future built environment around the wharf
- maximise stability (and therefore safety) of the berthing arrangements by taking into consideration the wind, waves and swell that the wharf would experience in its proposed location
- maximise equity of access for all customers
- minimise walking distances
- minimise pedestrian conflict points and crowding points
- minimise queuing at wharf facilities
- maximise the perception of security and safety

- minimise cost of ownership and maintenance
- accommodate potential for growth in patronage and changing travel patterns
- accommodate required design life (50 years for all components except the proposed Wharf 4 structure, which is to be 20 years)
- accommodate forecast sea level rise for design life.

2.3.3 Urban design objectives

Urban design objectives for the proposal include:

- integrate the wharf within its local area taking into consideration the nature of the site, local context, and the surrounding biodiversity
- integrate the wharf with its future urban context
- create a high quality, secure and positive addition to the public domain
- placemaking for community and wharf customers.

2.4 Options considered

This section describes the options considered to deliver the proposal.

2.4.1 Methodology for selection of the preferred option

The method by which Transport developed options for replacing the wharf considered:

- visual impact
- capacity / redundancy for future demand
- queuing impact
- equitable pathways
- catchment impact
- capital expenditure of the proposal (CAPEX)
- cost of operating the proposal (OPEX).

Selection of a preferred option involved scoring the identified option under a Multi-Criteria Assessment (MCA) and consideration of stakeholder feedback in order to select a preferred option.

2.4.2 Identified options

Three concept design options, in addition to the Do nothing option, were considered for The Manly Wharf 3 upgrade. These options were developed based on the strategic design, future needs analysis and the site-specific requirements.

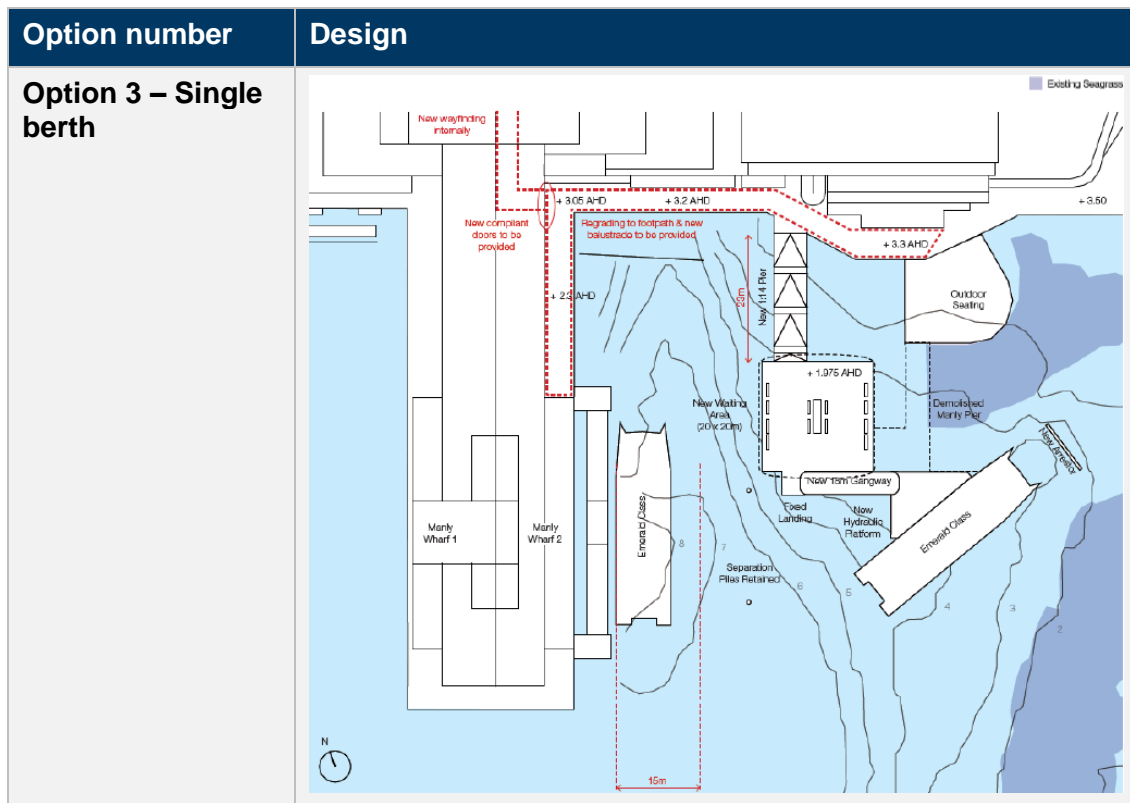
The following options were considered (refer Table 2.3):

- Do-nothing – no upgrade and not accessible, regular maintenance would continue
- Option 1 – two boarding platforms (two berths)

- Option 2 – one shared boarding platform (two berths)
- Option 3 – one berth in current location (minimum required to replace current capacity).

Table 2.3 Design options considered

Option number	Design
<p>Option 1 – Two boarding platforms</p>	
<p>Option 2 – Shared boarding platform</p>	



2.4.3 Analysis of options

Do nothing

The option of Do nothing would limit the scope of work to carrying out activities required to maintain operation of the existing wharf, including undertaking regular maintenance. Part of the existing Wharf 3 infrastructure are not DSAPT compliant. Undertaking regular maintenance would not correct this issue.

Although it would present the lowest initial capital cost and least environmental impact, the Do nothing option was discounted as it would not meet the objectives of the proposal to improve accessibility, passenger safety and comfort for future patronage.

Option 1, 2 and 3

Advantages and disadvantages of Options 1, 2 and 3 (refer Table 2.4) were presented to key stakeholders (including Transport and Transdev Sydney Ferries) at the first Key Stakeholder Workshop (KSW1) .

The relative performance of each option was assessed using a multi-criterion analysis (MCA) process, which included consideration of:

- wharf interchange operation
- wharf interchange maintenance
- deliverability
- customer experience
- transport integration
- urban design and precinct planning

- environment, sustainability and heritage
- accessibility
- infrastructure objectives, including accommodating supporting infrastructure and removing redundant assets.

Further iterations of the options were developed in response to internal stakeholder comments and the preferred option was selected by Transport.

Table 2.4 Option analysis

Option	Advantages	Disadvantages
Option 1	<ul style="list-style-type: none"> • two berths allow flexibility of operations and capacity for future demand • varying freeboards would allow for independent operation of berths • redundancy against mechanical failure – one platform can be used whilst the other is under repair • separate gangways allow more efficient and safer customer movements 	<ul style="list-style-type: none"> • greater maintenance requirements for two independent hydraulic platforms and two gangways • dredging required • higher CAPEX and OPEX costs
Option 2	<ul style="list-style-type: none"> • two berths allow flexibility of operations and capacity for future demand • less impact to swing moorings than existing Wharf 3 or Option 1 • no dredging required 	<ul style="list-style-type: none"> • less flexibility – shared platform only suits one freeboard level at a time • less redundancy against mechanical failure • single gangway less efficient for customer movement than two gangways • extends beyond line of Wharves 1 and 2 – operational navigation concerns and increased visual impact

Option	Advantages	Disadvantages
Option 3	<ul style="list-style-type: none"> • similar to current structure – minimal new visual impacts • lower CAPEX costs than other options • shorter construction timeframes than other options 	<ul style="list-style-type: none"> • limited service frequency compared to two berths • limited redundancy if berth is non-operational • some dredging required • may preclude future additional berth development

2.5 Preferred option

Following the MCA assessment of the options at the workshop with relevant stakeholders Option 1 was selected as the preferred option.

The Option 1 concept design was refined multiple times following feedback received during the initial workshop and a follow-up workshop) with key stakeholders (KSW2), which included stakeholders across all areas of Transport.

2.6 Design refinements

Refinements to the preferred option concept design included:

- The berth width was made narrower to allow the Wharf 3 and proposed Wharf 4 structure to be moved west into deeper water to minimise dredging and avoid impact to the Posidonia seagrass.
- The proposed Wharf 4 was redesigned to become a fixed structure. Wharf 4's vessel servicing requirements and draught levels were also reduced. This reduced its CAPEX and substantially reduced the area of dredging required for its construction. This design change means that the proposed Wharf 4 would only cater to small commercial and recreational vessels.
- The elevation of the promenade was altered to be in line with the existing boardwalk to accommodate greater sea level rise and to increase the accessibility of the access path to the new waiting area.
- The gangway roof was removed from the design in October 2022. This reduced the visual impact of the proposal on Manly Wharf businesses and visitors. This change also reduced the proposal's CAPEX. As this design change was made during the final preparation of the REF, the REF includes an impact assessment of the gangway roof in sections 6.2 and 6.5.
- The refined Option 1 concept design has been assessed in this REF. The refined Option 1 design is described in detail in Chapter 3 and is shown in Figure 1.3. This design may be further developed during detailed design.

3 Description of the proposal

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

3.1 The proposal

The proposal is to upgrade Wharf 3 and construct a new proposed Wharf 4 under the TAP.

Key features of the proposal would include:

- removal of the existing Wharf 3 timber wharf structure, piles and triangular platform
- retention of the existing Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a DSAPT compliant access path where required along the promenade from the Wharf 1-2 entry to the new hydraulic wharf platform at Wharf 3
- installation of a new public seating space / rest 'slow space' within the new public promenade area
- construction of a new covered waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the waiting area to the Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- staged delivery of a fixed structure (Wharf 4). Wharf 4 would be supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels.
- construction of a new arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- provision for a wharf booking information system
- providing conduits for Opal readers to be installed in the future if required.

Figure 3.1 shows the key features of the proposal.

In the future, it is likely that operational vessel frequencies would increase to meet the growing demand for ferry services. This would be managed by updating ferry timetabling in the future, and this would be subject to separate assessment and approvals under Part 5 of the EP&A Act if required.

This REF assesses the proposed upgrade to the existing infrastructure as described above. At opening, the proposal would maintain existing timetabling for ferries.

Construction of the proposal may be staged so that all work impacting the operation of Wharf 2 would be conducted first. During this time, Wharf 2 would be closed while Wharves 1 and 3 could continue to operate and receive vessels. Once these initial works are completed, Wharf 2 can reopen and be used during the remainder of the construction period.

Wharf 3 would be constructed first. The delivery of Wharf 4 would be staged.

For the purposes of the REF the proposal footprint, proposal area and compound area have been defined as follows (refer Figure 3.1 and Figure 3.2):

- Proposal footprint – the area directly impacted by proposed work, including the removal of structures (demolition area), installation of new wharf structures and the dredging area (refer Figure 3.2).
- Proposal area – the area around the proposal footprint required for construction including the compound areas (refer Figure 3.2).
- Compound area – the temporary facilities required for construction, including for example an office and amenities compound, construction compound and materials storage compound. The possible locations of the compound and laydown areas are shown on Figure 3.2 and described in section 3.4, however, the exact locations would be determined prior to construction.

Various specialist studies apply individual study areas relevant to the nature of the aspect being assessed. These are described in Chapter 6, where relevant.



Figure 3.1 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW. Imagery: © Department of Customer Service 2020. Data source: publicNSW. Imagery: © Department of Customer Service 2020. Created by inroads.



Figure 3.2 - Proposal Footprint – construction, dredging and demolition areas

Whilst every care has been taken to generate the demolition outline, CH2M makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unreliable in any way and for any reason.

World Street Map, Woolahra Municipal Council, Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Data source: publicNSW_Imagery © Department of Customer Service 2020, Created by mfrade

3.2 Design

3.2.1 Design criteria

The proposal has been designed to all applicable standards as well as Transport engineering and safety standards and guidelines.

Overall, the proposal has been designed to:

- provide an accessible precinct for the disabled, ageing and parents with prams
- meet the needs of a growing population
- allow for seamless transfer between all modes, and for all customers
- prioritise safety and comfort
- minimise impacts on the environment including noise, seagrass, penguins and visual amenity
- account for rising sea levels under climate change.

In addition, the proposal has been designed with reference to conservation design principles which were developed using the conservation best practice principles of the Burra Charter and the conservation policies established in the *Manly Ferry Wharf Conservation Management Plan*, including:

- Heritage places should be managed in accordance with their heritage values.
- Heritage values of heritage items, sites and conservation areas must be understood before making decisions about their future use and / or adaptation.
- Proposed changes should apply the principle 'do as much as necessary and as little as possible'.
- New developments should respect its heritage context in terms of scale, form, siting, setbacks, materials and articulation.
- Statements of significance must be used to guide decisions about future use, adaptation, and development of heritage places.
- The guidelines 'Design in Context: Guidelines for Infill Development in the Historic Environment' (NSW Heritage Office and Royal Australian Institute of Architects, 2005) should be used to guide the design of new infill development in the vicinity of heritage items.
- Infill development should be designed to respond to adjacent heritage items in terms of scale, form, setbacks, materials, colours and articulation.
- Decisions about change to an individual heritage item should be guided by its significance as a whole and of its individual components.
- Decisions about change to significant fabric should be guided by the fabric's relative level of heritage significance.
- New development in heritage landscapes and public spaces should be avoided.
- If new development is unavoidable, it should be integrated into existing development where possible.
- Identified views and vistas of the Wharf in its setting should be preserved.

- Adaptation and modification of significant fabric for access compliance should seek to conserve significant exterior fabric and interior spaces and fabric. Impacts to significant spaces and fabric, such as its removal should be avoided or minimised.
- Regrading and other modifications of decking to enhance accessibility should seek to avoid changes in levels that could obscure or damage significant building fabric including the walls of Wharves 1 and 2.
- A signage policy for the wharf should be developed to provide holistic and integrated guidelines for the design and installation of new wayfinding and commercial signage.
- Interpretation of the former Manly Fun Pier will be considered as part of the wider design which would also include Aboriginal design principles (as discussed below).
- New services such as security cameras and lighting should be attached to new elements rather than significant fabric. The need for and number of these elements should be rationalised. Where these services must be attached to significant fabric, existing penetrations should be used in preference to disturbing significant fabric, and new cabling concealed rather than surface mounted.
- New fixtures and fittings should be designed to be safe and functional, but complementary to the aesthetic values of the place. The extensive use of glazing for balustrades and screens is encouraged to minimise adverse visual impacts of the new Wharf 3 structure on the setting of Wharves 1 and 2. Balustrades, fixtures and fittings could reference nautical influences (like tensioned wire balustrades with turnbuckles and timber jetty decking) where functionally appropriate.

For a description of how the proposal meets the heritage design guidelines refer to the SOHI in Appendix I.

The artistic and cultural elements of the proposal's design were also informed through Aboriginal design principles developed through the draft 'Connecting with Country' design approach (WSP, 2022) set out below:

- Aboriginal led: Aboriginal people (designers, elder and community members) should be leading or co-leading the Indigenous design elements.
- Community involvement: The local Aboriginal communities to be engaged in this process.
- Appropriate use of Aboriginal design: All Aboriginal design elements must be approved by consulted Aboriginal elders and community members prior to its implementation.

Figure 3.3 and Figure 3.4 show sketched views of the proposal from different angles. The design is indicative of concept design and is subject to refinement in the next phase of detailed design development.

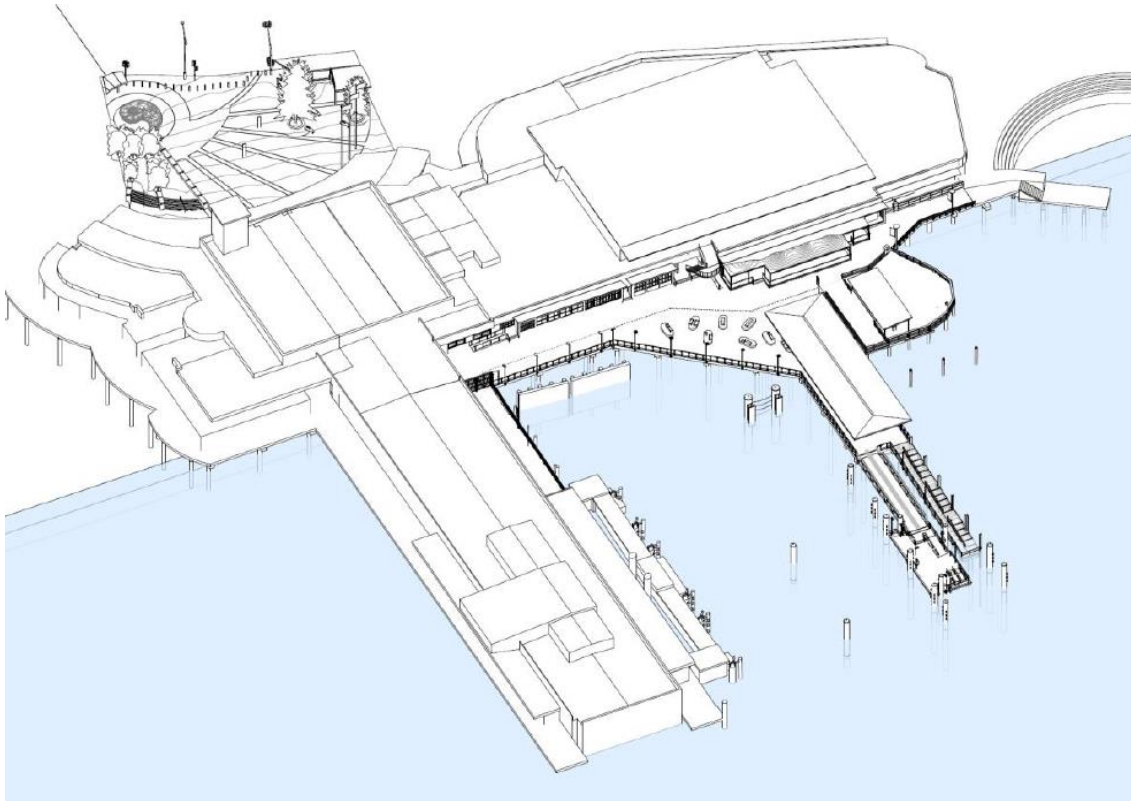


Figure 3.3 View of proposal from above

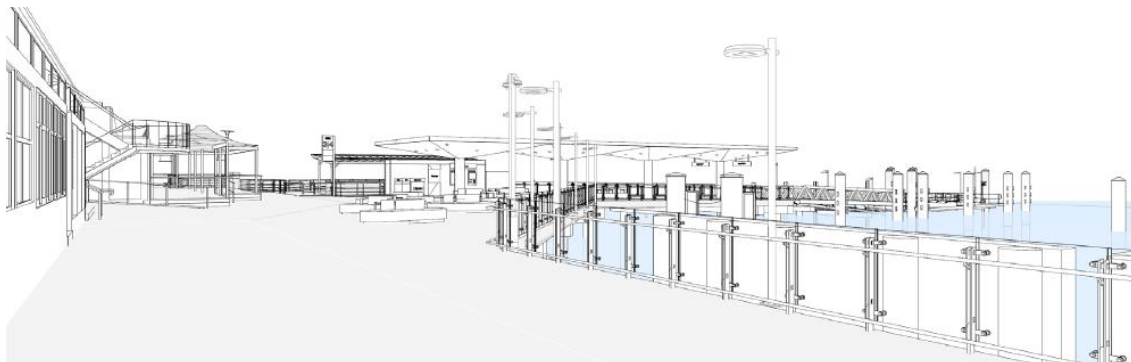


Figure 3.4 View of proposed 'slow space' and Wharf 3

3.2.2 Engineering constraints

Table 3.1 lists the main constraints to the development and describes how they have been addressed in the concept design.

Table 3.1 Engineering and development constraints

Constraint	Concept design provision
Construction constraints	
Proximity to stakeholders	Manly Wharf is a hub of activity and contains high pedestrian traffic and connections to transport to the Northern Beaches. There are also several hospitality venues in the area. As a result, property access has been considered in the construction sequence and staging plans.
Environmental	The design and staging have been developed to reduce impacts to the environment including noise, existing seagrass, and heritage. The design of Wharf 3 and proposed Wharf 4 have considered dredging requirements and have been altered to minimise seagrass impacts.
Operations at Wharf 2	Construction of the proposal would require a temporary closure of Wharf 2 for about eight weeks. To minimise the impact of this closure construction would take place outside of the summer peak season. During the closure, vessels would be diverted to Wharf 3 with pedestrian access via the East Esplanade side of Wharf 3. Once work that requires the closure of Wharf 2 has been completed, Wharf 3 would be closed, and Wharf 2 would resume receiving vessels.
Operational constraints	
Unstaffed – security and public safety	The design includes safety features including lighting, CCTV security cameras and tactile ground surface indicators, where required.
Visual impact	Manly Wharf is a visually prominent structure, and the viewpoints of the area are important to stakeholders. Viewpoints have been considered in the construction staging and design of the proposal.

3.2.3 Major design features

Main waiting area

The new sheltered main waiting area would be rectangular in shape (9.7 metres width, 38.4 metre long). The northern end of the main waiting area would be adjacent to the new promenade to the west and would overlook the existing Manly Wharf Bar outdoor seating area to the east. The floor level of the main waiting area would be generally flat with a slight slope (1:50 crossfall) from east to west to facilitate surface water runoff. A sketch of the concept design for the main waiting area is shown in Figure 3.5.



Figure 3.5 Concept design view of main waiting area, roof canopy, service pod, balustrades, screens and benches

The new main waiting area would comprise a reinforced concrete suspended deck on steel piles that would interface with the existing Manly Wharf infrastructure. The area is to be an independent structure supported on a steel pile grid with a maximum eight metre span. The steel piles with a 610-millimetre diameter (Circular Hollow Sections (CHS) 610 x 16) would support reinforced concrete headstocks, generally 800 millimetres wide by 750 millimetres deep. The concrete headstocks would support a reinforced concrete topping slab of about 300 millimetres depth. The slab would support a topping screen that is to suit surface grades for drainage.

The main waiting area would feature bench seating including some benches with DDA compliant armrests. These benches would be around five metres long, double sided and be positioned centrally between the columns supporting the roof. Wheelchair spaces would be provided next to the ends of these benches.

The southern edge of the main waiting area concrete slab would support the Wharf 3 gangway. The south-east corner of the main waiting area would also connect to the proposed Wharf 4 tidal structure.

Space in the main waiting area has been left to allow future installation of four Opal fixed location readers.

Main roof canopy

The main waiting area is proposed to be sheltered by a rectangular roof canopy of 10.5 metres wide to 33.6 metres long. This roof has been designed to match the shape of the Wharves 1 and 2 building but on a smaller scale. The height of the roof would be 4.2 metres from the underside of roof's fascia to floor at the main waiting area and 3.2 metres to the floor at the existing Wharf Bar outdoor seating area.

The roof would be designed to have three bays with a single column supporting the roof at centre of each bay. The inside of the roof bays would look like an inverted pyramid supported by a middle column. This design is structurally efficient and allows for a minimal roof form with a small number of supporting columns to minimise visual impact.

The roof sheeting is angled at one degree pitch and would drain to a central box gutter, which would discharge into concealed pipes running along the roof column. These pipes would discharge into the cove below.

The fascia of the main roof canopy would be painted 'heritage green' to match the green fascia of the existing Manly Wharf building, shown in Figure 3.6. The angled soffits, or underside, would be covered in an off-white composite timber cladding. This would create a geometric surface, similar to the horizontal cladding on the existing Manly Wharf buildings. The main roof canopy would feature downlights to illuminate the waiting area below.



Figure 3.6 Manly Wharf building

Service pod

It is proposed that a service pod be located beneath the main roof canopy in the north-east corner of the main waiting area. The service pod would use the Transport 'kit of parts' design and be 1.4 metres wide and 7.2 metres long. It would be positioned with its back wall adjacent to the existing Wharf Bar outdoor seating area.

The service pod would contain the following equipment and features:

- bins (1x recycling and 1 x general waste)
- lifebuoy
- hydraulic plant equipment
- electrical distribution board
- communications rack
- help point
- hearing loop and button
- signage
- space for future installation of conduits for Opal readers Maintenance access to the service pod would be via two doors, one at the end of the service pod and the other roughly in the centre.

To the north of the service pod there would be a water tap and space for hose reel storage for cleaning and washdown purposes.

To the right of the service pod would be a clear space for a commercial operator ticketing kiosk to be parked when not in use. A power outlet is to be located on the wall behind so the kiosk can be plugged in and charged when not in use.

There would also be provision for a wharf booking information screen to be suspended from the ceiling for boat users to identify if the wharf is booked.

Wharf 3

The proposal involves construction of a new Wharf 3 which would be suitable for large, commercial vessels. This wharf would be made of several components shown in Figure 3.3, including the uncovered gangway, hydraulic platform, and berthing, mooring, support, and separation piles.

Dredging

Construction of Wharf 3 would involve limited dredging of material at the northern face of Wharf 3 berth pocket area. This is discussed further in section 3.3.10.

Gangway

An uncovered aluminium gangway would connect the southern edge of the main waiting area with the Wharf 3 hydraulic platform. The gangway would be 18 metres long and 4.2 metres wide

Initial concept design options included a roof canopy over the gangway. As the design development for the proposal has progressed, the current design, as of October 2022, no longer includes a roof canopy.

The gradient of the gangway would vary with the changing height of the tide. The length of the gangway would allow the gangway access path to be at an accessible gradient (1:14) during 80% of the tidal heights experienced at Manly Cove. As such, the gangway would be compliant with Transport Design Guidelines for Ferry Wharf Gangways and DSAPT requirements. The gangway has also been designed with consideration of future sea level rise. This is discussed further in section 6.15.

Hydraulic platform

A new hydraulic platform would be installed at Wharf 3, accessed via the gangway. The hydraulic platform would be a steel fabricated unit held in place by three main steel beams, intermediate beams and steel stiffeners. The intermediate beams and steel stiffeners would stiffen the hydraulic platform and prevent it from rotating. This stiffening would enable the hydraulic platform to be supported by three piles in an asymmetrical position.

The platform piles would be installed into the bedrock and would be connected to each other with a submerged steel truss to provide rigidity to the structure. Each of the platform piles would support a hydraulic cylinder. The hydraulic cylinders would be 225 millimetres in diameter and have a stroke length of 2.3 metres. The hydraulic cylinders would be linked to a hydraulic power pack located in the wharf's promenade.

The hydraulic platform would be fixed to the hydraulic cylinders. The platform is designed to operate across the full tidal range (from +0.075 metres AHD to +2.175 metres AHD) and support a live load of up to 4.0 kPA uniformly distributed loading.

The hydraulic platform would not have a roof and would feature a surface fall to support drainage, metal balustrades and an emergency ladder.

Wharf 4

The proposal includes construction of a proposed additional wharf (Wharf 4), which would be located east of Wharf 3 and would be suitable for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels. The proposed Wharf 4 would be rectangular in shape and run parallel to Wharf 3. It would be a fixed structure of 26.6 metres in length and 3.5 metres in width supported by six piles.

The proposed Wharf 4 would consist of large tidal steps alongside a ramp with a 1:8 gradient and handrails leading down to three landings for vessel berthing at different tidal heights. The tidal steps would be offset by 200 millimetres from the berthing line to allow for easier vessel access without the need for gangplanks.

This structure is not a public transport facility so would not be DSAPT compliant but would allow for assisted access to and from vessels berthing at the wharf.

The proposed Wharf 4 would be constructed using 50-millimetre thick fibre-reinforced polymer (FRP) surface grating over a fabricated steel frame. This would allow light to travel through to the water below and assist aquatic flora and fauna growth.

Promenade

A new pile-supported promenade is proposed to be constructed alongside the existing boardwalk. The addition of the promenade would extend the existing boardwalk width from 4.7 metres to 8.4 metres and add an additional 289 square metres of public space to this area.

The promenade would be gently sloped from west to east to facilitate surface runoff. New light poles would be provided along the edge of the new promenade at regular intervals to illuminate this route sufficiently to comply with the DSAPT requirements.

The promenade may be paved with coloured concrete and exposed aggregate concrete. The widened boardwalk and 'slow space' concrete surface area may be decorated with indigenous and coastal motifs. Design of the concrete art would be developed through consultation with local indigenous groups in accordance with a Connecting with Country approach.

In addition to these changes, the existing area outside the doors into the main wharf building and the gates to Wharf 2 would be re-graded so that the gradients are DSAPT compliant.

'Slow space'

The new promenade would feature a public seating area. The 'slow space' would be 54 square metres and triangular in shape. Lighting, precast concrete bench seats and seating blocks are proposed to be incorporated in the new 'slow space' design, as shown in Figure 3.7.

The intention of the 'slow space' is to provide a space for people to informally meet and gather. The design would be developed further, in conjunction with the local community and indigenous groups, to provide further opportunity for the incorporation of public art and the telling of indigenous stories through its design.



Figure 3.7 Sketch of concept design of the widened boardwalk, informal seating, and new light poles

Other design features

Arrestors and separation piles

The proposal includes construction of a new arrestor at Wharf 3. In addition, installation of two new separation piles would occur between Wharves 2 and 3.

Six mooring / berthing piles would be installed in line with the Wharf 3 hydraulic platform. In addition, eight mooring / berthing piles would be installed in line with the proposed Wharf 4 tidal steps.

Balustrades and screens

The proposal would feature new 1.1-metre-high stainless steel and glass balustrades to the western and eastern edge of the new waiting area and the southern edge of the new promenade. These balustrades and screens use the Transport 'kit of parts' design and also feature stainless steel handrails.

Safety and security features

The proposal would include an upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required.

3.3 Construction activities

The appointed Contractor would confirm the final construction activities in discussion with Transport. 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 and equipment requirements/limitations. Should the work method differ from what is proposed in this REF, the Contractor would consult Transport to determine if additional impact assessment is needed.

3.3.1 Work methodology

The proposal would be built under Transport specifications as managed by the Contractor under a construction environmental management plan (CEMP). The specifications included in the CEMP would cover factors such as environmental performance and management, materials storage and management, water quality and seabed scour.

Construction of the proposal would likely occur in the stages set out in Table 3.2. These construction stages are discussed in more detail in the sections below.

Wharf 3 would be constructed first. The delivery of Wharf 4 would be staged. If Wharf 4 is not built concurrently to Wharf 3, then the construction activities in stage 5 relating to Wharf 4 (refer Table 3.2) would be conducted at a later date.

Table 3.2 Staging plan for the proposal

Stage	Operation	Works
1	Wharf 2 closed Wharf 3 open	<ul style="list-style-type: none"> • site establishment • conduct pre-clearance surveys for microbats, Black Rockcod, White's Seahorse and Little Penguin • install environmental controls (including silt curtains) • construct western side of new promenade (in front of Wharf 2 berthing area) • construct concrete topping slab • regrade a section of existing promenade • installation of temporary separation piles between Wharf 2 and proposed crane barge location at Wharf 3.
2	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> • construct hoarding on promenade to close Wharf 3 • demolish existing Wharf 3 pier and tidal steps (except for area to be retained) • demolish area of existing boardwalk to be removed • remove piles below demolished pier.
3	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> • install dredging environmental controls (including moon pool curtain) • dredge Wharf 3 berth pocket.
4	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> • construct remaining promenade structure • construct new waiting area structure • promenade and waiting area fit-out including wharf furniture and utilities.

Stage	Operation	Works
5	Wharf 2 open Wharf 3 closed New wharf opened	<ul style="list-style-type: none"> construct Wharf 3 platform, berthing piles and install gangway subject to funding availability, construct proposed Wharf 4 fixed structure install separation, arrestor, support and mooring and berthing piles commission of equipment and wharf site clean-up and opening of the new wharf.

3.3.2 Stage 1

Site establishment

Site establishment would involve the following steps:

- establishment of a temporary site compound (erect site offices, lunchrooms and amenities) within East Esplanade Park. The zone would be fenced off and tree protection provided to ensure trees would not be damaged.
- temporary fencing, or hoarding would be installed to segregate the proposal construction areas from the public space. The hoarding would leave enough room for a buffer zone around the working area whilst providing a pathway wide enough for the public to navigate through the promenade.
- safety ramps would be installed where required for safe pedestrian access such as over concrete lines.
- pre-clearance surveys would be conducted to identify and relocate any sensitive fauna in the proposal area including microbats, Black Rockcod, White's Seahorse and Little Penguin, prior to water-based work beginning.
- traffic control measures (including for vehicles, watercraft, pedestrians and cyclists) would be established in accordance with the traffic management plan. Appropriate wayfinding signage would be installed advising of alternative transport options where necessary.
- environmental controls would be established in accordance with the CEMP.
- a laydown area would be established at the end of wharves 1 and 2 during Stage 1. This laydown area would be moved to the newly extended promenade area after its construction.

During Stage 1 access to Wharves 1 and 2 from Wharf 3 would be closed.

Wharf 2 closure

Extending the promenade would require the use of a large crawler crane on a barge. During construction of the western side of the promenade, this barge would obstruct the Wharf 2 berthing pocket. During these works Wharf 2 would need to be closed. The period of this closure is expected to be about eight weeks. During this time Manly Fast Ferry (MFF) vessels would be diverted to Wharf 3.

The work would likely occur outside of the peak summer season to reduce impact to vessels and pedestrians. During the Wharf 2 closure pedestrian access to Wharf 3 would be via the promenade from the East Esplanade side.

Construction of the western side of the promenade

Pile caps and deck slabs (assumed to be precast concrete) would be delivered to site by barge and installed by a large barge mounted crane.

Construction of the western side of the promenade is assumed to be conducted through the following steps:

- piles and other materials would be transported by barge to the site
- foundation system for the promenade would be built by:
 - positioning steel tubular piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length.
 - lifting and placement of promenade precast concrete headstock beams onto the piles
 - lifting and placement of promenade precast concrete slab panels onto the headstocks
 - pumping concrete using temporary pipes from concrete trucks parked along East Esplanade to install an in-situ concrete topping surface.

Regrading of existing promenade

A section of the existing promenade outside the Wharf 2 exit doors would be regraded to provide accessible access. This would be constructed by pumping concrete using temporary pipes from concrete trucks parked along East Esplanade to install an in-situ concrete topping surface at the required levels.

Installation of temporary separation piles

Temporary separation piles between Wharf 2 and the proposed crane barge location at Wharf 3 would be constructed to assist with vessel navigation during construction of the proposal.

It is assumed that the temporary separation piles would be installed using the following steps:

- piles and other materials would be transported by barge to the site
- foundation system for the promenade would be built by:
 - positioning steel tubular piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length.

3.3.3 Stage 2

Reopening of Wharf 2 and closure of Wharf 3

At the conclusion of Stage 1, Wharf 2 would be reopened, and Wharf 3 would be closed. Access for water taxis and other vessels that use Wharf 3 would be relocated to other locations including, Manly Sailing pier, Bavarian deck, and East pier.

The laydown area at the ends of Wharves 1 and 2 would be moved to the newly constructed promenade area. Hoarding would be installed to prevent access to the existing Wharf 3.

Demolition

The work would involve demolition of several elements including most of the existing Wharf 3 timber wharf structure and the triangular platform. Other elements for removal would include:

- piles from under the existing wharf and boardwalk areas to be removed
- existing balustrades and seating to the edge of the existing boardwalk
- some existing light poles and services along the edge of the boardwalk
- the existing separation piles adjacent to Wharf 2
- a small section of screen adjacent to existing Wharf 2 security access gates.

The demolition plan for the proposal is shown in Figure 3.2

The existing Wharf Bar outdoor seating area and a small area of the timber Wharf 3 structure including the nearby piles, immediately adjacent to the Wharf Bar outdoor seating area would be retained.

The existing structures would be investigated prior to demolition to ensure that the demolition work does not affect the stability of the existing structures.

It is assumed that demolition would occur through the following steps:

- A barge fitted with a crane (about 12 metres high) would be transported to site. When on-site it would be anchored by four points but would reposition around the proposal area during the work, as required.
- The existing fixed tidal structure, jetty decking and promenade would be cut away from the piles and loaded onto another barge by crane and would be transported to an appropriately approved and licensed facility for reuse and/or disposal. Some of the timber may be salvaged and re-used in seating structures.
- The existing steel and timber piles would be removed by vibratory methods. If a pile is unable to be extracted by vibratory methods, it would be cut off level with the seabed. Divers would cut the pile at seabed level using appropriate underwater equipment. Piles would be transported by barge to an appropriately approved and licensed facility for reuse and/or disposal.

3.3.4 Stage 3

Dredging

Construction of Wharf 3 would involve limited dredging of material at the Wharf 3 berth pocket area. The area proposed for dredging is shown in Figure 3.1. Dredging would occur using an excavator barge and a hopper barge to transport the dredged material. Dredging is discussed further in section 3.3.10. In addition, environmental controls, such as silt curtains, would be installed to contain mobilised sediments.

3.3.5 Stage 4

Construction of remaining promenade area and the main waiting area

Construction of the new wharf would be done by a large crane barge located between Wharves 2 and 3. During the works, a marine exclusion zone around Wharf 3 would be established.

Construction of the remainder of the promenade and the main waiting area would be conducted through the following steps:

- piles and other materials would be transported by barge to the site
- foundation system for the promenade would be built by:
 - positioning steel tubular piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length.
- lifting and placement of promenade precast concrete headstock beams onto the piles
- lifting and placement of promenade precast concrete slab panels onto the headstocks
- pumping concrete using temporary pipes from concrete trucks parked along East Esplanade to install an in-situ concrete topping surface.

Promenade and waiting area fit-out

The main waiting area roof would be fabricated offsite and lifted in sections and installed using a barge mounted crane. The roof ceiling and column cladding would be installed followed by seating, glazed balustrades and the service pod. Services including power, water, lighting, communications, CCTV and hydraulics would also be installed. Once these main components are in place, signage and wayfinding would be erected in prominent locations to assist wharf users.

3.3.6 Stage 5

Construct Wharf 3 platform and install gangway

Construction of the Wharf 3 gangway and hydraulic platform would occur using a large crane barge and may be conducted through the following steps:

- piles and other materials would be transported by barge to the site

- the hydraulic platform support piles and the berthing piles would be built by:
 - positioning steel tubular piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length
- the new gangway and hydraulic platform would be fabricated in an off-site facility and floated to site by barge
- the gangway and hydraulic platform would be lifted into position by the crane and secured to the other wharf components
- the hydraulic rams would be fitted to the platform piles and connected to hydraulic system.

Construct Wharf 4 fixed structure

The delivery of the proposed Wharf 4 would be staged, and involve using a large crane barge and may be conducted through the following steps:

- piles and other materials would be transported by barge to the site
- foundation system for the proposed Wharf 4 would be built by:
 - positioning steel tubular piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length
- lifting and placement of precast concrete headstock beams onto the piles
- the steel support structure would be fabricated in an off-site facility and floated to site by barge
- the steel support structure would be lifted into position by the crane and secured to the headstocks and fibre-reinforced plastic decking would be installed on the steps and ramp
- the berthing piles for the proposed Wharf 4 would be built by:
 - positioning steel H shaped piles with a crane on a barge mounted with a driving unit and piling guide
 - driving or vibrating the steel piles into position
 - cutting the steel piles to length.
- handrails and fittings would be installed.

Install separation and arrestor piles

Separation and arrestor piles would be installed using the similar methods for pile installation described in previous steps. Arrestor fenders, chains and fittings would be installed.

Commissioning

The new services and system would be connected to existing services where required. Commissioning and testing of the wharf and services would occur including berthing trials.

Site clean-up and opening of the new wharf

The proposal area would be cleaned up and restored to its previous state, which would include:

- removal of sedimentation controls and temporary structures
- a safety assessment of the structure to identify any risks and rectify any safety hazards resulting from construction before opening these areas to the public
- removal of all construction fencing/hoarding and signage.

A handover process would occur which would include defect rectification, training and inspections.

3.3.7 Construction hours and duration

Start date and length of construction

It is anticipated construction of the proposal would take up to eight months to complete depending on weather, maritime conditions and staging requirements. Construction is expected to commence in late 2023 / early 2024.

Working hours

The work would take place within and outside of standard working hours. Standard working hours are as follows:

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

For safety reasons the piling may need to take place late at night or early in the morning when the water is calm and the cove is least busy, with potentially up to 40 staggered night shifts (from 11pm to 7am) proposed across the eight-month construction period. During piling, a work schedule similar to the following may be adopted:

- vibration of piles (preferred method):
 - setup: 11pm to 12am (approximately)
 - vibration: between 12am to 6am (approximately)
 - pack up: generally, 6am to 7am (approximately)
- hammering of piles (alternative method):
 - setup: 4am to 5am (approximately)
 - hammering: between 5am to 7am (approximately).

Due to the requirement for calm water conditions, the new gangway, hydraulic platform and main waiting area canopy would be lifted into position by a barge-mounted crane over a two to three-day period between approximately 11pm and 7am when the water is calmer.

To reduce the impact from *in-situ* concrete pouring on businesses within close proximity to the concreting work, concrete pouring is proposed to take place outside of hospitality venue business hours (4am to 12pm approximately).

3.3.8 Workforce

Workforce numbers on site during construction would vary between 10-15 people onsite at any one time. It would be expected that peak workforce numbers would reach about 20 people during the busiest period of construction.

3.3.9 Plant and equipment

The plant and equipment needed to build the proposal would be typical of any over water construction site. It would vary depending on the construction activity. The largest and most complex equipment needed would be to lift and install the structures required for the waiting area canopy, Wharf 3 platform, gangway and to undertake the piling work.

Table 3.3 indicates the plant and equipment that would be likely used to build the proposal and would be confirmed by the construction contractor. Generally, around 10 light vehicles would be required per day. A maximum of five truck movements would occur per day during construction.

Table 3.3 Indicative plant and equipment

Activity	Equipment	
Water based construction	<ul style="list-style-type: none"> • truck • barge • barge crane • crane mounted vibrator • excavator barge • pile storage barge • hopper 	<ul style="list-style-type: none"> • tug boat • welding equipment hand tools • generator • oxy acet cutting • workboats • pneumatic drill/hammer • piling rig
Land based construction	<ul style="list-style-type: none"> • crane • trucks • barge • franna crane • scissor lift • power generator • light vehicles 	<ul style="list-style-type: none"> • excavator • bob cat • compressor • welding equipment • concrete truck • concrete pump • hand tools

3.3.10 Earthworks

About 290 cubic metres of material would be removed as a part of the *in-situ* dredging. This is based on the size of the berthing pocket, including a one metre offset, a 1:5 batter and a 0.5 metre deep over-dredging allowance (refer Figure 3.2). Dredging would be carried out from a barge mounted excavator.

The volume of dredge spoil that would be produced would be about 350 cubic metres, accounting for a 1.2 bulking factor. All dredge spoil would be contained on hopper barges for offsite re-use or disposal to a licensed facility, depending on waste classification.

Beyond the dredging, there would be limited earthworks associated with the construction of the proposal. A small amount of seabed sediment would be disturbed during the piling work and demolition of the existing structures.

3.3.11 Source and quantity of materials

Various standard construction materials would be required 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. The main materials needed to build the proposal would comprise:

- marine-grade steel and aluminium for the superstructure (jetty, gangway, canopy and barriers) and substructure (piles)
- precast concrete
- concrete for elements required *in-situ* pouring
- fibre-reinforced plastic decking for the proposed Wharf 4 surface
- glass and steel balustrades
- prefabricated signage, light fittings, speakers
- electrical cabling and other electronic infrastructure
- additional materials such as relatively small quantities of paint, oils, fuels and other materials.

Materials would be sourced from overseas and local commercial suppliers, using local suppliers wherever feasible and cost effective.

Sustainable materials and finishes would be considered during sourcing while ensuring the final proposal considers maintenance, durability, and lifespan implications. For example, it is proposed that design of the new seating would explore opportunities to re-use salvaged timber from the demolished Wharf 3.

3.3.12 Traffic management and access

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

- closure of Wharf 2, with no ferry services running from Wharf 2 during construction of the promenade. Vessels would be redirected to Wharf 3 during this time.
- closure of the existing Wharf 3 prior to its demolition. Vessels usually using Wharf 3 would be redirected to other wharves around the Manly Cove during this time.
- establishment of a temporary compound area in East Esplanade Park, with no public access allowed to this area.
- introduction of construction traffic along East Esplanade during the *in-situ* concrete pour.

- installation of hoarding to segregate the proposal construction area from the public space. The hoarding would leave enough room for a buffer zone around the working area whilst providing a pathway wide enough for the public to navigate through the promenade.
- Temporary way-finding signage would also be provided for safe pedestrian movement, and passengers boarding and disembarking during construction.
- Information to boating and vessel operators would be provided during construction and clear delineation of water-side works would be carried out to maintain safe navigation to and from operational sections of Manly Wharf.

Where feasible, materials and equipment for water-based elements of the proposal would be shipped (barged) into and out of the area to limit impact on East Esplanade and surrounds. This would provide the best method to build the marine components and minimise traffic impacts.

It is anticipated that construction barges would be delivered to the construction area from a staging and fabrication area established by the construction contractor.

Most materials and equipment required for land-based elements of the proposal would be expected to be delivered by road via Belgrave Street and East Esplanade. The amount of materials shipped to site, as an alternative to being delivered by road, would be confirmed during detailed design.

3.4 Ancillary facilities

A temporary site compound would be located in East Esplanade Park (refer Figure 3.2). This compound would be used to establish offices, lunchrooms, amenities and limited storage. The compound would only utilise the grassed area of the park and no tree clearance would be required. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

The compound would likely be used during the work hours described in section 3.3.7. Due to the proximity of the compound to sensitive receivers some hours may be adjusted to reduce impacts to nearby businesses. For example, concrete pouring would occur outside of hospitality venue business hours for safety and business continuity reasons.

Given the limited space and road access, the preference would be to ship any major machinery and equipment. Road deliveries for concrete supply or small item deliveries would likely access the site compound would drive down Sydney Road, then turn right onto Belgrave Street and the East Esplanade before going around the block on Wentworth Street, Darley Road and Victoria Parade so vehicles would be on the correct side of the road and not be crossing the road to pull over.

Laydown areas on the marine side of Manly Wharf would be used to enable closer access to equipment and materials. During Stage 1, it is proposed that a storage area at the end of Wharf 1 be used while the expansion of the western side of the promenade was being constructed. This could potentially be directly accessed from the work area using a berthing ramp. Once completed, the laydown area would be moved to the newly constructed expanded promenade area.

3.5 Public utility adjustment

Public utilities in the vicinity of the proposal were identified to include:

- underground power supply (Ausgrid)
- sewer connection (Sydney Water Corporation)
- water mains connection (Sydney Water Corporation)
- connection to TransDev Sydney ferry wharves communication network.

It is not expected that these utilities would be impacted by the proposal. During detail design, further assessment of impacts to local utilities would be carried out including on-site services locating. A separate environmental assessment would be carried out for utility work, if required.

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 Transport. Table 2.2 contains details of land ownership in the proposal area.

4 Statutory planning framework

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

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

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

Section 2.80(4) of TISEPP states: “development for the purpose of wharf or boating facilities may be carried out by or on behalf of a public authority without consent on any land. However, such development may be carried out on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) only if the development is authorised by or under that Act”.

As the proposal is for the purposes of associated public transport facilities for a public ferry wharf and is to be carried out by Transport, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required. The proposal is not located on land reserved under the NPW Act.

The proposal does not trigger an approval or development consent under *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) or the four *State Environmental Planning Policies (Precincts) 2021*.

State Environmental Planning Policy (Planning Systems) 2021

The Planning Systems SEPP identifies development that is State significant infrastructure and critical State significant infrastructure.

Section 2.13(1) of the Planning Systems SEPP declares development to be State significant infrastructure if it is permissible without development consent by virtue of the operation of a SEPP, and it is specified in the categories of development in the Planning Systems SEPP.

Two categories of development that may be relevant to the proposal:

- development where the proponent is also the determining authority and requires an environmental impact statement to be obtained under Part 5 of the EP&A Act. This would not apply to proposal where it is likely that the only significant impact would be on threatened species.
- development for the purpose of port and wharf facilities or boating facilities (not including marinas) 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 does not require an environmental impact assessment under Part 5 of the EP&A Act. The proposal has a capital investment value of \$22.5 million. Therefore, the proposal is not considered to be State significant infrastructure under Planning Systems SEPP categories.

Schedules 2 and 4 identify sites where all development is considered State significant infrastructure. The proposal area is not within the sites identified under Schedule 2 or Schedule 4.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The proposal is located within the Sydney Harbour Catchment and is subject to Chapter 10 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP).

The aims of the Biodiversity and Conservation SEPP in relation to Sydney Harbour Catchment are considered in Table 4.1.

Table 4.1 Aims of the Chapter 10 (section 10.1) of the Biodiversity and Conservation SEPP

Aim	Comment
<p>(a) To ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained—</p> <p>(i) as an outstanding natural asset, and</p> <p>(ii) as a public asset of national and heritage significance, for existing and future generations.</p>	<p>Chapter 7 of this REF includes safeguards and management measures to protect and maintain the areas natural and heritage values. This would ensure the values of Sydney Harbour are recognised, protected, enhanced, and maintained.</p>
<p>(b) To ensure a healthy, sustainable environment on land and water.</p>	<p>Providing relevant standard controls are implemented and monitored (refer Chapter 7), the proposal’s environmental impact is expected to be minimised.</p>
<p>(c) To achieve a high quality and ecologically sustainable urban environment.</p>	<p>The design of the proposal has been based on the principles of sustainability outlined in the <i>Transport Sustainable Design Guidelines</i> (Transport, 2020).</p> <p>The proposal’s urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements.</p> <p>Overall, the proposal has been designed to provide for a sustainable urban environment over its 20-to-50-year design life.</p>
<p>(d) To ensure a prosperous working harbour and an effective transport corridor.</p>	<p>The majority of the proposal has a design life of 50 years, including Wharf 3, with some components having a shorter design life. The proposed Wharf 4 has a design life of 20 years.</p> <p>The proposal would increase the capacity of Manly Wharf to allow for population growth and increases accessibility of the Manly Wharf services.</p>

Aim	Comment
	<p>The proposal also connects to other transport modes through the Manly Wharf interchange.</p> <p>The proposal would contribute to a prosperous working harbour and an effective transport corridor.</p> <p>During construction of the proposal Wharf 2 and Wharf 3 would have periods of closures. Impacts to transport are discussed in sections 6.9 and 6.10.</p>
<p>(e) To encourage a culturally rich and vibrant place for people.</p>	<p>The proposal slow space would provide clusters of seating and is intended as a space for people to informally meet and gather.</p> <p>It is intended for the design of the slow space to be developed further in conjunction with the local community and indigenous groups. It is proposed that the design of the slow space incorporate public art and the telling of indigenous stories through its design.</p> <p>These design features would increase the ambience of the Manly Wharf increasing its cultural richness and vibrancy as a place to visit.</p> <p>Further, following construction the proposal would continue to provide Manly residents with access to the ferry network. This would sustain Manly as a vibrant place to visit.</p>
<p>(f) To ensure accessibility to and along Sydney Harbour and its foreshores.</p>	<p>The upgrade would ensure that Manly visitors are provided with ongoing access to Sydney Harbour and its foreshore areas over the next 20 to 50 years.</p> <p>It would also improve access for low mobility passengers.</p> <p>During construction of the proposal Wharf 2 and Wharf 3 would have periods of closures. Temporary impacts to transport are discussed in sections 6.9 and 6.10.</p>
<p>(g) To ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity.</p>	<p>The proposal would not have a significant impact on notable terrestrial or marine environments or values in the area.</p> <p>Safeguards and management measures would be implemented to prevent any indirect impact on the wider ecological environment from spills and sediment disturbance, mobilisation and smothering.</p> <p>Refer sections 6.2, 6.3, and 6.4.</p>

Aim	Comment
(h) 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.

Zoning

The Biodiversity and Conservation SEPP sets out objectives related to areas zoned under the 'Zoning Maps' established by the *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* zoning map.

The maritime components of the proposal area fall within an area zoned W2 Environmental Protection under the *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* Zoning Map 16.

The proposal has been considered in respect of the objectives from Chapter 10 section 10.13(1) of the Biodiversity and Conservation SEPP zone W2 in Table 4.2.

Table 4.2 Zone W2 environment protection objectives

Objective	Comment
(a) To protect the natural and cultural values of waters in this zone.	<ul style="list-style-type: none"> • Biodiversity values have been considered in the design and construction program for the proposal. • The Biodiversity Assessment Report (BAR) prepared for the proposal included an aquatic field survey and provided an assessment of impacts on the identified species. • The BAR concluded the proposal is unlikely to significantly impact biodiversity matters. • A Statement of Heritage Impact (SOHI) has been prepared for the proposal. The SOHI has assessed the heritage value of the area and potential impacts from the proposal. • The SOHI concluded that the proposed works would result in a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and Wharves 1 and 2) and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures. • Overall, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.

Objective	Comment
	<ul style="list-style-type: none"> Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) process was completed for the proposal by the Transport Aboriginal Cultural Heritage Officer. This process determined there is unlikely to be any impact on Aboriginal cultural heritage. <p>Refer sections 6.2, 6.1 and 6.8, and Appendix H, Appendix I and Appendix J.</p>
(b) To prevent damage or the possibility of longer-term detrimental impacts to the natural and cultural values of waters in this zone and adjoining foreshores.	<p>Safeguards and management measures would be implemented to prevent indirect impacts on the wider environment.</p> <p>Refer Chapter 7 for a full list of safeguards and management measures related to protecting natural and cultural values.</p>
(c) To give preference to enhancing and rehabilitating the natural and cultural values of waters in this zone and adjoining foreshores.	<p>The proposal would involve increasing the capacity of Manly Wharf to service recreational vessels and commercial vessels such as whale watching. This would increase the cultural value of the waters and the adjoining foreshores.</p> <p>The proposal would increase the accessibility of Manly Wharf and would therefore also enhance the accessibility of the natural and cultural value of the waters surrounding Manly Wharf.</p>
(d) To provide for the long-term management of the natural and cultural values of waters in this zone and adjoining foreshores.	<p>Providing relevant standard controls are implemented and monitored (refer Chapter 7), the proposal's environmental impact is expected to be minimised.</p> <p>The design of the proposal has been based on the principles of sustainability outlined in the Transport <i>Sustainability Design Guidelines</i> (Transport, 2017a).</p> <p>The proposal's urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements.</p> <p>Overall, the proposal has been designed to provide for a sustainable urban environment over its 20-to-50-year design life.</p>

Under section 10.15 of the Biodiversity and Conservation SEPP, the proposal, as a public water transport facility, is permissible with consent in the W2 zone. In any case, the development is permissible without development consent pursuant to the provisions of TISEPP which override the zoning provisions of the Biodiversity and Conservation SEPP Chapter 10 (refer section 10.6 of the Biodiversity and Conservation SEPP).

Matters for consideration

The matters for consideration listed in Division 2 at sections 10.18-10.27 of the Biodiversity and Conservation SEPP are provided in Table 4.3.

Table 4.3 Division 2 matters

Division 2 matter	Comment
Section 10.19 Biodiversity, ecology and environment protection	Section 6.2 describes the terrestrial and marine environmental impacts associated with the proposal. With the implementation of the safeguards and management measures, impacts would be minimised and/or managed.
Section 10.20 Public access to, and use of, foreshores and waterways	<p>Construction of the proposal would require a temporary closure of Wharf 2 for about eight weeks. To minimise the impact of this closure, construction would take place outside of the summer peak season.</p> <p>During the closure, vessels would be diverted to Wharf 3 with pedestrian access being via the East Esplanade side.</p> <p>Once work that requires the closure of Wharf 2 has been completed, Wharf 3 would be closed, and Wharf 2 would resume receiving vessels.</p> <p>The local community and ferry passengers would be notified ahead of the commencement of work.</p> <p>Impacts to transport are discussed in sections 6.9 and 6.10.</p>
Section 10.21 Maintenance of a working harbour	<p>The upgrade Manly Wharf 3 would provide Manly visitors with accessible access to a ferry service (and public transport) over the next 50 years.</p> <p>The proposed Manly Wharf 4 has a design life of 20 years and would provide access for smaller vessels.</p>
Section 10.22 Interrelationship of waterway and foreshore uses	The upgrade would allow the social and cultural association of a wharf in this location to be retained, including the relationship it provides for people between the harbour and foreshore.
Section 10.23 Foreshores and waterways scenic quality	<p>The design of the proposal considered impact to foreshore and waterways scenic quality.</p> <p>Visual impacts from the proposal were assessed in a landscape character and visual impact assessment. Several safeguards have been proposed to minimise impacts visual impacts from the proposal.</p> <p>Refer section 6.5 and Appendix E.</p>

Division 2 matter	Comment
Section 10.24 Maintenance, protection and enhancement of views	Section 6.5 describes the landscape character and visual impacts associated with the proposal. The proposal was assessed as having an overall negligible to moderate impacts on surroundings landscape character and negligible to high impact on views. Mitigation measures were proposed to manage impacts to views. Urban design principles would be integrated throughout the detailed design to minimise the impacts.
Section 10.25 Boat storage facilities	There are no boat storage works associated with, or impacted by, the proposal.
Section 10.26 Floating boat platforms	There are no floating boat platforms associated with, or impacted by, the proposal.
Section 10.27 Mooring pens	There are no mooring platforms associated with, or impacted by, the proposal.

Heritage provisions

Part 10.5 of the Biodiversity and Conservation SEPP contains heritage provisions that are to be taken into account with respect of Division 5.1 activities. One Biodiversity and Conservation SEPP listed heritage item, Manly Wharf (item no. 18), is located within the proposal footprint.

Sections 10.52 to 10.55 of the Biodiversity and Conservation SEPP provide for the protection of heritage items and places and require development consent to demolish or move. However, section 10.6(4) states that TISEPP overrides the Biodiversity and Conservation SEPP and as such the proposal is permissible without consent.

Heritage items are discussed further in section 6.1 and section 6.8. The heritage objectives from the Biodiversity and Conservation SEPP in sections 10.51(1) and (2) are considered in Table 4.4.

Table 4.4 Heritage objectives

Objective	Comment
1(a) To conserve the environmental heritage of the land to which this Part applies.	The proposal has been designed to be sympathetic to the area's heritage values and with reference to conservation design principles which were developed using the conservation best practice principles of the Burra Charter and the conservation policies established in the 'Manly Ferry Wharf Conservation Management Plan'.
1(b) To conserve the heritage significance of existing significant fabric, relics, settings and views associated with the heritage significance of heritage items.	The proposal has been designed to preserve the heritage and conservation values of surrounding heritage items. The SOHI and the maritime archaeological assessment concludes that overall, the proposed works would not result in significant impacts.

Objective	Comment
1(c) To ensure that archaeological sites and places of Aboriginal heritage significance are conserved.	As described in section 6.8, the proposal would not impact known archaeological site or places of Aboriginal heritage. The due diligence assessment of the PACHCI prepared for the proposal concluded that the proposed works are unlikely to have an impact on Aboriginal cultural heritage (refer section 6.8).
1(d) To allow for the protection of places which have the potential to have heritage significance but are not identified as heritage items.	Based on the maritime archaeological assessment carried out for the proposal, works that are carried out that disturb the seabed have a medium potential to uncover relics from operation of the Cargo Wharf during 1895 to 1927. Management measures to protect any relics uncovered have been outlined in section 6.1.
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 in 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.

Wetlands Protection

Part 10.6 of the Biodiversity and Conservation SEPP relates to wetlands protection. In Sydney Harbour these include mangroves, seagrasses, saltmarshes, sedgeland, wet meadows and mudflats and the wetlands protection areas cover a 40-metre buffer around these to account for movement, growth and seasonal variation.

Parts of the waterside area of the proposal area is identified as being located within a Wetland Protection Area under the Biodiversity and Conservation SEPP. The vegetation and habitat in the proposal area includes seagrass. The wetlands objectives from the Biodiversity and Conservation SEPP in clause 10.61 are considered in Table 4.5.

Table 4.5 Wetlands objectives

Objective	Comment
<p>(a) To preserve, protect and encourage the restoration and rehabilitation of wetlands.</p>	<p>Dredging and piling works, and demolition of the existing wharf would have a direct impact on the wetland, including loss of:</p> <ul style="list-style-type: none"> • 18 square metres around mixed Halophila and Zostera seagrass • around 48 square metres of macroalgae • additional macroalgae present on 63 piles to be removed • about 406 square metres of subtidal soft sediment. <p>Other potential direct impacts of the proposal to the wetland include (refer section 6.2) impacts to hearing sensitivity or behaviour from underwater noise on marine fauna.</p> <p>Potential indirect impacts to the wetland resulting from changes in vessel scour regimes and shading could include:</p> <ul style="list-style-type: none"> • loss of about 17 square metres of medium density Halophila beneath the new boardwalk, near the arrestor • loss of about 171 square metres of low density Zostera and Halophila seagrass • loss of about 31 square metres of mapped microalgae from within the dredge pocket. <p>These were not considered to substantially impact the aquatic habitat of Manly Cove provided mitigation measures are implemented.</p> <p>The seagrass and macroalgae areas lost from the proposal would be small in comparison to the wider harbour. These species are expected to recolonise areas around the proposal at the completion of construction.</p> <p>Construction of the boardwalk and the gangway would result in shading of seagrasses. This would likely result in some loss of seagrasses although demolition of the existing structures would allow some recolonisation of seagrass into areas of seabed previously shaded or disturbed by vessel scour.</p> <p>Use of FRP surface grating, which would enable some light to penetrate through the proposed Wharf 4 structure, would reduce shading impacts.</p>

Objective	Comment
	<p>Mitigation measures would be implemented to avoid or minimise the mobilisation of fine and coarse debris, and the habitat in the area is currently exposed to substantial scouring from an ambient level of vessel traffic (and propellor wash) at Manly Wharf.</p> <p>With all the above considerations including the implementation of mitigation measures described in Chapter 7, the proposal is unlikely to interfere with the preservation and protection of the wetland and the reinstatement of any lost habitat features, may promote restoration and rehabilitation.</p> <p>Refer to section 6.2 for more information.</p>
(b) To maintain and restore the health and viability of wetlands.	<p>Refer (a).</p> <p>Providing relevant standard controls are implemented and monitored as set out in Transport guidelines and quality assurance specifications (refer Chapter 7), the proposal's environmental impacts during construction are expected to be safeguarded and minimised thus maintaining the health and viability of the wetlands in the local area.</p>
(c) To prevent the fragmentation of wetlands.	<p>The proposal would not impact on the connectivity of Manly Cove, hence, would not cause any additional fragmentation of the Wetland Protection Area.</p>
(d) To preserve the scenic qualities of wetlands.	<p>The overall landscape character and visual impact of the proposal is provided in section 6.5.</p> <p>Impacts to viewpoints range from negligible to high and would be managed through a range of mitigation measures.</p>
(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).	<p>As described above, the proposal preferred design in combination with the proposed safeguards described in Chapter 7 are aimed at protecting the ecological function of the marine environment.</p> <p>The Wetlands Protection Area would continue to provide wetland habitat to flora and fauna and water quality would not be substantially or permanently impacted.</p>

The matters to be considered for works within a wetland protection area from section 10.63(2) of the Biodiversity and Conservation SEPP are considered in Table 4.6.

Table 4.6 Clause 10.63(2) matters

Objective	Comment
<p>(a) The development should have a neutral or beneficial effect on the quality of water entering the waterways.</p>	<p>The proposal would have a neutral effect if relevant standard safeguards in Transport guidelines, quality assurance specifications and this REF are implemented and monitored.</p> <p>The proposal is expected to have manageable, temporary environmental impact on the marine environment and water quality (refer section 6.4).</p>
<p>(b) The environmental effects of the development, including effects on:</p> <p>(i) the growth of native plant communities,</p> <p>(ii) the survival of native wildlife populations,</p> <p>(iii) the provision and quality of habitats for both indigenous and migratory species,</p> <p>(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</p>	<p>Impacts on macroalgae and seagrass are discussed in section 6.2. The seagrass and macroalgae areas lost from the proposal would be small. These species would be expected to recolonise areas around the proposal at the completion of construction.</p> <p>The Wetlands Protection Area in the proposal area is in a highly urbanised area. Disturbance during construction of the proposal would be unlikely to impact the long-term survival of native wildlife populations of commonly occurring species.</p> <p>The proposal would be unlikely to substantially impact threatened species, populations, communities or migratory species.</p> <p>Disturbances to potential habitat during construction would largely be temporary and managed through a range of mitigation measures.</p> <p>There are no aquatic or terrestrial groundwater dependent ecosystems in the biodiversity study area.</p> <p>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 minimal and temporary.</p>

Objective	Comment
(c) Whether adequate safeguards and rehabilitation measures have been, or will be, made to protect the environment.	Chapter 7 sets out the safeguards and management measures to protect the local environment. The chapter also includes post-construction measures, and corrective actions needed during an accident or emergency to manage any impacts.
(d) Whether carrying out the development would be consistent with the principles set out in The NSW Wetlands Management Policy (as published in March 1996 by the then Department of Land and Water Conservation).	<p>The Policy lists five principles for wetland protection (clauses 10.61a-e).</p> <p>A construction environmental management plan (CEMP) would be implemented during construction to minimise impact to shallow habitat. As such, the proposal aims meets the Policy's principles by:</p> <ul style="list-style-type: none"> • avoid and minimise impacts first • mitigate impacts where avoidance is not possible • offset where residual impacts cannot be avoided.
(e) Whether the development adequately preserves and enhances local native vegetation.	The proposal would not remove landside native vegetation.
<p>(f) Whether the development adequately demonstrates:</p> <p>(i) how the direct and indirect impacts of the development will preserve and enhance wetlands,</p> <p>(ii) how the development will preserve and enhance the continuity and integrity of the wetlands,</p> <p>(iii) how soil erosion and siltation will be minimised both while the development is being carried out and after it is completed,</p> <p>(iv) how appropriate on-site measures are to be implemented to ensure that the intertidal zone is kept free from pollutants arising from the development</p>	<p>(i) Section 6.3 and Table 4.5 describes how the proposal has been designed, and environmental safeguards have been proposed, to protect the area in and around the proposal footprint.</p> <p>(ii) Refer Table 4.5</p> <p>(iii) To minimise localised sediment mobilisation during construction, a silt boom, silt curtain and moon pool curtain may be used, while additional erosion management controls for land-based works have been identified in the safeguards and management measures in Chapter 7.</p> <p>(iv) Chapter 7 includes a range of standard pollution management controls that would be implemented and monitored during construction as set out in Transport guidelines and quality assurance specifications. If implemented, then the proposal's environmental impacts on the intertidal zone are expected to be avoided or minimised.</p> <p>(v) The proposed standard pollutant management and sediment disturbance controls included in Chapter 7 would be likely to prevent any nutrient loading into the marine environment.</p> <p>(vi) Refer to Clause 10.63 (2b) in this table.</p>

Objective	Comment
(v) that the nutrient levels in the wetlands do not increase as a consequence of the development, (vi) that stands of vegetation (both terrestrial and aquatic) are protected or rehabilitated, (vii) that the development minimises physical damage to aquatic ecological communities, (viii) that the development does not cause physical damage to aquatic ecological communities.	(vii) The proposal's direct impact to aquatic ecological communities is described in section 6.2. The impact of this on marine communities have been minimised through optioneering and design. (viii) As above
(g) 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 and mitigation measures that Transport, and its contractor(s), would commit to implementing and monitoring during construction to avoid and minimise any impact on the surrounding wetland values.

State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 of the Resilience and Hazards SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, specifying how development proposals are to be assessed if they fall within the coastal zone.

The proposal falls within land identified as coastal use area and coastal environment area under section 2.4(4) and section 2.4(5) of the Resilience and Hazards SEPP.

Section 2.10(3) and section 2.11(2) detail that land that falls within the Foreshores and Waterway Area in the Biodiversity and Conservation SEPP, then Chapter 2 of the Resilience and Hazards SEPP does not apply. As such, the provisions of the Resilience and Hazards SEPP have not been considered further.

4.1.2 Local Environmental Plan

Manly Local Environmental Plan 2013

The landside components of the proposal are located in an unincorporated area adjacent to the Northern Beaches LGA and includes land subject to the *Manly Local Environmental Plan 2013* (Manly LEP).

As the proposal is permitted without consent under the TISEPP, the consent requirements of the Manly LEP do not apply and as such, the proposal would be assessed under Part 5 of the EP&A Act.

4.2 Other relevant NSW legislation

Table 4.7 lists the NSW legislation relevant to the proposal or the land on which the proposal would be built.

Table 4.7 Other relevant NSW legislation

Legislation and application	Relevance to proposal and further requirements
<p>NPW Act: 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.</p>	<p>A Stage 1 PACHCI assessment confirmed that the proposal would be unlikely to harm Aboriginal objects or places (refer Appendix H). An Aboriginal heritage impact permit (AHIP) is not required for the proposal. Section 6.8 provides further details.</p>
<p><i>Heritage Act 1977</i>: 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.</p>	<p>A SOHI has been prepared to assess the potential impacts to listed heritage items and potential archaeological remains as a result of the proposal.</p> <p>The SOHI concluded that because the existing Wharf 3 structure within the Manly Wharf site (SHI No. 4920067) would be demolished, Heritage NSW, Department of Premier and Cabinet must be notified in accordance with s170A (1c) of the <i>Heritage Act 1977</i>.</p> <p>In addition, works carried out within the State heritage curtilage would require approval from the NSW Heritage Council under section 60 of the <i>Heritage Act 1977</i>. The proposal must receive this approval and adherence to any conditions of approval prior to the commencement of works.</p> <p>For works involving excavation (dredging and other seabed disturbance) outside of the State heritage curtilage (refer Figure 6.3) an excavation permit would be required under section 140 of the <i>Heritage Act 1977</i>.</p> <p>Section 6.1 provides further details.</p>
<p><i>Roads Act 1993</i>: 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</p>	<p>The proposal would involve temporary impacts to East Esplanade, a local road managed by Northern Beaches Council.</p> <p>An approval under the <i>Roads Act 1993</i> would be required from Northern Beaches Council for the proposed construction and installation and / or changes of any regulatory traffic control devices.</p> <p>In addition, consultation with Northern Beaches Council would be conducted regarding deliveries through local roads, as required.</p>

Legislation and application	Relevance to proposal and further requirements
<p><i>Fisheries Management Act 1994</i> (FM Act): 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.</p>	<p>Under section 199 of the FM Act, public authorities must give notification to the Minister before a public authority carries out or authorises dredging or reclamation work. Dredging work has been proposed for this proposal.</p> <p>Under Part 7 of the FM Act, a section 205 permit is required if the proposed works involve harm to marine vegetation including mangroves, seagrasses, macroalgae or any other marine vegetation declared by the regulations to be marine vegetation. Seagrasses in the proposal area that may be impacted include <i>Zostera capricorni</i> and <i>Halophila sp.</i> species.</p> <p>Black Rockcod (<i>Epinephelus daemeli</i>), listed as endangered under the FM Act, and the White's Seahorse (<i>Hippocampus whitei</i>), listed as endangered under the FM Act and EPBC Act are also likely to occur in the study area.</p> <p>A BAR assessed the impacts to terrestrial and aquatic biodiversity (refer section 6.2). The BAR includes an impact assessment on threatened species addressing the 7-part test outlined in section 220ZZ (clause 2A) of the FM Act. Based on this assessment no significant impacts are expected.</p> <p>The FM Act protects all <i>sygnathiformes</i> (i.e., Seahorses, Seadragons, Pipefish, Pipehorses, Ghost pipefish and Seamoths).</p> <p>In accordance with section 37 of the FM Act, a permit would be required for the translocation of any <i>sygnathiformes</i> found at the proposal area. The proposal would require this permit in order to relocate syngnathids collected during the targeted pre-clearance survey.</p> <p>Relocation of syngnathids would occur in accordance with the Syngnathid Relocation Plan contained in Appendix K.</p>

Legislation and application	Relevance to proposal and further requirements
<p><i>Biodiversity Conservation Act 2016</i> (BC Act): provides for a strategic approach to conservation in NSW. It includes provisions for 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.</p>	<p>Under the BC Act, an assessment of significance must be completed to determine the significance of impacts to threatened species, populations and/or communities or their habitat.</p> <p>The BAR (refer section 6.2) prepared to support the REF, identified that 17 terrestrial threatened species under the BC Act were considered to have a moderate to high likelihood of occurrence in the study area. However, assessments of significance concluded the proposal is unlikely to significantly impact these threatened species and a Species Impact Statement (SIS) is not required.</p> <p>The proposal does not require further assessment under the BAM.</p> <p>Refer to section 6.2 for further details.</p>
<p><i>Protection of the Environment Operations Act 1997</i>: focuses on environmental protection and provisions for the reduction of water, noise and air pollutions and the storage, treatment and disposal of waste. Introduces licencing provisions for scheduled activities that are of a nature and scale that have potential to cause environmental pollution. Also includes measures to limit pollution and manage waste.</p>	<p>The proposal would not involve undertaking or carrying out a scheduled activity.</p> <p>If standard controls set out in Transport guidelines and quality assurance specification are implemented and monitored, there is unlikely to be any material harm, 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.</p>
<p><i>Marine Pollution Act 2012</i>: sets out provisions to prevent pollution in the marine environment.</p>	<p>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).</p>
<p><i>Ports and Maritime Administration Regulations 2021</i>: requires Harbour Master permissions to alter any structure or disturb the harbour floor within Sydney Port</p>	<p>The proposal is likely to disturb sediment within Sydney Harbour (section 110 of the Regulation).</p> <p>Written permission of the Harbour Master would be requested prior to construction.</p>

Legislation and application	Relevance to proposal and further requirements
<p><i>Marine Safety Act 1998</i> and <i>Marine Safety Regulation 2016</i>: 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 operations, and controls on reckless, dangerous or negligent navigation.</p>	<p>Construction of the proposal would be defined as an aquatic activity under section 18(1) of the <i>Marine Safety Act 1998</i> (i.e., an activity that is conducted in or on any navigable waters and that restricts the availability of those waters for normal use by the public) and would be subject to the licensing requirements of clause 97 of the <i>Marine Safety Regulation</i>.</p> <p>Navigational exclusion zones would be installed while the work is taking place. This would include updating the Port Authority of NSW. Where required, nautical charts would be updated once the wharf is upgraded.</p>
<p><i>Crown Lands Management Act 2016</i>: to provide for the ownership, use and management of the Crown land of New South Wales, to provide clarity concerning the law applicable to Crown land, to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, to provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of NSW, and to provide for the management of Crown land having regard to the principles of Crown land management.</p>	<p>Lot 7011 DP 1074608 includes East Esplanade Park where the compound is proposed to be located. This lot is Crown Land.</p> <p>Consultation should be carried out with NSW Department of Planning and Environment – Crown land to determine the need for any licence or lease.</p>
<p><i>Contaminated Land Management Act 1997</i>: Must report to EPA if contaminated land is encountered during the works that meets the duty to report contamination requirements under section 60 of this Act.</p> <p>Aims to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation under Division 2 of Part 3.</p>	<p>A contamination assessment is provided in section 6.3. The assessment concluded there is a risk of encountering contaminants of potential concern in the sub-surface materials, groundwater and sediment.</p> <p>Safeguards to manage potential impacts from contaminants of potential concern are listed in Chapter 7.</p> <p>If contaminated land is encountered during construction of the proposal this would be reported to the EPA.</p>

Legislation and application	Relevance to proposal and further requirements
<p>The Act aims to set out accountabilities for managing contamination if the EPA considers the contamination is significant enough to require regulation under Division 2 of Part 3.</p>	
<p><i>Biosecurity Act 2015</i>: The object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.</p>	<p>No priority weeds listed under the <i>Biosecurity Act 2015</i> for the Greater Sydney region were recorded in the vegetated areas in the study area.</p> <p>Reporting and managing biosecurity risks in the marine environment is considered a general biosecurity duty under the <i>Biosecurity Act 2015</i>. The marine pest species, <i>Caulerpa</i>, is established within the proposal area. Safeguards are recommended to minimise the spread of <i>Caulerpa</i> as a result of the proposal (refer Table 7.1).</p>

The proposal is mapped as Coastal Use Area and Coastal Environment Area under the Resilience and Hazards SEPP. The Resilience and Hazards SEPP gives effect to the objectives under the *Coastal Management Act 2016*.

Table 4.8 lists the objectives of the *Coastal Management Act 2016* and whether the proposal is consistent with the objectives.

Table 4.8 Coastal Management Act 2016 Clauses 8 and 9 objectives

Objectives	Relevance to proposal
<p>8 (2)(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity</p>	<p>The proposal would not significantly impact on the coastal environmental values and natural processes of coastal waters. Biological diversity and ecosystem integrity are unlikely to be impacted.</p>
<p>8 (2)(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change</p>	<p>The proposal would have a neutral impact to coastal waters and estuaries.</p>
<p>8 (2)(c) to maintain and improve water quality and estuary health</p>	<p>The proposal would maintain the long-term water quality and ecological environment provided the safeguards and management measures in this Chapter 7 of this REF are implemented.</p>

Objectives	Relevance to proposal
8 (2)(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons	Social and cultural values have been considered in the design process by providing safe and equitable access to public transport on coastal waters
8 (2)(e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place	Beaches and dunes would not be impacted by the proposal.
8 (2)(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms	The proposal would have short term impacts to public access to the foreshore, however the proposal would provide long term improvements to access and amenity.
9 (2)(a) to accommodate both urbanised and natural stretches of coastline. (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and	The proposal is appropriate for the location.
(ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and	Heritage impacts have been considered in sections 6.1 and 6.8, and safeguards and management measures are detailed in Chapter 7.
(iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and	Urban design has been considered during the design process.
(iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and	During construction, the proposal would impact users of Manly Wharf and limit access to the area for recreation.
(v) the use of the surf zone is considered	The proposal would not impact the surf zone.
9 (2)(b) to accommodate both urbanised and natural stretches of coastline.	The proposal would retain a coastline similar to the existing environment.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act a referral is required to the Australian Government for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'. These are considered in 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 Climate Change, Energy, the Environment and Water under the EPBC Act.

4.3.2 Disability Discrimination Act 1992

The DDA is the Commonwealth legislation that seeks to provide equity for people with disabilities. The main objectives of the DDA include the elimination, as far as possible, of discrimination against persons on the grounds of disability in relation to access to premises and the provision of facilities and services. The proposal has been designed to respond to the requirements of this Act.

Disability Standards for Accessible Public Transport (DSAPT) 2002

The DSAPT, made under the DDA, prescribes minimum standards of accessibility in relation to both public transport buildings and conveyances to remove discrimination from public transport services. The proposal has been designed to respond to the development standards identified under the DSAPT.

4.3.3 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. There are no active native claims for the Northern Beaches LGA.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a public ferry wharf and is being carried out by or on behalf of a public authority. Under section 2.80(4) of the TISEPP, the proposal is permissible without consent. The proposal is not State significant infrastructure and is subject to environmental impact assessment under Division 5.1 of the EP&A Act.

Accordingly, Transport is the determining authority for the proposal, with this REF fulfilling the obligation under section 5.5 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 for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

A Community and Stakeholder Engagement Plan (CSEP) has been prepared for the proposal consistent with guidance provided in the Transport Stakeholder engagement toolkit and the International Association for Public Participation (IAP2) Spectrum for Public Participation.

The community and stakeholder engagement objectives are to:

- develop open communication channels with key stakeholders and the community.
- raise awareness of the project benefits for the Manly Wharf 3 upgrade, including improved safety for vessels, access for customers with assisted and unassisted mobility needs, increased capacity and facilities for recreational vessels, and travel experience for all customers.
- inform stakeholders and community about the constructability considerations of the Manly Wharf 3 upgrade
- understand local needs and values associated with Manly Cove from businesses, residents, the community, Northern Beaches Council, and other key stakeholders.
- engage with key stakeholders on Aboriginal and non-Aboriginal heritage aspects around Manly Wharf
- engage with the maritime community on the future use of the surrounding Cove.
- engage with NSW DPI Fisheries and NSW Heritage Council.

The CSEP has included consultation on the proposal's early concept design. The *Manly Cove – Manly Wharf 3 Upgrade 'Have Your Say'* (Transport, 2022a) has been prepared to document consultation carried out between 17 December 2021 to 19 January 2022. The outcomes of the 'Have Your Say' are described in the following sections and the consultation report is available on the Transport project website at <https://roads-waterways.transport.nsw.gov.au/projects/manly-cove/index.html>.

5.2 Community involvement

The community and stakeholders were invited to provide feedback on the proposal's concept design between 15 December 2021 to 28 January 2022.

The purpose of the consultation was to:

- inform community and stakeholders of the proposed concept design
- obtain feedback from the community on the proposal
- build a database of community members interested in the proposal so they could be engaged with while the proposal progresses
- consider all feedback and provide responses.

Community members and stakeholders were encouraged to provide feedback and comments via phone, email, online, postal mail, or in person at community drop-by sessions. Meetings were also held with key stakeholders such as recreational boating associations, Transdev Sydney Ferries, commercial vessel and private ferry operators.

As part of this consultation campaign, four community drop-by sessions were held with COVID-19 measures in place as advised by NSW health guidelines at the time.

A Consultation Summary Report (Transport, 2022a) was prepared outlining the engagement activities carried out during this period for Transport’s proposals in Manly Cove, one of which includes the Manly Wharf 3 Upgrade. The report also summarised the feedback received by the community and stakeholders. Two hundred comments were received during this consultation period.

The key themes specifically raised about the proposed Wharf 3 upgrade included:

- general support for the proposed upgrade of Wharf 3 and accessibility improvements
- considerations that may be integrated into the proposed design
- concern about potential impacts to biodiversity and requests that any environmental assessment should consider and assess the impacts to aquatic ecology around Manly Cove
- creation of an opportunity to share the Aboriginal and non-Aboriginal heritage of the area
- support for recreational berthing at Manly Wharf 3 and the consideration of providing a facility to allow small boats to be able to pick up and drop off passengers
- possible impacts to existing facilities near Wharf 3 and impacts to businesses and lessees.

The Consultation Summary Report is available online at <https://roads-waterways.transport.nsw.gov.au/projects/manly-cove/index.html>. The key issues raised by community and stakeholders on the Manly Wharf 3 proposal are listed in Table 5.1, along with a response and where the issue has been addressed in the REF.

Table 5.1 Summary of issues raised by the community

Issue raised	Response/where addressed in REF
The design should include improved public amenities and better access to the wharves for mobile and less-mobile people	<ul style="list-style-type: none"> • The design includes amenities such as sheltered and unsheltered seating in the main waiting area and the promenade ‘slow space’. • The new main waiting area would also feature seating, including accessible waiting options, such as benches with armrests that are compliant with the DDA, and wheelchair waiting spaces. The design provides space for mobile ticketing facilities and allows space for any future installation of fixed location Opal readers. <p>Refer Chapter 3.</p>

Issue raised	Response/where addressed in REF
<p>The design should consider access for smaller recreational vessels including yachts</p>	<ul style="list-style-type: none"> • Manly Wharf 3 would be used primarily for commercial commuter services, under the wharf booking system, and would provide drop off and pick up support for charter vessels, cruises, and other commercial recreational activity vessels (such as whale watching). • Following community feedback, a proposed Wharf 4 was included in the design to allow for safe drop-off and pick-up for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels. This would be built when funding becomes available. <p>Refer Chapter 3.</p>
<p>Concern about business impacts from loss of commercial moorings.</p>	<ul style="list-style-type: none"> • Impacts to water transport, including moorings, are discussed in section 6.9.
<p>Concern about biodiversity impact, including impacts on Little Penguins, seagrass and marine life.</p>	<ul style="list-style-type: none"> • Biodiversity matters have been considered in the design and construction program for the proposal. • The BAR prepared for the proposal included an aquatic field survey and provided an assessment of impacts on the identified species and marine life. The BAR concluded the proposal is unlikely to significantly impact biodiversity matters. <p>Refer section 6.2 and Appendix J.</p>
<p>Design and division of services between Wharf 3 and the proposed Wharf 4 should consider varying vessel sizes and efficient vessel organisation</p>	<ul style="list-style-type: none"> • The new design of Wharf 3 would provide access to all vessels except for the Freshwater class of ferries. • The proposed Wharf 4 tidal steps and access ramps would allow vessels at a range of sizes, under 1.5 metres in draft and 24 metres length, to berth. • A maritime traffic management plan would be developed and implemented to ensure safety of all wharf and foreshore users <p>Refer Chapter 3.</p>

Issue raised	Response/where addressed in REF
Concern about impacts on traffic and parking around Manly Wharf	<ul style="list-style-type: none"> A traffic impact assessment has been prepared for the proposal. The traffic impact assessment concluded the proposal is unlikely to have significant impacts on the surrounding road network. <p>Refer section 6.10 and Appendix G.</p>
Concern around impacts to surrounding land users, including the Supball courts on East Esplanade Beach	<ul style="list-style-type: none"> Impacts to surrounding land users have been assessed in this REF. Safeguards have been proposed to reduce potential impacts to visual amenity, noise, air quality and land transport and parking. <p>Refer sections 6.11, 6.5, 6.6, 6.12, and 6.10 as well as Appendix F.</p>
Concern regarding the use of government funding to upgrade a wharf that would be used by private vessels	<ul style="list-style-type: none"> Private vessels operate public transport services from Wharf 3. Wharf 3 requires upgrading to ensure these services are accessible for less-mobile passengers. <p>Refer Chapter 2.</p>
Request that safety and security be considered in the proposal's design	<ul style="list-style-type: none"> The proposal includes an upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required. The proposal would include Crime Prevention through Environmental Design (CPTED) design features. <p>Refer section 6.14.</p>
Sustainability should be considered in the design of the proposal and sourcing of materials	<ul style="list-style-type: none"> As the design for the project progresses, a wide range of sustainable materials and finishes and opportunities would be considered while ensuring the final proposal considers maintenance, durability and lifespan implications. <p>Refer section 6.16.</p>
The proposal should be "future proofed" and consider growing populations	<ul style="list-style-type: none"> When designing Wharf 3, consideration was given to the future use of the wharf. Wharf 3 was designed to meet the predicted 2056 vessel and passenger demand. The key elements of the wharf are designed to last for 50 years, and a climate change risk assessment was carried out to inform design requirements to accommodate predicted sea level rise. <p>Refer sections 2.3, 6.15 and 6.16.</p>

Issue raised	Response/where addressed in REF
<p>Concern that the concept design is 'bulky' and should be further refined to reduce visual and heritage impacts</p>	<ul style="list-style-type: none"> • The design principles used for the proposal considered visual and heritage impacts as well as efficiency and customer amenity. For example, following stakeholder feedback the roof shelters and main roof canopy were reduced in size to minimise visual impacts from the proposal. • Heritage impacts from the proposal were assessed in a SOHI. The SOHI concluded that the proposed works would result in a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and Wharves 1 and 2) and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures. • Aboriginal heritage has been considered during the development of the design through the <i>Connecting to Country Framework</i> (NSW Government, 2020). The proposal is unlikely to impact on Aboriginal heritage and would likely have a positive impact through the inclusion of Aboriginal cultural heritage as a part of the design. • Visual impacts from the proposal were assessed in a landscape character and visual impact assessment. Several safeguards have been proposed to minimise visual impacts from the proposal. <p>Refer sections 2.3, 6.1, 6.8, and 6.5, and Appendix E, Appendix H and Appendix I.</p>
<p>Construction should be limited during peak summer periods and minimise impacts to ferry services</p>	<ul style="list-style-type: none"> • Construction work would likely occur outside of the peak summer season to reduce impact to ferry customers and the local community when the Manly precinct is at its busiest. • Access arrangements to the Manly wharves during construction are discussed in section 3.3. • Either Wharf 2 or Wharf 3 would be open throughout construction to minimise impacts to vessel traffic. <p>Refer Chapter 3.</p>

Issue raised	Response/where addressed in REF
<p>The proposal should include shelter for sun safety, however, impacts to viewpoints should be considered in their design.</p>	<ul style="list-style-type: none"> • The proposal design includes sheltered seating in the main waiting area. Following stakeholder feedback, the roof shelters and main roof canopy were reduced in size, and the gangway roof was removed, to minimise visual impacts from the proposal. • A landscape character and visual impact assessment has been developed as part of the proposal. This assessment includes potential impacts to viewpoints. A number of safeguards have been proposed to reduce impacts on visual amenity. <p>Refer section 6.5 and Appendix E.</p>
<p>The proposal should consider how swimmers using the wharves would be controlled.</p>	<ul style="list-style-type: none"> • Swimming from the new wharves would not be allowed as this would be unsafe. ‘No swimming’ signage would be installed to inform community members. <p>Refer section 6.14.</p>
<p>Ticketing systems need to be placed strategically and consider pedestrian congestion around the wharves.</p>	<ul style="list-style-type: none"> • The proposal includes a service pod for ticketing and customer information screen within the main waiting area. • Boarding of vessels would occur via the hydraulic platform at Wharf 3 and tidal steps at the proposed Wharf 4. <p>Refer Chapter 3.</p>
<p>The proposal has the potential to impact business and lessees at Manly Wharf due to changes in amenity and visual impact</p>	<ul style="list-style-type: none"> • The design principles used for the proposal considered visual impacts and customer amenity. • Following stakeholder feedback, the small roof shelters were removed, the main roof canopy was reduced in size and the gangway roof was removed to minimise visual impacts from the proposal. • Refer sections 6.5, 6.11, and Appendix E and Appendix F.
<p>Request for items outside the scope of works for Manly Wharf 3.</p>	<p>The proposed Manly Wharf 3 upgrade is an initiative to provide a better experience for public transport customers.</p> <p>The primary purpose of the upgrade is so the wharf is accessible from a compliance perspective for all customers.</p> <p>Other items outside of the accessibility upgrade are out of scope.</p>

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, RMS, 2011). The PACHCI is outlined in Table 5.2.

Stage 1 of the PACHCI process was completed for the proposal by the Transport Aboriginal Cultural Heritage Officer, which confirmed that there is unlikely to be any impact on Aboriginal cultural heritage (refer section 6.8, and Appendix H).

An Aboriginal heritage impact permit (AHIP) under the *National Parks and Wildlife Act 1974* is not needed for the proposal.

Table 5.2 Summary of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial Transport assessment
Stage 2	Site survey and further assessment
Stage 3	Formal consultation and preparation of a cultural heritage assessment report
Stage 4	Implement environmental impact assessment recommendations

Consultation meetings with the Metropolitan Local Aboriginal Land Council (MLALC) were run from the end of July 2021 to late November 2022. Table 5.3 summaries the issues that were raised by MALC.

Table 5.3 Issues raised through MALC consultation

Agency	Issue raised	Response/where addressed in REF
MLALC	Transport should continue to engage with recognised representatives of Aboriginal groups throughout the project, to enable ongoing involvement of the Aboriginal community.	Transport has worked with the Aboriginal community to identify opportunities to enable ongoing involvement, and to incorporate Aboriginal culture and language into the design of the proposal.

Engagement with the Aboriginal community was continued through a Connecting with Country approach. The Connecting with Country approach involved engagement with the Aboriginal community to incorporate cultural values of Gayemagal people into the proposal concept design. This process led to the opportunities being identified for inclusion of indigenous and coastal motifs into the design of the extended promenade, as described in section 3.2.

5.4 Transport and Infrastructure SEPP consultation

Appendix B contains a Transport and Infrastructure SEPP (TISEPP) consultation checklist that documents how TISEPP consultation requirements have been considered.

This proposal triggers the notification requirements with Northern Beaches Council under sections 2.10, 2.11 and 2.14 as the proposal would:

- involve the installation of a temporary structure on, or the enclosing of, a public place
- result in 'more than minor or inconsequential' impacts to Manly Wharf (LEP: I145 and I146)
- occur on land within the coastal zone.

A formal TISEPP letter for the proposal was issued on 26 July 2022 to Northern Beaches Council. No response to this letter was received.

Transport has been consulting with Northern Beaches Council since July 2021 to develop a design with consideration of their feedback as outlined in section 5.5.

5.5 Government agency involvement

Various government agencies were consulted about the proposal during the development of the concept design, including:

- Northern Beaches Council
- NSW DPI Fisheries
- Heritage Council NSW.

DPI Fisheries were provided the opportunity to review specialist assessment reports for Biodiversity (Appendix J) and the Syngnathid Relocation Plan (Appendix K). DPI Fisheries feedback on these reports are outlined in Table 5.4. Issues that have been raised as a result of consultation with all these agencies and stakeholders are also outlined in Table 5.4.

Table 5.4 Issues raised through stakeholder consultation

Agency	Issue raised	Response/where addressed in REF
Northern Beaches Council	Request that ongoing operational and maintenance costs of the new wharf remain a responsibility of Transport	<ul style="list-style-type: none"> • Transport regularly cleans, maintains and meets the operational costs of the wharf under an existing wharf maintenance contract. This would continue for the proposed wharves.
	Request that the proposal integrates with other transport modes in the area	<ul style="list-style-type: none"> • The proposal is aimed at improving the Manly Wharf to provide a better experience for public transport customers. • The proposal would be connected to surrounding modes of transport including buses, footpaths and bicycle areas. The accessible path from Wharf 3 to the other modes of transport would be via the main Manly Wharf interchange. <p>Refer Chapter 2.</p>
	Request that security and crime prevention be considered in the design	<ul style="list-style-type: none"> • The proposal includes an upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required. • A Crime Prevention Through Environmental Design (CPTED) assessment would be completed for the proposal to consider crime prevention further within the detailed design. <p>Refer Chapter 3.</p>

Agency	Issue raised	Response/where addressed in REF
	Additional approvals will be needed by the proposal on the presence and location of 'seahorse hotels'	<ul style="list-style-type: none"> • The BAR prepared for the proposal included an aquatic field survey and provided an assessment of impacts on aquatic biota, including seahorses. • Relocation of seahorse and other syngnathids would occur in accordance with a Syngnathid Relocation Plan approved by NSW DPI Fisheries provided in Appendix K. • This plan provides a legislative context for the syngnathid relocation and provides the required approval processes to be followed. • Under this plan, safeguards and management measures would be put into place so that if syngnathids are found they would be relocated and placed in seahorse hotel in a nominated area west of the wharf complex prior to the commencement of construction. • In accordance with section 37 of the FM Act, a permit would be required for the translocation of any <i>syngnathiformes</i> found at the proposal area. Translocation would be carried out by a DPI Fisheries pre-qualified organisation. <p>Refer section 6.2 and Appendix K.</p>
	Concern about marine biodiversity impacts of the proposal and the need for them to be adequately assessed	<ul style="list-style-type: none"> • Biodiversity considerations have been integrated into the design and construction programs of the proposal to reduce impacts on biodiversity. • The BAR prepared for the proposal included an aquatic field survey and provided an assessment of impacts on biodiversity including underwater noise. The BAR concluded the proposal is unlikely to significantly impact biodiversity matters. • The BAR has been prepared in accordance with relevant legislation, policies and guidelines.

Agency	Issue raised	Response/where addressed in REF
		Refer sections 6.2 and 6.7, and Appendix J.
	The heritage value of the Manly area needs to be considered by the proposal	<ul style="list-style-type: none"> • A SOHI has been prepared for the proposal. The SOHI has assessed the heritage value of the area and potential impacts from the proposal. A separate maritime archaeological assessment was also prepared. • A section 60 permit would be required for the proposal for works undertaken on an item listed on the State Heritage Register under the <i>Heritage Act 1977</i>. • For works involving excavation (dredging and other seabed disturbance) outside of the State heritage curtilage (refer Figure 6.3) an excavation permit would be required under section 140 of the <i>Heritage Act 1977</i>. • Stage 1 of the PACHCI process was completed for the proposal by the Transport Aboriginal Cultural Heritage Officer. This process confirmed that there is unlikely to be any impact on Aboriginal cultural heritage. <p>Refer sections 6.1 and 6.8, Appendix H and Appendix I.</p>
	Proposal should consider and consult with the local Indigenous community.	<ul style="list-style-type: none"> • MLALC are regularly engaged as part of the proposal's Aboriginal community involvement. • A Connecting with Country approach is being used to include cultural values of the Gayemagal I people into the proposed concept design. • Impacts to Aboriginal heritage were considered through the PACHCI process. <p>Refer sections 5.3 and 6.8, and Appendix H.</p>

Agency	Issue raised	Response/where addressed in REF
Heritage Council NSW	Ongoing involvement in the development of the design	Heritage Council NSW has been consulted on, and informed about, the proposal's concept design. Heritage NSW Council NSW would continue to be consulted as the detailed design develops.
NSW DPI Fisheries	Requested impacts to seagrasses be considered in the REF	<ul style="list-style-type: none"> • Impacts to seagrass was considered throughout the design process leading to a reduced impact area and use of Fibre Reinforced Polymer (FRP) to allow sunlight to penetrate to the water. • Other impacts to seagrasses have been assessed in the BAR. <p>Refer section 2, section 6.3, and Appendix J.</p>
	Raised that construction activities may mobilise sediments causing impacts to marine vegetation.	<ul style="list-style-type: none"> • Impacts to marine vegetation from construction are assessed in the BAR. • Dredging is unlikely to cause significant impacts to marine vegetation outside of the dredging footprint. <p>Refer section 6.3 and Appendix J.</p>
	<p>Highlighted that demolition of the existing wharf structure would result in a direct loss of seahorse habitat, and it may take at least a year for the new wharf structures to be encrusted with enough organisms to act as appropriate substitute habitat.</p> <p>To mitigate the temporary loss of seahorse habitat, NSW DPI Fisheries recommended seahorse hotels be installed near to the Manly Wharf, but outside the zone of disturbance from the works.</p>	<ul style="list-style-type: none"> • Impacts to syngnathids are assessed in the BAR. • Relocation of syngnathids would occur in accordance with the Syngnathid Relocation Plan provided in Appendix K. • Section 6.3 includes a mitigation measure that requires the Syngnathid Relocation Plan to be updated to address NSW DPI Fisheries recommendations. <p>Refer section 6.2 and Appendix K.</p>

Agency	Issue raised	Response/where addressed in REF
	<p>Loss of seagrass through dredging or other construction impacts would need to be offset at a ratio of 2:1.</p> <p>The preferred offset option would be to install an environmentally friendly mooring within an existing mooring scar. However, if this option was found not to be feasible, then loss of seagrass could be offset via monetary compensation at a rate of \$113.50 per square metre.</p>	<ul style="list-style-type: none"> • Offsets for the proposal are discussed in section 6.2.5. • Offsets would be calculated in accordance with NSW DPI Fisheries advice. <p>Refer to section 6.2 and Appendix J.</p>
	<p>NSW DPI Fisheries noted no <i>Posidonia australis</i> is proposed to be harmed by the proposal and noted that the CEMP would need to include measures to protect <i>Posidonia australis</i>.</p>	<ul style="list-style-type: none"> • Mitigation measures regarding protection of endangered flora and fauna, including <i>Posidonia australis</i>, are included in Table 6.9. <p>Refer to section 6.2 and Appendix J.</p>
	<p>Requested more information regarding manoeuvring of vessels and control measures to ensure no scour of <i>Posidonia australis</i> occurs.</p>	<ul style="list-style-type: none"> • Scour from manoeuvring of vessels, and potential subsequent impacts to seagrass, is discussed in sections 6.2 and 6.3. <p>Refer sections 6.2 and 6.3, and Appendix J.</p>

5.6 Ongoing or future consultation

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

A submissions report will be published responding to the comments received. Transport will notify those who made submissions and distribute a community update. The update will summarise the submissions report process and the actions Transport took to address these comments. Transport will also meet with affected residents, businesses and other stakeholders, as required.

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP, 1995/1996) and as required under section 171(1) of the Environmental Planning and Assessment Regulation 2021 and the *Marinas and Related Facilities EIS Guideline* (DUAP, 1996). The factors specified in section 171(2) of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.

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

6.1 Non-Aboriginal heritage

This section summarises the non-Aboriginal heritage impacts including maritime heritage associated with the proposal. Appendix I contains the SOHI prepared by Artefact (Artefact 2022) and the *Maritime Archaeological Assessment* prepared by Comber (Comber 2022).

6.1.1 Methodology

Statement of heritage impact

A statement of heritage impact (SOHI) was prepared in accordance with the guidelines outlined by the former Heritage Office, now Heritage NSW, Department of Premier and Cabinet (Heritage NSW, DPC), and Department of Urban Affairs and Planning in the document *Statements of Heritage Impact as part of the NSW Heritage Manual*. The SOHI was prepared in accordance with the principles contained in the most recent edition of *The Burra Charter: The Australian ICOMOS Charter for Places of Cultural Significance*.

The term 'subject site' was used for the SOHI to refer to the broader heritage-listed Manly Wharf precinct, shown in Figure 6.2, comprising of Lots 1, 2 and 3 of DP 1170245 and formed the study area of the assessment.

Heritage listed items within or in the vicinity of the proposal area were identified through a search of the relevant state and federal statutory and non-statutory registers including:

- World Heritage List (WHL)
- Commonwealth Heritage List (CHL)
- National Heritage List (NHL)
- State Heritage Register (SHR)
- Manly LEP
- Section 170 Heritage and Conservation Registers
- Register of the National Estate (RNE)
- Documentation and Conservation of buildings, sites and neighbourhoods of the Modernist Movement (DOCOMOMO)

- Australian Institute of Architects Register of Significant Architecture
- The National Trust (NSW)
- Australasian Underwater Cultural Heritage Database.

A site inspection was conducted on 7 September 2021. The aim of the site inspection was to identify any potential impacts on the heritage significance of Manly Wharf as a result of the proposal. The inspection was carried out of foot and a photographic record was made.

Assessment of heritage impact

The SOHI identifies impacts as the following:

- direct impacts, resulting from works located within the boundaries of the heritage item
- potential direct impacts resulting from increased noise, vibrations and construction works located outside the boundaries of the heritage item
- indirect impacts, resulting in changes to the setting or views from the proposed works outside the boundary of the heritage item
- archaeological impacts to potential archaeological remains located within the boundaries of the heritage item.

Specific terminology and corresponding definitions (refer to Table 6.1) are used in this assessment to identify the magnitude of the proposal’s direct, indirect or potentially direct impacts on the subject site. Impacts to heritage items near the subject site were assessed qualitatively.

Table 6.1 Definition of the magnitude of impacts used in the assessment

Magnitude	Definition
Major adverse	Actions that would have a severe, long-term and possibly irreversible impact on a heritage item. Actions in this category would include partial or complete demolition of a heritage item or addition of new structures in its vicinity that destroy the visual setting of the item. These actions cannot be fully mitigated.
Moderate adverse	Actions that would have an adverse impact on a heritage item. Actions in this category would include removal of an important part of a heritage item’s setting or temporary removal of significant elements or fabric. The impact of these actions could be reduced through appropriate mitigation measures.
Minor adverse	Actions that would have a minor adverse impact on a heritage item. This may be the result of the action affecting only a small part of the place or a distant/small part of the setting of a heritage place. The action may also be temporary and/or reversible.
Little or no	Actions that are so minor that the heritage impact is considered negligible.
Minor positive	Actions that would bring a minor benefit to a heritage item, such as an improvement in the item’s visual setting.

Magnitude	Definition
Moderate positive	Actions that would bring a moderate benefit to a heritage item, such as removal of intrusive elements or fabric or a substantial improvement to the item's visual setting.
Major positive	Actions that would bring a major benefit to a heritage item, such as reconstruction of significant fabric, removal of substantial intrusive elements/fabric or reinstatement of an item's visual setting or curtilage.

The methodology for the assessment of visual impacts, vibration impacts and archaeological impacts are provided in Appendix E, Appendix C and Appendix I.

Maritime archaeology

Assessment of the maritime archaeological heritage was carried out by Comber Consultants for the proposal (Comber 2022). Assessment of significance was carried out using criteria developed by NSW Heritage and in accordance with the guidelines provided by the *Burra Charter*.

A specific 'study area' was used for the maritime archaeological assessment which focused on the proposed dredged pocket and areas of where works may disturb the seabed, such as piling works. Potential area of seabed disturbance area shown in Figure 6.1.

The maritime archaeological heritage assessment identifies archaeological potential as the likelihood of a site to contain:

- Archaeological deposits that are protected by the relic's provisions of the *Heritage Act 1977*
- Aboriginal objects protected under the provisions of the NPW Act.

The level of archaeological potential is assessed as low, medium and high, defined as follows:

- High: indicates that there is a high probability that the archaeological remains of a structure or structures are reasonably intact as there have been little or no impact following the demolition of the known structures.
- Medium: indicates that there is a medium probability that the archaeological deposits or remains of a structure are partially or mostly intact but there has been some impact on its integrity through later development.
- Low: indicates that there is a low probability that the archaeological remains survive as there have been extensive impacts by known later development or works.

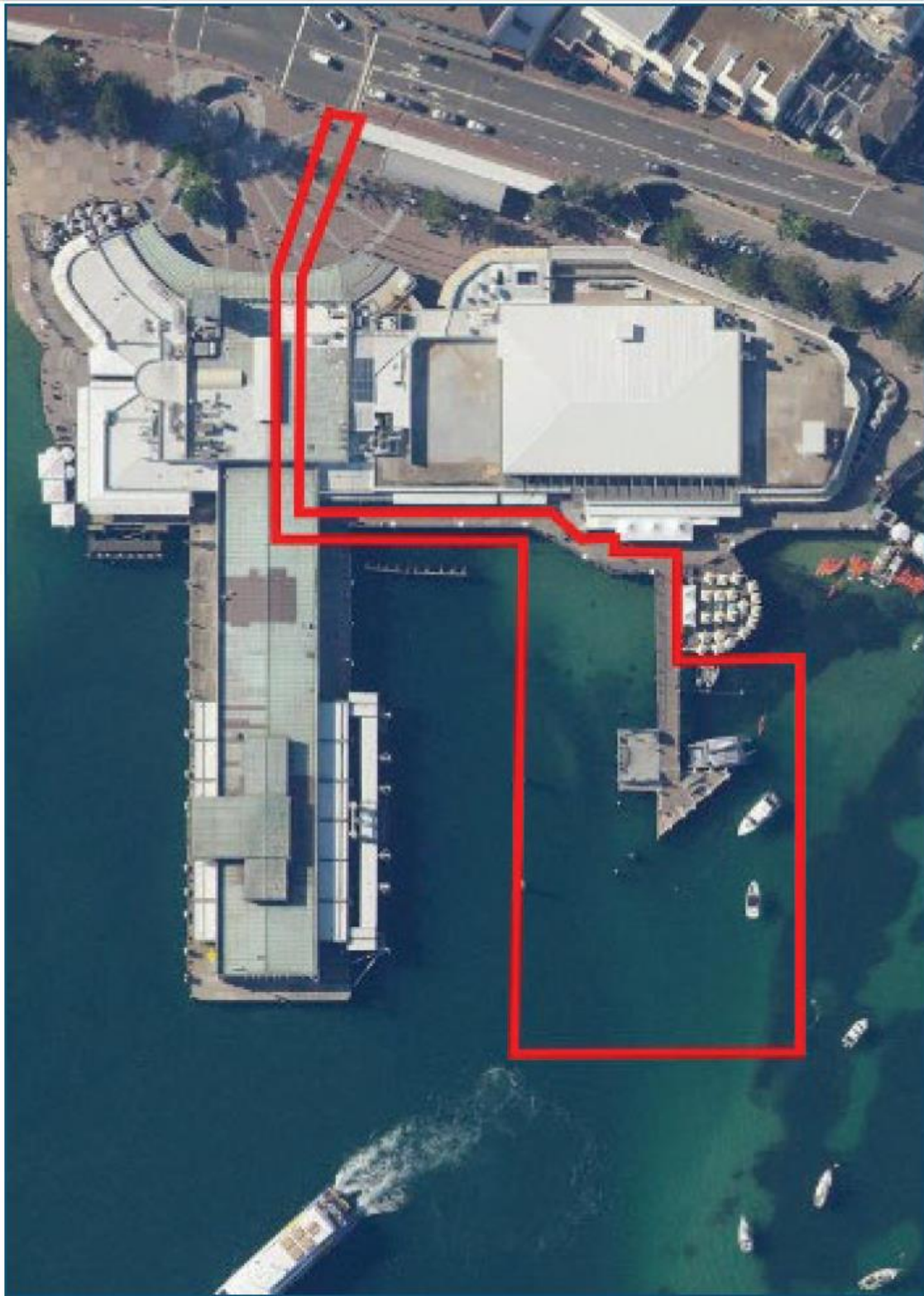


Figure 6.1 Maritime archaeology study area

The assessment involved a desktop study of available historical records and supplied bathymetric and survey data.

6.1.2 Existing environment

The following description of the existing non-Aboriginal heritage environment is a summary of information presented in the SOHI and the Maritime Archaeological Assessment. In addition to this, the description of key physical and cultural values of Manly Wharf are drawn from the Manly Ferry Wharf Conservation Management Plan (Architectural Projects, 2011).

Aboriginal history

Historical records report that at the time of European settlement, Manly Cove was formed as part of the Gayamaygal clan's area (also referred to as Kai'yamaygal, Gayamaygal, Gamaragal or Cameragal). Early European records indicate several place names relating to North Head as Boree (Bora) and Car-rang-gel (Garungal/ Carrangle).

The Sydney region has been inhabited by Aboriginal people for tens of thousands of years. The Gayamaygal people are the traditional custodians of this land and are part of the oldest surviving continuous culture in the world.

At North Head, there is considerable evidence of long and enduring Aboriginal history. There are at least thirty-five Aboriginal places present on the head, including rock engravings, rock shelters with art or artefact deposits, camp sites, middens, and burials. Most of the sites are concentrated on the western, harbour side of the heads, which is sheltered, littered with coves and beaches, and closer to fresh water sources.

Further description of Aboriginal cultural heritage is provided in section 6.8.

Manly Wharves 1 and 2

The first wharf at Manly was constructed in 1856 on the same site as the present wharf (Wharves 1 and 2). It is documented that the wharf was built by English-born merchant, Henry Gilbert Smith, who bought the land in 1853. Smith had an interest in steam ferries serving the locality. Other notable buildings by Smith included a house known as 'Fairlight', cottages, church, school pleasure grounds and swimming baths. He also is known to have been involved in the planting of the Norfolk Island pines on the ocean front.

Improvements were made to the wharf in the early 20th century which later made way for a new wharf constructed by the Maritime Services Board during 1938. A fire occurred in 1939 which led to major reconstruction of the wharves at Manly and Circular Quay.

Wharves 1 and 2 were designed in a modern style characteristic of marine transport featuring geometric shapes such as the bayed façade to the water, clock tower and a wide arc plan to the entrance designed as a tram terminus and turning area.

Manly Fun Pier/ Manly Amusement Pier

Manly Fun Pier was located where Manly Pier (Wharf 3) is currently located. It was originally used as a cargo wharf during the 1850s until 1927. It was reopened as Manly Amusement Pier in 1931 and underwent a number of renovations until it was eventually demolished in the late 1980s which made way for the extension to the east and redevelopment of the passenger wharf in 1989 which included the construction of the present-day Wharf 3.

The most recent substantial redevelopment of the wharf was in 2000. This redevelopment involved demolishing the Manly Fun Pier and extending the wharf to create the current day Wharf 3. Retail, food, and beverage outlets were added, as well as a public boardwalk connecting Wharf 3 to the existing Wharves 1 and 2.

Manly Wharf

Manly Wharf consists of two buildings which include the passenger ferry wharf (Wharves 1 and 2) on the eastern side and Manly Pier (Wharf 3) on the eastern side and are linked by a public boardwalk.

Its geometric design is described as characteristic of a 1940s style with a strong maritime feel and has retained elements of the original shopfitting and signage.

The NSW Heritage Branch State Heritage Inventory describes Manly Wharf as “a dominant feature of Manly Cove viewed from the harbour approaches, from the harbour beach and from the main cross streets of Manly which conjoin at the terminus.”

Wharves 1 and 2 were constructed in 1941. The Manly Wharf superstructure is constructed of steel and timber on a concrete platform supported on timber and concrete piers.

The public promenade, retail area and boardwalk which links Wharves and 2 with Wharf 3 is of a mixture of concrete and timber framed construction.

The retail and food arcade and underground carpark have a predominantly concrete structure; with concrete piers and retaining walls, and a concrete frame.

Marine heritage

A search of the Australasian Underwater Cultural Heritage Database on 28 July 2022 did not identify recorded shipwrecks or other underwater artefacts within the proposal area.

The marine archaeological assessment (Comber 2022) concluded there is potential for artefacts of State and/or local significance to be present in the maritime archaeology study area that provides evidence of Manly’s early history. This includes its association with Henry Gilbert Smith and subsequent development of ferry services, the cargo wharf, and the Fun Pier. However, there is low archaeological potential for evidence of the period up to 1895. While there is medium to high archaeological potential for evidence of the amusement pier phase of the wharf, this would be of low archaeological significance.

There is potential for the study area to contain items that are of archaeological significance in the form of structural remains of the cargo wharf from 1895 until 1927, artefacts related to the workers on the wharf, wharf equipment and personal items associated with the wharf workers and the crews vessels berthing at the wharf. Depending on what artefacts may be recovered through archaeological excavation, such items may meet the threshold of State or local heritage significance under the criterion for historical, association, social, research, rarity and representative values.

Listed heritage items

Table 2.2 lists the statutory heritage items located within 800 metres of the proposal footprint. Figure 6.2 presents the location of statutory items located within 100 metres of the proposal footprint.

The SOHI did not report any items listed on the world heritage list, national heritage list or Commonwealth heritage list within 800 metres of the proposal footprint. There are no maritime heritage items listed within the proposal area.

A search of all relevant non-statutory listed items and conservation areas was conducted. This search found three items listed on non-statutory registers within the Manly Wharf vicinity. Two of these listings were for Manly Wharf on both the DOCOMOO and the National Trust. The other listing was for the Manly Urban Conservation Area which is also included in the National Trust.

Table 6.2 List of heritage items within 800 metres of the proposal

Item	Address	Significance	Listing	Distance from proposal footprint
Manly Wharf	West Esplanade, Manly, NSW, 2095	State	SHR #01434	Within
Manly Wharf	West Esplanade, Manly, NSW, 2095	State	Biodiversity and Conservation SEPP 26 Sch.4, Item 18	Within
Manly Wharf (façade and street returns only)	West Esplanade, Manly, NSW, 2095	State	RMS S170 #4920067	Within
Manly Wharf	East and West Esplanades, Manly, NSW, 2095	State	Manly LEP #I145	Within
Pier (former Fun Pier, Manly Wharf)	East and West Esplanades, Manly, NSW, 2095	Local	Manly LEP #I146	Within
Park/ Reserve	East Esplanade, Manly, NSW, 2095	Local	Manly LEP #I143	Adjacent
Park	West Esplanade, Manly, NSW, 2095	Local	Manly LEP #I251	Adjacent
Harbour Foreshores	Manly municipal area boundary adjacent to the Harbour	Local	Manly LEP #I1	Adjacent

Item	Address	Significance	Listing	Distance from proposal footprint
Governor Phillip Monument	West Esplanade, Manly, NSW, 2095	Local	Manly LEP #I248	30 m
Manly Town Centre Heritage Conservation Area	East and West Esplanades, Manly, NSW, 2095	Local	Manly LEP C2	40 m
Street Trees	Wentworth Street, Manly, NSW, 2095	Local	Manly LEP #I246	60 m
Two terrace houses	41–42 East Esplanade, Manly, NSW, 2095	Local	Manly LEP #I150	65 m
Group of commercial buildings	The Corso, Manly, NSW, 2095	Local	Manly LEP #I106	<100 m
Street Trees	The Corso (from Whistler Street to Sydney Road), Manly, NSW, 2095	Local	Manly LEP #I104	<100 m
2 cast iron pedestals (former street lights)	The Corso (central reservation, between The Esplanade and Darley Road), Manly, NSW, 2095	Local	Manly LEP #I102	<100 m
Monument – war memorial (cenotaph)	The Corso, Manly, NSW, 2095	Local	Manly LEP #I103	100 m

Item	Address	Significance	Listing	Distance from proposal footprint
Civic buildings – Council Town Hall Administration building, police station and courthouse	1-3 Belgrave Street, Manly, NSW, 2095	Local	Manly LEP #I82	180 m
Monument – memorial (broken fountain)	East Esplanade (East Esplanade Park), Manly, NSW, 2095	Local	Manly LEP #I144	220 m
Manly Rowing, Sailing, Yacht and Launch Club	East Esplanade, Manly, NSW, 2095	Local	Manly LEP #I142	230 m
Manly Cove Pavilion	West Esplanade, Manly, NSW, 2095	Local	Manly LEP #I249	250 m
Esplanade Park and Fairlight Pool	Fairlight Foreshore, North Harbour, Manly, NSW, 2095	Local	Manly LEP #I149	800 m



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Source: Artefact 2022

Figure 6.2 Listed heritage items in the vicinity of the proposal

6.1.3 Potential impacts

Construction

Direct impacts to heritage items

The proposed works would have a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and Wharves 1 and 2) and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures.

The proposed works would:

- make the precinct more easily accessible
- increase the amount of public domain and seating space encouraging more people to swell within the Manly Wharf area
- retain all existing significant fabric
- retain the existing commercial uses within the wharf
- future proof the wharf by increasing its functional capacity for vessels and passengers.

As the proposed works have been designed to be sympathetic in design and scale with the existing Manly Wharf, they would result in a moderate positive impact to the significance of the site. The works would also ensure that Wharf 3 retains its maritime use for another 50 years.

Potential direct impacts to heritage items

The proposal would involve construction works and vibration directly adjacent to the significant 1940's fabric of the existing Manly Wharves 1 and 2. This could result in minor adverse impacts on the retained structures and significance of the Manly Wharf listing.

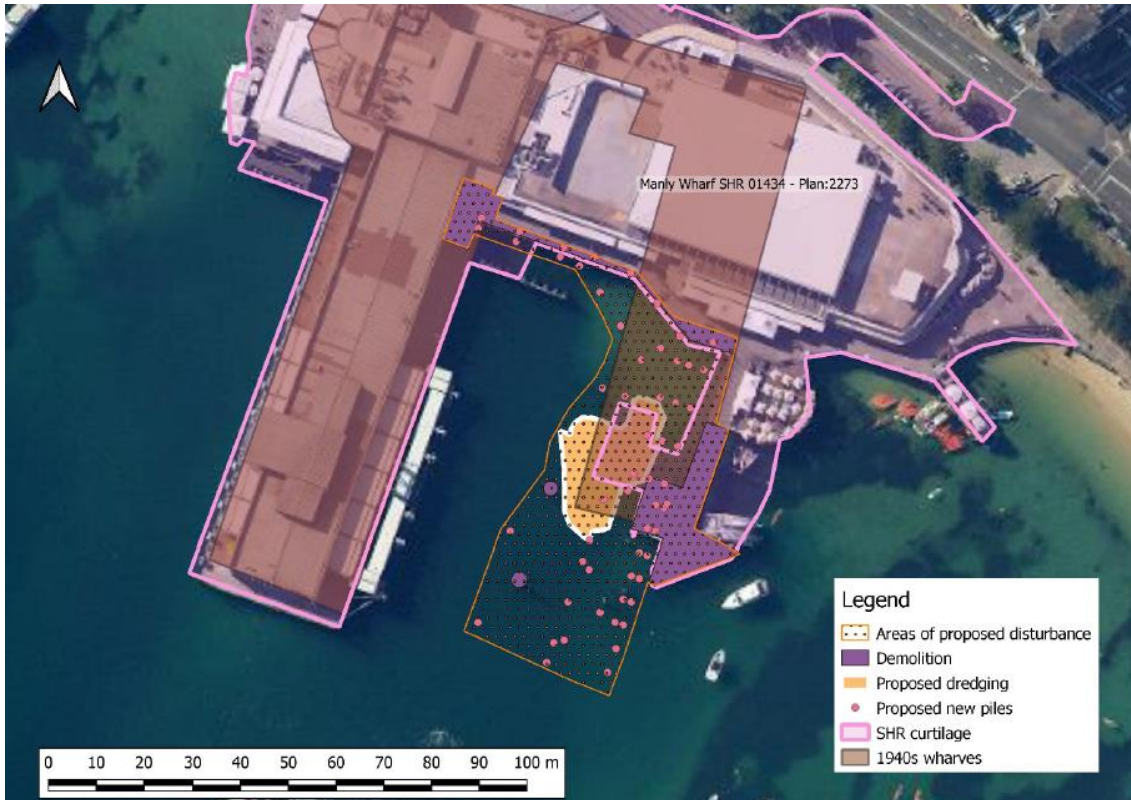
Maritime archaeology impacts

As discussed in section 3.3.10, about 290 cubic metres of material would be removed as a part of the *in-situ* dredging from the dredge pocket immediately west of the existing Wharf 3, shown in Figure 1.3.

The dredge material has potential to contain maritime archaeological relics associated with different operational phases of the existing Manly Wharf. The likelihood of the dredge sediment to contain maritime archaeological relics from various time periods are as follows:

- prior to operation of the Cargo Wharf in 1895: low archaeological potential
- operation of the Cargo Wharf 1895 to 1927: medium archaeological potential
- operation of the Amusement Pier 1931 to 2000: low archaeological potential
- operation of the existing Manly Wharf 2000 to present: low archaeological potential.

Maritime archaeological relics uncovered by proposed dredged works may provide information about the history of Manly Wharf. Further, if relics are within the north-east portion of the dredge pockets and cove bed disturbance area then they would fall under the curtilage of the SHR listed (refer Figure 6.3).



Source: Comber, 2022

Figure 6.3 Overlay of proposed worked with potential to disturb the seabed with the SHR listing curtilage

Pile extractions would also have the potential to lift buried relics out of the sediment and deposit them on the seabed.

Other proposed works that would disturb the cove bed would have limited potential impacts to maritime archaeology:

- pile driving would have very limited impacts on subsurface artefact deposits due to their limited footprint
- piles that are cut off at or near the surface of the sediment would not have any significant impacts.

Operation

The new wharf would be constructed in the same location as the existing Manly Wharf 3 and therefore have little or no indirect impact on the heritage significance on the Manly Wharf.

Impact on nearby listed heritage items

The proposal has the potential to have impacts on listed heritage items near the subject site. Potential visual impacts on nearby listed heritage items (refer Table 6.2) are provided in Table 6.3.

The new wharf would result in a partial visual obstruction of the view of Wharf 2 from East Esplanade it is considered that the new scale and design of Wharf 3 and the proposed Wharf 4 would result in a minor positive impact on the significance of the Manly Wharf precinct. Most nearby listed heritage items would not be impacted by the proposal.

Table 6.3 Impact of the proposal on listed heritage items near the subject site

Item	Significance	Proposal impact (Yes (Y) / No (N))	Qualitative assessment of potential impacts
Manly Town Centre Heritage Conservation Area (LEP)	Local Manly LEP 2013 C2	Y	The proposal would indirectly impact this LEP listing as it involves the partial demolition of the 1990s Manly Pier / Wharf 3 (which is included in the LEP). Despite this the proposal would have an overall positive impact on the Manly Wharf and greater Manly town centre as it would result in an improved public experience of commuters at the wharf (via increased accessibility), it would retain the existing retail tenancies and would provide new public domain and dwell spaces.
Two terrace houses	Local Manly LEP 2013 #I150	N	The proposal would not result in any modifications to the East Esplanade façade. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible this site.
Manly Rowing, Sailing, Yacht and Launch Club	Local Manly LEP 2013 #I142	Y	The proposed Wharf 3 would be consistent with the current scale of the Manly Pier. Whilst the new Wharf would be potentially visible from the yacht club the scale and materiality would provide have a positive indirect visual impact on this listing.
Monument – memorial (broken fountain)	Local Manly LEP 2013#I144	N	The proposal would not result in any modifications to the East Esplanade façade. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Park/ Reserve	Local Manly LEP 2013 #I143	Y	The proposed Wharf 3 would be consistent with the current scale of the Manly Pier. Whilst the new wharf would be potentially visible from the park, the scale and materiality would provide have a positive indirect visual impact on this listing.
Manly Cove Pavilion	State Manly LEP 2013 #I249	N	The proposal would not result in any modifications to the West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.

Item	Significance	Proposal impact (Yes (Y) / No (N))	Qualitative assessment of potential impacts
Governor Phillip Monument	Local Manly LEP 2013 #I248	N	The proposal would not result in any modifications to the West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible this site.
Park	Local Manly LEP 2013 #I251	N	The proposal would not result in any modifications to the West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible this site.
Civic buildings – Council Town Hall Administration building, police station and courthouse	Local Manly LEP 2013 #I82	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Group of commercial buildings	Local Manly LEP 2013 #I106	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Street Trees	Local Manly LEP 2013 #I104	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
2 cast iron pedestals (former street lights)	Local Manly LEP 2013 #I102	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.

Item	Significance	Proposal impact (Yes (Y) / No (N))	Qualitative assessment of potential impacts
Monument – war memorial (cenotaph)	Local Manly LEP 2013 #I103	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Street Trees	Local Manly LEP 2013 #I246	N	The proposal would not result in any modifications to the West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Esplanade Park and Fairlight Pool	Local Manly LEP 2013 #I49	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.
Harbour Foreshores	Local Manly LEP 2013 #I1	N	The proposal would not result in any modifications to the East / West Esplanade façade or Wharves 1 and 2. The new Wharf 3 would be consistent with the current scale of the Manly Pier and therefore would not cause any indirect visual impacts on this listing as it would not be directly visible from this site.

6.1.4 Cumulative impact

In considering the cumulative impact of the proposal, the new wharf structure represents one of the more substantial changes at Manly Wharf since the construction of the central wharf building in the 1940s, removal of the Fun Pier and addition of retail space. However, the proposal represents a major extension to the capacity for maritime and commercial use rather than an incremental loss of fabric or significance.

The safeguards provided in section 6.1.5 would reduce the risk of impacts from operation of the proposal.

6.1.5 Safeguards and management measures

Table 6.4 lists the safeguards and management measures that would be implemented to avoid, minimise and manage potential impacts on non-Aboriginal heritage.

Table 6.4 Non-Aboriginal heritage safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
NAH1	Original and highly significant fabric	Any construction works with the potential to impact original and highly significant fabric in Manly Wharf will: <ul style="list-style-type: none"> • be done in accordance with <i>How to Carry Out Work on Heritage Buildings & Sites</i> (NSW Heritage Office 2002) • be done by tradespersons with experience in working with modern heritage materials • use methods, tools and materials that would not cause inadvertent damage. 	Contractor	Construction
NAH2	Non-Aboriginal heritage	All works will be carried out in accordance with the principles and objectives of the Burra Charter: the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter).	Contractor / Transport	Pre-construction / construction
NAH3	Original and highly significant fabric	Where options exist for alternative installation methodologies and materials, that achieve the desired functional outcome, preference should be given to the option that has the least deleterious impact on significant heritage fabric.	Contractor / Transport	Detailed design / construction

ID	Impact	Environmental safeguards	Responsibility	Timing
NAH4	Minimise impacts on non-Aboriginal heritage	<p>Opportunities for interpretation and site signage should be considered as part of detailed design to:</p> <ul style="list-style-type: none"> • support ongoing interpretation of the historical development of the Manly Wharf • reduce negative impacts from signage on significant fabric. 	Transport	Detailed design
NAH5	Minimise impacts on non-Aboriginal heritage	<p>A Construction Cultural Heritage Management Plan (CCHMP) will be prepared by a suitably qualified heritage consultant and implemented during construction. The CCHMP will include measures to:</p> <ul style="list-style-type: none"> • protect original heritage features within the vicinity of the work • protect original and significant heritage fabric, particularly for the piling works next to Wharf 2 including, vibration monitoring. 	Contractor / Transport	Pre-construction / construction
NAH6	Original and highly significant fabric	<p>If any inadvertent damage occurs to original and highly significant fabric within and in the vicinity of the Manly Wharf due to the proposed works, the damage will be reported immediately to the Project Manager and the relevant Heritage Specialists. Damage is to be made good in accordance with specialist heritage advice.</p>	Contractor	Construction
NAH7	Heritage sympathetic design	<p>The detailed design will be assessed by a suitably qualified heritage specialist prior to finalisation to minimise potential direct impact of the proposed design on the original and highly significant fabric including, but not limited to the:</p> <ul style="list-style-type: none"> • interface detail between the new boardwalk and Wharf 2 • proposed painting colour scheme. 	Contractor / Transport	Detailed design / pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
NAH8	Minimise impacts on non-Aboriginal heritage	Prior to the commencement of works a Photographic Archival Recording (PAR) will be carried out of all areas proposed for demolition, including Manly Pier (Wharf 3).	Contractor / Transport	Pre-construction
NAH9	Maritime archaeological significance	<p>A staged archaeological program will be conducted under the supervision of an appropriately qualified maritime archaeologist as follows:</p> <ul style="list-style-type: none"> • Stage 1: an archaeological dive inspection will be conducted. Results of the dive inspection will be submitted to Heritage NSW to support a section 60 permit application (for work within the SHR curtilage) and a concurrent section 140 permit application (for work outside the SHR curtilage) under the <i>Heritage Act 1977</i>. The permit applications would also be supported by an Archaeological Research Design (ARD) and Excavation Methodology. • Stage 2: archaeological excavations will be conducted within the area of dredging in accordance with the approved Excavation Methodology, prior to dredging activity. The results of the archaeological excavation will be documented and provided to Heritage NSW for their records. 	Contractor / Transport	Pre-construction
NAH10	Maritime archaeological significance	Any relics identified in the dive inspection or archaeological excavation will be managed in accordance with a procedure agreed with Heritage NSW and Transport.	Contractor / Transport	Pre-construction

6.2 Biodiversity

This section describes the existing biodiversity and assesses the impact of the proposal on biodiversity. A supporting technical paper is attached in Appendix K and Appendix J.

6.2.1 Methodology

The assessment included a search of published State and Commonwealth databases as well as available literature to provide background of the potential presence of threatened flora, fauna and ecological communities that may be impacted by the proposal. This included:

- *Soil Landscapes of the Sydney 1:100, 000 Sheet* (Chapman & Murphy, 1989)
- The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489 (NSW OEH, 2016)
- NSW Department of Planning and Environment – Environment, Energy and Science (DPE-EES) Vegetation Classification
- NSW BioNet
- NSW DPE-EES Threatened Biodiversity Data Collection (TBDC)
- NSW Department of Primary Industries (NSW DPI) Fish Communities and Threatened Species Distribution of NSW (NSW DPI, 2016)
- NSW DPI Threatened species lists
- NSW DPI Listed Protected Fish Species
- NSW DPI Spatial Data Portal. Estuarine Macrophytes (NSW DPI, 2022a)
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) formerly Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST)
- Atlas of Living Australia
- National System for the Prevention and Management of Marine Pest Incursions
- National Introduced Marine Pest Information System (NIMPIS) (NIMPIS, 2022)
- Sensitive ecological sites were identified through searches of the following:
 - Regional Conservation Plans prepared by the former NSW OEH
 - Areas of Outstanding Biodiversity Value (AOBV) (formerly Critical Habitat) register
- Important habitat to threatened species as mapped for the BAM (accessed through the Biodiversity Offsets and Agreement Management System (BOAMS))
- NSW DPI Critical Habitat register
- NSW DPI key fish habitat maps (NSW DPI, 2022b)
- Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW) Register of Critical Habitat
- the Bureau of Meteorology's (BoM's) Groundwater Dependent Ecosystems (GDEs) Atlas

- Commonwealth DCCEEW Directory of Important Wetlands Australia
- Resilience and Hazards State Environmental Planning Policy (SEPP) (Chapter 2 – Coastal Management) maps
- Locations of NSW marine parks and reserves available from NSW DPI, Marine Parks website.

Aerial imagery from Nearmap was used to identify potential vegetation and habitat to assist in the creation of presumptive maps prior to the field investigations. A site inspection, terrestrial and aquatic field surveys and targeted surveys for White's Seahorse (*Hippocampus whitei*) were carried out on 15 February 2022 over the study area. A survey for Little Penguin (*Eudyptula minor*) was carried out at dusk on 10 March 2022 at specific locations over the study area where the species has historically nested.

For this assessment, the biodiversity study area is shown on Figure 6.5 and the study locality refers to the area within a five-kilometre radius of the study area. Further details on methodology can be found in Appendix J.

The impact assessment was prepared in accordance with *Environmental Impact Assessment Practice Note: Biodiversity Assessment* (EIA-N06) (RMS, 2016a) with consideration of the following:

- Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects (RTA, 2011)
- *Guidelines for Biodiversity Offsets* (RMS, 2016b)
- *Biodiversity Policy* (Transport, 2022b).

The biodiversity impact assessment presented in this chapter and in Appendix J was based on an initial concept design that included a roof canopy over the Wharf 3 gangway. As the design development for the proposal has progressed, the current design, as at October 2022, no longer includes a roof canopy on the gangway

While removal of the gangway roof may lead to reduced shading impacts on marine vegetation and habitat the design change would not result in modification to the identified mitigation measures.

6.2.2 Existing environment

Aquatic

Protected areas

There are no Coastal Wetland or Littoral Rainforests, as defined in the Hazards and Resilience SEPP, in the study area.

There are no nationally important wetlands or Ramsar Wetlands in the study area or the wider locality.

No Aquatic Reserves or Marine Parks occur within the study area or the locality.

The nearest listed AOBV are nearby habitat for the endangered Little Penguin population in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue and extending 100 metres offshore from that shoreline). The area is located about 500 metres south of the study area.

Aquatic vegetation and habitat

The aquatic study area is comprised of a low artificial seawall, sandflats and subtidal soft sediment surrounding the existing Manly Wharf. Marine habitat in the study area is shown in Figure 6.4.

The study area is mapped as key fish habitat (KFH). As it is an estuarine environment, it is considered a Class 1 waterway – Major KFH (NSW DPI, 2022b). The modified shoreline in the study area did not support mangroves or saltmarsh.

The aquatic field survey found the study area was comprised of a mix of seagrass, unvegetated soft sediment, sparse rocky rubble colonised by macroalgae and artificial structures (such as subtidal/intertidal wharf piles and structures like the seawall) that supported a variety of marine species including soft corals, ascidians (sea squirts) and macroalgae.

NSW DPI Fisheries identifies three types of KFH in their *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) comprising:

- type 1 (highly sensitive KFH)
- type 2 (moderately sensitive KFH)
- type 3 (minimally sensitive KFH).

These categories indicate aquatic habitat sensitivity to disturbance.

Three KFH types were recorded within the study area as follows (refer Figure 6.5):

- About 17,000 square metres of seagrass (Type 1 KFH). Seagrass was generally observed east and south-east of the wharf. Seagrass habitat was made up of patches dominated by species of *Posidonia*, *Zostera* and *Halophila* seagrass, as well patches with a mix of these species. The most commonly recorded seagrass were species of *Halophila*.
- About 100 square metres of macroalgae (Type 2 KFH). The macroalgae, comprised mainly of *Ecklonia radiata*, was recorded in proximity to the wharf, and were attached to rocky rubble and small boulders on the surface of the seabed. In addition, the vertical piles of the existing wharf were colonised by species commonly found on subtidal rocky reefs. Subtidal sections of the wharf piles were heavily encrusted with a thick layer of marine growth and soft corals.
- About 30,000 square metres of subtidal soft sediment habitat (Type 3 KFH). Subtidal soft sediment habitat mostly comprised of bare sand and shell grit in the deeper water. Some small areas of rock rubble were observed within subtidal soft sediment habitat closest to shore.

Threatened and protected flora

No threatened species of flora were recorded during the aquatic field survey. However, all marine vegetation, including seagrass, saltmarsh, mangroves and macroalgae, is protected under the FM Act. The study area does not encompass saltmarsh or mangroves, but seagrass was present and macroalgae was observed colonising the existing submerged wharf structures and debris in the soft sediment habitat.

Seagrass patches recorded in the study area matched the description of plant community type (PCT) 1913 (Seagrass meadows). They also contained the species *Posidonia australis*. As a result, these seagrass patches form part of an endangered population for *Posidonia australis* in Sydney Harbour under the FM Act (*Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie).

Under the EPBC Act, *Posidonia australis* Seagrass Meadows of the Manning-Hawkesbury Ecoregion is listed as an endangered ecological community. The patches of seagrass present in the study area do not meet the condition thresholds to be classed under the EPBC Act listed endangered population (see Appendix J). Furthermore, the areas of *Posidonia australis* are located outside the area that would be directly impacted by the proposal footprint.

Threatened and protected fauna

Based on the aquatic field surveys and analysis of the background information that was collected during desktop reviews, the likelihood of threatened species potentially occurring in the study area was determined. The full list can be found in Appendix J.

Two marine / aquatic fauna species and one endangered population were determined as having a moderate to high likelihood of occurrence within the study area as follows:

- Black Rockcod (*Epinephelus daemeli*) listed as vulnerable under the FM Act and vulnerable under the EPBC Act
- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act and EPBC Act
- Little Penguin (*Eudyptula minor*) in the Manly Point Area listed as an endangered population under the BC Act.

Some species of fish have been formally protected because they are naturally scarce, or their numbers have been substantially reduced over recent decades. These species are protected to help prevent them becoming threatened in the future. Twenty-four fish protected under the FM Act and / or listed as protected marine species under the EPBC Act have potential to occur within the locality. This list is provided in Appendix J.

Marine pests

According to the NIMPIS, the study area is at risk of infestation from the invasive *Caulerpa taxifolia* (NIMPIS, 2022). The species is already established in the study area and was recorded during the field survey. This pest is spread via activities like boating and fishing and is known to alter the physical and chemical environment, which can affect biodiversity.

Noise and vibration

Manly Wharf is used daily by ferries, with other vessels also regularly using the harbour nearby. As a result, it is expected that a relatively high ambient underwater noise environment already exists in the study area, similar to other parts of Sydney Harbour.

Commercial and recreational fishing

The surrounding environment has many access points to the water that recreational fishers may use. No commercial fishing zones are near the study area.

Underwater noise

Ambient noise levels around Australia coastal waters are generally around 100 to 120 dB (Government of South Australia, 2012) and noise generated from vessel movements would be intermittent. Noise levels would vary depending on the type and the size of the vessel, where ferries could generate ambient noise levels of 141 to 145 dB (re: 1 µPa) at distances of 100 metres and 50 metres, respectively (Transport, 2021).

No specific underwater noise measurements were taken to establish background levels of noise in the study area. However, given the frequent vessel movements in Manly Cove

(Transport, 2021), including fast ferries with high powered engines, maritime vessel traffic is expected contribute to a relatively high background noise level.



Figure 6.4 Marine habitat in the study area



Figure 6.5 Key fish habitat types of the study area

Terrestrial

Protected areas

The study area is located on a highly modified, urban, foreshore. It does not contain any remnant vegetation of ecological significance. The closest protected areas are nearby National Parks within the study locality, the nearest being one kilometre south.

Terrestrial vegetation and habitat

Terrestrial vegetation is limited to small, mown, patches of turf within an almost completely urbanised environment. Vegetation is associated with landscaped areas and gardens. Among the landscapes areas are also some larger Norfolk Pines (*Araucaria heterophylla*). These larger trees may provide some limited habitat for common species that are able to survive in urban environments but are not suitable for threatened fauna.

There are no groundwater dependent ecosystems (GDEs) near the study area. The closest mapped GDE is at Manly Lagoon, about 1.6 kilometres north.

Threatened and protected flora

No threatened terrestrial fauna was recorded or likely to occur in the study area. No terrestrial TECs were recorded during the site inspection.

Threatened and protected fauna

Seven species of threatened microbats were assessed as having a moderate likelihood of occurrence as the existing wharf structures at Manly Wharf may provide some roosting habitat. These were:

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*)
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Cave Bat (*Vespadelus troughtoni*).

Under the EPBC Act, migratory species are listed as matters of national environmental significance (MNES). In total, 45 migratory species were identified as potentially occurring in the study area. However, all listed migratory species were considered to have a low occurrence in the study area based on the absence of suitable habitat and high level of disturbance from pedestrians and dogs in the area. Impacts to these species as a result of the proposal were also considered unlikely to be significant and were therefore not assessed further.

Priority weeds and pests

No priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney region were recorded during the survey. The location of the proposed compound, and vegetation near the wharf, is Crown Land managed by Northern Beaches Council.

6.2.3 Potential impacts

This section assesses potential impacts to coastal and marine biodiversity in the study area as a result of the construction and operation of the proposal. A summary of the direct impacts on terrestrial and marine vegetation and habitat is provided in Table 6.8.

Construction

Aquatic

Direct loss of habitat

Part of the existing wharf structure, about 54 timber piles and seven steel piles, all about four metres in length, would be removed and a new wharf structure installed. Two existing piles positioned between Wharf 2 and Wharf 3 will also be removed. The removal of the existing piles would result in the loss of aquatic species that have colonised them, such as crabs and macroalgae. As these are common species and would be likely to recolonise the new piles over a period of months to years, it would be a short-term impact.

The proposal would involve the removal of about 290 cubic metres of material (marine sands) via excavator barge and hopper barge at the Wharf 3 berth pocket area. This would cover an area of about 388 square metres of seabed. The removal of sediment would cause the loss of a small number of burrowing organisms. The proposed dredging area for the Wharf 3 berth pocket is small and limited to the immediate area of Wharf 3 already affected by sediment movement from propellor wash (refer to section 6.4). It is expected that there would be a far greater number of burrowing fauna remaining in the locality after dredging. Due to the limited extent of direct sediment disturbance, the impact on borrowing fauna habitat would be small.

Dredging and installing new piles may also cause some impacts on any overlapping low density *Zostera* and *Halophila* seagrass and macroalga growing on boulders within the study area. This would be a very small area (397 square metres in total for both macroalgae and seagrass) and would not cause direct impacts to the larger meadows of seagrass, including the endangered population of *Posidonia australis*, located east and south-east of the site.

Dredging may also cause indirect impacts from the mobilisation of sediment, which may cover seagrass or other areas of habitat. Whilst seagrass and communities of other flora and fauna that occur on the seabed may be impacted, they have also evolved to survive in conditions with fluctuating levels of turbidity and sediment mobilisation and so would have some resilience to the potential impacts. Additionally, dredging may result in contaminated sediment being mobilised. This is unlikely but could strongly impact nearby seagrass meadows should contaminated sediment exist within the proposal area (refer to section 6.3). These impacts would be minimised by implementing safeguard measures (see section 6.2.4).

A summary of potential habitat losses and any areas expected to be reinstated is provided in Table 6.8.

Vessel strike

The proposal is expected to have a minimal impact on coastal and marine fauna such as whales, dolphins, penguins, turtles and sharks. A temporary increase in vessel and barge activity during construction is associated with an increased risk of vessel strikes with Little Penguins, marine turtles and mammals. The study area is considered suboptimal habitat for most marine turtles and mammals and very few individuals, if any, would be likely to occur during construction. The Little Penguin has a potentially increased chance of collision. They are known to swim fast enough to enable them to avoid vessels and would

already do so, based on existing vessel movements in the harbour. With these considerations, the small increase in vessel activity associated with construction would present a negligible increase in vessel strike risk. Safeguard measures such as speed limits and regular monitoring would further minimise potential for vessel strike (see section 6.2.4).

Underwater noise impacts on fauna

Increased vessel activity, as well as construction activities such as dredging and piling, may increase ambient noise levels and disturb aquatic fauna. Given the frequent vessel movements in Manly Cove (Transport, 2021), including fast ferries with high powered engines, maritime vehicle traffic is expected to contribute to a relatively high background noise level.

The main sources of construction related noise would be from:

- dredging (barge mounted excavator)
- pile driving (impact or vibratory piling).

While dredging activities are likely to cause a temporary behavioural shift such as mobile marine fauna avoiding the area immediately in the vicinity of the noise source, the overall risk from this activity is considered to be lower than for pile driving.

The following threatened and protected marine fauna have been identified as having a moderate to high likelihood of occurring in the study area and would be potentially at risk from impacts from underwater noise during construction:

- syngnathids (including White's Seahorse).
- fish (including the Black Rockcod, Estuary Cod and the Eastern Blue Devil Fish).
- seabirds, including the Little Penguin.

Other marine fauna that are less likely to enter the study area have been identified as including cetaceans, pinnipeds, sirenians and marine reptiles.

As discussed in section 6.7, a worst-case scenario assessment conducted for the proposal found that that underwater noise caused by impact piling could cause permanent reduction in hearing sensitivity (PTS), temporary reduction in hearing sensitivity (TTS) or behavioural changes depending on how close marine fauna is to the noise source.

Distances for these impacts for different fauna include:

- Fish and seahorses: 12 metres for PTS, 175 metres for TTS and over 1.2 kilometres for behavioural changes
- Seabirds including Little Penguins: 120 metres for PTS, and over one kilometre for behavioural responses
- Humans: 100 metres for PTS, 650 metres for TTS and 2 kilometres for behavioural changes.

There is also the potential for some behavioural impacts from noise disturbance on Little Penguins within the AOBV 500 metres south of the study area.

Impacts from underwater noise would be managed through the installation of buffer distances and other mitigation measures set out in section 6.7.4. Implementation of these measures would mean that construction noise is unlikely to cause significant negative impacts to coastal or mobile marine fauna in the study area.

Threatened, migratory and protected species

The proposal is unlikely to significantly impact threatened or protected aquatic species and their habitat. Expected impacts would be temporary and affect areas considered to be suboptimal and / or small compared to that available in the locality. Details of the assessments of significance carried out for species considered to have a moderate to high likelihood of occurring in the study area are outlined in Appendix J.

Potential impacts from the proposal are greatest for the Little Penguin, Black Rockcod and White's Seahorse as some habitat for these species would be directly removed, while other habitat would be altered but left in-place. Despite this, completion of construction would provide an increase in habitat for the Black Rockcod and White's Seahorse. Specifically, the new piles that would be progressively recolonised with macroalgae and soft corals after construction is completed. Additionally, prior to construction commencing, aquatic field surveys would be carried out to identify any individuals present and relocate them to minimise the potential of harm to threatened, migratory and protected species (see section 6.2.4).

Pests and disease

Construction activities over water have a small potential to introduce marine pests if vessels, equipment or plant are brought into the study area from other estuaries where marine pests are present. *Caulerpa* are already established within the locality and movements of vessels, plant and equipment could further spread *Caulerpa* within Manly Cove or more broadly. Safeguard measures would be implemented to manage marine pest species (see section 6.2.4).

Commercial and recreational fishing

The proposal is unlikely to substantially impact populations of marine species important to recreational fishing. Some localised impacts to fishing may result from construction. These impacts would be short term and restricted to a small area of Manly Cove.

Key threatening processes

Two key threatening processes may arise from the proposal:

1. Introduction of Non-indigenous Fish and Marine Vegetation to the Coastal Waters of NSW (FM Act)

The proposal may cause the spread of invasive marine species from the movement of vessels and equipment. This would be managed by safeguards (refer section 6.2.4).

2. Installation and Operation of Instream Structures and Other Mechanisms That Alter Natural Flow Regimes of Rivers and Streams (FM Act)

The proposal would remove the existing wharf structures and install 76 piles and associated wharf structures. Due to the relatively small size and seabed footprint of these structures in proportion to Manly Cove, alterations to hydrodynamics are likely to be localised and unlikely to impact any threatened species (see section 6.7).

Terrestrial

Direct loss of vegetation and habitat

The proposal would not require the removal of terrestrial vegetation. A temporary compound facility would be established to support the construction of the proposal. The proposed compound area would be in East Esplanade Park and would utilise the grassed area. No tree removal would be required. The compound site is not expected to be close to any trees (within 5 metres). Despite this, safeguards would be implemented to minimise any potential impacts to trees around the compound site (refer section 6.2.4). As a result, impacts on terrestrial vegetation and habitat are expected to be negligible.

Airborne noise impacts on fauna

Noise impacts from construction would also affect terrestrial fauna, with similar responses to marine fauna expected (such as moving away from or avoiding the study area). Measures to minimise noise would be expected to reduce the impact from this (refer section 6.2.4).

Pests and disease

The study area is unlikely to be susceptible to any land-based pests and disease as a result of the proposal as land-based works would be confined to the compound area.

Threatened, migratory and protected species

No terrestrial species are expected to be significantly impacted by the proposal. Seven microbats are considered to have a moderate likelihood of occurrence and wharf structures have the potential to provide suitable roosting habitat. With the removal of existing piles and existing Wharf 3 structures, there is potential for loss of roosting habitat. Demolition of structures may directly impact on roosting microbats should they be present at the time of construction. The installation of new structures would potentially provide replacement roosting habitat. An AoS under the BC Act was completed for this group of microbat species which determined the proposal is unlikely to have significant impacts.

Operation

Marine vegetation and habitat

Seagrasses have specific light requirements necessary for survival. Construction of the boardwalk would result in permanent coverage of a 17 square metre meadow of medium density *Halophila*, which may be lost due to shading (refer Table 6.8). The installation of a new Wharf 3 gangway, hydraulic platform and main waiting area with a new roof would cast shadow over the water and onto the meadow of high density *Halophila* and medium density *Zostera* seagrass at certain times of day. The shading from the new Wharf 3 pedestrian walkway roof would not permanently shade the seagrass so that day-time light would not reach the area. The area would experience intermittent shading during the day and would unlikely result in a significant impact. In addition, the proposed Wharf 4 would be constructed with light penetrable decking which will allow some sunlight to reach the seabed at all times of the day.

There would be a change in the use of wharf berthing areas, with Fast Ferries to berth alongside the new Wharf 3. This may cause new scouring between Wharves 2 and 3 from the movement of vessels (refer to section 6.3), with impacts to a small section (171 metres squared) of seagrass. Significant reduction in scouring on the eastern side of the wharf (where Fast Ferries previously berthed), may also provide opportunity for the recolonisation of a significant area of seagrass previously unable to establish due to engine thrust and scour. The new wharves also extend into deeper water meaning scour effects from vessels using Wharf 3 and the proposed Wharf 4 would likely be less.

Threatened, migratory and threatened species

Light poles would be installed along the edge of the boardwalk. Artificial light from these poles may disturb marine fauna such as the Little Penguin returning from daytime foraging at dusk / night. Given the Wharf 3 area is currently highly disturbed with pedestrian activity and well illuminated at night from commercial operations (such as bars and restaurants), disturbance impacts from artificial light associated with the proposal are considered negligible.

Summary and conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the BC Act or FM Act and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act. A referral to the Australian Government DCCEEW is not required for biodiversity matters.

A summary of potential biodiversity impacts in relation to impact areas during construction and operation is provided in Table 6.8. A summary of the AoS outcomes is provided in Table 6.5, Table 6.6 and Table 6.7.

Table 6.5 Summary table for assessments of significance under the BC Act

Significance assessment question¹						
Threatened species, or communities	1	2	3	4	5	Likely significant impact?
Little Penguin (<i>Eudyptula minor</i>) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.	N	X	N	N	X	No
Large-Eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Yellow-bellied sheath-tail-bat, Greater Broad-nosed Bat and Eastern Cave Bat.	N	X	N	X	X	No

Notes: Y = Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. Section 7.2 of the BC Act

Table 6.6 Summary table for assessments of significance under the FM Act

Significance assessment question ¹								
Threatened species, or communities	1	2	3	4	5	6	7	Likely significant impact?
<i>Posidonia australis</i> seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie.	X	N	N	N	X	N	N	No
White's Seahorse	N	X	X	N	X	N	N	No
Black Rockcod	N	X	X	N	X	N	N	No

Notes: Y = Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. Section 220ZZ of the FM Act

Table 6.7 Summary table for assessments of significance under the EPBC Act

Significance assessment question ¹										
Threaten species, or communities	a	b	c	d	e	f	g	h	i	Likely significant impact
White's Seahorse	N	N	N	N	N	N	N	N	N	No.
Black Rockcod	N	N	N	N	N	N	N	N	N	No

Notes: Y = Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. Section Matters of National Environmental Significance: Significant Impact Guidelines 1.1

Table 6.8 Areas of terrestrial and marine vegetation and habitat to be directly impacted and reinstated by the proposal during construction and operation.

Vegetation and habitat	Process: Construction and demolition	Construction: Area to be directly impact / removed (square metres)	Process: Operational impacts	Operational: Area to be directly / indirectly impacted (square metres)	Areas to be reinstated (square metres)	Net loss/gain (square metres)	Comment
Landscaped gardens and parks	Compound area establishment	~408	-	-	~408	No net loss	-
Microbat roosting habitat	Demolition of existing wharf	~514	-	-	~1097	Net gain	-
Seagrass (mixed Halophila and Zostera) (Type 1 KFH)	Piling and dredging	~1 (piling) ~17 (dredging)	Shading	~17	N/A	Net loss of ~18 (dredging/piling) and ~17 from shading of boardwalk	-
Seagrass (mixed Halophila and Zostera) (Type 1 KFH)	-	-	Indirect effects of ferry scour regime	~171	N/A	Potential net loss of ~171	-
Mapped macroalgae (Type 2 KFH)	Dredging	~48	Shading	~31	N/A	Net loss of ~48 from dredging and ~31 square metres from shading	Potential for relocation of rock rubble with attached macroalgae

Vegetation and habitat	Process: Construction and demolition	Construction: Area to be directly impact / removed (square metres)	Process: Operational impacts	Operational: Area to be directly / indirectly impacted (square metres)	Areas to be reinstated (square metres)	Net loss/gain (square metres)	Comment
Macroalgae on piles (Type 2 KFH)	Demolition of existing wharf and piles	~63 piles to be removed with macroalgae attached (demolition)	-	-	76 piles to be installed	Net gain of 13 piles for future colonisation	-
Subtidal soft sediment (Type 3 KFH)	Piling and dredging	~75* (piling) ~331 (dredging)	-	-	N/A	Net loss of ~406 from piling/dredging	Subtidal soft sediment habitat will be retained in dredge area, but the seabed will be slightly deeper
Total (square metres)	-	~922 (terrestrial) ~472 (marine)	-	~219 (marine)	~583 (terrestrial)	<u>Net loss:</u> 441 (marine) <u>Net gain:</u> 583 (terrestrial) 15 piles (marine)	-

* Based on impact area of 1 square metre per pile.

6.2.4 Safeguards and management measures

The following table lists relevant safeguards to avoid, minimise and manage potential impacts to biodiversity. Other safeguards and management measures that are relevant to biodiversity are also identified in sections 6.4 (water quality), 6.6 (airborne noise and vibration), 6.7 (underwater noise and vibration) and 6.3 (land surface and hydrology).

Table 6.9 Biodiversity safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
B1	Biodiversity	<p>Prepare a Construction Flora and Fauna Management Plan as part of the CEMP. The Plan is to include all terrestrial and marine flora and fauna and include, but not be limited to, mitigation measures such as:</p> <ul style="list-style-type: none"> • documenting and establishing site disturbance limits • establishing no-go zones to protect seagrass meadows • implementing tree protection measures in line with Australian Standard 4970-2009 <i>Protection of trees on development sites</i> • undertaking pre-clearing surveys prior to demolition, dredging and piling to avoid direct harm to protected species • implementing the unexpected finds measures in line with the <i>Biodiversity Guidelines Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) • reference to relevant measures in the <i>Stockpile Management Guideline</i> (RMS, 2015). 	Contractor	Pre-construction
B2	Removal and disturbance to marine vegetation and habitat.	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) and Section 3.3.2 Standard precautions	Contractor	During construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		and mitigation measures of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (NSW DPI, 2013).		
B3	Removal and disturbance to marine vegetation and habitat.	Detailed design will consider opportunities to promote colonisation of habitat-forming species by including structures which provide habitat complexity. This may include consideration of designs available as part of the Living Seawalls Project and perforated materials (like glass reinforced plastic) for boardwalks, ramps, gangway and waiting areas to minimise shading impacts on marine vegetation and habitat.	Contractor	Detailed design
B4	Removal and disturbance to marine vegetation and habitat.	Anchoring will be minimised, where possible, and avoided in areas known to support marine vegetation particularly seagrass. ‘No-go’ zones will be delineated, implemented and maintained during construction. Vessels will not remain stationary for an extended period of time over areas of seagrass. All personnel and vessels will be inducted and made aware of the importance of seagrasses and macroalgae and their occurrence in proximity to construction activities.	Contractor	During construction
B5	Removal and disturbance to marine vegetation and habitat.	Work associated with positioning barges, dredging and pile driving will be carried out during calm conditions to prevent excessive scouring and minimise smothering of marine vegetation from sediment.	Contractor	During construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B6	Surface and underwater noise and vibration impacts on marine fauna	<p>Two safety zones will be implemented during impact or vibratory piling that will be applied around each piling location (GHD, 2022):</p> <ul style="list-style-type: none"> • Shut-down zone (PTS): the sighting of marine fauna or human divers/swimmers would trigger piling activities to be ceased as soon as reasonably practical: <ul style="list-style-type: none"> ○ 12 metres for threatened and/or protected fish and syngnathids. ○ 120 metres for threatened and/or migratory seabirds including the Little Penguin. ○ 100 metres for humans. • Observation zone (TTS): the movement zone of marine fauna or human divers/swimmers that may approach the shut-down zone would be monitored to identify any approach to the shut-down zone: <ul style="list-style-type: none"> ○ 175 metres for threatened and/or protected fish and syngnathids. ○ one kilometre for threatened and/or migratory seabirds including the Little Penguin (Note: There is no calculated TTS impact distance for diving birds/penguins. A one-kilometre observation zone has been adopted for conservatism). ○ 650 metres for humans. 	Contractor	During construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B7	Surface and underwater noise and vibration impacts on marine fauna	<p>Standard management and mitigation procedures with respect to piling operations will be adopted as per <i>Underwater Piling Noise Guidelines</i> (Government of South Australia, 2012). This will include the following:</p> <ul style="list-style-type: none"> • Use low noise piling methods, instead of impact piling, where possible. A low noise piling method may include vibro-piling or bored piling. • Consideration given to avoiding conducting impact piling activities during times when marine fauna are likely to be breeding, calving, feeding, migrating or resting in biologically important habitats located within the potential noise impact footprint. • Additional pre-summer and pre-construction inspections for Little Penguins at the historical nesting site (i.e., under the north-west corner of the wharf precinct, outside of the proposal area). If Little Penguins are observed, avoid conducting impact piling activities during times Little Penguins are likely to be breeding within the potential noise impact footprint. The Little Penguin breeding season this includes the months of June through to February. • Presence of marine fauna and human swimmers/divers will be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the impact piling procedure. 	Contractor	During construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • If no marine fauna and human swimmers/divers are nearby, a soft start piling procedure will be used. This involves gradually increasing the piling impact energy over a 10-minute time period. Visual observations of marine fauna and humans within the exclusion zone will be maintained by trained crew throughout the start period. • If a marine fauna or people are sighted within the observation zone during the soft start of normal operation procedures, the operator of the impact piling rig will be placed on stand-by to shut down the piling rig. <p>A record of procedures employed during the operations will be maintained by the piling contractor.</p>		
B8	Surface and underwater noise and vibration impacts on marine fauna.	<p>Vibro-piling should be considered the preferred piling method, where possible.</p> <p>If impact piling is required, then consideration will be given to the use of the following to reduce underwater noise and vibration:</p> <ul style="list-style-type: none"> • pile head cushion block • bubble curtain • dewatered, aerated isolation casing system and/or damped outer casings. 	Contractor	During construction
B9	Risk of vessel strike on marine fauna	<p>All work boats and barges will adhere to the 4-knot speed limit when operating within the proposal area.</p> <p>Contractors will be made aware of marine fauna that might occur in the area and report any sightings within the observation zone</p>	Contractor	During construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		during works and vessel movements. Works will cease until any observed marine fauna move out of the proposal area.		
B10	Removal/disturbance to threatened, migratory and protected species.	<p>A targeted microbat survey of structures proposed for removal or modification will be carried out in accordance with <i>Microbat Management Guidelines</i> (Transport, 2021) prior to construction or as soon as feasible prior to disturbance (demolition).</p> <p>If threatened microbats are detected, a Microbat Management Plan will be developed in accordance with the <i>TfNSW Microbat Management Guidelines</i> (Transport, 2021) as part of the Construction Environment Management Plan (CEMP) and implemented by a suitably qualified bat specialist.</p>	Contractor	Pre-construction
B11	Removal/disturbance to threatened, migratory and protected species.	The unexpected species find procedure will be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal area.	Contractor	Pre-construction
B12	Removal/disturbance to threatened, migratory and protected species.	Fauna will be managed in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B13	Removal/disturbance to threatened, migratory and protected species.	<p>A targeted survey for Black Rockcod, White's Seahorse and Little Penguins, will be completed 24 hours prior to the commencement of water-based construction activities. Black Rockcod will be encouraged to move away from the study area prior to silt curtain installation. White's Seahorse will be collected and relocated to nearby similar habitat (i.e., Manly Cove tidal pool netting, seagrass beds and retained piles) using methods approved by NSW DPI Fisheries.</p> <p>A Syngnathid Relocation Plan (Appendix K) will be finalised in consultation with NSW DPI Fisheries and be updated to address NSW DPI Fisheries feedback. The Syngnathid Relocation Plan will be implemented to guide the collection and relocation of White's Seahorse.</p>	Contractor	Pre-construction
B14	Removal/disturbance to threatened, migratory and protected species.	A Section 37 permit under the FM Act will be obtained to relocate syngnathids collected during the targeted preclearance survey upon approval of the Syngnathid Relocation Plan. Relocation must be undertaken by a prequalified permit holder.	Contractor	Pre-construction
B15	Introduction/spread of weeds and/or marine pests and diseases.	Equipment and vessels will be cleaned and inspected prior to entering and departing from the proposal area.	Contractor	Pre, during and post construction
B16	Introduction/spread of weeds and/or marine pests and diseases.	Weed species will be managed in accordance with Guide 6: Weed management of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction
B17	Introduction/spread of weeds and/or marine pests and diseases.	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
B18	Introduction/spread of weeds and/or marine pests and diseases.	Occurrence of any marine pests will be reported to NSW DPI Fisheries.	Contractor	During construction
B19	Alterations to hydrology indirectly impact	The detailed design will aim to avoid or minimise any impact to coastal processes and hydrology that would indirectly impact protected marine fauna and fauna habitat.	Transport	Detailed design

6.2.5 Biodiversity offsets

The proposal is not expected to clear any terrestrial vegetation (native or otherwise). The proposal is expected to directly impact marine vegetation from dredging and piling activities, including:

- 8 square metres of sparse macroalgae (attached to unconsolidated material) within the dredge area (Type 2 KFH) and 61 piles with associated macroalga (Type 2 KFH) and attached encrusting biota
- 16 square metres of low density *Zostera* and *Halophila* overlapping the dredge area (Type 1 KFH)
- 1 square metre of low density *Zostera* and *Halophila* (Type 1 KFH) as a result of one arrestor pile (western pile) is anticipated to be driven into a small patch (about 123 metres squared) of low density *Zostera* and *Halophila* (Type 1 KFH).

An additional 16 piles would be available for recolonisation by marine vegetation and other habitat-forming species as part of the new wharf to replace the areas removed during construction.

There is potential for the macroalga and the loose rocks it is attached to within the dredge area to be relocated to nearby unaffected areas of subtidal soft sediment. This option should be explored as it may avoid the need for offsetting for direct impacts to macroalga within the dredge area.

The remaining 17 square metres of seagrass would require off-setting as it exceed the thresholds outlined in the Transport *Biodiversity Offset Guidelines*. If macroalgae attached to the substratum is unable to be relocated in the dredge area, the total off-setting of Type 1 and 2 KFH required (inclusive of seagrass) would be 65 square metres.

Consideration of offsetting under the *Guideline for Biodiversity Offsets* (RMS, 2016) or the recent *Biodiversity Policy* (Transport, 2022b) is also required for the residual impacts to Type 1 and Type 2 KFH. The proposal may indirectly impact marine vegetation from changes in vessel scour regimes and shading of structures resulting in a loss of:

- 31 square metres of macroalgae beneath the new Wharf 3 structure
- 7 square metres of medium density *Halophila* beneath the new boardwalk, near the existing arrestor
- 171 square metres low density *Zostera* and *Halophila* (Type 1 KFH).

Similarly, macroalgae beneath the new wharf structure may also be potentially relocated to nearby unshaded subtidal soft sediment which may avoid the need for offsetting for indirect impacts to macroalga beneath the new wharf structure. The remaining 188 square metres of seagrass that may be indirectly affected as a result of the proposal would require off-setting as these exceed the thresholds outlined in the Transport *Biodiversity Offset Guidelines*. If macroalgae attached to the substratum is unable to be relocated beneath the new Wharf 3, the total off-setting of Type 1 and 2 KFH required (inclusive of seagrass) would be 219 metres squared.

Consultation with NSW DPI Fisheries was carried out to identify the requirements and scope for offsetting, as well as applicable offset rates. In accordance with the *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013), it was confirmed that the loss of seagrass would need to be offset at a ratio of 2:1.

Two options for offsetting were identified:

1. installation of an environmentally friendly mooring within an existing mooring scar, or
2. if installation of an environmentally friendly mooring was explored to its fullest extent and found not to be possible, offsetting would be based on monetary compensation at a rate of \$113.50 per square metre of seagrass harmed.

6.3 Land surface and coastal processes

This section describes the existing land surface and coastal processes, and potential impacts, associated with the proposal.

6.3.1 Methodology

Water based

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

- hydrographic and bathymetric mapping and data
- climate data (BoM, 2022)
- Met-Ocean Design Parameters Study (Cardno, 2021)
- Ferry Wash Modelling Manly Wharf East (Cardno, 2019)
- Geotechnical and contamination assessment report (GHD, 2021a)
- Australian National Tide Tables (Department of Defence, 2020)
- Maritime Basis of Design Manly Wharf 3 Upgrade Project (GHD, 2022c)
- Acid sulfate soils risk (Naylor et al., 2011).

Land based

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 (Herbert, 1983)
- NSW Planning Portal
- EPA online contaminated land register
- Environmental Protection Licences (EPL) under the PoEO Act
- Geotechnical and contamination assessment report (GHD, 2021a).

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 land and aquatic environment.

Operational assessment

The operational assessment considered how the operation of the proposal would potentially result in hydrodynamic changes in terms of sedimentation, erosion, and scour.

6.3.2 Existing environment

Tides

The proposal is located within the Port Jackson (Sydney Harbour) estuary. Port Jackson is a tide dominated drowned valley estuary with an open entrance.

The proposal is located on the northern shores of Sydney Harbour in Manly Cove. Water levels in Manly Cove are subject to ocean tides. Tide conditions at the proposal area are outlined in Table 6.10.

Table 6.10 Tidal levels at the proposal area. Sourced from *Australian National Tide Tables, 2020*.

Description	Water level (m AHD)	Water level (m LAT)
Highest Astronomical Tide	1.175	2.1
Mean High Water Springs	0.675	1.6
Mean High Water Neaps	0.475	1.4
Mean Sea Level	0.095	1.02
Mean Low Water Neaps	-0.325	0.6
Mean Low Water Springs	-0.525	0.4
Lowest Astronomical Tide (Chart Datum, CD)	-0.925	0.0

Currents

The main tidally influenced water movement in the Sydney Harbour occurs in the main channel. Closer to the edge of the harbour, tidal-generated current speeds reduce due to the shallower waters. As such, the tidal-generated current speeds close to the foreshore, and the proposal footprint, are very low (i.e., the waters are typically calm) (Cardno, 2021).

Local currents may be attributed to tidal flows, wind shear, propeller wash, and localised flows at stormwater outlets (GHD, 2022c). Currents may also be generated by the passing of other vessels nearby (GHD, 2022c).

Current speed investigations at the proposal area found that the normal spring tide currents are small and less than 5 centimetres per second (Cardno, 2021). During extreme storm events, such as were experienced in Manly Cove during a storm in May 1974, currents could increase to 15 centimetres per second (Cardno, 2021). The fastest currents in Manly Cove are generated by propeller from vessels which can reach up to 8 metres per second (GHD, 2022a)

Waves

The NSW coastline experiences several storms each year with the majority of wave energy generated within the Corral Sea and Tasman Sea (Shand, 2014) and approaching coastline from south to south-easterly directions.

The wave climates at Manly Cove and East Manly Cove beaches are composed of a combination of wind and vessel generated waves and swell penetrating from the ocean (GHD, 2022). Vessel generated waves are governed by the submerged shape of the boat hull, the boat speed, and the water depth (GHD, 2022c).

Manly Cove is exposed to wind generated waves from the south-south-west. Average annual wave height is one metre, while waves of 1.3 metres are experienced with 1 in 10-year return period and waves of 1.5 metres are experienced with 1 in 50-year return period (GHD, 2022c).

Storm surge

During extreme events, the water level can be elevated higher than the predicted tidal levels due to barometric pressure, and wind and wave setup. This increase is known as storm surge. Wave conditions during extreme conditions at the proposal area are presented in Table 6.11.

Table 6.11 Design Wave Conditions and Crest Level at proposal governed by Swell Waves (GHD, 2022c)

Average Recurrence Intervals (years)	1	2	5	10	20	25	50	100	200	250	500
Wave height (Hm)	0.76	0.85	0.96	1.03	1.11	1.13	1.20	1.27	1.34	1.36	1.43
Peak wave period (Tp)	12-13	12-13	12-13	12-13	12-13	13-14	13-14	13-14	14-15	14-15	14-15
Design Crest Level (mAHD)	1.72	1.87	2.06	2.21	2.36	2.45	2.56	2.71	2.87	2.92	3.07

Bathymetry

The bathymetry at the site slopes from the shore to deep waters south-west of the proposal area. The navigation channel extending directly south-west of Wharves 1 and 2 is deeper at about 5 to 6 metres CD. The seabed around the existing Wharf 3 is somewhat shallower at about 2 to 5 metres CD with deeper areas occurring around the berthing area (refer Figure 6.10). Bathymetry in Manly Cove is shown in Figure 6.6.

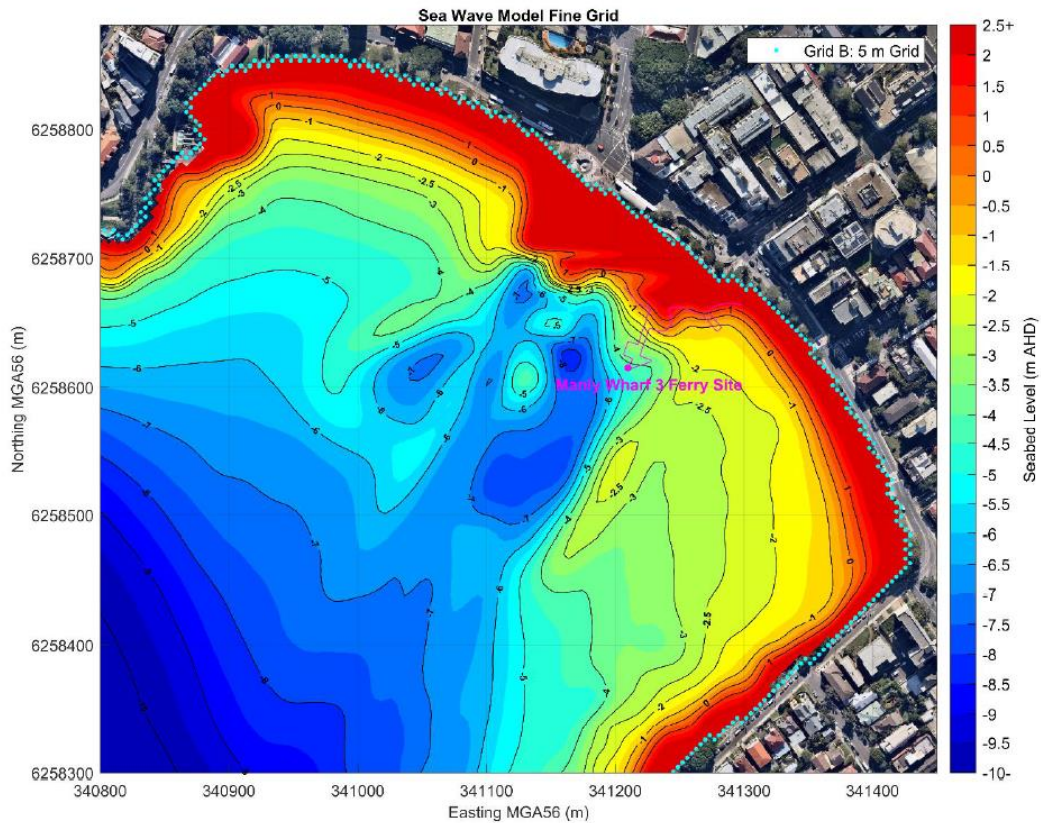


Figure 6.6 Bathymetry in Manly Cove (Cardno, 2021)

Wind

Sydney Harbour (Wedding Cake West) weather station (station number 066196) is located about five kilometres to the south-west of the proposal area. Afternoon winds are generally stronger than morning winds tending towards 20-28 kilometres per hour with morning winds generally 16-19 kilometres per hour (BoM, 2022).

A wave climate study conducted for the proposal utilised wind data from Sydney Airport and West Wedding Cake Island (Cardno, 2021). Wind rose directional data for Sydney Airport and West Wedding Cake Island are shown in Figure 6.7 and Figure 6.8. The study produced directional extreme wind speeds for the proposal area for a range of return periods provided in Table 6.12.

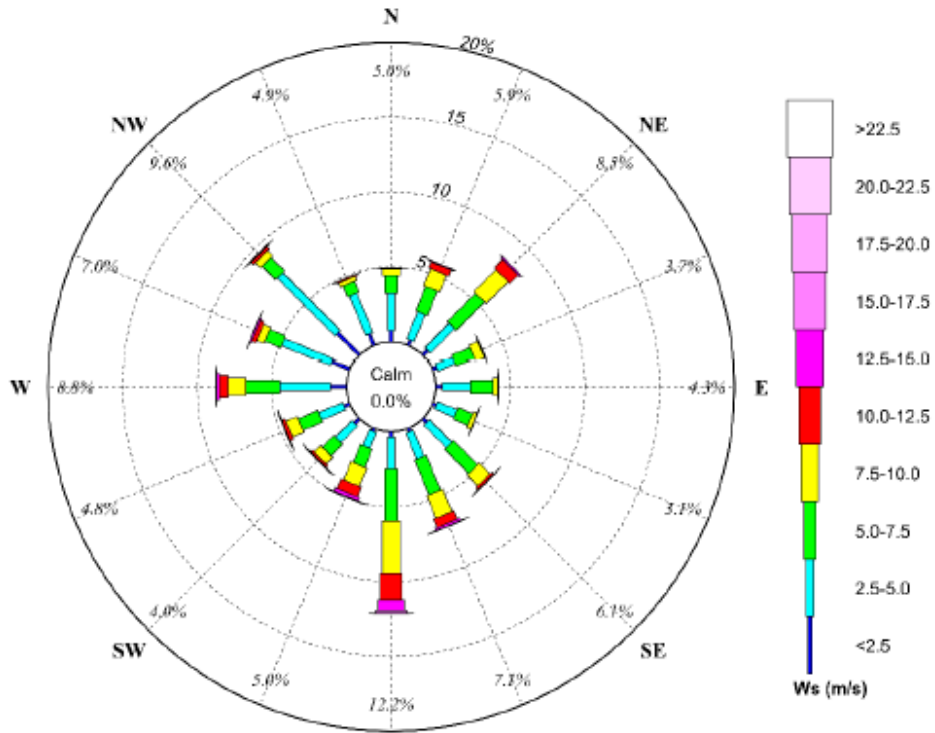


Figure 6.7 Sydney Airport Wind Rose (1939 – 2012) (Cardno, 2021)

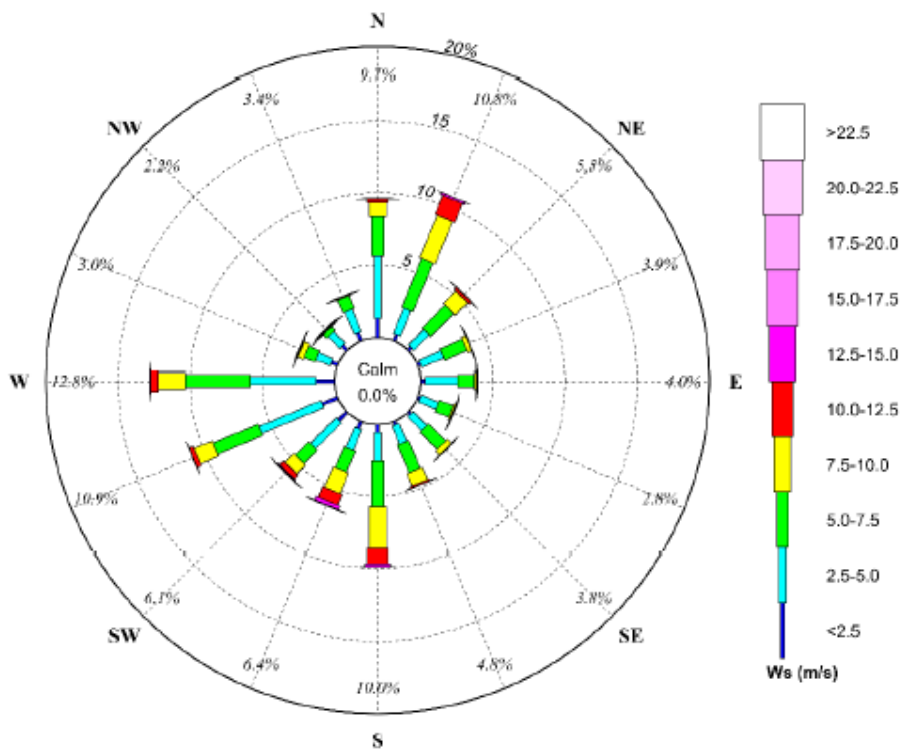


Figure 6.8 West Wedding Cake Island Wind Rose (1996-2021) (Cardno, 2021)

Table 6.12 Extreme wind 10 minutes average (median values in metres per second) in Port Jackson (Cardno, 2021)

ARI (Years)	1	20	50	100	1000	2500
S	21.0	25.0	26.4	27.3	30.3	31.5
SW	17.4	20.6	21.8	22.6	25.3	26.5
W	20.4	23.0	25.1	25.9	28.7	30.0
NW	18.3	20.2	20.8	21.3	22.7	23.3
N	14.1	15.9	16.5	16.9	18.3	19.0
NE	17.4	18.7	19.2	19.5	20.7	21.0
E	10.8	14.0	15.1	15.9	18.6	19.8
SE	13.8	16.6	17.6	18.3	20.5	21.6

Geology and topography

The central business district of Manly is built on a sand spit which is about 400 metres wide and 600 metres long and has an elevation of about four metres to six metres above AHD (GHD, 2021a). Manly Cove is a southwest-facing pocket beach, constrained by Hawkesbury Sandstone headlands to the north-west and south-east.

The Sydney: 100,000 scale Geological Series Sheet (sheet 9030) (1991) indicates that the proposal area is situated on coarse quartz sand with varying amount of shell fragments and medium to fine marine sand. The sand layers are underlain by medium to coarse-grained quartz sandstone, very minor shale and laminate lenses (Hawkesbury Sandstone).

A *Geotechnical and contamination assessment* (GHD, 2021) was carried out for the proposal and included geotechnical testing at a borehole within the proposal area. The geotechnical borehole drilling encountered deep marine sands, interbedded with silty sands of a loose to medium dense consistency. No bedrock material was encountered. This is consistent with geophysical surveys and past investigations which found that the sandstone bedrock is very deep, at about 60 metres below the surface.

Soils

The soils at the proposal area typically comprise of loose to medium density marine sands with occasional beds of silty sands (GHD, 2021a). Marine sands at the proposal area generally go to a depth of about 60 to 70 metres before reaching bed rock due to the proposal's location near a deeply incised paleochannel (GHD, 2021a). Significant maritime traffic and previous developments are likely to have disturbed the underlying fluvial sediments in the shallow waters near the wharf.

The immediate landscape has been significantly disturbed by human activity, with heavy residential development in the area and the creation of East Esplanade Park adjacent to the wharf. Significant maritime traffic and previous developments and investigations are likely to have disturbed the underlying fluvial sediments in the shallow waters near the wharf.

Particle size distribution (PSD)

In a previous study carried out by Cardno (2018), a total of six seabed samples were obtained in the vicinity of the berthing area of the existing Wharf 3 (refer Figure 6.9). These samples were tested to determine their particle size distribution (PSD). The results of the PSD testing are presented in Table 6.13.



Figure 6.9 Locations of sediment sampling carried out by Cardno (2018). Sourced from Cardno, 2019.

The PSD analysis indicated that the seabed sediments are non-cohesive and that the median grain size diameter (d_{50}), ranges between 0.22 mm and 0.40 mm (Cardno, 2019). The average median grain size diameter of all sampled sediments was 0.34 mm with 90% of the sediment (by mass) maintaining a grain size above 0.17 mm. This analysis indicates that the percentage of fine material which is particularly susceptible to mobilisation and transport is relatively low near the existing Wharf 3 (Cardno, 2019).

Table 6.13 Sediment grain size (samples 1 to 6) Sourced from Cardno, 2019.

Sample	d_{90} (mm)	d_{50} (mm)	d_{10} (mm)
1	0.47	0.26	0.16
2	0.59	0.33	0.17
3	2.23	0.40	0.19
4	1.18	0.34	0.17
5	0.79	0.32	0.17
6	1.97	0.37	0.17
Mean	1.20	0.34	0.17

Sourced from Cardno, 2019.

Existing sediment transport

Sediment transport occurs when shear stress on seabed sediment particles causes them to mobilise. This occurs at different water velocities depending on the energy required for various sediment particle sizes. Mobilisation of soft sediments, resulting in a temporary increase in turbidity and suspended sediments loads can create short-term impacts to water quality (refer section 6.4) and biodiversity (refer section 6.1).

The seabed and shoreline regions of Manly Cove are formed from marine sand and rocky heads. As discussed above, tidal-generated current speeds close to the proposal footprint are very low with normal spring tide currents being less than 5 centimetres per second (Cardno, 2021). During extreme storms, such as were experienced in Manly Cove during a storm event in May 1974, currents could increase to 15 centimetres per second (Cardno, 2021). Consequently, natural changes to the seabed would be minimal around Manly Wharf except during severe storms (Cardno, 2019).

The greatest cause of high velocity water, and consequently sediment transport, is due to propeller wash resulting from ferries around the existing Manly Wharf, which can reach up to 8 metres per second (Cardno, 2019). Propeller wash occurs when ferries approaching or leaving the existing wharf generate fast water velocities around their propellers. This increased water velocity creates sheer stress, scouring the seabed and suspending sediments. This sediment generally settles locally around berthing pockets.

There is evidence that over time sediment transport caused by propeller wash has caused a scour hole to the north-east of the existing Wharf 3 berthing site, as shown in Figure 6.10 (Cardno, 2019). Evidence suggests that the angle of berthing vessels at the existing Wharf 3 has caused propeller wash that has scoured the cove bed along the north-west sides of Transects 1 and 2 in Figure 6.10, causing a lower seabed elevation and a retreat of seagrasses in this area (refer section 6.1).

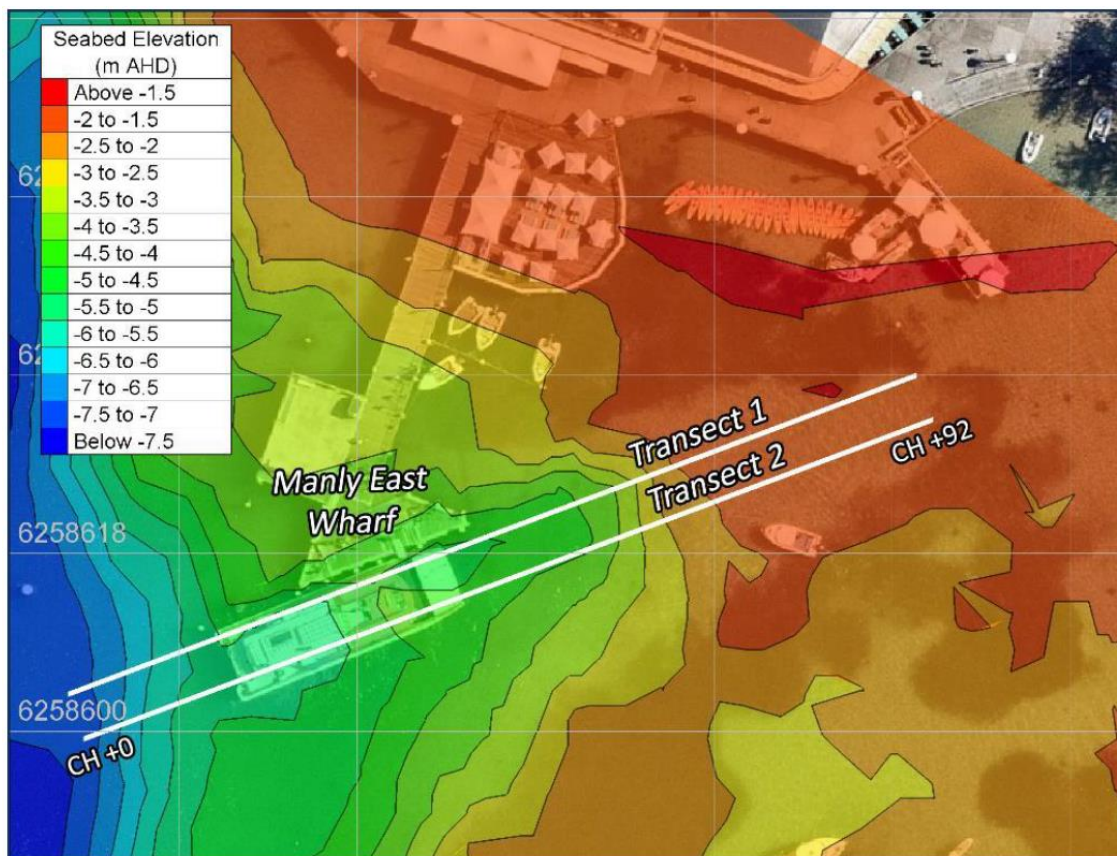


Figure 6.10 Scour hole produced by ferry propeller wash at the existing Wharf 3.

Contamination

Sydney Harbour has extensive areas of polluted sediments mainly associated with the historical industrial character of the catchment. Key potential contamination sources at and near the proposal footprint include contaminated nearshore sediments, stormwater discharge and surface water runoff (GHD,2021).

A *Geotechnical and contamination assessment* (GHD, 2021) was carried out for the proposal in part to identify sources of potential contamination or potentially contaminating activities that may have taken place on or adjacent to the proposal area.

A review of the proposal area’s history identified that historical use of the proposal area has predominately been marine transport and vessel infrastructure since 1941. The surrounding historical land has predominately been used for residential and some commercial purposes.

As such, potential sources of contamination at the proposal area include:

- contaminated sediment from Sydney Harbour particularly heavy metal contamination and dioxins which are easily transported due to nature of the estuarine systems.
- hazardous material contaminated within the aging wharf structure.

The corresponding potential contaminants of concern in the proposal area include benzene, toluene, ethylbenzene and xylene (BTEX), polychlorinated biphenyls (PAH) total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), heavy metals, organochlorine pesticides/ organophosphorus pesticides (OCP/OPP) and tributyl tin (TBT).

GHD (2021) tested two samples from a bore hole about 40 metres from the dredge pocket for these potential contaminants. These samples were from 1.0-1.45 metres and 2.5-2.95 metres below the seabed and deeper than the proposed dredging for the Wharf 3 berth pocket. Elevated concentrations of TBT were found in the sample from 1.0-1.45 metres below seabed.

Contamination levels present at the sample site were compared to assessment guidelines to investigate the risk to the health of construction workers, and appropriateness of onshore or offshore disposal. The results of this assessment are summarised in Table 6.14.

Table 6.14 Contamination presence in marine sediments at 1.0 – 2.95 metres below the seabed (GHD, 2022)

Purpose	Guideline	Conclusion
Human health risk	National Environment Protection Measures (NEPM) 1999 health investigation levels (HIL) and health screening levels (HSL) (NEPC, 2013)	<ul style="list-style-type: none"> • Contaminant were below the adopted human health screening criteria for commercial / industrial land use. • Potential human health risk to construction workers of proposal is considered low.

Purpose	Guideline	Conclusion
Offshore disposal	National Assessment Guidelines for Dredging (NAGD 2009)	<ul style="list-style-type: none"> Marine sediment is contaminated with concentration of the organometal TBT exceeded the adopted criteria. Offshore disposal of dredging material would not be suitable.
	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ ARMCANZ, 2009)	
	Australia and New Zealand Guidelines for Fresh and Mine Water Quality - Toxicant default guideline values for sediment quality (ANZAST, 2018)	
Onshore disposal	Waste Classification Guidelines, Part 1: Classifying Waste (NSW EPA, 2014)	<ul style="list-style-type: none"> High contamination from TBT means that further investigation of dredge material would be required to determine the appropriate waste classification. Exceedance of the sediment guidelines for TBT indicates that the material would be provisionally classified as Restricted Solid Waste and that onshore disposal would be the appropriate disposal method.

A search of the list of Contaminated Sites Notified to the EPA and the Contaminated Land Record of Notices were carried out on 11 May 2022 and no sites were identified within 500 metres of the proposal area.

A search of the Public Register under the PoEO Act on 11 May 2022 identified one site with an EPL within 500 metres of the proposal area. The licence holder was for Macquarie Hospital Services Pty. Limited at Manly Waters Private Hospital, 17 Cove Avenue, Manly about 490 metres away. The licence for this premises is no longer in force.

Acid sulphate soils

A review of site mapping (Naylor *et al.*, 2011) indicates that the proposal area is located in a location with high probability of Acid Sulphate Soils (ASS) occurrence. However, sediment sample testing and observations from the proposal area during field investigations did not indicate that ASS, or the conditions needed to form ASS, were present (GHD, 2021). As such, the likelihood of ASS or Potential Acid Sulphate Soils (PASS) being present within marine sediment at the proposal area is considered low.

Flooding

Neither the Northern Beaches Council (2019) or DPIE (2017) flood mapping identified the proposal area, including the compound site, to be in an area at risk of flooding. Given that the proposal footprint is mostly over water flood inundation is not considered likely to occur.

6.3.3 Potential impacts

Construction

Water based

Dredging and sediment mobilisation

Dredging of the berth pocket has potential to mobilise soft sediments, resulting in a temporary increase in turbidity and suspended sediments loads. This may impact on water quality (refer section 6.4) and adjacent seagrasses via light attenuation (limiting photosynthesis) or by sedimentation and smothering (refer section 6.2). The extent, concentration, and duration of increased suspended sediments depends on the fine content of the material to be disturbed, dredging equipment and methodology used, as well as meteorological and oceanic conditions at the time of the works.

As discussed in section 3.3.10, about 290 cubic metres of material would be removed as a part of the *in-situ* dredging. Dredging would be carried out from a barge mounted excavator. The volume of dredge spoil that would be produced would be about 350 cubic metres, accounting for a 1.2 bulking factor. All dredge spoil would be contained on hopper barges for offsite re-use or disposal to a licensed facility, depending on waste classification. Dredging works would require about three to five days.

Locally, the distributed coarser sediments would settle out of suspension almost immediately while the finer sediments could mobilise in a turbid plume over a greater area as they would remain buoyant in the water column. However, sediment transport of finer sediments is expected to be short-term and minimal given:

- currents in the proposal area are generally calm, under 5 centimetres per second
- dredging works would be carried out during calm conditions, when there would be the least water movement in the cove
- dredging works would be carried out at low tide, when there would be the least amount of water in the cove
- sediment material in dredge pocket is likely to be largely made up of coarser material not particularly susceptible to mobilisation and transport
- finer sediment would be captured and controlled using erosion control measures including silt curtains and a moon pool curtain.

Whilst the dredging equipment is dependent upon detailed design and the availability of dredging plant at the time of tender, it is recommended that a grab or clam shell dredger be used in order to minimise potential mobilisation of sediment and subsequent impacts on biodiversity and water quality. These dredging methods excavate materials using a closed container thus reducing sediment transport.

Use of a moon pool curtain, which completely encloses dredge sites to capture all the sediments contained within, would further reduce risk. A measure committing detail design to fully consider dredging equipment options for reducing sediment transport impacts has been included in Table 6.17.

The sediment mobilisation risks associated with dredging would be limited to the immediate surrounds, and are expected to be short term in nature, causing low risk to water quality with the implementation of the nominated management controls. As such, risks associated with dredging are considered acceptable and as low as reasonably practical.

Other sources of sediment mobilisation

Beyond dredging, there is potential for coarse debris to be mobilised during removal of existing structures, construction of new structures and vessel movement. Any larger debris would, however, be disposed of offsite and should not result in any sediment transport.

The temporary use of jack-ups / anchors during lifting and piling work would be the only equipment that would impact on the seabed. However, the associated equipment would typically 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 jackups / anchors would be reduced to the minimum required, with the placement of these locations selected to avoid any areas of sensitive habitat.

Similar management measures used for dredging would be utilised for piling work. Piling work would be carried out during calm conditions and at low tide. Erosion control devices would be used to limit the transport of finer sediments. With the introduction of these safeguards and the other standard safeguards described in Table 6.15, it is concluded that impacts would be avoided and / or minimised.

Water-based construction activities would result in the temporary increase in vessel and barge movements in and around the proposal area. This has potential to mobilise sediments via vessel wash, engine thrust, and use of anchors. Marine vessels used for construction would travel at slow speeds limited to 4 knots and trafficking to and from the construction site would be minimal. Measures to manage these potential impacts are outlined in Table 6.17.

Hydrodynamic effects

The proposal involves activities that would cause physical disturbance to the aquatic environment. This includes dredging, piling and the installation of the prefabricated wharf elements using a barge mounted crane. The scale of the disturbance would be minimal and insufficient to cause any dynamic changes in current speed, saline / freshwater mixing or flushing during construction.

There may be short-term and minor localised impacts to wave action around the wharf structures during construction where construction barges are moored. Marine vessels used for construction would travel at slow speeds and trafficking to and from the construction site would be minimal. As a result, vessel movement and the potential to create wave action negatively impacting on the shoreline is considered unlikely.

Contamination and ASS

The geotechnical and contamination assessment carried out for the proposal (GHD, 2021a) identified elevated levels of TBT in marine sediment near the proposed dredging and piling footprints. There is potential that dredging as well as removal of piles and the existing wharf elements could mobilise this material. The potential impact of this on water quality is discussed in section 6.4.

TBT has low solubility in water however it binds strongly to sediment (Langston and Pope, 1995). As a result, TBT is unlikely to dissolve into seawater and disperse aqueously. Due to its low solubility, TBT dispersion can be controlled through the management of mobilised sediment.

Potential impacts would be limited by the requirement to undertake the dredging and piling work during calm conditions and low tide, when there would be the least water movement in the cove, use of sediment control devices and other standard safeguards. Potential disturbance of seabed sediments during removal of piles and the existing wharf elements, and dredging would be localised and temporary in nature.

In addition, the results of the geotechnical and contamination assessment were used to determine the disposal method for the dredged material. The dredged seabed material would be disposed of onshore to limit the potential spread of contamination and to remove contaminated material from the marine environment. Dredged material would receive further testing to determine the appropriate waste classification and would be disposed of at a licenced facility. For further discussion on waste management refer section 6.13.

The likelihood of ASS or Potential Acid Sulphate Soils (PASS) being present within marine sediment at the proposal area is considered low. However, any material removed from marine environment via dredging would go through further investigation to determine the appropriate waste classification and disposed of at a licenced facility.

Land based

Erosion and sediment

Construction of the land-based elements would not involve any earthworks. As such there are no impact on erosion and sediment expected.

Contamination

Accidental material spill within the compound area may occur 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.

Flooding

If flooding was to occur during the construction of the proposal, the site compound in East Esplanade Park may be inundated with water, which could cause damage to plant and equipment and pollute the floodwater and surrounding environment with construction materials, sediment and chemicals.

However, as neither the Northern Beaches Council (2019) or DPIE (2017) flood mapping identified the proposal area to be in an area at risk of flooding this is not considered likely.

Operation

Water based

Ferry movements during operation of the proposal are expected to be the same as current arrangements. As such no additional sediment disturbance is anticipated as a result from ferries.

Although operations would not change in terms of frequency of vessel movements, size and types of vessels, there would be a change in the use of wharf berthing areas. Fast ferries previously berthing at the existing Wharf 3 (as shown in Figure 6.10) would berth alongside the new Wharf 3 (within the new dredge area).

This may cause a new zone of scouring and sediment transport between the new Wharf 3 and Wharf 2. There would also be a significant reduction in scouring on the eastern side of the wharf (where fast ferries previously berthed). The new Wharf 3 and the proposed Wharf 4 would extend into deeper water meaning scour effects, and mobilisation of sediments, from vessels would likely be lessened thus reducing impacts to water quality and nearby seagrass beds. Further, it is expected that over time sediment mobilisation from propeller wash would be reduced at the seabed settles into an adjusted bathymetry.

Only small recreational and commercial vessels such as water taxis would berth at the proposed new Wharf 4. The impact of these vessel types on erosion and scour is expected to be minimal due to their smaller engine sizes.

Under the proposal, new piles would be installed. As water flows around these structures there is the potential to create local scour and erosion. In this location, the only expected impacts would be limited to within a few metres of each pile given that currents are slow in the proposal area and the sediment is generally of a large size (Cardno, 2019). Local sediment conditions would adjust over time.

Dredging and removal of about 290 cubic metres at the eastern section of the wharf would deepen the area to ensure the Wharf 3 meets the vessel size design criteria. Increasing the water depth in this area would likely result in a very minor change to local currents.

A climate change risk assessment has been completed which identifies climate variables that are a risk to the proposal including sea level rise and increased coastal erosion. Refer section 6.15.3 for further information. These risks would be addressed in detailed design through the implementation of adaptation measures.

Land based

No significant impacts to the terrestrial land surface are anticipated during operation as no significant change to existing operations are proposed.

6.3.4 Safeguards and management measures

Table 6.15 lists the safeguards and management measures that would be implemented to avoid, minimise or mitigate potential impacts on the land surface and coastal processes identified in section 6.3.3. Other safeguards and management measures that are relevant to land surface and coastal processes are also identified in section 6.2 (biodiversity) and section 6.4 (water quality).

Table 6.15 Land surface and coastal processes safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
LC1	Land and coastal processes	<p>A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion, sediment scour and water pollution and describe how these risks will be addressed during construction. This will include:</p> <ul style="list-style-type: none"> • developing a work methodology to minimise sediment disturbance by progressing the work in sections to allow sediments to settle between works • conducting works associated with positioning barges, dredging, drilling and pile driving during calm conditions • conducting dredging and piling works during low tide • installing silt curtains around the construction site to contain sediments • installing a moon pool sediment control device around dredge site to contain sediment • minimising the number of barge anchor points • implementing a 4-knot construction marine vessel speed limit • implementing appropriate procedures to manage the effects of potential flooding during construction. 	Contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
LC2	Erosion and sedimentation	<p>Prior to commencement of construction activities, sediment control device (such as sediment boom and curtain) will be installed around the site to contain disturbed sediment from the water surface by allowing suspended sediments to settle back on the bottom of the seabed overtime. The silt boom and curtain are to extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work.</p> <p>Installation will be carried out during high tide periods from a boat. The silt boom and curtain will be designed to rise and fall with the tide to prevent disturbance.</p> <p>Inspection of the silt boom and curtain device will be carried out on a daily basis after ebbing tides, with additional inspection carried out following storm events.</p> <p>Prior to removing the silt boom and curtain, conditions within the curtain will be assessed visually and with a field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.</p>	Contractor	Construction
LC3	Erosion and sedimentation	Consideration will be given in detailed design to the use of lower impact dredging equipment such as use of a grab or clam shell dredger.	Transport / Contractor	Detailed design
LC4	Acid sulfate soils	Minimise the disturbance and exposure of sediment and/or the underlying soils to oxygen.	Contractor	Construction
LC5	Contaminated material	Any excavated sediments or soil that require disposal will be sampled, tested and classified in accordance with the <i>Waste Classification Guidelines: Part 1 Classifying Waste</i> (EPA, 2014) prior to being disposed of at a waste facility licensed to accept the relevant class of waste. Any materials classified as Hazardous Waste may require treatment or an immobilisation approach in accordance with Part 10 of the <i>Protection of the Environment Operations (Waste) Regulation 2014</i> prior to off-site disposal.	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
LC6	Contaminated material	If unexpected contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport Environment Manager and/or EPA.	Contractor	Construction

6.4 Water quality

This section describes the existing water quality in Manly Cove and potential impacts associated with the proposal.

For specific discussion on hydro-oceanic conditions, geology and contamination at the proposal area refer to section 6.3. For specific discussion on potential impacts on biodiversity from changes to water quality refer to section 6.2.

6.4.1 Methodology

Published data was used to define the water quality and sediment characteristics of the proposal area. This included:

- Sydney Harbour Water Quality Improvement Plan (LLS, 2015)
- State of the Beaches Annual Reports 2010-2019 (OEH, 2011, 2012, 2013, 2014a, 2015, 2016, 2017, 2018; DPIE, 2019, 2020a)
- Ferry Wash Modelling Manly Wharf East (Cardno, 2019)
- Manly Cove Coastal Zone Management Plan (Manly Council, 2011)
- As discussed in section 6.3, sources of potential contamination were established using analysis and sampling carried out by GHD (2021).

Proposed activities which have the potential to impact water quality were then qualitatively assessed based on understanding of likely plume behaviour, sediment characteristics, and the quality of water and sediment present at the proposal area.

6.4.2 Existing environment

Port Jackson catchment

Manly Cove is in the Port Jackson catchment of Sydney Harbour (LLS, 2015). The majority of this catchment is residential land use (40 per cent), with roads (20 per cent), commercial (17 per cent) and parklands (11 per cent) making up the majority of the catchment (LLS, 2015). Sewer overflows are also a substantial issue in the catchment. These overflows generally operate during high flow events and discharge a mix of stormwater and untreated sewage (LLS, 2015).

The hydrodynamics of Sydney Harbour play an important role in the state of its water quality. Stormwater is mainly generated under high rainfall events. Sydney Harbour is well flushed near the entrance, such as near Manly Cove, but poorly flushed in the upper reaches. During high rainfall and consequential stormwater events, pollutants that are discharged near to the outlet can be flushed to the ocean, but otherwise they will linger within the estuaries (LLS, 2015).

In Port Jackson, industrialisation in the Sydney area has caused marine pollution and anthropogenic sediment to be deposited into the harbour. There are several sewer overflow points and stormwater drain discharges throughout the region, thus water quality compliance is varied across the Port Jackson region (LLS, 2015).

Stormwater discharge and surface water runoff are considered to be the main sources of contamination to the estuary. Pollutants commonly associated with stormwater discharge include:

- sediment from erosion and stormwater inflows, impacting turbidity
- pathogens such as faecal coliforms
- litter and other wastes
- pesticides from agricultural land uses
- nutrients and pathogens from fertilizers and sewage overflows
- heavy metals (in river sediments)
- other contaminants such as hydrocarbons from oil and fuel leaks.

Manly Cove water quality

Generally, water quality of Manly Cove is of high standard, primarily due to its close proximity to the entrance of Sydney Harbour which results in steady tidal flushing. However, during large rain events and/or large swell events or a combination of both (i.e., East Coast Low pressure systems) Manly Cove can experience elevated turbidity and suspended sediments.

This is reflected in beach quality data for Manly Cove. A review of beach water quality data for the last 10 years for Manly Cove (OEH, 2011, 2012, 2013, 2014a, 2015, 2016, 2017, 2018; DPIE, 2019, 2020a) indicates that water quality is generally safe for swimming most of the time but is susceptible to pollution after rain from several potential sources of minor faecal contamination. Enterococci levels generally increase with increasing rainfall and can exceed the safe swimming limit in response to 10 millimetres of rainfall or more (OEH, 2012).

Previous modelling of Manly Cove (Manly Council, 2011) has estimated the total pollutants in stormwater entering Manly Cove. The result of this modelling is presented in Table 6.16. However, recent works to upgrade stormwater networks, such as the introduction of a new gross pollutant trap at East Esplanade Park in 2021, would have likely reduced levels of pollutants entering Manly Cove (Northern Beaches Council, 2021).

Table 6.16 Total load of pollutants in stormwater entering Manly Cove, based on the modelling exercise carried out for a normal rainfall year. Sourced from Manly Council, 2011.

Pollutant	Modelled level
Total Nitrogen	750 kg / year
Total Phosphorous	100 kg / year
Copper	50 kg / year
Lead	70 kg / year
Zinc	150 kg / year
Sediment	41 tonnes / year

6.4.3 Potential impacts

Construction

The proposal includes a number of activities which have the potential to impact water quality. These include movement and anchoring of construction vessels, such as dredging equipment and construction barges, which may lead to hydrocarbon spills, disturb bottom sediments, and contribute to dispersal of suspended sediments. In particular, dredging and the placement and removal of piles may generate turbid plumes and increase rates of sedimentation within the nearshore habitat.

Dredging and sediment mobilisation

Dredging of the berth pocket has potential to impact water quality via the mobilisation of soft sediments, resulting in a temporary increase in turbidity and suspended sediments loads. This may impact on adjacent seagrasses via light attenuation (limiting photosynthesis) or by sedimentation and smothering (for more detail refer to section 6.2).

As section in section 6.3, coarser sediments would settle out of suspension almost immediately. While mobilisation of finer sediments would occur, this is likely to be short-term and cause a minimal impact on water quality with the use of appropriate management measures including:

- undertaking works at low tide in calm water
- using sediment control devices
- choosing appropriate dredge equipment.

As such, impacts to water quality from dredging would be short-term and would be expected to be within levels of current variability within Manly Cove. As such, risks associated with dredging are considered acceptable and as low as reasonably practical.

Other sources of sediment mobilisation

There is potential for coarse debris to be mobilised during removal of existing structures, construction of new structures and vessel movement. Any larger debris would, however, be disposed of offsite and should not cause any impacts to water quality.

Water-based construction activities would result in the temporary increase in vessel and barge movements in and around the proposal area. This has potential to mobilise sediments via vessel wash and engine thrust, and further scouring of the seabed from anchors. Measures to manage these potential impacts are outlined in Table 6.17.

In terms of water quality, significant impacts beyond the proposal area would not be expected with suitable controls in place. As the impact of localised sediments would be limited, controlled within silt curtains, and the behaviour of plumes is well understood, hydraulic modelling of the proposal is not required.

Pollutants

Water quality could potentially be impacted through the introduction or mobilisation of pollutants. Disturbance of sediments could result in the mobilisation of contaminants known to persist in proposal area (i.e., TBT). TBT has low solubility in water however it binds strongly to sediment (Langston and Pope, 1995). As a result, TBT is unlikely to dissolve into seawater and disperse aqueously.

Due to its low solubility, TBT dispersion can be controlled through the management of mobilised sediment. As discussed in section 6.3, sediment transport from the proposal is not expected to be significant and would be effectively managed using appropriate controls. Dredged materials would be disposed of onshore in order to remove any contaminated material from the marine environment.

Accidental spills

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 waterway namely:

- dredging
- drilling / hammering the piles
- transferring equipment and machinery
- installing the new piles and structures.

The primary impact from spills would be a decline in water quality which would have an impact upon the aquatic environment. The impact would depend on the quantity and type of material spilt. However, providing relevant standard controls, such as those identified in Table 6.17 are implemented the impacts are expected to be minimised.

Accidental material spill within the compound area may occur from storing, handing and/or transferring the required small volumes of welding materials, lubricants, solvents, fuels, oils and diesels.

Operation

No significant impacts to water quality are anticipated during operation of the proposal. Ferry movements during operation of the proposal are expected to be similar to current movements. As such no significant additional sediment disturbance is anticipated as a result from ferries.

However, although operations would not change in terms of frequency of vessel movements, size and types of vessels, there would be a change in the use of wharf berthing areas. Fast ferries previously berthing at the existing Wharf 3 (as shown in Figure 6.10) would berth alongside the new Wharf 3 (within the new dredge area). Only small recreational and commercial vessels such as water taxis would berth at the proposed new Wharf 4. This could cause a temporary increase in turbidity and a reduction in water quality between the new Wharf 3 and Wharf 2. However, this is expected to reduce over time as the seabed settles into a new bathymetry.

The rainfall collected on the main roof canopy would drain to a central box gutter, which would discharge into concealed pipes running along the roof column. These pipes would discharge into the cove below. This is not anticipated to impact stormwater quality as the rainwater would only be in contact with roof and guttering material before entering the cove.

There is the potential for an accidental waste or pollutants to enter the marine environment and impact water quality during operation of the proposal. This could include:

- accidental spills or discharge
- litter and solid waste
- other contaminants such as hydrocarbons from oil and fuel leaks.

Accidental spills or discharges from vessels would be most likely occur during berthing at the wharves. While this is the case, the same potential exists from the current wharf and would be managed under the standard controls already in place across the ferry network.

Similarly, the existing facilities also have the potential to reduce water quality from litter and solid waste entering the marine environment. A bin would be provided as part of the proposal design. As such, the impacts are expected to be safeguarded against and the same at the existing risk at the current facility.

6.4.4 Safeguards and management measures

Table 6.17 lists the safeguards and management measures that would be implemented to avoid, minimise or mitigate potential impacts on water quality identified in section 6.4.3. Other safeguards and management measures that are relevant to water quality are also identified in section 6.3 (land surface and hydrology).

Table 6.17 Water quality safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
WQ1	Accidental spill	<ul style="list-style-type: none"> A spill management plan will be developed as part of the CEMP and communicated to all staff working on site. Appropriate land and aquatic spill kits will be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit must be appropriately sized for the volume of potentially polluting liquids stored on site. All workers will be advised of the location of the spill kit and will be trained in its use. 	Contractor	Pre-construction / Construction
WQ2	Accidental spill	If an incident (e.g., spill) occurs, the Transport <i>Environmental Incident Classification and Reporting Procedure</i> is to be followed and the Transport Contract Manager notified as soon as practicable.	Contractor	Construction
WQ3	Accidental spill	In the event of a maritime spill, the incident emergency plan will be implemented in accordance with Port Authority of NSW's response to shipping incidents and emergencies outlined in the <i>NSW State Waters Marine Oil and Chemical Spill Contingency Plan</i> (RMS, 2016c).	Contractor	Construction
WQ4	Accidental spill	Vehicles, vessels and plant will be properly maintained and regularly inspected for fluid leaks.	Contractor	Construction
WQ5	Accidental spill	No vehicle or vessel wash-down or re-fuelling will occur on site.	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
WQ6	Accidental spill	Any chemicals or fuels stored at the site or equipment barges will be stored in a bunded area.	Contractor	Construction
WQ7	Pollution	An environmental work method statement (EWMS) will be developed for the removal of the existing wharf elements to minimise the risk of pollutants and debris entering the waterway. The EWMS must be approved by Transport prior to the demolition works.	Contractor	Pre-construction
WQ8	Water quality - spills and turbidity	Visual monitoring of local water quality (i.e., turbidity, hydrocarbon spills/slicks) will be carried out on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. Results of the observations are required to be recorded. Records are required to be kept on the site and to be made available for inspection by persons authorised by Transport.	Contractor	Construction
WQ9	Mobilisation of soils, sediments and contaminants impacting on water quality	Water quality and surface sediments should be tested in the vicinity of the dredge area for contaminants, including TBT during and post-construction to determine whether there has been an increase in contaminant levels (potentially harmful to marine biota) and whether remediation action is required.	Contractor	During and post-construction

6.5 Landscape character and visual impact

This section summarises the proposal’s landscape character and visual impacts. Appendix E contains the Landscape and Visual Impact Assessment prepared by GHD (GHD 2022).

6.5.1 Methodology

A landscape character and visual impact assessment (LCVIA) was prepared based on the following guidelines:

- Environmental impact assessment practice note EIA-N04 – Guideline for landscape character and visual impact assessment, Version 2.2 (Transport for New South Wales, 2020)
- *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition (Landscape Institute and Institute of Environmental Management & Assessment, 2013).

The assessment identifies the overall impact of the proposal on each of the Landscape Character Zones (LCZ) through predicting the sensitivity of the LCZ to proposed followed by identifying the anticipated magnitude of change that would result from the proposal within each LCZ.

The assessment also provides a visual impact assessment to identify the visual changes and impacts on the site and its surroundings when viewed from key vantage points. Of the 13 viewpoints assessed, six viewpoints were selected for the production of photomontage images to represent changes to views following the completion of the proposal. These six viewpoints were chosen to illustrate a representative view of the proposal from the most sensitive viewpoints.

The assessment combines the viewers' sensitivity to the proposed works/structures with the magnitude of the proposed works/structure within the existing views. Table 6.18 details the landscape character and visual impact grading matrix.

Table 6.18 Magnitude of impact matrix (GHD 2022)

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

A specific ‘study area’ was used for the LCVIA assessment which included the wider Manly Cove and harbour area with a potential visual line to the proposal area. This is shown in Figure 6.1.



Figure 6.1 - LCVIA study area

Whilst every care has been taken to generate what structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: NSW Imagery © Department of Customer Service 2020
 World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by Imbula

The LCVIA presented in this chapter and Appendix E was based on an initial concept design that included a roof canopy over the Wharf 3 gangway. As the design development for the proposal has progressed, the current design, as at October 2022, no longer includes a roof canopy on the gangway.

Removal of the gangway roof would have a reduced impact on the visual amenity and landscape character of the area. As such, this assessment is considered conservative. The design change would not result in modification to the identified mitigation measures.

6.5.2 Existing environment

Manly Wharf is located in within Sydney Harbour in Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes two ferry terminals (wharves 1 and 2), a third tidal step wharf (Manly 3) and a restaurant and retail section. It supports a transport interchange providing public ferry and bus transport that service Manly, the Northern Beaches suburbs, and connection to Circular Quay.

Landscape and urban context

The existing wharf is supported on timber piers and has a concrete platform and architectural design of the façade is similar to that of the Circular Quay ferry terminals. The locality consists of a variety of landforms such as bays, beaches, headlands, rugged cliffs, steep slopes and hills.

Manly Wharf has established itself as a major destination and meeting-place for commuters, tourists and visitors. The wharf complex contains shops, bars, and restaurants, some of which have views over the cove. Also in Manly Cove are the Manly Art Gallery and Museum, the Manly Pavilion and the former Manly Sea Life Sanctuary. Parallel to the beach are the Fairlight Walk and the East and West Esplanades. The waterfront is lined by a long strip of tall and iconic Norfolk Island pine trees. The town centre is adjacent to the wharf and features buildings that are typically two to six stories high. Running through the town centre is The Corso, a lively pedestrian mall which connects Manly Cove and Manly Beach.

The area surrounding the town centre is mostly residential, with areas zoned general, low-density and medium density. The Sydney Harbour National Park is located approximately one kilometre to the south-east at Dobroyd Head, offering walking trails and views of the harbour and city. The Pacific Ocean and Manly Beach are located to the east.

Landscape character zones

In assessing the landscape character of Manly Wharf and how the proposed wharf upgrade would fit within the surrounding landscape, areas around the proposal were divided into four LCZ as described in Table 6.19. Figure 6.12 shows the extent and boundary of the LCZ based on computer modelled analysis to identified land from which it would be theoretically possible to view the components of the proposal. (labelled study area).

Table 6.19 Landscape character zones

Landscape Character Zone (LCZ)	Description
<p>LCZ1 – Manly foreshore and cove</p>	<p>Key characteristics of the zone include:</p> <ul style="list-style-type: none"> • a coastline that has a combination of natural bushland, rocky cliffs, a sandy beach, ocean pools and built form • vegetation dominated by coastal heaths on exposed parts of the landscape and dry sclerophyll forests in protected parts. • a park running parallel to Manly Cove, East and West Esplanades accommodating a tall row of Norfolk Island Pine trees • vessels of a variety of sizes including the yellow and green Sydney ferry, and yellow and blue Fast Ferry which dock at Manly Wharf • built form which responds to the topography. On low-lying sections of coastline, built form commonly extends over the water, such as numerous ocean pools, the Manly Pavilion, the Sea Life Centre, Yacht Club and Manly Wharf • built form which includes iconic, heritage-listed buildings such as the modernist architectural style of the Manly Wharf and the Mediterranean architectural style of the Manly Pavilion • Fairlight Walk which follows much of the coastline, providing long views across the North Harbour. • LCZ1 has high scenic, recreational, ecological and cultural value and makes a very strong contribution to the local character. LCZ1 therefore has a High landscape value. <p>Values associated with this landscape include:</p> <ul style="list-style-type: none"> • Aboriginal cultural values associated with multiple AHIMS registered sites along the Dobroyd Head shoreline and the Guringai Resting Place – Reef Beach (NGH Environmental and Roads and Maritime Services, 2018), as well as the area’s long history of habitation by the Gayemaygal people • scenic values are associated with the attractive views from beaches, lookouts, Fairlight Walk, the ferry and nearby residences • recreational values are associated with the beaches, harbour, ocean pools, Yacht Club and Fairlight Walk • ecological values are associated with the seagrass meadows in Manly Cove and along the coastline

Landscape Character Zone (LCZ)	Description
	<ul style="list-style-type: none"> from an international perspective, the Manly foreshore and bay are nationally important features and form a key part of Australia's character.
LCZ2 – National Park and open space	<p>Key characteristics of the zone include:</p> <ul style="list-style-type: none"> parklands including Dobroyd Head to the south-west of the proposal which forms part of Sydney Harbour National Park. Dobroyd Head is characterised by well-preserved, extensive areas of Sydney Coastal Dry Sclerophyll Forests, Sydney Coastal Heaths and smaller areas of littoral rainforests. Multiple walking tracks with intermittent rest areas meander through the forest Ivanhoe Park, Tower Hill Park, Dalley Castle Park and Gilbert Park situated north-west of the proposal area within residential areas. Vegetation in urban parks is characterised by lawn areas with scattered, mature trees and some clusters of dense vegetation topography is relatively flat in the urban parks, in contrast to Dobroyd Head, which is characterised by steep slopes, reaching a peak elevation of about 80 metres Dobroyd Head as extensive and well-known walking tracks offering enclosed forest views, and long views across the harbour. Including Arabanoo Lookout, a popular attraction offering long views towards Manly Reef Beach Track forms part of the popular Spit Bridge to Manly Walk Reef Beach is accessed from Reef Beach Track and offers a secluded, bush setting with long views towards Manly Guringai Resting Place, an Aboriginal reburial site where ancestral remains have been returned to Country is located at Reef Beach Ivanhoe Park features significant Aboriginal elements, an oval, sporting facilities and the Victorian-style botanical gardens sports facilities such as a bowls club, tennis courts and sports ovals are situated next to Ivanhoe Park. LCZ2 has high scenic, recreational, ecological and cultural value and makes a very strong contribution to the local character. LCZ2 therefore has a High landscape value. <p>Values associated with this landscape include:</p> <ul style="list-style-type: none"> Aboriginal cultural values associated with multiple AHIMS registered sites on Dobroyd Head (NGH Environmental and Roads and Maritime Services, 2018), as well as the area's long history of habitation by the Gayemaygal people

Landscape Character Zone (LCZ)	Description
	<ul style="list-style-type: none"> • from an international perspective, the Sydney Harbour National Park (on Dobroyd Head) is a nationally important feature and forms a key part of Australia's character. Arabanoo Lookout is a prominent stop for tourist coaches, enhancing its prominence from an international perspective. • the Sydney Harbour National Park (on Dobroyd Head) is zoned as 'C1 National Parks and Nature Reserves' in the LEP, to protect the environmental significance of that land • scenic and recreational values are associated with the beaches, lookouts and walking tracks • ecological values are associated with the well-preserved forest on Dobroyd Head as well as the urban parks
LCZ3 – Low lying urban centre	<p>Key characteristics of the zone include:</p> <ul style="list-style-type: none"> • The Corso, the main spine of the town centre; a vibrant pedestrian mall that runs between the beach and the cove • Manly town centre consists of supermarkets, specialist retailers, fitness clubs, hospitality venues, hotels and civic areas. It is a popular destination with high foot traffic due to its proximity to the beaches and wharf, catering for residents and visitors year-round. • The Corso pedestrian mall is a key feature; a wide, formal street, with playgrounds, water features, and a central avenue of mature Phoenix palms and Moreton Bay figs. The street is lined with late 19th Century to early 20th Century buildings occupied by shops, restaurants and bars • development tends to be low scale on principle streets with built form generally four to six stories high, preventing the town centre from feeling too enclosed corner buildings tend to be slightly higher and more distinctive architectural styles vary, such as civic buildings (Council Chambers and St. Matthews Church) located nearby large-scale modern development • a small number of apartment buildings and hotels reach up to 17 stories, such as the National Hotel • footpath awnings and through-block arcades protect pedestrians and produce strongly defined and comfortable urban spaces most structures extend to property boundaries • topography is relatively flat and low-lying.

Landscape Character Zone (LCZ)	Description
	<ul style="list-style-type: none"> • character elements make a strong contribution to the local character, including locally important landscape features such as The Corso and heritage-listed buildings. LCZ3 therefore has a High landscape character value. <p>Values associated with this landscape include:</p> <ul style="list-style-type: none"> • the town centre reflects the early development of Manly, most notably the intact quality of The Corso and its turn of the century streetscape, as well as key built elements • recreational value is associated with vibrant streets and laneways, as well as playgrounds on the Corso and bike and pedestrian paths • scenic values are associated with mature street trees and heritage building facades, as well as framed views of the sea and harbour and wide vistas afforded by low-scaled buildings • from an international perspective, Manly forms a key part of Australia's character as an encapsulation of Australian beach culture, and operates as an international tourist destination • Aboriginal cultural values are associated with long history of habitation by the Gayemaygal people.
<p>LCZ 4 – Hilly Settlement</p>	<p>This zone includes residential areas located to the north-east and south-west of the proposal. Key characteristics of the zone include:</p> <ul style="list-style-type: none"> • residential buildings fan outwards of the centre and up the hillsides around the harbour, transitioning from four to five storey apartment buildings to stand-alone dwellings, many with large setbacks and established gardens. • built form is characterized by detached dwellings in mixed architectural styles ranging from one to three stories, with large setbacks and mature gardens • on sections of coastline with cliffs, built form tends to be set back, with a grassed area and walking track separating houses and the coast • on sections of coastline without cliffs, residential gardens commonly extend all the way to the waterfront, such as properties on Cove Avenue, many of them featuring ocean pools or traditional pools • houses are commonly oriented to face to views of the water

Landscape Character Zone (LCZ)	Description
	<ul style="list-style-type: none"> • mature street trees with large canopies provide shade and contribute to the area’s lush, established character and soften the houses into their natural setting • wide streets with parallel parking, nature strips, footpaths and building setbacks on both sides make the streets open and light • a mix of native and non-native vegetation is present. Exotics such as palm trees and European hedging are commonplace in front gardens • zoning is a mix of low density, medium density and general residential • topography is gently sloping reaching approximately 60 metres at the highest points within the study area • long, framed views are frequently achieved towards the town centre, other residential areas, the national park, Pacific Ocean or North Harbour • character elements are in reasonably good condition and that make an average contribution to the local character, include locally important features outlined above. LCZ4 therefore has a medium landscape character value. <p>Values associated with this landscape include:</p> <ul style="list-style-type: none"> • landscape items of local heritage significance include Margaret Street, the street trees on Addison Road and various individual buildings and street trees due to their strong contribution to the character of the suburb • Aboriginal cultural values are associated with long history of habitation by the Gayemaygal people.



Figure 6.12 - Landscape character zones

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Data source: NSW Imagery © Department of Customer Service 2020
 World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by inroads

Viewpoints

The following viewpoint locations have been established to assist in the assessment of key views within the vicinity of the proposal. Visual receivers have been considered in terms of the views they are likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view. Visual receivers are identified based on:

- proximity of the receivers to the proposal, as the most affected visual receivers are anticipated to be located closest to the proposal, unless located at an elevated vantage point
- type of receiver, as different viewer types would have different perceptions of the change.

Based on the analysis of the existing landscape and visual environment, viewpoint locations were selected for assessment as representative of sensitive visual receiver locations. The viewpoint selection process considers a range of criteria including representation of a range of receiver types and distances from the proposal. It may include the most sensitive visual receivers and/or viewing locations where views may experience the greatest level of change. The assessment requires that viewpoints are in publicly accessible locations only, which means some private properties and residences may not be represented. The viewpoints represent the most sensitive visual receivers which may have prolonged views to the proposal. The locations of the viewpoints are shown in Figure 6.13. Photomontages have been produced to assess potential visual impacts at six of the 13 assessed viewpoints (Table 6.20).

Viewpoint locations include:

- Viewpoint location 1 (VP01) Arabanoo Lookout, looking north-east
- Viewpoint location 2 (VP02) Reef Beach, looking north-east
- Viewpoint location 3 (VP03) Federation Point, looking east
- Viewpoint location 4 (VP04) Manly Pavilion deck, looking east
- Viewpoint location 5 (VP05) Sea Life and Cove Beach West, looking south-east
- Viewpoint location 6 (VP06) Wharf 2, looking south
- Viewpoint location 7 (VP07) Manly Wharf stairs, looking south
- Viewpoint location 8 (VP08) Between Wharves 2 and 3, looking south-west
- Viewpoint location 9 (VP09) The Tropic bar and Kayak Centre, looking south-west
- Viewpoint location 10 (VP10) East Manly Cove Beach, looking west
- Viewpoint location 11 (VP11) Esplanade East and Ashburner Street, looking north-west
- Viewpoint location 12 (VP12) Manly Yacht Club, looking north-west
- Viewpoint location 13 (VP13) Manly Fast Ferry, looking north-east.

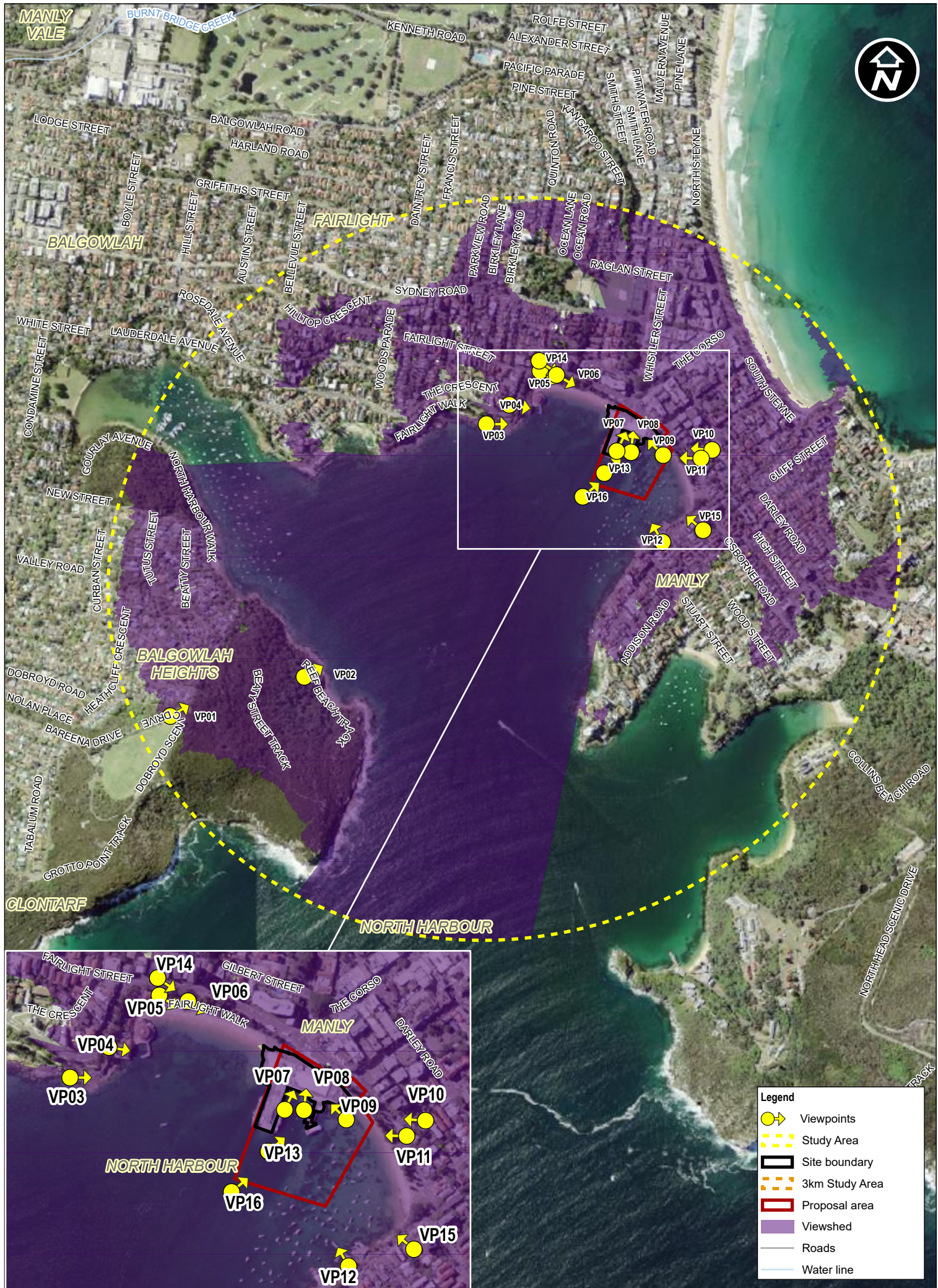




Figure 6.13 - Viewpoints

Whilst every care has been taken to generate what structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unreliable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017; Office of Environment and Heritage NSW. Created by inroads

Table 6.20 Viewpoint descriptions and photomontages

Viewpoint	Description
<p>Viewpoint location 1 (VP01) Arabanoo Lookout, looking north-east</p>	<p>VP01 is situated approximately 1.5 kilometres south-west from the proposal and is facing in a north-east direction. This viewpoint is representative of views experienced by visitors to Arabanoo Lookout, which sits within the Sydney Harbour National Park and is accessed via a path from Dobroyd Scenic Drive.</p>
 <div style="position: absolute; top: 10px; right: 10px; background-color: #003366; color: white; padding: 5px; border-radius: 10px;">Existing view</div>	
<p>Viewpoint location 2 (VP02) Reef Beach, looking north-east</p>	<p>VP02 is situated approximately one kilometre south-west of the proposal and is facing in a north-east direction. This viewpoint is representative of views experienced by users of Reef Beach which is accessed by Reef Beach track, a popular and scenic coastal walk. This viewpoint is located within Sydney Harbour National Park, on Dobroyd Head.</p>
 <div style="position: absolute; top: 10px; right: 10px; background-color: #003366; color: white; padding: 5px; border-radius: 10px;">Existing view</div>	

Viewpoint	Description
<p>Viewpoint location 3 (VP03) Federation Point, looking east</p>	<p>VP03 is situated approximately 300 metres west of the proposal and is facing in an eastern direction.</p> <p>This viewpoint is representative of views experienced by pedestrians on Fairlight Walk and users of the rest area just east of the path. It is also representative of views from road users and residential properties on Commonwealth Parade, approximately 40 metres north-west of this viewpoint location.</p>



<p>Viewpoint location 4 (VP04) Manly Pavilion deck, looking east</p>	<p>VP04 is situated on the public walkway (boardwalk) in front of the Manly Pavilion, within the state heritage listed site. It is approximately 250 metres west of the proposal and is looking in an eastern direction. This viewpoint is representative of views experienced from the walkway outside the Pavilion, by members of the public using the walkway, workers and patrons on the Manly Pavilion outdoor dining deck, and boat users on the harbour.</p>
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Viewpoint	Description
<p>Viewpoint location 5 (VP05) Sea Life and Cove Beach West, looking south-east</p>	<p>VP05 is situated on Cove Beach West, next to the former Sea Life Centre. It is approximately 250 metres west from the proposal and is looking in a south-eastern direction. This viewpoint is representative of views experienced by pedestrians and cyclists on Fairlight Walk, as well as beach users.</p>



<p>Viewpoint location 6 (VP06) Wharf 2, looking south</p>	<p>VP06 is situated within the proposal area and is looking in a southern direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians on the boardwalk and users of the Manly Wharf complex.</p>
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Viewpoint	Description
<p>Viewpoint location 7 (VP07) Manly Wharf stairs, looking south</p>	<p>VP07 is situated within the proposal area and is looking in a southerly direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians using the stairs to access upper levels of the wharf, and patrons and staff at the upper level restaurants and bars.</p>



Note: As of October 2022, Wharf 3 no longer includes a roof canopy on the gangway.

Viewpoint	Description
<p>Viewpoint location 8 (VP08) Between Wharves 2 and 3, looking south-west</p>	<p>VP08 is situated within the proposal area and is looking in a south-western direction, towards Wharf 3.</p> <p>This viewpoint is representative of views experienced by pedestrians using the boardwalk to access any part of Manly Wharf, as well as patrons and staff using the outdoor dining areas of lower level restaurants and bars.</p>



Note: As of October 2022, Wharf 3 no longer includes a roof canopy on the gangway.

Viewpoint	Description
<p>Viewpoint location 9 (VP09) The Tropic bar & Kayak Centre, looking south-west</p>	<p>VP09 is situated within the proposal area and is looking in a south-westerly direction, towards Wharf 3.</p> <p>This viewpoint is representative of views experienced by pedestrians using the boardwalk to access any part of Manly Wharf, as well as patrons and staff at the Tropic Bar outdoor area, and users of the Kayak Centre.</p>



Existing view



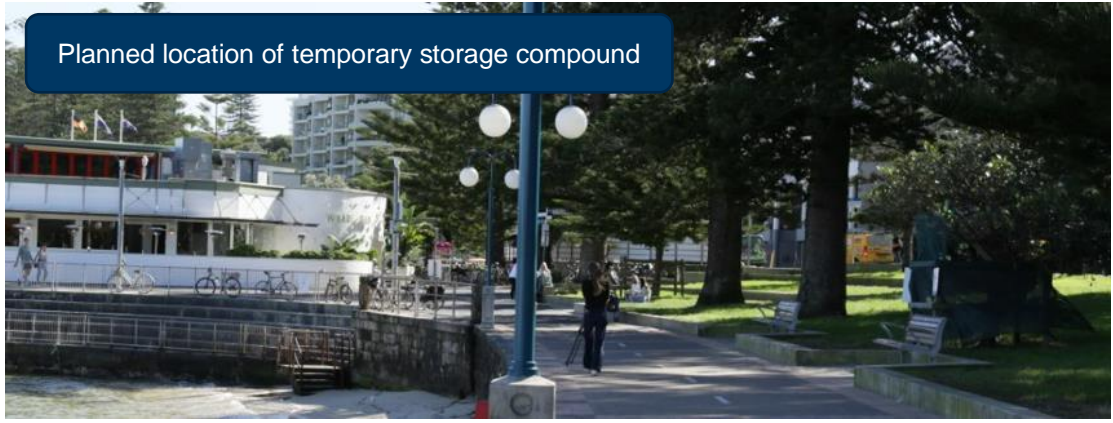
Photomontage

Note: As of October 2022, Wharf 3 no longer includes a roof canopy on the gangway.

Viewpoint	Description
<p>Viewpoint location 10 (VP10) East Manly Cove Beach, looking west</p>	<p>VP10 is situated approximately 100 metres east from the proposal and is looking in a western direction. This viewpoint is representative of views experienced by pedestrians and cyclists on Fairlight Walk, and users of East Manly Cove Beach.</p> <p>This viewpoint would include the proposed compound area adjacent to Fairlight walk.</p>



Note: As of October 2022, Wharf 3 no longer includes a roof canopy on the gangway.





Viewpoint	Description
<p>Viewpoint location 11 (VP11) Esplanade East and Ashburner Street, looking northwest</p>	<p>VP11 is situated approximately 200 metres east of the proposal and is looking in a north-westerly direction. This viewpoint is representative of views experienced by pedestrians, cyclists and vehicles along East Esplanade and the southern end of Ashburner Street, as well as residents in harbour facing dwellings on East Esplanade.</p>



Viewpoint	Description
<p>Viewpoint location 12 (VP12) Manly Yacht Club, looking north-west</p>	<p>VP12 is situated approximately 250 metres south-east of the proposal area and is looking in a north-westerly direction. This viewpoint is representative of views experienced by users of the Manly Yacht Club, Sailing Club and Launch Club, as well as users of the Yacht Club balcony, boats on the harbour and pedestrians on the East Esplanade near the Yacht Club.</p>



Viewpoint	Description
<p>Viewpoint location 13 (VP13) Manly Fast Ferry, looking north-east</p>	<p>VP13 is situated within the proposal area and is facing in a north-eastern direction. This viewpoint is representative of views from ferries as they depart from and arrive at the Manly Wharf.</p>
 <p>Existing view</p>	
 <p>Photomontage</p>	
<p>Note: As of October 2022, Wharf 3 no longer includes a roof canopy on the gangway.</p>	

6.5.3 Potential impacts

Construction

During construction landscape and visual impacts are expected as follows:

- temporary visual impacts associated with barges, cranes, and machinery as well as water taxis and other boats being redirected to other locations including Manly Sailing pier, Bavarian deck, and East pier
- temporary visual impacts associated with storage areas, fencing, hoarding and signage at the end of Wharves 1 and 2 and in the East Esplanade Park
- temporary visual impacts to the existing views of the wharf from lookouts would unlikely be noticeable at a distance of 1.5 kilometres and would be intermittently screened by vegetation as visitors move through the lookout area and along Fairlight Walk

- changes to the existing views wharf from beaches would unlikely be noticeable at a distance of one kilometre and would be intermittently screened by passing boats.

Operation

The proposal would alter viewpoints and change landscape character within Manly Cove and from Manly Wharf ferries; a popular tourist route featuring scenic views and iconic landmarks.

The proposal area is within an internationally significant setting, with high landscape values in the wider area including scenic views of Sydney Harbour and the Sydney Harbour National Park, many heritage-listed buildings and features, and sites of Aboriginal culture and heritage significance.

Of the four landscape character zones identified in Table 6.19, LCZ1 Manly Foreshore and Cove was found to have a moderate impact associated with its heritage values and internationally significant character of the foreshore area.

The remaining landscape character zones were found to have a negligible impact. Overall, this assessment found there to be no significant landscape character impacts arising from the proposal.

Sensitive visual receivers in the study area include residents, pedestrians, road users, ferry and boat users, and workers and patrons in hospitality venues. Thirteen viewpoint locations were chosen to assess the visual impact of the proposal on sensitive receivers within the study area.

Out of the 13 viewpoint locations identified in Table 6.20, all were found to have negligible to moderate impacts, except VP7 and VP8, which had more significant ratings. VP7 and VP8 had ratings of high-moderate and high, respectively, as they represent views from pedestrians on the Manly Wharf boardwalk, and patrons and staff in outdoor dining areas, all in close proximity to the proposal.

Potential impacts to the land character zones and viewpoints are summarised in Table 6.21.

Mitigation measures proposed to reduce visual impacts from operation of the proposal are provided in Table 6.22.

Table 6.21 Summary of Landscape and visual impacts to LCZs and VPs

Sensitivity	Magnitude	Impact rating
<p>LCZ1</p> <p>During operation, a new pile-supported promenade and seating space would extend over the water adjacent to the existing boardwalk. The Wharf Bar would be retained. The rest of the existing wharf would be replaced with a new Wharf 3 of a similar length, including a covered waiting area, gangway, and hydraulic platform. Parallel to Wharf 3, to its east, would be a public jetty (Wharf 4) consisting of large tidal steps and a ramp leading down to landings at intervals for berthing at different tidal levels. The new wharf design is to use the established ‘kit of parts’ components as much as possible, as used by other Transport ferry wharves, to minimise change to the existing landscape character. The roof canopy would have a minimal form and would be a similar height to the adjacent Wharf Bar roof, helping it to blend in. The facias of the canopy are proposed to be painted ‘heritage green’ to match the existing heritage building. Water taxis and other small vessels would utilise the proposed Wharf 4, and Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would utilise Wharf 3.</p>		
<p>High</p> <p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscapes susceptibility to change from the type of proposed development. The sensitivity is considered High, as the landscape value is High and the susceptibility to change is Moderate.</p>	<p>Low</p> <p>The magnitude of change would be Low, as the introduction of components whilst new would not be uncharacteristic within the existing landscape character, as the new structures are sensitively designed to be in keeping with the existing structures, and the increased presence of people and boats would be in keeping with existing wharf activities. Construction impacts are short-term and therefore do not significantly impact the magnitude.</p>	<p>Moderate</p> <p>Based on the landscape character and visual impact grading matrix (Table 6.18).</p>

Sensitivity	Magnitude	Impact rating
<p>LCZ2</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ2, as changes to distant views to the Manly Wharf would be negligible.</p>		
<p>Moderate</p> <p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscape's susceptibility to change from the type of proposed development. The sensitivity is considered to be Moderate, as the landscape value is High and the susceptibility to change is Low.</p>	<p>Negligible</p> <p>The magnitude of change is considered as Negligible. There would be no change in the landscape character as there would be little or no change to the elements, features or characteristics of the landscape.</p>	<p>Negligible</p>
<p>LCZ3</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ3, as alterations to the Manly Wharf would not be out of character.</p>		
<p>Moderate</p> <p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscape's susceptibility to change from the type of proposed development. The sensitivity is considered as Moderate, as the landscape value is High and the susceptibility to change is Low.</p>	<p>Negligible</p> <p>The magnitude of change is considered as Negligible. There would be no change in the landscape character as there would be little or no change to the elements, features or characteristics of the landscape.</p>	<p>Negligible</p>

Sensitivity	Magnitude	Impact rating
<p>LCZ4</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ4, as alterations to the Manly Wharf would not be out of character.</p>		
<p>Moderate</p> <p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscape's susceptibility to change from the type of proposed development. The sensitivity is considered as Moderate, as the landscape value is High and the susceptibility to change is Low.</p>	<p>Negligible</p> <p>The magnitude of change is considered as Negligible. There would be no change in the landscape character as there would be little or no change to the elements, features or characteristics of the landscape.</p>	<p>Negligible</p>
<p>VP01</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP01, as the change the view would be imperceptible as there is very little change to the elements, features or characteristics of the view.</p>		
<p>High</p> <p>Arabanoo lookout is a prominent stop for tourist coaches and visitors place value upon enjoyment of views of the harbour and surrounding landscape. However, this location is at approximately 1.5 kilometres from the proposal and views are intermittently screened by foreground vegetation</p>	<p>Negligible</p> <p>The change the view would be imperceptible as there is very little change to the elements, features or characteristics of the view. Being approximately 1.5 kilometres away from the proposal, the new structures and boats may be visible but would occupy a very small portion of a much wider view, to the point of being unnoticeable. Furthermore, the new structures would not be uncharacteristic within the existing view.</p>	<p>Negligible</p>

Sensitivity	Magnitude	Impact rating
<p>VP02</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP02, as the new structures would be almost entirely obscured by the existing Wharves 1 and 2 structure and the boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>		
<p>Moderate</p> <p>Visitors to the beach place value upon enjoyment of views in this setting and due to its location in a national park and on a very popular walking trail. However, viewers are at a distance of approximately one kilometre from the proposal and when views are achieved they are very distant and/or screened by passing boats.</p>	<p>Negligible</p> <p>The new structures would be almost entirely obscured by the existing Wharves 1 and 2 structure.</p>	<p>Negligible</p>
<p>VP03</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP03, as the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>		
<p>High</p> <p>Occupiers of residential properties on Commonwealth Parade and users of the rest area adjacent to Fairlight Walk have long viewing periods over the water. Viewers place value upon enjoyment of views in this setting.</p>	<p>Negligible</p> <p>The new structures would be entirely obscured and the increased number of boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>	<p>Negligible</p>

Sensitivity	Magnitude	Impact rating
<p>VP04</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP04, as the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>		
<p>High</p> <p>The viewpoint is within a state heritage listed site and patrons dining outdoors at the Manly Pavilion have long viewing periods. Patrons and users of the walkway place value upon the landscape and enjoyment of views of their setting.</p>	<p>Negligible</p> <p>The new structures would be entirely obscured and the increased number of boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>	<p>Negligible</p>
<p>VP05</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP05, the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>		
<p>High</p> <p>The Manly foreshore is of local heritage significance and users of the Cove Beach West and Fairlight Walk place value upon the landscape and enjoyment of views of their setting. Viewers are located within close proximity to the proposal area but viewing periods are short and screened by the existing wharf structures as well as passing boats and ferries.</p>	<p>Negligible</p> <p>The new structures would be entirely obscured and the increased number of boats accessing Manly Wharf would not be uncharacteristic within the existing view.</p>	<p>Negligible</p>

Sensitivity	Magnitude	Impact rating
<p>VP06</p> <p>During operation, the proposal would have a moderate impact on VP06, as there would be discernible changes in the existing view due to the introduction of the new promenade, wharf structures and waiting area.</p>		
<p>Moderate</p> <p>Users of the Manly Wharf are located in very close proximity to the proposal area but are passing through the transport hub and therefore have short term views.</p>	<p>Moderate</p> <p>There would be discernible changes in the existing view due to the introduction of the new promenade, wharf structures and waiting area. Although the introduced components would not be out of character or be an adverse impact on the view themselves, they would lead to a minor loss of the view of the houses in the background and the water in the foreground, a key characteristic of this view.</p>	<p>Moderate</p>
<p>VP07</p> <p>During operation, the proposal would have a high-moderate impact on VP07, there would be noticeable changes in the existing view due to the introduction of the new wharf structure that would result in a partial loss of the view of the Wharf Bar and docked boats in the harbour.</p>		
<p>High</p> <p>Patrons and staff at the upper-level restaurants and bars have long viewing periods and place value upon enjoyment of views in this setting.</p>	<p>Moderate</p> <p>There would be noticeable changes in the existing view due to the introduction of the new wharf structure. Although the new wharf structure would not be out of character or be an adverse impact on the view itself, it would lead to a partial loss of the view of the Wharf Bar and docked boats in the harbour.</p>	<p>High-Moderate</p>

Sensitivity	Magnitude	Impact rating
<p>VP08</p> <p>During operation, the proposal would have a high impact on VP08, as there would be a substantial change to the existing view due to the introduction of the new wharf and associated infrastructure, as well as a partial loss of the view of the sky, water and houses in the background, which are key characteristics of this view thus somewhat diminishing the views from Manly Wharf restaurants and bars.</p>		
<p>High</p> <p>The viewpoint is within a state heritage listed site and patrons dining outdoors at the Manly Wharf restaurants and bars have long viewing periods. Patrons and users of the boardwalk place value upon the landscape and scenic views within this setting.</p>	<p>High</p> <p>There would be a substantial change to the existing view due to the introduction of the new wharf and associated infrastructure, as well as a partial loss of the view of the sky, water and houses in the background, which are key characteristics of this view. The changes would cause a view to be permanently changed and its quality somewhat diminished.</p>	<p>High</p>
<p>VP09</p> <p>During operation, the proposal would have a moderate impact on VP09, as the viewpoint is within a state heritage listed site, and patrons, users of the boardwalk, and users of the Kayak Centre would view the proposal. However, it would not be uncharacteristic within the existing view.</p>		
<p>High</p> <p>The viewpoint is within a state heritage listed site and patrons in the Tropic Bar outdoor dining area are seated facing directly towards the proposal with long viewing periods. Patrons, users of the boardwalk, and users of the Kayak Centre place value upon the landscape and enjoyment of views of their setting.</p>	<p>Low</p> <p>The foreground elements would be retained, the view of Dobroyd Head in the background is already partially obscured by the existing Wharf Bar canopy, and visual impacts during the construction phase are temporary. The changes to the Manly Wharf would be visible but would not be uncharacteristic within the existing view.</p>	<p>Moderate</p>

Sensitivity	Magnitude	Impact rating
<p>VP10</p> <p>During operation, the proposal would have a moderate impact on VP10, as users of Manly Cove Beach and Fairlight Walk would view the introduced structures but they would not be uncharacteristic within the existing view.</p>		
<p>High</p> <p>Users of Manly Cove Beach and Fairlight Walk are located within close proximity to the proposal area and place value on the enjoyment of views in this setting. Viewers have passing views of, or are adjacent to, the proposal area.</p>	<p>Low</p> <p>The introduced structures would be visible but would not be uncharacteristic within the existing view. As the existing Wharves 1 and 2 structures are located directly behind the proposed location of the Wharf 3 upgrade from this viewpoint, the proposal would not contribute to any further loss of harbour views. The height of the proposal is in keeping with the height of the existing structures and therefore there is no loss of long views towards the horizon. Furthermore, the proposal would be partially obscured by the existing Wharf Bar and may also be intermittently screened by passing boats.</p>	<p>Moderate</p>

Sensitivity	Magnitude	Impact rating
<p>VP11</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on VP11, as there would be a minor alteration to the background view due to the introduction of the new wharf structures, however the introduced components would be very significantly screened.</p>		
<p>Moderate</p> <p>As road users and pedestrians on the East Esplanade are located within close proximity to the site but viewing periods are limited and significantly screened by vegetation. Occupiers of residential properties on this road have long viewing periods but are at a distance and/or screened from the study area, most significantly by the tall row of Norfolk Island Pines.</p>	<p>Negligible</p> <p>There would be a minor alteration to the background view due to the introduction of the new wharf structures, however the introduced components would be very significantly screened by the Norfolk Island Pines and parked cars, and therefore would not be noticeable within the existing view.</p>	<p>Negligible</p>
<p>VP12</p> <p>During operation, the proposal would have a moderate-low impact on VP12, as the alteration to the Manly Wharf may be visible but would not be uncharacteristic within the existing view and would be at a moderate distance and screened.</p>		
<p>Moderate</p> <p>Users of the Manly Yacht Club, Sailing Club and Launch Club have short-term views of the proposal area, when starting or ending a boat trip, but are likely to place value on the enjoyment of views in this setting. Users of the Yacht Club dining deck have longer views, but views are screened and framed by the balcony structure, and users tend to be seated around tables rather than facing towards the proposal area. Viewers are located at a moderate distance from the site and new components would</p>	<p>Low</p> <p>The alteration to the Manly Wharf may be visible but would not be uncharacteristic within the existing view. Changes to the existing view would be at a moderate distance and screened by passing boats and ferries.</p>	<p>Moderate-Low</p>

Sensitivity	Magnitude	Impact rating
be partially screened by the existing Wharf Bar as well as passing boats and ferries.		
<p>VP13</p> <p>During operation, the proposal would have a moderate-low impact on VP13, as users Manly to Circular Quay ferry trip, a popular attraction, would be able to view the introduced structures but they would not be uncharacteristic within the existing view.</p>		
<p>Moderate</p> <p>The Manly to Circular Quay ferry trip is a popular attraction during which visitors place value on the scenic views in this setting. However, viewers are passing through on a departing or arriving ferry and therefore have short term views.</p>	<p>Low</p> <p>The introduced structures would be visible but would not be uncharacteristic within the existing view. As the existing Wharf Bar and Manly Wharf complex are located directly behind the proposed location of the Wharf 3 upgrade from this viewpoint, the proposal would only contribute to minor loss of Esplanade views.</p>	<p>Moderate-Low</p>

6.5.4 Safeguards and management measures

Table 6.22 lists the safeguards and management measures that would be implemented to avoid, minimise and mitigate potential impacts on landscape character and visual amenity identified in section 6.5.3.

Table 6.22 LCVIA safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
LCVIA1	Landscape and visual	<p>General considerations for detailed design will include the following to further minimise potential impacts on landscape character and visual amenity:</p> <ul style="list-style-type: none"> • utilise clean, minimal design of wharf components throughout, to increase visual permeability and connection to the surrounding harbour • ensure the proposal design, siting and materiality is of high quality, sympathetic to the existing heritage context and contributes positively to the existing landscape character values • although using standard kit of parts elements, ensure the proposal design is place-specific and ensure landscape and urban design contributes positively to the existing landscape character and principles outlined in Beyond the Pavement (Transport, 2020) • consider utilising materials that complement the ‘waterfront’ character area as outlined in the Northern Beaches Council Public Space Vision & Design Guidelines (Northern Beaches Council, 2021) • avoid or minimise the use of shiny or reflective materials to minimise associated visual impacts on surrounding sensitive receivers • colours should be sympathetic and responsive to the surrounding landscape and visual context • minimise size of the service pod, to maintain view lines towards Smedley’s Point and the harbour. 	Transport	Design / pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
LCVIA2	Landscape and visual	<p>Considerations for detailed design with regards to signage and services to further minimise visual impacts will include:</p> <ul style="list-style-type: none"> • minimising signage dimensions • avoiding brightly illuminated signage • locating signage on buildings rather than freestanding • ensuring the design and materiality of services components such as poles, signage and lighting, contributes positively to the heritage and waterfront context, and key view lines and views towards the water are open and unimpeded. 	Transport	Design / pre-construction
LCVIA3	Landscape and visual	<p>The CEMP will include measures to minimize visual impacts during construction, including, but not limited to:</p> <ul style="list-style-type: none"> • taking all practical measures to ensure construction equipment, storage areas, and other visible elements are located away from key views, to or from the sensitive visual receivers identified in this assessment • ensuring the site is kept tidy and general tidiness is maintained • minimising light spill during evening and night work periods • ensuring construction activities, equipment and storage areas are, where possible, located away from existing vegetation, and the dripline of canopy trees, particularly the Norfolk Island Pine trees • where works cannot be located away from trees, provide tree protection to ensure they are not damaged • all areas disturbed by construction and ancillary works are to be rehabilitated to their previous condition 	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> the temporary site compound in East Esplanade Park is to employ a neat, neutral design and screening implementing measures to assist in blending into the surrounding area. Choice of screening is to be sympathetic to the existing context of the park (e.g., neutral colours or green depending on location). 		

6.6 Airborne noise and vibration

This section summarises the proposal's airborne noise and vibration impacts. Appendix C contains a supporting airborne noise and vibration impact assessment prepared by GHD (GHD, 2022).

6.6.1 Methodology

The airborne noise and vibration impacts were assessed in accordance with applicable guidelines including:

- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- Construction Noise and Vibration Guideline (CNVG) (Transport, 2016)
- Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)
- Structural Vibration – effects of vibration on structures (DIN 4150-3) (German Standards, 1999)
- Evaluation and measurement for vibration in buildings Part 2 (BS7385) (British Standards, 1993)
- NSW Road Noise Policy (RNP) (DECCW, 2011)
- Noise Policy for Industry (NPfi) (EPA, 2017).

The study area used for the airborne noise and vibration assessment included the area two kilometres from the proposal footprint. The study area was then divided into the noise catchment areas (NCAs) shown in Figure 6.14.

Existing background noise in the study area was determined using the result of ambient noise monitoring carried out at locations representative of residential areas. The results of noise monitoring were used to determine appropriate construction noise management levels (NMLs) and trigger levels for which additional management measures may be required.

Nearby sensitive receiver within the study area, including Little Penguin habitat, were identified for the assessment.

Construction scenarios, presented in Table 6.35 were developed based on the proposed construction staging and work periods (refer section 3.3), including required equipment. Noise modelling carried out using the ISO 9613- 2:1996 calculation method was then completed for each construction scenario. The results of the noise modelling were used to predict impacts at identified sensitive receivers. These impacts were then assessed against NMLs.

In addition, vibration impacts from construction activities (including piling activities) were assessed and buffer distances adopted from CNVG for human comfort and structural damage were provided.

Potential operation impacts from the proposal were assessed qualitatively to understand potential impacts to sensitive receivers.

Recommendations of safeguards and management measures were developed in accordance with the CNVG to reduce potential impacts to sensitive receivers.

6.6.2 Assessment criteria

Noise management levels

NMLs for sensitive receivers were calculated for both standard and non-standard hours using the ICNG and the CNVG. The NMLs for proposal are provided in Table 6.23.

Table 6.23 Proposal construction noise management levels, dBA

Receiver type	Time of day		Noise management level, dBA
Residential – NCA1	Recommended standard hours		Noise affected: 56
			Highly noise affected: 75
	Outside recommended standard hours	Day	51
		Evening	47
		Night	43
		L _{AFmax} 53 sleep disturbance	
Residential – NCA2	Recommended standard hours		Noise affected: 65
			Highly noise affected: 75
	Outside recommended standard hours	Day	60
		Evening	58
		Night	53
		L _{AFmax} 63 sleep disturbance	
Residential – NCA3	Recommended standard hours		Noise affected: 56
			Highly noise affected: 75
	Outside recommended standard hours	Day	51
		Evening	49
		Night	43
		L _{AFmax} 53 sleep disturbance	
Residential – NCA4	Recommended standard hours		Noise affected: 57
			Highly noise affected: 75
	Outside recommended standard hours	Day	52
		Evening	51
		Night	48
		L _{AFmax} 58 sleep disturbance	
Commercial	When in use		70 (external)
Industrial	When in use		75 (external)

Receiver type	Time of day	Noise management level, dBA
School, hospital, POW	When in use	45 (internal)
Recreation	When in use	60 (external)

Hearing sensitivity of Little Penguin

The BAR carried out for this REF (Cardno, 2022) identified a breeding area for Little Penguins classified as an AOBV near the proposal area on Cannae Point, shown in Figure 6.14 (refer section 6.2).

Effects of Noise on Aquatic Life (Hawkins and Popper, 2012) provides airborne noise levels that may cause permanent reduction in hearing sensitivity (PTS), temporary reduction in hearing sensitivity (TTS) or behavioural changes in penguins. These noise levels are presented in Table 6.25. For further details on the zone types refer to section 6.7.

Table 6.24 Threshold levels for hearing sensitivity of Little Penguins

Zone	Noise level
Permanent Threshold Shift (PTS)	110 dBA (continuous)
Temporary Threshold Shift (TTS)	90-95 dBA (continuous)
Behavioural response	80 dB

Human comfort vibration

Acceptable vibration levels for human comfort have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006) which is based on the guidelines contained in *British Standard BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz). Acceptable values of vibration dose are presented in Table 6.25 for sensitive receivers.

Table 6.25 Human comfort intermittent vibration limits (BS 6472-1992)

Receiver type	Period	Intermittent vibration dose value (m/s ^{1.75})	
		Preferred value	Maximum value
Residential	Day (7 am to 10 pm)	0.2	0.4
	Night (10 pm to 7 am)	0.13	0.26
Offices, schools, educational institutes and places of worship	When in use	0.4	0.8

Vibration impacts to structures

The effects of transient vibration on structures are considered in *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. The criteria provided in BS 7385 are presented in Table 6.26.

Table 6.26 Transient vibration guide values – minimal risk of cosmetic damage

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

The predominant vibration for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and excavators occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per general structure receiver type is given below:

- reinforced or framed structures: 25.0 mm/s
- unreinforced or light framed structures: 7.5 mm/s.

A heritage building or structure would only be considered more vibration sensitive than other structures if they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) should be considered.

Table 6.27 Vibration intensive equipment and safe working distances – sub scenario specific

Equipment	Construction sub-sections with vibratory intensive equipment	Human comfort (AVTG guideline) (m)	Damage to standard structures (BS 7385) (m)	Vibration screen distance for heritage structures (m)
Impact piling rig	S4 – Piling	50	15	45
Vibratory roller (1-2 tonnes)	S1 – Site establishment of landside compound area	15 – 20	5	15

Safe working distances were adopted from CNVG to comply with the human comfort and the cosmetic damage criteria. These are presented in Table 2.3.

Table 6.28 Vibration safe working distances

Equipment	Human comfort (OH&E Vibration guideline)	Cosmetic damage (BS 7385)	Heritage structures (screening distance to trigger inspection)
Piling rig – Bored <800 mm	N/A	2 m (nominal)	6 m
Piling rig–Hammer (12 tonnes down force) ¹	50 m	15 m	45 m
Piling rig – Vibratory (sheet piles)	20 m	2 m to 20 m	60 m
Vibratory roller (>18 tonnes)	100 m	25 m	75 m
Vibratory roller (13-18 tonnes)	100 m	20 m	60 m
Vibratory roller (7-13 tonnes)	100 m	15 m	45 m
Vibratory roller (4-6 tonnes)	40 m	12 m	36 m
Vibratory roller (2-4 tonnes)	20 m	6 m	18 m
Vibratory roller (1-2 tonnes)	15 m to 20 m	5 m	15 m
Small hydraulic hammer 300 kg (5-12t excavator)	7 m	2 m	4 m
Medium hydraulic hammer 900 kg (12-18t excavator)	23 m	7 m	14 m
Large hydraulic hammer 1600 kg (18-34t excavator)	73 m	22 m	66 m
Jackhammer (handheld)	2 m	1 m (nominal)	3 m

Note: 1. Safe working distances for Hammer piling rig have been sourced from Transport’s Construction Noise and Vibration Strategy (CNVS) (Transport, 2019).

The worst-case vibration intensive equipment proposed to be used during construction were identified, along with their relevant construction sub-scenarios, and safe working distances. These are presented in Table 6.29.

Table 6.29 Vibration intensive equipment and safe working distances – sub-scenario specific

Equipment	Construction sub-scenarios with vibratory intensive equipment	Human comfort (AVTG guideline)	Damage to standard structures (BS 7385)	Vibration screening distance for heritage structures
Impact piling rig	S4 – Piling	50 m	15 m	45 m
Vibratory roller (1-2 tonnes)	S1 – Site establishment of landside compound area	15 m to 20 m	5 m	15 m

Traffic

The *Road Noise Policy* provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network. Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment against the road traffic noise criteria in Table 6.30 is required.

Table 6.30 Road traffic noise criteria, dBA

Type of development	Day, $L_{Aeq}(15 \text{ hour})$ 7 am to 10 pm	Night, $L_{Aeq}(9 \text{ hour})$ 10 pm to 7 am
Existing residence affected by additional traffic on freeway/arterial/sub-arterial roads	60	55
Existing residence affected by additional traffic on local roads	55	50

Operational noise

Part 5, clause 35 of the Protection of the Environment Operations (Noise Control) Regulation 2017, states that a person must not cause a vessel to be used on navigable waters in such a way as to emit offensive noise.

Operational noise emanating from the wharf including any mechanical plant would be designed to comply with the project noise trigger levels (PNTL) in the NPI presented in Table 6.31 and Table 6.32.

Table 6.31 NPI operational criteria for residential receivers

Time of day	Intrusiveness noise criteria $L_{Aeq(15\text{ min})} BG^1 +5$, dBA	Amenity noise criteria $L_{Aeq(15\text{ min})}$, dBA ^{2,3}	PNTL $L_{Aeq(15\text{ min})}$, dBA
Day (7 am to 6 pm)	45	53	45
Evening (6 pm to 10 pm)	45	43	43
Night (10 pm to 7 am)	41	38	38

Notes: 1. Background noise level $L_{Aeq(15\text{ min})}$

2. The amenity noise criteria is defined as the recommended amenity level minus 5 dB. The recommended amenity $L_{Aeq(\text{period})}$ noise level for residential suburban is defined as:

- Day: 55 dBA
- Evening: 45 dBA
- Night: 40 dBA

3. A – 3 dB correction is applied to convert the $L_{Aeq(\text{period})}$ descriptor to the $L_{Aeq(15\text{ min})}$ descriptor

Table 6.32 NPI operational criteria for non-residential receivers

Receiver Type	Time of day	PNTL $L_{Aeq(15\text{ min})}$, dBA
Commercial	When in use	63 ¹
Industrial	When in use	68 ¹
Educational	Noisiest 1 hour	35 (internal) 45 (external)
Hospital / medical	When in use	35 (internal) 45 (external)
Place of worship	When in use	48 ¹

Note: 1. A + 3 dB correction has been applied to convert $L_{Aeq(\text{period})}$ to $L_{Aeq(15\text{ min})}$

6.6.3 Existing environment

Noise catchment areas

The study area was divided into the four noise catchment areas summarised below and shown in Figure 6.14.

Table 6.33 Description of Noise Catchment Areas (NCAs)

NCA	Area	Land use types within area
1	Residential area west of Manly Harbour	General Residential (R1), Public Recreation (RE1)
2	Central business area of Manly	Local Centre (B2), Medium Density Residential (R3)
3	Northern area adjacent to Pittwater Road	General Residential (R1), Medium Density Residential (R3), Neighbourhood centre (B1)
4	Residential area east of Manly Harbour and residential area in Balgowlah south of Manly Harbour	General Residential (R1), Low Density Residential (R2), Special Activities (SP1), Environmental Conservation (C2),

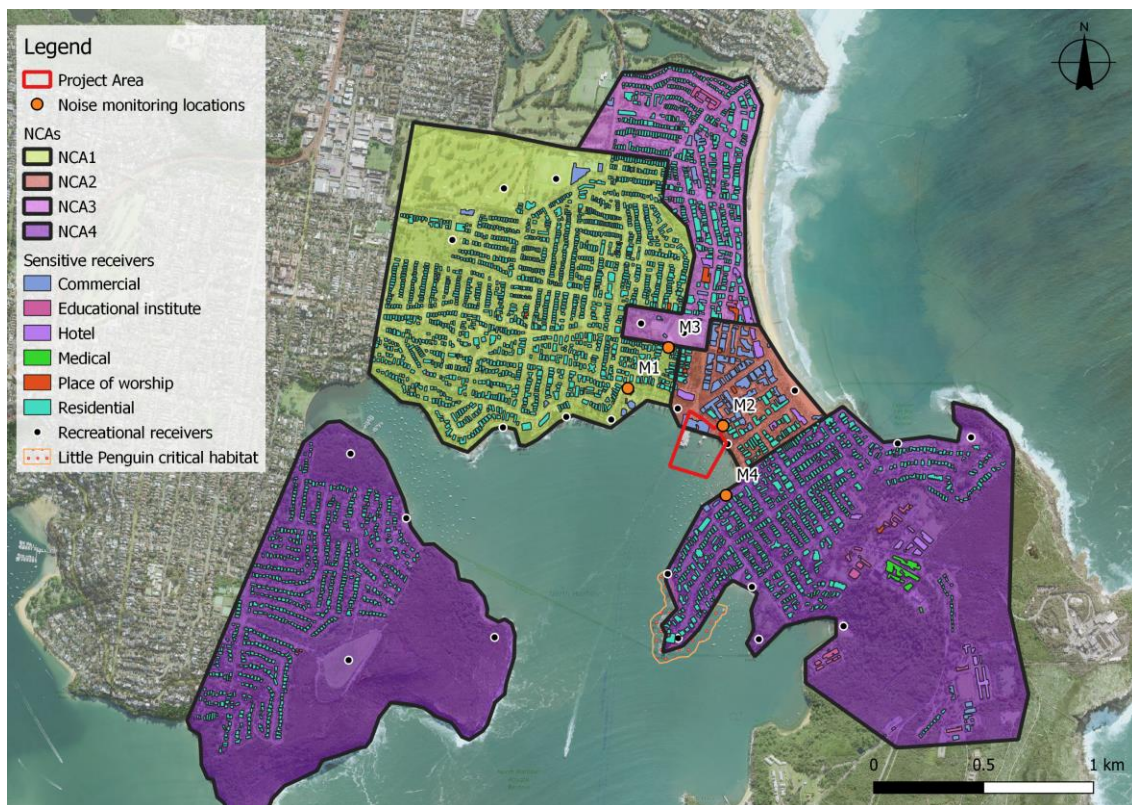


Figure 6.14 Proposal area, noise catchment areas and sensitive receivers

Noise monitoring and ambient noise levels

Existing noise levels surrounding the proposal were determined through unattended noise monitoring between 18 and 27 July 2022 in four locations representative of residential areas. The locations used for noise monitoring are shown in Figure 6.14.

Details of noise monitoring locations, rating background noise levels (RBLs) and ambient noise description are identified in Table 6.34.

Table 6.34 Unattended noise monitoring results, dBA

Location	Rating Background Level ¹ (RBL), L _{A90} (Period)			Ambient noise descriptors L _{Aeq} (period)		
	Day ²	Evening ²	Night ²	Day ²	Evening ²	Night ²
M1	46	42	38	57	54	50
M2	55	53	48	60	57	55
M3	46	44	38	59	51	56
M4	47	46	43	57	51	49

Notes: 1. RBL – rating background level. The overall single-figure background level representing each assessment period (daytime/evening/night-time) as defined in the *NPfl* (EPA 2017)

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

Sensitive receivers in the study area, shown in Figure 6.14, include residencies, educational institutions, places of workshops, recreational areas, accommodation buildings, commercial buildings, and industrial premises.

In addition, heritage buildings within 100 metres that could potentially be sensitive to vibration impacts from the proposed works include:

- Manly Wharf (Local: ID I145 and State: SHR #01434)
- former Fun Pier, Manly Wharf (Local ID I146)
- Governor Phillip Monument (Local ID I248)
- residential building 'Abbyleix' at 2 Victoria Parade, Manly (Local ID I149)
- commercial and residential buildings in Manly commercial centre including, two terrace houses (Local ID I150), commercial buildings on The Corso (Local ID I106) and the heritage conservation area (Local ID C2).

For the locations of these heritage items refer to section 6.1.2.

6.6.4 Potential impacts

Construction

Noise

Construction noise impacts were modelled using predicted construction noise levels for the construction scenarios outlined in Table 6.35. A full description is provided in Appendix C.

Table 6.35 Noise modelling scenarios, equipment, and noise levels

Scenario	Name	Working hours	Activity sound power level (SWL), dBA	
			LA _{eq} (15 min)	LA _{max}
S01	Site establishment – land based	Standard hours	113	-
S02	Demolition (including removal of piles)	Standard hours	115	-
S03	Dredging	Standard hours	112	-
S04	Piling (impact)	Out-of-hours works (OOHW) Period 2 (11 pm to 7 am)	125	136
S05	Wharf construction	Standard hours OOHW Period 2 (11 pm to 7 am)	113	118
S06	Finishing works / fit out	Standard hours	111	-
S07	Operation of site compounds	All approved working hours	112	115

The following noise impacts to residential receivers during standard hours were identified:

- No impacts during demolition works (S02), dredging (S03), wharf construction (S05) and fit out works (S06)
- During site establishment (S01) three residences within NCA1 and five residences within NCA2 are predicted to experience noise levels above the NMLs, with predicted noise levels above the highly noise affected level at one receiver in NCA2.
- Operation of the construction compound (S07) is predicted to result in four exceedances of the NMLs within NCA2 during standard hours.
- If impact piling works (S04) were to occur during standard hours a large number of residences within NCA1, NCA2 and NCA4 are predicted to experience noise impacts, however, no receivers are expected to be highly noise affected (i.e., experience levels above 75 dBA) during standard hours.

If impact piling works (S04) were to occur during standard hours it would also result in impacts to non-residential receivers with the largest number of impacts being to educational institutes, places of worship, and medical facilities.

Other than impact piling works, site establishment (S01) is predicted to have the highest impact on non-residential receivers during standard hours. Minimal impacts are predicted at non-residential receivers during standard hours in all other scenarios.

For safety and environmental reasons, impact piling works (S04) are proposed between the hours 11 pm and 7 am, during OOHW Period 2. Additionally, construction of the new gangway, hydraulic platform, and main waiting area canopy (S05) and operation of the construction compound (S07) are required during OOHW Period 2.

Due to the loud nature of the works proposed during the night, a large number of receivers are predicted to experience noise impacts outside of standard hours, including sleep disturbance impacts. A total of 1277 receivers are predicted to experience noise levels above the OOHW Period 2 NMLs during impact piling works. Exceedances of OOHW Period 2 NMLs are also expected during S05 and S07. However, no receivers are expected to perceive highly intrusive levels greater than 25 dBA above the NMLs.

While exceedances are predicted to occur during construction of the proposal, these impacts are considered manageable as they would be short-term, intermittent, and managed via the proposed safeguards and mitigation measures detailed in section 6.6.5.

Traffic

Construction would generate heavy vehicle movements associated with the transportation of construction machinery, equipment, and materials to the proposal area. In addition, light vehicle movements would be associated with employees and smaller deliveries.

As existing traffic levels would be higher than 16 light vehicles and 8 heavy vehicles in a day, the proposed construction generated traffic of 10 light vehicles and 5 heavy and are unlikely to increase traffic noise by 2 dB. Existing traffic volumes are significantly greater than the construction traffic generation, no impacts are predicted due to construction traffic along the proposed route.

For a further discussion of land traffic refer to section 6.10.

Potential noise impacts to Little Penguins

A high-level noise assessment has been carried out for transient construction activities that may cause adverse responses for the Little Penguins in Manly. The worst-case scenario noise levels predicted for the known Little Penguin habitat is 54 dBA and 67 dBA (unweighted). These predicated noise levels are below the noise levels expected to result in PTS, TTS and behavioural impact (refer Table 6.24). As such, airborne construction noise impacts to Little Penguins are considered unlikely.

Vibration

Construction vibration impacts from the proposal were predicted using the worst-case equipment shown in Table 6.29. No structures are expected to experience structural damage or human comfort vibration impacts based on distances provided in Table 6.27. Should a vibratory roller be required for the site establishment of the construction compound it should not exceed a limit of 2 tonnes in order to avoid human comfort vibration impact to structures on East Esplanade.

Heritage structures within 45 metres could be impacted by vibration if impact piling occurs as part of construction of the proposal. As such, additional safeguards and management measures have been provided in section 6.6.5 if impact piling occurs.

Operation

There are no proposed changes to the frequencies of ferry movements at Manly Wharf. As such operational noise impacts are not anticipated and have not been quantitatively assessed. It is anticipated that all vessels accessing the wharf would do so in accordance with Part 5, clause 35 of the *Protection of the Environment Operations (Noise Control) Regulation 2017* which prohibits the emission of offensive noise.

The main potential operational noise generating sources from the upgrade of Manly wharf are any mechanical plant, if required to be operated at the wharf. Should such plant items be required they will need to be designed to meet the project noise trigger levels in Table 6.31 and Table 6.32.

6.6.5 Safeguards and management measures

Table 6.36 lists the safeguards and management measures that would be implemented to avoid, minimise or mitigate potential airborne noise and vibration impacts identified in section 6.6.4. Other safeguards and management measures that would reduce the source of piling noise and vibration are identified in section 6.2 (biodiversity) and 6.7 (underwater noise and vibration).

Table 6.36 Airborne noise and vibration safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
ANV1	Stakeholder consultation	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be included in the CEMP to provide the framework for the management and mitigation of potential construction noise and vibration impacts. Potential impacts will be managed in accordance with the CNVG.</p> <p>The CNVMP will include:</p> <ul style="list-style-type: none"> • standard mitigation measures from the CNVG as relevant, including management measures, source control measures and path control measures • using low noise piling methods, instead of impact piling, where possible. A low noise piling method may include vibro-piling or bored piling. • respite periods for high noise generate activities • a strong justification for works taking place outside of the ICNG recommended standard hours • a commitment that the proponent will apply all feasible and reasonable works practices to meet the noise management levels • a commitment to negotiate with the community where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise management levels. 	Transport	Pre-construction / Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
ANV2	Noise impact from piling	<ul style="list-style-type: none"> Piling will be conducted in continuous blocks not exceeding 3 hours between the hours 8 am to 5 pm Monday to Friday and 9 am to 1 pm on Saturday. 	Contractor	Construction
ANV3	Heritage impacts from vibration	<ul style="list-style-type: none"> A dilapidation report of the historic Manly Wharf will be carried out to determine specific vibration management levels prior to any piling works within 45 metres of the structure. 	Contractor	Construction
ANV4	Heritage impacts from vibration	<ul style="list-style-type: none"> If the dilapidation report determines that there is a risk of cosmetic damage occurring to Manly Wharf heritage then a permanent vibration monitoring system will be installed to warn plant operators (via flashing light, audible alarm, SMS, etc) when vibration levels are approaching the cosmetic damage objective. 	Contractor	Construction
ANV6	Impacts from preparation of the compound area	<ul style="list-style-type: none"> To avoid any vibration impacts to structures on East Esplanade, a maximum 2 tonne roller will be used during site establishment. 	Contractor	Construction
ANV7	Periodic notification	<ul style="list-style-type: none"> Additional mitigation measures provided in the CNVG will be implemented for sensitive receivers where noise management levels have been exceeded. 	Contractor	Construction

6.7 Underwater noise and vibration

This section summarises the potential underwater noise and vibration impacts for the proposal. Appendix D contains a supporting underwater noise impact assessment prepared by GHD (GHD 2022).

6.7.1 Methodology

The construction noise and vibration assessment reviewed how the proposed piling and dredging works, as described in section 3.3, would affect the noise environment of sensitive receivers within the underwater environment.

A specific 'study area' was used for the underwater noise assessment which included the wider Manly Cove and harbour area. This study area is shown by the extent of the aerial photograph in Figure 6.15.

Guidelines

Currently, there are no quantitative national guidelines on acceptable exposure levels for fauna to underwater noise generated by construction works. Assessment was completed in accordance with the following published guidelines:

- The South Australian Department of Planning Transport and Infrastructure *Underwater Piling Noise Guidelines* (2012)
- The Irish Guideline Guidance to manage the Risk to marine Mammals from man-made Sound Sources in Irish Waters (2014)
- The U.S. Department of Commerce NOAA Technical Memorandum NMFS-OPR-59 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (2018).

In addition to the guidelines, assessment included guidance and recommendations from the latest research from the following:

- Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI (Popper et al., 2014)
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall et al., 2019).

Worse-case scenario assessment

Underwater noise sources associated with the construction of the proposal would include:

- dredging (barge mounted excavator)
- pile driving (impact piling)

To understand the worst-case scenario for underwater noise generation, the worst-case construction activity, being impact pile driving, was assessed to determine the buffer distances where marine fauna may be impacted, (either a permanent temporary shift (PTS), temporary temporal shift (TTS) response or a behavioural response).

A conservative assumption of 1000 pile strikes per day has been adopted to calculate the accumulated sound exposure over a 24-hour period.

Noise data was obtained from the following sources:

- piling noise data – ICF Jones & Stokes et al. (2009), prepared for the California Department of Transportation
- dredge source level data – Erbe (2016)
- no attenuation measures (such as bubble curtains) were considered for either activity.

The activities were then modelled to determine potential underwater noise generation, and these were compared against thresholds for humans and marine fauna (see below). The noise models determined the likely level of noise decay (transmission loss) and the buffer distances to meet the threshold noise criteria.

Assessment criteria

The threshold noise criteria for sensitive underwater receptors was determined based on published research for the following:

- marine fauna noise frequency sensitivity
- species.

The threshold noise criteria for behavioural and physiological impacts on marine fauna likely to occur in the study area, as well as humans, are provided in Appendix D.

Based on the worst-case construction scenario of pile driving, the predicted buffer distances for species likely to occur within the proposal area are provided in Table 6.37.

Table 6.37 Predicted buffer distances required to meet noise criteria

Noise sensitive species	Distance to meet noise criteria ⁵ (m)				
	PTS ¹ Peak	TTS ² Peak ³	PTS SEL ⁴	TTS SEL	Behavioural
Fish (no swim bladder)	<10	-	<10	225	1250
Fish (swim bladder not involved in hearing)	<10	-	12	225	1250
Fish (swim bladder involved in hearing) including whales and seahorses	<10	-	20	225	1250
Seabirds including Little Penguins	-	-	175	-	>2 km
Humans	100	650	-	-	2 km

- Notes:
1. Permanent temporary shift (PTS) refers to permanent injury or mortality.
 2. Temporary threshold shift (TTS) refers to temporary loss of hearing sensitivity.
 3. Peak level is the highest sound pressure level of an impulsive sound signal.
 4. Sound exposure level (SEL) is most often used to compare the total energy in impulsive signals with different time durations, average pressure levels and temporal characteristics.

6.7.2 Existing environment

Manly Cove is sheltered and relatively shallow. Various marine fauna inhabit or visit Manly Cove and it is also used for recreational and commercial activities.

Underwater sound transmitted as pressure waves that travel at about 1.5 kilometres per second and are described by the acoustic frequency which is determined by the number of pressure cycles per second (measured in Hertz).

Underwater sound pressure is expressed in decibels (dB) with the standard reference pressure of 1 micro Pascal (μPa) for water.

The properties of the underwater environment can affect how sound travels. Noise levels at receptors from the noise source would depend on the depth, range and physical properties of sediment and seawater. Based on surface sediments observed, the seabed profile is characterised as sand, silty sand and sandstone bedrock.

Sensitive receivers

The following marine fauna have been identified as having a moderate to high likelihood of occurring in the study area:

- syngnathids (including White's Seahorse)
- fish (including the Black Rockcod, Estuary Cod and the Eastern Blue Devil)
- seabirds, including the Little Penguin.

Other marine fauna that are less likely to enter the study area have been identified as including cetaceans, sirenians, carnivores and turtles. Marine fauna is assessed in section 6.2.

Additionally, people visit Manly Cove and its surrounds for recreational purposes such as swimming or diving.

Noise sources

The existing underwater noise environment in the Manly Cove would be influenced by a combination of natural events (waves, wind, precipitation), noise from marine fauna and human, including vessel, generated noise as described in the sections below.

Natural noise sources

Based on published research, the underwater noise assessment indicates the levels of ambient underwater noise generated from natural sources such as wave movement, wind and wave interaction and rainfall can vary between 1 Hertz and 100 kilohertz. Rainfall is generally the greatest noise source at frequencies below 10 Hertz and above 100 Hertz. At frequencies at about 10 kilohertz, noise generated from the movement of sediment from strong currents, wave action or tidal flow would be a dominant underwater noise source. For frequencies above 50 kilohertz the motion of water contributes to the ambient underwater noise levels.

Marine animal noise sources

Underwater noise sources from marine animals include Baleen whales that produce intense low frequency sound, dolphins that produce rapid bursts of high-frequency clicks and some fish species that produce sounds individually or in chorus.

Human noise sources

The dominant noise sources from humans are from vessels using the harbour with other sources that comprise a range of maritime, commercial, and recreational activities.

The noise assessment indicates that typical ambient noise around Australian coastal waters is generally about 100 dB to 120 dB, noise generated from vessels movements is generally intermittent.

Noise levels from vessels would vary depending on type and size. Ferries are reported to generate ambient noise levels of 141 to 145 dB (1 μ Pa) at distances of 100 metres and 50 metres.

6.7.3 Potential impacts

Construction

Potential impacts of excessive levels of underwater noise on marine fauna can include:

- significant behavioural disturbance that may affect important populations or species survival
- noise masking interference with acoustic communication and echo location
- temporary loss of auditory sensitivity
- permanent loss of auditory sensitivity
- other tissue damage (lethal and sub-lethal).

Noise generated from impact piling increases the sound exposure level by a log function depending on the number of strikes. A conservative assumption of 1000 pile strikes per day was used to calculate the accumulated sound exposure over a 24-hour period. It is assumed 1000 pile strikes a day comprises:

- 4500 pile strikes per pile case
- up to two piles cases to occur during the 2-hour impact piling period
- no additional piling occurring outside of the 2 hour impact piling period (5 am to 7 am).

Noise generated from dredging activities would be significantly less than piling works however the same buffer distances as calculated for piling works have been applied.

Marine fauna impacts

Syngnathids and fishes

There is a high likelihood for syngnathids, including the White's Seahorse, and other fishes to be present in study area during piling and dredging works. There is potential for TTS impacts within 225 metres of piling works and for behavioural impacts at distances over 1.2 kilometres for all types of fish and syngnathids. PTS impacts for fish involved in hearing, including the White's seahorse, have the potential to occur up to 20 metres from the source.

Little Penguin and diving birds

An AOBV has been declared for the Little Penguin breeding ground approximately 500 metres south of the proposal area. While the ships and construction activities are likely to deter penguins from swimming through the proposal area, there is potential for PTS impacts within 158 metres of piling works and for behavioural impacts over 1.2 kilometres.

Humans

As Manly Cove is a popular area for swimming and diving, impacts may be experienced by humans from underwater noise from the construction activities. There is potential for PTS and TTS impacts to swimmers and divers at distances of 100 metres and 650 metres respectively, from piling works.

The noise level within the entire study area is predicted to exceed the threshold for behavioural impacts to human swimmers and divers. Noise from a single pile strike is predicted to exceed the 145 dB re 1 μ Pa recommended threshold at a distance of approximately two kilometres (with line of sight to the works). This indicates that piling noise is likely to be extremely unpleasant for any swimmers or divers exposed to the noise level and severe avoidance reactions (including startle reactions) may be expected, with divers and swimmers unlikely to want to remain in the water while exposed to the noise.

Impact distances

Based on likely underwater noise generated by the proposal and the buffers set out in Table 6.37, impact distances were generated for marine fauna likely to be present in study area. These are shown in Figure 6.15.

These impact distances have informed the proposed mitigation and management measures set out in Table 6.38. These measures should be followed to manage impacts from underwater noise.



Figure 6.15 Impact distances for marine fauna likely to occur within the study area

The safeguards provided in section 6.7.4 would reduce the risk of impacts from construction of the proposal.

Operation

Underwater noise impacts associated with the operation of the proposal are anticipated to be similar to the existing conditions and therefore have not been considered further.

6.7.4 Safeguards and management measures

Table 6.38 lists the safeguards and management measures that would be implemented to avoid, minimise or mitigate underwater noise and vibration potential impacts identified in section 6.3.3. Safeguards and managements measures that relate to reducing underwater noise impacts to fauna are identified in section 6.2 (biodiversity).

Table 6.38 Underwater noise and vibration safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
UWN1	Underwater noise	Consideration would also be given to undertaking underwater noise monitoring, should impact piling be required, at selected areas (chosen by a marine ecologist) to measure actual underwater noise levels and to refine the shutdown and observation zones, if required.	Transport / Contractor	Pre-construction
UWN2	Underwater noise	<p>The selected contractor undertaking the piling activities would maintain a record of procedures employed during operations and would include:</p> <ul style="list-style-type: none"> • Information on any marine fauna sighted during the piling activity, and their reaction to the piling activity would be documented • A report on the piling activity should, at a minimum, contain the location, date, start and completion time of the piling activity, information on the piling rig (hammer weight and drop height, pile size, number of piles, number of impacts per pile, etc.) • Details on the trained crew members conducting the visual observations • Times when observations were hampered by poor visibility or high winds • Times when start-up delays or shut-down procedures occurred • The time and distance of any marine fauna sightings. 	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
UWN3	Underwater noise	<p>Prior to (and during) any vibratory or impact piling periods, public swimming and diving areas will be cleared where the TTS threshold may be exceeded. This includes the following areas:</p> <ul style="list-style-type: none"> • Manly Cove • East Manly Cove Beach • Delwood Beach/Federation Point. <p>For other swimming and diving areas within 2 kilometres of impact piling works, visible signs should be erected containing the following information:</p> <ul style="list-style-type: none"> • the scheduled times for piling works • a warning that swimming is not recommended during impact piling works as it has the potential to cause adverse hearing effects and could be extremely unpleasant. <p>The community should be notified a minimum of seven calendar days prior to piling works regarding the dangers of swimming/diving in proximity to piling works (especially impact piling).</p> <p>To avoid significant disruptions to the community's ability to engage in recreational swimming and diving within Manly Cove for the duration of piling works, it is recommended that vibratory or impact piling works be scheduled to provide periods in which recreational swimming or diving can be conducted.</p> <p>No vibratory or impact piling works on weekends, public holidays works or during school holidays, where possible. If piling is required during these times, the contractor is required to implement the Out of Hours work protocol contained within the Construction Noise and Vibration Guidelines (RMS 2016).</p>	Contractor	Construction

6.8 Aboriginal cultural heritage

This section summarises the proposal's Aboriginal heritage impacts. The Transport Aboriginal Cultural Heritage Officer has issued a Stage 1 clearance letter for the proposal in accordance with Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (RMS, 2011) on 29 July 2022, included as Appendix H.

6.8.1 Methodology

The assessment included a desktop review of published records, data and literature, including a records search of the Aboriginal Heritage Information Management System (AHIMS) to confirm the presence of values in the local area.

The PACHCI assessment was completed for Aboriginal heritage assessment in reference to the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW, 2010b).

The proposal's design relevant to Aboriginal cultural heritage, including the draft 'Connecting with Country' approach (WPS, 2022) was reviewed and its impact on Aboriginal cultural heritage was assessed.

The proposal's draft 'Connecting with Country' approach was informed by the draft *Connecting with Country Framework* guideline which informs government and industry on how to incorporate Aboriginal knowledge and Country into the planning, design and delivery of the built environment (NSW Government, 2020).

6.8.2 Existing environment

A search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 19 May 2021 for a one kilometre radius of the proposal. The nearest AHIMS sites were identified about 150 north-west of Manly Wharf (AHIMS 45-6-2087) and 220 metres east of Manly Wharf (AHIMS 45-6-2090).

The Manly Cove area was used extensively by the local Aboriginal population (the Gayamagal people) for fishing activities due to the abundance of fish and shellfish resources in the cove. This is evidenced by the middens located along the coastal area. Manly was named by Governor Phillip after seeing an Aboriginal man who Governor Phillip considered 'Manly'.

The proposal area contains highly disturbed land with significant development activities including building and dredging occurring over previous decades.

6.8.3 Potential impacts

Construction

The proposed works are unlikely to result in harm to Aboriginal objects and sites, as the works areas are all within heavily disturbed land.

Stage 1 of the PACHCI was completed for the proposal, which concluded the proposal was unlikely to have an impact on Aboriginal cultural heritage and did not require further investigations or assessment.

An Aboriginal Heritage Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* is not required for the proposal.

Operation

Manly Wharf would continue to operate as a wharf facility, serviced by the same vessels, so it is not expected that there would be any change in the nature or severity of impact to unknown Aboriginal objects or sites. No impacts to Aboriginal heritage items are anticipated during operation of the proposal as no significant change to the existing operation is proposed.

The draft 'Connecting with Country' design approach (WSP, 2022) was informed by the following Aboriginal design principles:

- Aboriginal led: Aboriginal people (designers, elder and community members) should be leading or co-leading the Indigenous design elements.
- Community involvement: The local Aboriginal communities to be engaged in this process.
- Appropriate use of Aboriginal design: All Aboriginal design elements must be approved by consulted Aboriginal elders and community members. If approval is not given, the knowledge will not be used on the project.

The proposal's design was informed by the Aboriginal design principles developed through the draft 'Connecting with Country' design approach (WSP, 2022) (refer section 3.2.1). As a result of this design approach, it is proposed that the widened promenade and seating area / slow space would potentially include a concrete finish and may highlight indigenous and coastal motifs.

Artistic design of the proposal would continue to be developed through detailed design with the local community and Aboriginal groups. However, it is expected that the proposal would have a positive impact on Aboriginal cultural heritage as it would highlight Aboriginal cultural heritage as part of its design.

6.8.4 Safeguards and management measures

Table 6.39 lists the safeguards and management measures that would be implemented to manage Aboriginal cultural heritage to account for the potential impacts identified in section 6.8.3.

Table 6.39 Aboriginal cultural heritage safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
AH1	Aboriginal heritage	Should the scope of the proposed work change during detailed design or construction, further consultation with Transport's Aboriginal Cultural Heritage Officer and regional environmental staff must be carried out to reassess any potential impacts on Aboriginal cultural heritage.	Transport	Pre-construction
AH2	Aboriginal heritage	The <i>Unexpected Heritage Items Procedure</i> (RMS, 2015) will be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Transport does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work will only restart once the requirements of that procedure have been satisfied.	Contractor	Construction
AH3	Aboriginal heritage	Design elements recommended by the 'Connecting with Country' design approach (WSP, 2022) will be considered for inclusion during detailed design, in consultation with the local Aboriginal community.	Transport	Detailed design

6.9 Water transport

This section describes the water-based traffic, transport and access impacts associated with the proposal.

6.9.1 Methodology

A qualitative assessment of water transport, traffic and access was carried out based on information presented in the *Manly Wharf 3 Upgrade – Navigational Study* (TCS, 2021), Opal card data, and other existing information regarding vessel movements at Manly Wharf.

The qualitative assessment included:

- identifying and characterising the existing water transport options near the proposal
- reviewing construction staging plans for the proposal
- reviewing ferry operational requirements as described in TCS (2021)
- evaluation of construction and operation impacts to water transport.

6.9.2 Existing environment

Public ferry services

Manly Wharf is a key location for maritime transport and tourism services located on the F1 Manly route. The ferry services operating from Manly Wharf are listed in Table 6.40. Note that a Captain Cook Cruises service from Wharf 3 to Barangaroo was removed in 2019 and may be reinstated in the future.

A review of Opal card data from July 2016 to October 2021 indicated that the average monthly users of the F1 Manly route was 306,111 (Transport Performance and Analytics, 2022). The highest month of use during this period was January 2017, which would have been during the summer high period.

Table 6.40 Ferry services provided at Manly Wharf

Wharf	Operator	Routes	Frequency (peak 1 hour)			Travel Time (minutes to / from CQ)
			Weekday AM	Weekday PM	Sunday	
1	Transdev Sydney Ferries	F1 Shuttle to Circular Quay	3	3	3	22
2	Manly Fast Ferry	Shuttle to Circular Quay	6	6	3	18

Wharf	Operator	Routes	Frequency (peak 1 hour)			Travel Time (minutes to / from CQ)
			Weekday AM	Weekday PM	Sunday	
3	Captain Cook Cruises	Circular Quay via Watsons Bay & Hop On Hop Off service	1	2	2	30
4	Manly Fast Ferry	Manly to Pyrmont then Darling Harbour	3	2	0	N/A

Commercial and recreational activity

Charter boats are able to use the existing Wharf 3 and do so regularly, particularly during summer months in accordance with the Transport *Wharf Access Policy*. Public transport ferry services have priority to access the wharf based on their timetabling.

Several recreational and tourism services operate from Wharf 3 and within Manly Cove. These services are listed in Table 6.41.

There are public moorings within the south-east portion of the proposal area.

Table 6.41 Commercial and recreational water transport services operating at Wharf 3 and in Manly Cove

Area	Commercial and recreation vessels
Manly Wharf 3	<ul style="list-style-type: none"> GoSail Sydney operates a sailing vessel hire service. The yachts are moored in the mooring field east and south-east of the isolated danger mark. This service uses Wharf 3 to pick up customers. Water taxis use Wharf 3 to berth. There is anecdotal evidence that Wharf 3 is used by recreational vessels without bookings.
East Pier (location of Discover Manly)	<ul style="list-style-type: none"> Manly Ocean Adventures operates whale watching cruises from East Pier shown in Figure 1.2. These generally go four times a day and use 12-metre boats and use the channel past Wharf 3. Manly Kayaks operate a kayak and stand-up paddle board hire service from the Discover Manly to the east of Wharf 3, shown in Figure 1.2. Manly Kayaks hold a sublease with TMG Developments Pty Ltd for two piles and moorings for kayaks on the north-east side of Wharf 3.

Area	Commercial and recreation vessels
	<ul style="list-style-type: none"> • Access to East Pier would be maintained through construction of the proposal from the north-east of the construction marine exclusion zone.
Manly Cove races	<ul style="list-style-type: none"> • Manly 18' Skiff Club runs yacht races in Manly Cove on the weekends from September to March. During these races participants cross the Manly Wharf navigation channel to access the race area. • Manly Yacht Club runs yacht races throughout the year with junior races in dinghies. Races are held in an area from just west of the Manly Wharf navigation channel in the vicinity of Aquarium Wharf. Participants cross the channel to reach the race area.

6.9.3 Potential impacts

Construction

Maritime traffic and congestion in Manly Cove may result from construction of the proposal by:

- closure of wharf facilities within Manly Wharf
- shipping construction material to site
- utilising vessels to conduct construction.

Some public moorings to the east of the existing Wharf 3 may be inside the construction marine exclusion zone, and as such may be temporarily impacted by construction of the proposal. However, as the public moorings would remain accessible, impacts are expected to be minor. The number of moorings impacted would be determined in detailed design.

Construction of the proposal would involve temporary closures of Wharves 2 and 3. Staging of the proposal, outlined in sections 3.3.1 and 3.3.12, would ensure that these wharves would not be closed at the same time. This would mean that current ferry services would be maintained, although their berthing wharf might change.

During the closure of Wharf 3, water taxis and other commercial and recreational vessels that use the wharf would be redirected. Other wharves that could be used for berthing include Sea Life Pier, Manly Sailing Pier, Bavarian Deck or East Pier (refer Figure 1.2). This would add about a six-minute walk for people travelling to Manly Wharf from Manly Sailing Pier, five minutes from Sea Life Pier and about a minute for those for those travelling from Bavarian Deck or East Pier.

Construction of the proposal would also increase marine traffic, as vessels would be used for construction and transporting material to site. Construction of the proposal would result in up to 15 vessels travelling between an off-site facility and the wharf each day. This would increase congestion in Manly Cove which could impact other users of water. However, given that construction would occur outside of the peak summer period impacts would be limited and short-term. Sailing races occurring in the area could continue noting that boats would need to stay outside of the construction marine exclusion zone. Where feasible, materials and equipment for water-based elements of the proposal would be shipped (barged) into and out of the area to limit any impact on East and West Esplanade and surrounds. This would provide the best

method to build the marine components of the proposal. The amount of materials to be shipped to site would be confirmed prior to construction.

To mitigate impacts from increased maritime traffic and congestion in Manly Cove, construction would take place outside of summer months when maritime traffic is generally lower.

Information to boating and vessel operators would be provided during construction and clear delineation of water-side works, using a construction marine exclusion zone, would be carried out to maintain safe navigation to and from operational sections of Manly Wharf. For further discussion on impacts to safe navigation refer to section 6.14.

Access to the construction marine exclusion zone would be restricted to the public. The maritime exclusion zone would be limited to the areas of active construction. The public mooring area to the east of the proposal footprint would also be accessible for public use including kayaking and paddle boarding. Access to East Pier would be maintained via an approach from the north-east through the public moorings. As such, construction of the proposal would have a limited impact on recreational water transport in the wider Manly Cove.

Operation

Ferry operations to Manly Wharf would continue once the new wharf is operational. The proposal would result in the improvement of efficiency and user experience of ferry services from the wharf.

The proposal would also result in safer water transport navigation due to reduced congestions and installation of navigation markers. For further discussion on safe navigation refer to section 6.14.

This may result in an increase to patronage of the Manly Wharf and ferry service and additional commuter traffic travelling to and from Manly Wharf. However, this is not considered to be significant.

The proposal would also improve access for recreational vessels such as whale watching vessels, party boats and fishing charters at the proposed Wharf 4. This would support recreational use of Manly Cove and provide safer navigation for small vessels.

The footpaths around the wharf would be regraded to meet DDA standards, improving accessibility to the wharves from East and West Esplanade.

6.9.4 Safeguards and management measures

Table 6.42 lists the marine transport safeguards and management measures that would be implemented to avoid, minimise or mitigate potential impacts identified in section 6.9.3.

Table 6.42 Marine transport safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
WT1	Water transport	A maritime navigation exclusion zone will be established during construction to prevent unauthorised vessels entering the area. This zone will be clearly defined to communicate access for other water users.	Contractor	Pre-construction
WT2	Water transport	<p>A Maritime Transport Management Plan (MTMP) will be prepared and implemented during the water based construction work. The MTMP will be prepared in consultation with Transport and approved by the Harbour Master. In addition, the proposal will:</p> <ul style="list-style-type: none"> • 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. <p>Any variation to the above will be agreed in advance with Transport and the Harbourmaster.</p>	Contractor	Pre-construction / construction

ID	Impact	Environmental safeguards	Responsibility	Timing
WT3	Water transport	Commercial, recreational operators and private services that use the existing wharf will be advised of the wharf closures at least two weeks prior to closure. Detail of alternative arrangements for berthing will be provided at this time.	Transport	Pre-construction / construction
WT4	Water transport	Construction of the proposal shall take place outside of the summer high period (December to February).	Contractor	Construction

6.10 Land transport, access and parking

This section describes the land-based traffic, transport, access and parking impacts associated with the proposal. Appendix G contains the land transport impact prepared by GHD (GHD, 2022).

6.10.1 Methodology

An assessment of land transport, access and parking was performed and considered the following:

- desktop assessment of the exiting road access, traffic volumes and transport options near the proposal
- evaluation of the construction and operation impacts to land-based transport
- traffic surveys were carried out to identify the peak periods and typical volumes of traffic in the vicinity of the proposal
- computerised modelling software (SIDRA 9.0) was used to identify the existing performance of intersections in the vicinity of the proposal.

6.10.2 Existing environment

Land transport

Road network

Manly Wharf is located about 15.8 kilometres (by road) from Sydney CBD and about 50 metres south of the Esplanade. Access to Manly Wharf is via the Esplanade which runs west to east next to the wharf and is joined from Belgrave and Wentworth Streets, refer Figure 1.2.

The road network within the vicinity of the wharf is characteristic of a commercial and retail local centre within a residential area. Speed limits are 30 kilometres per hour in the vicinity of the wharf and 50 kilometres per hour within the surrounding roads.

Traffic surveys carried out on the 31 March 2022 at the intersections of the Esplanade with Belgrave Street and Wentworth Street identified that peak times for travel are between 8.15am to 9.15am and 5.00pm to 6.00pm.

The peak hour traffic volumes and pedestrian volumes identified in the traffic surveys are displayed in Figure 6.16 for the AM peak hour and Figure 6.17 for the PM peak hour.

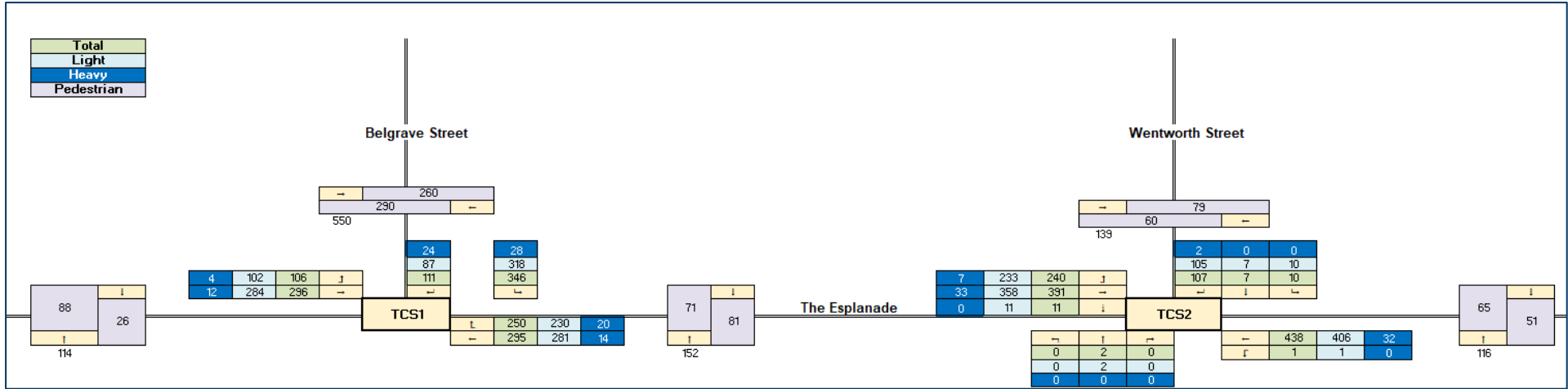


Figure 6.16 AM peak hour traffic volumes – existing situation

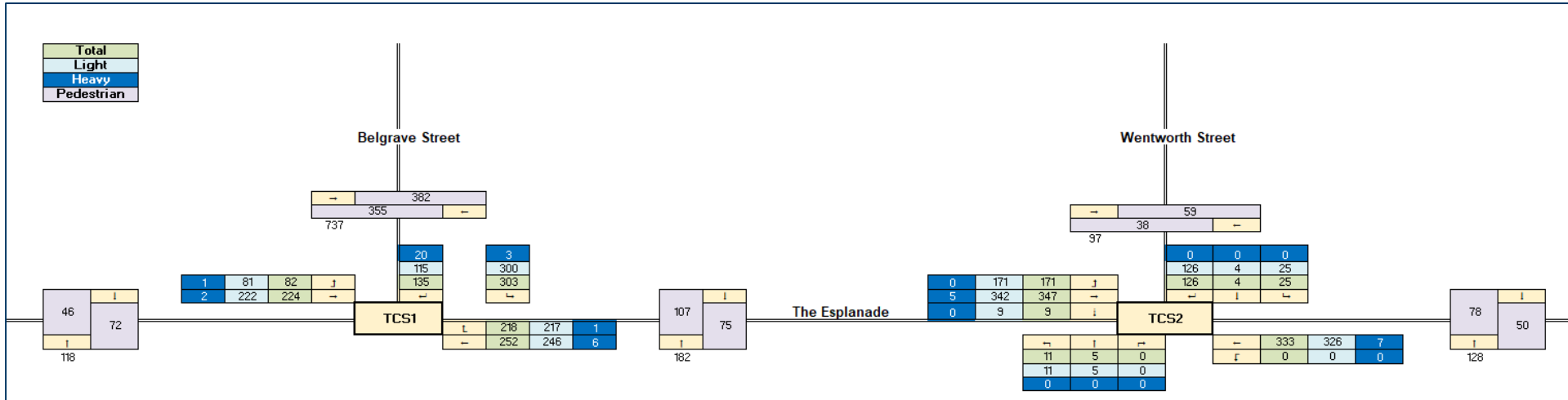


Figure 6.17 PM peak hour traffic volumes – existing situation

Current intersection performance

SIDRA 9.0 intersection modelling software was used to assess the proposed peak-hour operating performance of intersections on the surrounding road network. The modelling software found the intersections of Belgrave Street and West Esplanade and Wentworth Street and West Esplanade are currently operating with an acceptable Level of Service (LoS).

Public transport

The Esplanade is an important public transport interchange zone with dedicated bus zones along Belgrave Street and the south side of the Esplanade between Euston Street and Wentworth Street.

Eleven bus routes operate from the Esplanade with five routes operating every eight to twelve minutes during morning and evening peak times during weekdays. These include:

- Route 144 to Chatswood via St Leonards
- Route 162 to Seaforth
- Route 199 to Palm Beach via Dee Why
- Route 150X to Milsons Point
- Route 170X to Wynyard.

Other routes operate between twenty to sixty-minute intervals include:

- Route 141 Austlink via Seaforth and Frenches Forest.
- Route 142 to Allambie Heights
- Route 161 Manly to North Head loop service
- Route 166 to Frenches Forest
- Route 167 Warringah Mall
- Route 144N North Sydney (night service only).

Outside of peak times and during weekends services operate between ten minutes to sixty-minute intervals.

Pedestrian and bicycle access

The area directly to the north of Manly Wharf is a high pedestrian activity area. There are wide footpaths on both sides of the Esplanade and signalised pedestrian crossings the intersections of the Esplanade with Belgrave Street and Wentworth Street.

A shared pedestrian and bicycle path is provided along the front of Manly Cove that has direct access to Manly Wharf.

Parking

On-street car parking near to Manly Wharf is typically time-restricted between thirty minutes and two hours to discourage commuter car parking.

An underground off-street parking facility is located below the wharf and another next to Manly Wharf and is accessed via the intersection of the Esplanade and Wentworth Street.

Taxi

Taxi zones are also provided on Belgrave Street to the north and south of Gilbert Street.

6.10.3 Potential impacts

Construction

Haulage routes

It is expected that large construction vehicles, equipment and machinery would be transported to the proposal area via a barge. Road deliveries for concrete supply and smaller construction materials would access the proposal area via Sydney Street. The access route taken would involve turning right in Belgrave Street, left into the Esplanade and using Wentworth Street, Darley Road and Victoria Parade to turn around so that vehicles approach the proposal area on the correct side of the road without the need to cross traffic.

Traffic impacts

Up to ten heavy vehicle trips per day (five inbound and five outbound) and 40 light vehicle trips per day (twenty inbound during the morning peak and twenty outbound during the afternoon peak) are expected during construction. These additional 50 vehicle trips per day are within the typical daily fluctuations in traffic for the area. As such, it is not likely that construction traffic would impact on the operation of the road network, or impact on the performance of the relevant intersections.

Minor detours would be required during establishment of the proposal area and concrete pours along the Esplanade. This may result in minor delays for pedestrians, cyclists and traffic travelling through the proposal area. Pedestrian and cyclist access to and from the wharf would be maintained during construction.

A small section of the designated bus zone on the southern side of the Esplanade (next to the proposed construction compound) may be required for a total of five days during construction to provide access for concrete delivery. The proposal is not anticipated to have any additional impacts to the operation of the existing bus services in proximity to Manly Wharf.

Parking

Up to twenty workers would be involved in the construction of the proposal and it is recommended that these workers would use the off-street parking facility next to Manly Wharf. Preferably workers would use public transport to access the proposal area. Impacts to parking are anticipated to be minor.

Operation

The proposal would result in the improvement of access and user experience of the wharf and ferry services from the wharf. This may result in an increase in patronage of the wharf and ferry services.

All assets, access paths and transport services within the wharf public transport interchange would be fully compliant with the requirements of the DSAPT.

The proposed Wharf 4 is not a public transport facility so would not be DSAPT compliant but would allow for assisted access to and from vessels berthing at the wharf.

6.10.4 Safeguards and management measures

Table 6.42 lists the land transport safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.10.3.

Table 6.43 Land transport, access and parking safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
LT1	Land transport and parking	A Construction Traffic Management Plan (CTMP) will be prepared and will detail the construction signage and traffic controller requirements.	Contractor	Pre-construction
LT2	Land transport and parking	Each morning, prior to work commencing, ensure all temporary signage is erected in accordance with the Traffic Guidance Scheme.	Contractor	Construction
LT3	Land transport and parking	Where possible, the preferred means of transporting equipment and materials to the site will be via boat and barge over land transport to limit impacts to the local road network.	Contractor	Construction
LT4	Land transport and parking	Prior to the commencement of works on site, the Contractor is to inform neighbouring properties of proposed works, impacts and site contact information as per the Community Liaison Plan (to be developed prior to construction).	Contractor	Pre-construction
LT5	Land transport and parking	The necessary approvals will be obtained, as required by the <i>Roads Act 1993</i> and NSW traffic acts and regulations, prior to conducting any works including lane closures for deliveries, loading and unloading. The Contractor is required to seek the concurrence of the relevant road authority prior to undertaking works.	Contractor	Pre-construction
LT6	Land transport and parking	All staff and subcontractors engaged on site will be required to undergo a site induction. Additionally, the Site Manager will discuss Traffic Management Plan requirements regularly as a part of “toolbox talks”.	Contractor	Construction

6.11 Socio-economic

This section describes the socio-economic impacts associated with the proposal. Appendix F contains the Socio-economic Impact Assessment (SEIA) prepared by GHD (GHD, 2022).

6.11.1 Methodology

The SEIA assess the socio-economic impact of the proposal in accordance with the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (NSW Government, 2020).

Specific 'study areas' were used for the socio-economic assessment. These included:

- the 'regional study area' which comprises of the Northern Beaches LGA and provides an overview of the broader population that may be affected by the proposal
- the 'local study area' which comprises Manly state suburb areas (SSC).

A socio-economic baseline for the area was determined using current social and economic characteristics within the study areas. The socio-economic baseline utilised data from the following sources:

- Australian Bureau of Statistics (ABS) Census, 2016 (ABS, 2016)
- Economy id economic data (Economy id., 2022)
- local, State and Australian Government websites and publications
- various online sources
- information gathered during a site visit.

The SEIA also considered outcomes of stakeholder and community consultation activities conducted by Transport (between December 2021 and January 2022). Desktop findings were ground-truthed and verified during a site visit carried out on 8 July 2022.

Potential socio-economic impacts and benefits were then identified and assessed through:

- an initial issue scoping process
- review of the proposal's concept design
- results of stakeholder consultation on the concept design
- review of other technical studies and chapters prepared for this REF.

Cumulative socio-economic impacts were also assessed, taking into account other planned proposals within the vicinity of the proposal area.

Socio-economic impacts were categorised and rated for significance based on the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (NSW Government, 2020).

Specific safeguards and management measures were suggested to avoid or minimise the socio-economic impacts identified. The final level of socio-economic impact identified by the SEIA considered the implementation of recommended safeguards and management measures as outlined in section 6.11.4 as well as those identified in other assessments included in this REF.

6.11.2 Existing environment

Regional study area

Overview

The proposal is located in the Northern Beaches LGA, which is about 254 square kilometres in size. It extends from Manly and Seaforth in the south to Palm Beach and Ku-ring-gai National Park in the north.

The Garigal or Caregal people are the Traditional Owners of the land occupied by Northern Beaches LGA. The Garigal people continue to live along the coastal areas of northern Sydney and out to north-western Sydney. Manly Cove is part of the Gayamaygal clans area (also referred to as Kai'yamaygal, Gayamaygal, Gamaragal or Cameragal).

Key findings

Key findings for the regional study area most relevant to SEIA include the following:

- The Northern Beaches LGA is primarily made up of low to medium density residential areas, with the southern end, including Manly, more urbanised than the north.
- The LGA is well serviced and connected to the Sydney CBD by road infrastructure and waterways. Manly Ferry F1 and Manly Fast Ferry are popular public transport routes.
- There are lower rates of unemployment amongst all populations including Indigenous persons in Northern Beaches LGA compared to NSW.
- There are low levels of socio-economic disadvantage for Northern Beaches LGA.
- There is a low residential vacancy rate in Northern Beaches LGA which is similar to the rest of Greater Sydney.

Community values, opportunities, and challenges

The Northern Beaches LGA is characterised by its beachside location and its proximity to Ku-ring-gai National Park. These two features contribute to the overall visual amenity of the area, as well as its character and lifestyle. Community values aim to protect and enhance the natural and built environments, create a more connected and caring community, embrace the diverse sports and recreation, culture and sustainability (Northern Beaches Council, 2018).

Local study area

Overview

Manly is located approximately 10 kilometres north-east of the Sydney CBD. The surrounding area is urban, characterised by commercial, residential, recreational and open space areas.

Manly Wharf and its surrounds represents key areas for local recreation and business. Manly Wharf 3 is used by a number of commercial operators including GoSail Sydney and water taxis as well as recreational vessels.

Manly Wharf 3 is also a listed NSW State Heritage item as it is the oldest surviving wharf at Manly illustrating former dependence on maritime transport and trade (Heritage NSW, 2022). For further detail on the heritage elements of Manly Wharf refer section 6.1.

Economy and business

Manly Wharf houses 15 hospitality venues, one speciality store, one information centre, one supermarket and one convenience store which can be broken up into the respective location / position within the wharf as detailed in Table 6.44.

Table 6.44 Businesses located at Manly Wharf

Businesses located inside Manly Wharf	Business located at Manly Wharf facing the water	Businesses located at Manly Wharf facing the Esplanade
Convenience Store	Sake	Guzman and Gomez
Aldi	El Camino	Betty's Burgers
Gelatissimo	Wharf Bar	Fish and Lemonade
Candlicious	The Tropic	The Bavarian
Chat Thai	Queen Chow	Manly Information Centre
Asagao	Sonoma	
Stone and Peel	Hugos	

Other businesses located in close proximity to the proposal include the Manly Kayak Centre which operates from the south-eastern end of the Manly Wharf at East Pier, refer Figure 1.2.

Recreational users and customers of Manly Kayak Centre are permitted to use the water space surrounding the south-eastern portion of the wharf and private mooring at Manly Cove.

There are also a number of businesses located on the eastern side of the Esplanade which may also have views of Manly Wharf and Manly Cove and potentially the proposal area.

Access and connectivity

Manly is accessed via land by Sydney Road from the west and Pittwater Road from the north. It is also served by two ferry services which run between Circular Quay and Manly Wharf.

Manly Wharf 3 is used as an alternative wharf for passenger ferries when needed as well as hop-on / hop-off services for privately operating services from Darling Harbour. The eastern area of Manly Cove also provides private moorings for boating vessels up to 20 metres in length.

The Esplanade, which runs parallel to Manly Cove, operates as an important road and bus zone for people accessing the wharf with bus stops located at the intersection of West Esplanade, East Esplanade and Belgrave Street. The wharf can also be accessed via active transport such as walking with The Corso being a key link between the wharf and Manly Beach.

An on-road cycle path is provided on the northern side of Wentworth Street, while bike logos are provided on the southern side of Wentworth Street. Shared paths along the Manly Cove frontage and the Corso can also be used for cycles. Bicycle parking is provided at the near the Manly Wharf Interchange (refer Figure 1.2).

For further details on the land and water transport around the proposal area refer to sections 6.10 and 6.9.

Key socio-economic indicators

At the time of the 2016 census, the local study area had a population of 15,866 people. Of these, 0.4 per cent of people identified as Aboriginal or Torres Strait Islander (ABS, 2016). Manly had a median age of 36 years and had a high proportion of people born in non-main English-speaking countries (20.6 per cent).

In 2016, Manly had a high proportion of couple families without children (53.6 per cent). Overall, 5.4 per cent of the Manly population were younger than 4 years old and 5.7 per cent were primary age children (5 to 11 years old). Seniors of 65 years old and above made up 14.7 per cent of the population.

The average household size in Manly was 2.2 persons and 76.8 per cent of dwellings in Manly in 2016 were apartments, flats, or units. This is representative of the high-density nature of the locality.

In 2016, 96.1 per cent of the population in Manly was employed. The predominant industry in terms of contribution to employment was professional, scientific, and technical services which accounted for 20.8 per cent of the workforce. The median weekly individual income in Manly was \$1,280 and the weekly household income was \$2,449.

In 2016, the proportion of the population who required assistance in Manly was 2.8 per cent, which was lower than the broader LGA at 3.7 per cent. In 2016, Manly had a higher proportion of households without a motor vehicle (17.8 per cent) compared to Northern Beaches LGA at 6.6 per cent. A significant proportion of people travelled to work by ferry in Manly (29.0 per cent) compared to Northern Beaches LGA (3.4 per cent). About 30.3 per cent of people indicated that they drive to work in Manly, which is significantly lower than Northern Beaches LGA at 55.4 per cent.

Tourism

Tourism and hospitality are key industries and major contributors to Manly's economy. In 2019-20, the total value added from tourism and hospitality in Manly was \$1360.9 million (Economy.id, 2021).

The ferry service that connects Manly to Circular Quay, is one of the country's most famous ferry routes and is thus a tourist attraction while also providing a vital transport link for residents, daily commuters and tourists (Northern Beaches Council, 2022).

Services and facilities

There are two beaches located on either side of the Manly Wharf, Manly Cove Beach (to the north) and East Manly Cove Beach (to the south). Both of these beaches are attached to parks along the Esplanade. These areas are valued by locals and visitors for swimming, kayaking, fishing, walking, cycling, picnicking, sailing, and yachting.

There are also a number of community facilities and services located within 400 metres to the proposal area including Manly Art Gallery and Museum, Manly Surf n Slide, Manly Yacht Club, Manly Sailing, Manly Kayak Centre, and the Manly Town Hall.

Manly Police Station is also located nearby on Belgrave Street. The closest Fire and Rescue Station is located in the suburb of Fairlight. Northern Beaches Hospital is the closest hospital to the proposal area, which is located in the Northern Sydney Local Health District (LHD). It provides emergency department care, surgery, and treatment for specialist cases to the region.

6.11.3 Potential impacts

Construction

The SIEA identified several socio-economic impacts associated with construction of the proposal. The key impacts are summarised below, and a full list of impacts is provided in Appendix F.

Access and connectivity

Construction of the proposal would result in temporary closure of wharves 2 and 3. During the temporary closure of Wharf 2 Manly Fast Ferry vessels would be diverted to Wharf 3. This could create accessibility issues or confusion for vulnerable community members.

During the closure of Wharf 3, water taxis, GoSail Sydney and other commercial and recreational vessels would be redirected to other wharves around Manly Cove. This would add about a six-minute walk for commuters travelling to Manly Wharf from Manly Sailing Pier, five minutes from Sea Life Pier and about a minute for those for those travelling from Bavarian Deck or East Pier. This would add additional travel time for people using these travel methods, particularly if there is any confusion on where to board or alight these vessels.

There is potential that other wharf upgrades planned as part of the broader FWUP programme of work could create cumulative delays in transport system. However, given that most of the other planned wharf upgrades are not close to the proposal area or on the same routes as the Manly Wharf ferries this is considered unlikely. Management measures for reducing cumulative impacts of the proposal are provided in section 6.17.5.

During construction, public access to East Esplanade Park would be restricted. This would create impacts to local residents that use the park. Construction would also change pedestrian pathways along the promenade during construction.

Finally, up to twenty workers would be involved in the construction of the proposal and would likely use the off-street parking facility next to Manly Wharf thus reducing parking availability for other users.

Overall, these access and connectivity impacts from construction of the proposal would have a low-moderate significance as these impacts would be temporary, public transport service frequencies would be maintained, and construction would take place out of the peak summer period.

Amenity and character

Construction of the proposal would result in a range of impacts to amenity and character from:

- noise (refer section 6.6)
- dust impacts to air quality (refer section 6.12)
- changes to visual surrounds due to construction activities (refer section 6.5)
- impacts to a State Heritage place (refer section 6.1).

Amenity and character impacts during construction could potentially impact local residents, wharf users, tourists, visitors and local businesses.

Cumulative impacts to amenity and character could occur if construction of the nearby West Esplanade activation plan and the former Manly Sea Life project occurred concurrently to the proposal. However, these impacts would be adequately managed by the mitigation measures provided in section 6.17.5.

Apart from the impacts to a State Heritage place, impacts would be temporary and limited to a small geographic area. Amenity and character impacts are expected to be suitably managed by the safeguards and management measures proposed in Table 6 and Chapter 7.

Construction of the proposal would have an impact on the heritage of Manly Wharf as it would involve the partial demolition of the existing heritage structures. This may result in a perceived loss of character for the local area, however, as outlined in section 6.1, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.

Economy, employment and business

Construction related impacts on parking, traffic, and access, as well as reduced amenity due to construction activities, may deter customers at businesses, in particular hospitality related businesses, at Manly Wharf.

Businesses which overlook Manly Wharf 3 (refer section 6.5) are likely to be more sensitive to these changes due to the impact on the existing view scape likely to occur during construction of the proposal. Transport consultation indicated that customer loss is a concern amongst operators.

However, impacts would be temporary in nature and the proposed upgrade would take place outside of the peak summer period. As a result, this impact is considered to be of moderate-low significance. The safeguards and management measures proposed in Table 6 would help to mitigate potential business impacts.

Positive impacts

Positive impacts that would be generated by construction of the proposal including:

- increased employment opportunities for skilled and semi-skilled workers (about 20 opportunities)
- increased opportunities for local businesses to supply goods and services to the construction workforce.

Operation

The majority of socio-economic operation impacts of the proposal would be positive with a high to moderate significance. The proposal would bring Manly Wharf 3 up to DSAPT standards and which would result in overall improved accessibility to transport services and safety while accessing and using the wharf. This would be a particularly positive for people with a disability, people who are mobility impaired and customers with prams.

In addition, the proposal would result in new public spaces and facilities including:

- the proposed new wharf (Wharf 4), which would enable better access for small commercial vessels (e.g., water taxis) and recreational vessels at a range of tidal levels
- the new pile-supported promenade resulting in additional public space to the wharf area
- new public seating spaces within the new public promenade area and a canopy over the new wharf waiting area. These new facilities may provide more comfort for the wharf users including commuters and other wharf users.

The proposal is also likely to have a positive cumulative impact with the planned upgrades to the ferry network and the local study area. The broader FWUP programme of work would have a beneficial cumulative impact through improved passenger amenity and consistent ferry wharf design across the network. In addition, operation of the West Esplanade activation plan and the former Manly Sea Life project, both of which plan to upgrade infrastructure in the vicinity of Manly Wharf, would result in a rejuvenated Manly Cove area with improved public waterfront access. For further details on cumulative impacts refer to section 6.17.

The main waiting area roof canopy may impact the view of businesses and customers facing Wharf 3 and the proposed Wharf 4. This impact is expected to have a low significance as the roof would be similar in form to existing the infrastructure and it is expected that businesses and customers would adapt to this change over time. A full assessment of visual impacts associated with the proposal and managements measures proposed to mitigate visual impacts is provided in section 6.5.

6.11.4 Safeguards and management measures

Table 6 lists the socio-economic safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.13.3. Other safeguards and management measures that are relevant to socio-economic impacts are also identified in sections 6.1 (non-Aboriginal heritage), 6.5 (landscape character and visual impact), 6.6 (airborne noise and vibration), 6.8 (Aboriginal cultural heritage), 6.9 (water transport), 6.10 (land transport, access and parking), and 6.12 (air quality).

Table 6. SEQ Table * ARABIC \s 1 4Socio-economic quality safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
SE1	Impacts to local residents and businesses	<p>Transport will continue to manage and deliver a Community and Stakeholder Engagement Strategy in the lead up to and during construction of the proposal. This will help to ensure that:</p> <ul style="list-style-type: none"> • the community and stakeholders have a high level of awareness of all processes and activities • the community and stakeholder are made aware of any potential disturbances and/or disruptions well in advance of them occurring • accurate and accessible information is made available • a timely response is given to issues and concerns raised by the community • feedback from the community is encouraged • opportunities for input are provided. 	Transport	Pre-construction / construction

ID	Impact	Environmental safeguards	Responsibility	Timing
SE2	Impacts to local residents and businesses	<p>A proposal-specific communication management plan will be developed by the primary construction contractor in accordance with the Community and Stakeholder Engagement Strategy and implemented to define the specific requirements for engagement during construction.</p> <p>Engagement will include, and not be limited to, notifications and provision of signage.</p> <p>This will be developed and implemented to ensure that residents and businesses are notified in a timely manner about:</p> <ul style="list-style-type: none"> • works commencing and work activities • potential for impacts including changed wharf access, wharf closures, access and use of East Esplanade Park, impacts to heritage, noisy construction activities and out-of-hour work • accurate information on the proposal • enquiries and complaints management. <p>The communication management plan will define the requirements for the complaints management system to be implemented throughout the duration of the proposal, including 24-hour, seven days a week phone line, postal and email address for written enquiries, and publication of contact details.</p>	Transport	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
SE3	Consultation and communication with businesses	Early and ongoing direct consultation with businesses will occur throughout the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations. Direct consultation will be continued throughout the construction period to understand and mitigate any access impacts.	Transport	Detailed design / Pre-construction / Construction
SE4	Local and Indigenous employment and procurement	<p>As specified by Transport's Aboriginal Participation Strategy (Transport, 2021), Transport will prioritise opportunities for Indigenous workers and procurement in line with the NSW's Governments Aboriginal Procurement Policy (NSW Government, 2021).</p> <p>This will include local and Indigenous participation commitment in tender documents which will outline the sub-contracting, employment, training, Indigenous and community contributions that contractors will need to deliver.</p>	Transport	Pre-construction

6.12 Air quality

This section describes the existing air quality and potential impacts associated with the proposal.

6.12.1 Methodology

The assessment established air quality existing conditions by examining databases and reports recording air quality and weather information near the proposal area. Potential impacts to air quality from construction activities were then considered. Potential impacts to air quality from operation of the proposal were not considered as changes to ferry type and frequencies are not proposed.

6.12.2 Existing environment

The existing air quality of the local area is primarily influenced by emissions from motor vehicles and residential activities. Air quality conditions are also influenced by the prevailing weather and climatic conditions, bushfires, and other natural factors such as pollen.

The nearest long term air quality monitoring site is located between the Bradfield Highway and the Cahill Expressway, near Ennis Road, Milsons Point. This station is part of the Sydney East monitoring network. A review of air quality data for the year to May 2022 for Bradfield Highway indicates that air quality is generally categorised as 'Good' based on the Air Quality Category (DPE, 2022).

The closest Bureau of Meteorology (BoM) monitoring station to the proposal with rainfall data is located at Collaroy (Long Reef Golf Club), Sydney (station number 66126). Data from the BoM (BoM, 2021c) reports that the average annual rainfall recorded at Collaroy is 963.4 millimetres.

Wedding Cake West weather station (station number 066196) is located about five kilometres to the east of the proposal area. Afternoon winds are generally stronger than morning winds at Wedding Cake West weather station tending towards 20-28 kilometres per hour with morning winds generally 16-19 kilometres per hour (BoM, 2022). Wind conditions at the proposal area are discussed further in section 6.3.2.

6.12.3 Potential impacts

Construction

During the construction of the proposal temporary impacts on air quality may arise from:

- minor generation of particles and dust from general construction work (e.g., demolitions, excavations, concrete cutting and breaking)
- minor emissions (primarily diesel exhaust) from plant and machinery
- minor emissions from construction traffic and water vessels.

The proposal has been designed to be in line with pollution control targets set out in Transport's 'Sustainable Design Guidelines', including 'all surface coatings to comply with the Australian Paint Approval Scheme (APAS) Volatile Organic Compounds (VOC) Limits where fit for purpose' (Transport, 2020).

These impacts are expected to be short-term, low intensity and be able to be managed through identified safeguard and management measures.

Operation

At opening, the level of operation of the ferry services would be maintained at existing frequencies and would not increase. As a result, impacts to air quality from vessel emissions are not expected to change from the operation of the proposal.

6.12.4 Safeguards and management measures

Table 6 lists the air quality safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.12.3.

Table 6. SEQ Table * ARABIC \s 1 4Air quality safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
AQ1	Air quality	<p>Air quality during construction will be considered and addressed within the CEMP and will include methods to manage work during strong winds or other adverse weather conditions as required. As a minimum, the following measures will be included:</p> <ul style="list-style-type: none"> • covering all loaded trucks and vessels • machinery to be turned off rather than left to idle when not in use • maintenance of all vehicles, including trucks and vessels entering and leaving the site in accordance with the manufacturers specifications to comply with all relevant legislation • maintenance of all plant and equipment to ensure good operating conditions and exhaust emissions comply with the <i>Protection of the Environment Operations Act 1997</i> • maintaining the work site in a condition that minimises fugitive emissions such as minor dust. 	Contractor	Pre-construction / construction
AQ2	Sustainability	<p>During construction, the Contractor is to monitor performance of their non-road diesel plant and equipment against US EPA, EU or equivalent emissions standards using Transport <i>Air Emissions Workbook - DMS-FT-439</i>.</p>	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
AQ3	Air quality	<p>All surface coatings used for the proposal would need to comply with the Australian Paint Approval Scheme (APAS) Volatile Organic Compounds (VOC) Limits where fit for purpose.</p> <p>The architectural materials and finishes register are to identify the requirement for low VOC levels for paints used on site.</p>	Contractor	Detailed design / construction

6.13 Waste

This section describes the existing waste management at the proposal area and potential impacts associated with the proposal.

6.13.1 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 *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).

6.13.2 Existing environment

Public waste bins are provided at the existing Manly Wharf and are managed as part of the existing Manly Wharf operations. There is the potential for litter to enter Sydney Harbour from existing Manly Wharf activities.

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

6.13.3 Potential impacts

Construction

Waste management

Construction activities would generate various waste streams that would need to be managed and disposed of. Potential wastes include:

- existing timber and concrete wharf and associated infrastructure
- waste fuels, oils, liquids and chemicals
- packaging wastes such as cardboard, timber, paper and plastic
- general garbage and sewage from the temporary compound
- potential for acid sulfate soils in the marine environment (refer section 6.1)
- potential for contaminated sediment (refer section 6.1)
- various building material wastes (including metals, timbers, plastics and concrete)
- earthworks spoil, about 350 cubic metres, associated with dredging (refer section 3.3.10)

- asphalt and concrete
- general waste, including food, litter and other wastes generated by the construction workers.

Any excavated material, including dredged material, would be reused where suitable or classified before being disposed to an appropriately licenced facility in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA, 2014). Waste classification would include the testing and sampling consider of TBT, as discussed in section 6.3, and will inform the potential for material re-use or onshore disposal to a licenced facility should it be classified as Restricted Solid Waste.

Ancillary facilities would be contained within the site compound and include a portable toilet. Minimal storage of materials is anticipated but may include storage concrete supply or small item deliveries. Where feasible, materials would be barged, including fuels, oils and other required liquids which would be stored in bunded containers. All waste removed from the proposal area would be transferred by a licenced contractor to a licenced receiving facility.

Resource use

Transport 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.

Sustainable materials and finishes would be considered during sourcing while ensuring the final proposal considers maintenance, durability, and lifespan implications. For example, it is proposed that design of the new seating in the 'slow space' would explore opportunities to re-use salvaged timber from the demolition of Wharf 3.

Operation

The proposal may lead to an increase in patronage as a result of improved access and generally improving the wharf facility. With increased patronage there is potential for increased domestic waste to be generated. Incidences of littering are not expected to increase given that waste management is likely to improve with the installation of new garbage and recycling receptacles in the main waiting area.

6.13.4 Safeguards and management measures

Table 6.45 lists the waste management safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.13.3.

Table 6.45 Waste management safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
W1	Waste	<p>A waste management plan (WMP) will be prepared in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>. A WMP is to be prepared as part of the CEMP and would include measures to minimise waste, outline methods of disposal, reuse and recycling and monitoring, as appropriate. This is to include the following:</p> <ul style="list-style-type: none"> • appropriate measures to avoid and minimise waste associated with construction including the re-use of salvaged timber from the demolition of Wharf 3. • waste management, littering and general tidiness will be monitored during routine site inspections. 	Contractor	Pre-construction / Construction
W2	Resource use	Recycled, durable, and low embodied energy products will be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (e.g., where quality control specifications allow).	Contractor	Detailed design
W3	Sustainability	During construction, the Contractor is to monitor waste and recycling quantities using <i>Transport Waste Data Collection Workbook – DMS-FT-436</i> to support compulsory requirement 4 of the <i>Transport Sustainable Design Guidelines version 4.0</i> .	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
W4	Waste	Any excavated sediments or soil that require disposal will be sampled, tested and classified in accordance with the <i>Waste Classification Guidelines: Part 1 Classifying Waste</i> (EPA, 2014) prior to being disposed of at a waste facility licensed to accept the relevant class of waste. Any materials classified as Hazardous Waste may require treatment or an immobilisation approach in accordance with Part 10 of the <i>Protection of the Environment Operations (Waste) Regulation 2014</i> prior to off-site disposal.	Contractor	Construction

6.14 Hazards and utilities

This section describes the existing hazards, utilities and potential impacts associated with the proposal.

6.14.1 Methodology

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

6.14.2 Existing environment

Embarking and disembarking the existing Wharf 3 requires the use of the tidal steps which make it difficult for prams, wheelchairs, and people with mobility issues to access ferries. The existing boardwalk and wharf timber finish, gradient, steps and lighting is not DSAPT compliant, making this pedestrian route more hazardous for people with mobility issues.

The existing Wharf 3 can be hazardous for less-mobile passengers at very low tides and at very high tides, particularly when coinciding with the storm surge. This is due to the tidal range of about two metres in Manly Cove, as well as storm surge created by strong southerly wind and large ocean swells.

The existing Wharf 3 can become congested during busy periods (such as during summer, public holidays, and weekends) with the combination of existing ferry services, other commercial and recreational users. This can create navigational conflicts. In addition, the existing Wharf 3 is currently unofficially used by recreation and commercial vessel partly due to limited berthing options in the vicinity of Manly Wharf.

Although prohibited, anecdotal evidence suggests swimming sometimes occurs around Wharf 3 which creates a safety risk for the swimmers and a navigational hazard.

Contamination is known to be present within the sediments near the proposed dredge pocket (refer section 6.1).

A preliminary assessment identified that the following services are present in the vicinity of Manly Wharf:

- underground power supply (Ausgrid)
- sewer connection (Sydney Water Corporation)
- water mains connection (Sydney Water Corporation)
- connection to TransDev Sydney ferry wharves communication network.

There is potential for unknown services to exist within the proposal footprint.

6.14.3 Potential impacts

Construction

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

- risk of vessel collision due to marine vessel traffic from construction.
- physical injury to public due to various hazards and risks associated with the construction activities
- construction materials, waste and/or other objects have the potential to fall from the land-based construction area, construction barge or other construction vessels into Manly Cove causing water pollution and risk to human health
- physical injury to construction workers due to various hazards and risks associated with the construction activities (e.g., piling or underwater construction activities)
- risk to human health for any swimmers in proximity of Manly Wharf during impact piling (see section 6.7)
- risk to human health or the environment from spillage of materials and/or wastes on land or into the water
- risk to human health or the environment from the dispersion of potentially contaminated sediments
- risk to human health or the environment from air quality related impacts from dust generated during construction activities
- potential impacts to known and unknown utilities.

Construction hazards created by the proposal would be managed by a range of safeguards listed in Table 6.46. Other hazards from waste, contamination and air quality are discussed in sections 6.13, 6.3 and 6.12, respectively.

Operation

The proposal has been designed to comply with relevant standards, minimising risk to passenger welfare during operation of the wharves and improving accessibility. Access for less-mobile passengers would have improved safety through the installation on new lighting, glass balustrades, handrails, ramps and safely grading.

The proposal has been designed to withstand swell and tidal ranges present in Manly Cove. The height of the hydraulic platform would adjust according to the tide height increasing the tidal range. This would make berthing at Wharf 3 and the proposed Wharf 4 safer during storm surge conditions or low tides. Increased navigational safety would be gained through separating commercial vessels on Wharf 3 and smaller, recreational vessels on the proposed Wharf 4.

Stakeholder consultation raised concerns that greater commercialisation and use of Manly Wharf created by the proposal would increase crime and anti-social behaviour at Manly Wharf. The proposal's concept design has included a security risk assessment using crime prevention through environmental design (CPTED) principles to address security, safety and risk issues. This has led to the inclusion of safety and security features, such as a Help Point on the service pod in the main waiting area. This Help Point could be used to contact police, ambulance, or other emergency services at all times. CCTV coverage would also be provided for the new Wharf. CPTED principles

would be further applied during detailed design to integrate safety in the next phase of design development.

A navigation study was carried out for the proposal to assess the safe navigation of vessels to and from the proposal (TCS, 2021). The proposal's concept design (refer Figure 3.1) includes the installation of:

- separation piles between Wharves 2 and 3, and between Wharf 3 and the sandbank to the east of the Wharf
- arrestor piles for Wharf 3
- navigation lights fitted to the arrestor piles.

These current concept design features would assist in safer navigation during the operation of the proposal.

6.14.4 Safeguards and management measures

It is expected that hazard safeguards and management measures would be identified and appropriately managed in the design and construction risk management documentation for the proposal. Hazard safeguards and management measures would include but not be limited to those identified in Table 6.46. Other safeguards and management measures that are relevant to hazards are also identified in section 6.9 (water transport).

Table 6.46 Hazard safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
HR1	Hazards and risks - navigation	<p>Consultation with stakeholders will be carried out during detailed design, commissioning and operations, including Transport Maritime Operations, Harbour Master, maritime operators and TransDev to:</p> <ul style="list-style-type: none"> • further consider navigational risk and safety during detailed design • develop and implement boating safety campaigns and awareness/ educational tools for all wharf users. 	Transport	Pre-construction
HR2	Hazards and risks – weather events	Weather forecasts will be monitored during construction of the proposal. In the unlikely event of a major flood event or strong marine winds/waves, equipment and materials will be temporarily removed from the site, where possible.	Contractor	Construction
HR3	Hazards and risks – utilities	Further investigations and assessment of impacts to local utilities will be carried out.	Contractor	Detailed design
HR4	Hazards and risks – utilities	Onsite service location will be carried out prior to undertaking any excavation or piling works to identify any additional cables not identified during design.	Contractor	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
HR5	Hazards and risks – pedestrian safety	Safe pedestrian access through the proposal will be managed through the installation of way-finding signage, hoarding and safety ramps to provide access over concrete lines.	Contractor	Construction
HR6	Hazards and risks – recreation	Swimming at and from Wharf 3 and the proposed Wharf 4 is to be prohibited and communicated through 'No swimming' signage to inform community members. Life buoys will be provided in the service pod in the main waiting area for use in the event of a person falling into the water. Ladders will be provided at key locations to allow a person to get out of the water.	Transport/ Contractor	Detailed design / construction

6.15 Climate change and greenhouse gas

6.15.1 Strategic framework

The Intergovernmental Panel on Climate Change has produced climate change projections. In Australia, both the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology (BoM) have produced regional downscaled projections for Australia from these projections.

In 2014 the NSW Government published climate change 'snapshots' for each region in NSW, including the Sydney region. The climate change predictions for Sydney can be summarised as (OEH, 2014):

- higher than average temperatures (maximum and minimum temperatures)
- the number of hot days will increase and the number of cold nights will decrease
- rainfall is projected to decrease in spring and winter, and increase in summer and autumn
- average fire weather is projected to increase in spring, and severe fire weather days are projected to increase in spring and summer.
- the NSW Coastal Planning Guideline: *Adapting to Sea Level Rise* (DoP, 2010) applies to the proposal. This guideline requires that the following eight criteria be considered when designing development proposals:
 - development avoids or minimises exposure to immediate coastal risks (seaward of the immediate hazard line)
 - development provides for the safety of residents, workers or other occupants on site from risks associated with coastal processes
 - development does not adversely affect the safety of the public off-site from a change in coastal risks as a result of the development
 - development does not increase coastal risks to properties adjoining or within the locality of the site
 - infrastructure, services and utilities on-site maintain their function and achieve their intended design performance
 - development accommodates natural coastal processes
 - coastal ecosystems are protected from development impacts
 - existing public beach, foreshore or waterfront access and amenity is maintained.

In October 2009 the NSW government released its NSW Sea Level Rise Policy (DECCW, 2009). The policy provided sea level rise planning benchmarks as follows:

- 40 centimetres by 2050
- 90 centimetres by 2100.

On 8 September 2012, the State government withdrew these benchmarks in order to provide more flexibility in considering local conditions when determining future hazards. Responsibility for adopting sea level rise projections for use in planning was transferred back to local government.

6.15.2 Methodology

A Climate Change Risk Assessment was completed at Concept Design Phase (GHD, 2022b). The assessment identifies climate variables that are a risk to the proposal including:

- sea level rise – sea level rise could cause inundation of the proposal's accessway and platforms
- increase maximum temperatures, including urban heat island effect – could have the potential to cause heat stress in customers and compromise the proposal assets, such as the integrity of materials
- increases in extreme rainfall – could lead to the potential inundation of stormwater management system and potential user safety impacts
- increases in number of heavy rain periods – could impact on passenger amenity where shelter is not available
- increases in windspeed – could potentially cause damage to shade structures from additional wind loading thus creating a potential commuter safety risk.

6.15.3 Potential impacts

Construction

Climatic factors would not constrain construction of the proposal except during adverse weather conditions such as prolonged heavy rain or high winds which may occur during the construction period. These may delay the completion of construction.

As a part of the proposal's *Sustainability Strategy Report* it was estimated that the proposal would generate 1,296 kilograms of carbon dioxide equivalent during construction (GHD, 2022b). The carbon dioxide equivalent produced by the proposal would be lessened due to the use of lower carbon steels and concretes.

Due to the small scale of the proposal and the short-term temporary nature of the individual construction works, it is considered that greenhouse gas emissions resulting from the construction would be kept to a minimum through the implementation of the standard mitigation measures.

Operation

Projections for various climate variables which have the potential to impact the wharf were considered in the Climate Risk Assessment (GHD, 2022b) completed during the concept design phase in line with Transport Climate Risk Assessment Guidelines.

The proposal has minimised its exposure to climate change risks by designing the proposal to have appropriate clearances of existing tides, storm surge, sea and wave action whilst also considering projected sea level rise over the next 50 years. The wharf has been designed to account for the projected sea level rise to 2075.

For example, the gangway has been designed to achieve gradients of up to 1:20 with the rise and fall of the tides to account for rising sea levels. The gangway would also be connected to the main waiting area using a pinned connection. This would allow the gangway to be simply reconnected to the main waiting area if this area needs to be raised in the future due to sea level rise. More extreme and more frequent heat events as a result of climate change may lead to more rapid degradation of the wharf structures. This may result in additional maintenance requirements.

Shading is provided on the main waiting area to protect passengers during extreme weather events, include heatwave events and heavy rainfall.

Any climate change impacts of operating and maintaining the proposal are considered minor. There would be some greenhouse gas emissions during maintenance of the wharf, although maintenance requirements have been considered in the materials used for the proposal and are considered minor.

It is anticipated that, once operational, the proposal may result in an increase in use of Manly Wharf and a relative decrease in use of private motor vehicles by commuters to travel to and from Manly. A modal shift in transport usage may reduce the amount of fuel consumed by private motor vehicles with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

6.15.4 Safeguards and management measures

Table 6.47 lists the climate change and greenhouse gas safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.15.3.

Table 6.47 Climate change and greenhouse gas safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
CC1	Climate change	During detailed design undertake a compliant carbon footprinting exercise in accordance with the Transport Carbon Estimate and Reporting Tool Manual (Transport, 2019). The carbon footprint will be used to inform decision making in design and construction.	Transport	Detailed design / construction
CC2	Climate change	During detailed design undertake a compliant climate risk assessment in accordance with the Transport <i>Climate Risk Assessment Guidelines – DMS-SD-081</i> .	Transport	Detailed design
CC3	Climate change	The detailed design process will consider adaptation measures for climate change, including the following: <ul style="list-style-type: none"> finished levels and wharf adjustment thresholds light colour palate for wharf materials, where practical selection of resilient materials to storm events weather protection features adoption of energy efficient light fittings with ambient lighting level responsive controls concrete mixes to utilise recycled or captured water and to maximise use of Supplementary Cementitious Materials (SCM) such as Ground Granulated Blast Furnace Slag (GGBFS) and Fly Ash to replace Portland Cement source steel from suppliers that use electric arc furnace (EAF) technology adoption of sustainable procurement initiatives for steel and timber. 	Transport	Detailed design

6.16 Sustainability

6.16.1 Sustainability in design

Transport is committed to minimising the impact on the natural environment using the Transport *Sustainable Design Guidelines (SDG) v4.0 rating tool* (Transport, 2017a) to measure and drive sustainability performance. The SDG rating tool was developed to support Transport's ongoing commitment to sustainability to deliver environmental and social benefits as outlined in the Transport *Environment and Sustainability Policy* (Transport, 2020c) and Transport's *Future Transport Strategy 2056* (Transport, 2018).

The SDG rating tool sets targets across the following key areas:

- climate change adaptation and resilience
- energy management
- waste and recycling
- materials
- water conservation
- supply chain management
- community benefit.

Key design elements and strategies developed during concept design will be used to further develop the design and construction.

6.16.2 Potential impacts

The design of the proposal has been based on the principles of sustainability, including aiming for a 'Silver' rating under the SDG and the Transport Environmental Management System (EMS). These guidelines require a number of mandatory and discretionary initiatives to be applied.

Further positive impacts in relation to climate change and sustainability associated with the proposal include encouraging a reduction in private vehicle use and increase the accessibility of public transport services.

6.16.3 Safeguards and management measures

Table 6.48 lists the sustainability safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.16.2. Other safeguards and management measures that address sustainability are identified in section 6.12 (air quality), section 6.13 (waste management) and section 6.15 (climate change)

Table 6.48 Sustainability safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
S1	Sustainability	The Contractor shall propose a suitably qualified and experienced sustainability officer at a minimum 14 days prior to site establishment to be endorsed by Transport. The sustainability officer will be responsible for implementing the sustainability objectives for the proposal. Details of the sustainability officer, including defined responsibilities, duration and resource allocation throughout the appointment are to be submitted to Transport prior to the preparation of the Sustainability Management Plan.	Contractor	Detailed design / Construction
S2	Sustainability	Prior to commencement of construction, a Sustainability Management Plan shall be endorsed by Transport. The Plan will be provided prior to construction and include the following minimum components: <ul style="list-style-type: none"> • a completed electronic checklist demonstrating compliance with Transport's <i>NSW Sustainable Design Guidelines Version 4.0 (7TP-ST-114)</i> • the Contractors sustainability goals and targets, internal procedures, and implementation strategy. 	Contractor	Detailed design / Pre-construction
S3	Sustainability	The Contractor must comply with the <i>Transport for NSW Sustainable Design Guidelines version 4.0</i> .	Contractor	Detailed design / Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
S4	Sustainability	<p>The detailed design process will consider sustainability initiatives, including the following:</p> <ul style="list-style-type: none"> • material re-use and diverting waste from landfill where appropriate and compliant with waste classifications • concrete mixes to utilise recycled or captured water and to maximise use of Supplementary Cementitious Materials (SCM) such as Ground Granulated Blast Furnace Slag (GGBFS) and Fly Ash to replace Portland Cement • source steel from suppliers that use EAF technology • adoption of sustainable procurement initiatives for steel and timber and sourcing major materials from local suppliers. 	Contractor	Detailed design

6.17 Cumulative impacts

6.17.1 Study area

The cumulative impact assessment has considered projects within the Northern Beaches LGA and the Sydney Ferries Network. It has considered projects which would be under construction at the same time as, or close to, the proposal. Projects were identified via searches of the:

- Northern Beaches Council website
- NSW Government Planning Portal Major Projects website
- Transport Manly Cove projects website.

Three projects were identified as potentially causing a cumulative impact. These were FWUP, the West Esplanade activation plan and the Former Manly Sea Life project:

- The broader FWUP program of work, which includes the proposal, was identified as having a potential cumulative impact due to the scale of the project. The FWUP impacts multiple wharves in the ferry system thus potentially causing cumulative delays in the transport system.
- The West Esplanade activation plan was identified as having a potential cumulative impact due to the proximity of the project to the proposal. The West Esplanade activation plan is a scope of works involving the upgrade of West Esplanade Park which is about 80 metres north-west of the proposal area.
- Former Manly Sea Life was identified as having a potential cumulative impact due to the proximity of the project to the proposal. The Former Manly Sea Life project proposes to demolish the former Manly Sea Life aquarium building and extend the beach-side boardwalk. These works would take place about 250 metres north-west of the proposal area.

6.17.2 Broader program of work

The proposal is part of a broader program of work to upgrade the commuter ferry wharves in Sydney Harbour. The FWUP works include:

- Darling Point Wharf – to be constructed over a duration of around eight months starting in early 2023
- Double Bay Wharf – to be constructed over a duration of around six months starting in 2023
- Greenwich Point Wharf – to be constructed over a duration of around six months starting in 2023
- South Mosman Wharf – to be constructed over a duration of around six months starting in 2023
- Taronga Zoo Wharf – to be constructed over a duration of around six months starting in late 2022.

Based on the proposed construction timings of the wharf upgrades included under FWUP, construction of Darling Point Wharf, Double Bay Wharf, Greenwich Point Wharf, South Mosman Wharf and Taronga Zoo Wharf may occur concurrently to the proposal. However, given Darling Point, Double Bay, Greenwich Point, and South Mosman are not located near Manly, and are on a different ferry route than Manly Wharf, no cumulative impact on transport is expected for communities.

Captain Cook Cruises operate an off-peak time Hop-On Hop-Off service to Watsons Bay, Shark Island, Taronga Zoo, Circular Quay and King Street from Wharf 3. Construction of the Taronga Zoo Wharf upgrade and the proposal may coincide in late 2023. During construction of the

proposal access to berthing facilities would be maintained for Captain Cook Cruises. As such, no impacts to this service are anticipated.

Other cumulative impacts from the broader FWUP program of work would relate to minor short term cumulative increases in exhaust emission. Refer to Table 6.49 for additional information.

6.17.3 Other projects and developments

Projects identified that could create cumulative impacts with the proposal have been detailed in Table 6.49.

Table 6.49 Past, present and future projects

Project	Construction impacts	Operational impacts
<p>FWUP, including the upgrade of Wharf 3</p>	<p>Upgrade of Wharf 3 would require additional boat movements within Sydney Harbour for the delivery of materials to the study area and may conflict with other wharf upgrades. There would be a potential minor short term cumulative increase in exhaust emissions from construction projects within the region.</p> <p>Developments within the region would contribute to climate change through the generation of greenhouses gases from construction activities. Greenhouse gases would be generated through the use of fossil fuels by construction plant and equipment, transportation of personnel and materials and the embodied carbon in the materials used such as concrete and steel. These impacts are considered to be minor.</p>	<p>The FWUP would have a beneficial cumulative impact through improved passenger amenity and consistent ferry wharf design across the network. It would result in improvements to:</p> <ul style="list-style-type: none"> • safety for commuters • recreational facilities • improved travel times • improved customer experience due to upgraded facilities • the public domain and quality of customer experience.
<p>West Esplanade activation plan</p> <p>Located 80 metres north-west of the proposal area in the West Esplanade Park.</p> <p>Accessibility, landscaping, and refresh works in the park and path area.</p> <p>Detailed design of the works taking place in early 2022.</p> <p>Construction yet to begin.</p>	<p>If construction of the West Esplanade activation plan were to coincide with the proposal, then access to the Manly Cove front would be disrupted on both the East Esplanade and West Esplanade sides of Manly Wharf.</p> <p>This would result in cumulative noise, air, visual amenity, and transport impacts.</p> <p>The proposal program would be managed to minimise impacts from construction of the proposal and the West Esplanade activation plan via ongoing consultation with Northern Beaches Council.</p>	<p>Operations of the proposal and the West Esplanade activation plan would result in a rejuvenated Manly Cove area with continuous access for less mobile people from the Wharf facilities to the West Esplanade area.</p> <p>History in the Manly Cove area would be highlighted through both the proposal and the West Esplanade area.</p>

Project	Construction impacts	Operational impacts
<p>Former Manly Sea Life project</p> <p>Located 250 metres north-west of the proposal area at the former Manly Sea Life aquarium building and adjacent boardwalk area along Manly Cove Beaches</p> <p>Demolishing former aquarium building and extension of adjacent boardwalk.</p> <p>Still in planning process, construction unlikely to occur at the same time as this proposal.</p>	<p>If construction of the Former Manly Sea Life project were to coincide with the proposal, then access to the Manly Cove front would be disrupted on both the East Esplanade and West Esplanade sides of Manly Wharf.</p> <p>This would result in cumulative noise, air, visual amenity, socio-economic and transport impacts.</p>	<p>Operation of the proposal and the Former Manly Sea Life project (as well as the West Esplanade activation plan) would result in a rejuvenated Manly Cove area with improved public waterfront access. Recreational spaces provided by the Former Manly Sea Life project would be more accessible due to the proposal.</p>

6.17.4 Potential impacts

The potential cumulative impacts are listed in Table 6.50.

Table 6.50 Potential cumulative impacts

Environmental factor	Construction	Operation
Socio-economic	Construction of the West Esplanade activation plan may overlap with construction of the proposal. During this time residences and businesses along East and West Esplanade may experience elevated noise, reduced visual amenity, general disturbances and potential inconveniences from increased activities in the local area.	Residents and businesses in the area could utilise a more accessible and rejuvenated Manly Cove area.
Transport and traffic	Minor increase in marine traffic.	No operational impacts are anticipated.

6.17.5 Safeguards and management measures

Table 6.51 lists the cumulative impacts safeguards and management measures that would be implemented to account for the potential impacts identified in section 6.17.3.

Table 6.51 Cumulative impacts safeguards and management measures

ID	Impact	Environmental safeguards	Responsibility	Timing
C1	Cumulative construction impacts	Consultation will include notification prior to the start of the works and updates on any delays or changes to the construction period.	Transport / Contractor	Pre-construction / construction
C2	Cumulative construction impacts	Consultation will include discussions with Northern Beaches Council on how to manage programs between the proposal and the West Esplanade activation plan.	Transports for NSW	Pre-construction
C3	Cumulative construction impacts	Transport will consider the potential for cumulative impacts when determining construction programs for the proposal and the Former Manly Sea Life project.	Transports for NSW	Pre-construction

7 Environmental management

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

7.1 Environmental management plans (or systems)

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

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

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 would 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 safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing
GEN1	General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Transport Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. 	Contractor / Transport Project Manager	Pre-construction / detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
		The endorsed CEMP will be implemented during the undertaking of the activity.		
GEN2	General – notification	All businesses, residential properties and other key stakeholders (e.g., schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor/ Transport project manager	Pre-construction
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include [the following are examples only: <ul style="list-style-type: none"> • areas of Aboriginal heritage sensitivity • threatened species habitat • adjoining residential areas requiring particular noise management measures. 	Contractor/Transport project manager	Pre-construction/detailed design
NAH1	Original and highly significant fabric	Any construction works with the potential to impact original and highly significant fabric in Manly Wharf will: <ul style="list-style-type: none"> • be done in accordance with <i>How to Carry Out Work on Heritage Buildings & Sites</i> (NSW Heritage Office 2002). • be done by tradespersons with experience in working with modern heritage materials • use methods, tools and materials that would not cause inadvertent damage. 	Contractor	Construction
NAH2	Non-Aboriginal heritage	All works will be in accordance with the principles and objectives of the Burra Charter: the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter).	Contractor / Transport	Pre-construction / construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NAH3	Original and highly significant fabric	Where options exist for alternative installation methodologies and materials, that achieve the desired functional outcome, preference should be given to the option that has the least deleterious impact on significant heritage fabric.	Contractor /Transport	Detailed design / construction
NAH4	Minimise impacts on non-Aboriginal heritage	Opportunities for interpretation and site signage should be considered as part of detailed design to: <ul style="list-style-type: none"> • support ongoing interpretation of the historical development of the Manly Wharf. • reduce negative impacts from signage on significant fabric. 	Transport	Detailed design
NAH5	Minimise impacts on non-Aboriginal heritage	A Construction Cultural Heritage Management Plan (CCHMP) will be prepared by a suitably qualified heritage consultant and implemented during construction. The CCHMP will include measures to: <ul style="list-style-type: none"> • protect original heritage features within the vicinity of the work • protect original and significant heritage fabric, particularly for the piling works next to Wharf 2 including, vibration monitoring. 	Contractor / Transport	Pre-construction / construction
NAH6	Original and highly significant fabric	If any inadvertent damage occurs to original and highly significant fabric within and in the vicinity of the Manly Wharf due to the proposed works, the damage will be reported immediately to the Project Manager and the relevant Heritage Specialists. Damage is to be made good in accordance with specialist heritage advice.	Contractor	Construction
NAH7	Heritage sympathetic design	The detailed design will be assessed by a suitably qualified heritage specialist prior to finalisation to minimise potential direct impact of the proposed design on the original and highly significant fabric including, but not limited to the: <ul style="list-style-type: none"> • interface detail between the new boardwalk and Wharf 2 • proposed painting colour scheme. 	Contractor / Transport	Detailed design / pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
NAH8	Minimise impacts on non-Aboriginal heritage	Prior to the commencement of works a Photographic Archival Recording (PAR) will be carried out of all areas proposed for demolition, including Manly Pier (Wharf 3).	Contractor / Transport	Pre-construction
NAH9	Maritime archaeological significance	<p>A staged archaeological program will be conducted under the supervision of an appropriately qualified maritime archaeologist as follows:</p> <ul style="list-style-type: none"> • Stage 1: an archaeological dive inspection will be conducted . Results of the dive inspection will be submitted to Heritage NSW to support a section 60 permit application (for work within the SHR curtilage) and a concurrent section 140 permit application (for work outside the SHR curtilage) under the <i>Heritage Act 1977</i>. The permit applications would also be supported by an Archaeological Research Design (ARD) and Excavation Methodology. • Stage 2: archaeological excavations will be conducted within the area of dredging in accordance with the approved Excavation Methodology, prior to dredging activity. The results of the archaeological excavation will be documented and provided to Heritage NSW for their records. 	Contractor / Transport	Pre-construction
NAH10	Maritime archaeological significance	Any relics identified in the dive inspection or archaeological excavation will managed in accordance with a procedure agreed with Heritage NSW and Transport.	Contractor / Transport	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B1	Biodiversity	<p>Prepare a Construction Flora and Fauna Management Plan as part of the CEMP. The Plan is to include all terrestrial and marine flora and fauna and include, but not be limited to, mitigation measures such as:</p> <ul style="list-style-type: none"> • documenting and establishing site disturbance limits. • establishing no-go zones to protect seagrass meadows • implementing tree protection measures in line with Australian Standard 4970-2009 <i>Protection of trees on development sites</i> • undertaking pre-clearing surveys prior to demolition, dredging and piling to avoid direct harm to protected species • implementing the unexpected finds measures in line with the <i>Biodiversity Guidelines Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) • reference to relevant measures in the <i>Stockpile Management Guideline</i> (RMS, 2015). 	Contractor	Pre-construction
B2	Removal and disturbance to marine vegetation and habitat.	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (NSW DPI, 2013).	Contractor	During construction
B3	Removal and disturbance to marine vegetation and habitat.	Detailed design will consider opportunities to promote colonisation of habitat-forming species by including structures which provide habitat complexity. This may include consideration of designs available as part of the Living Seawalls Project and perforated materials (like glass reinforced plastic) for boardwalks, ramps, gangway and waiting areas to minimise shading impacts on marine vegetation and habitat.	Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
B4	Removal and disturbance to marine vegetation and habitat.	<p>Anchoring will be minimised, where possible, and avoided in areas known to support marine vegetation particularly seagrass.</p> <p>'No-go' zones will be delineated, implemented and maintained during construction.</p> <p>Vessels will not remain stationary for an extended period of time over areas of seagrass.</p> <p>All personnel and vessels will be inducted and made aware of the importance of seagrasses and macroalgae and their occurrence in proximity to construction activities.</p>	Contractor	During construction
B5	Removal and disturbance to marine vegetation and habitat.	Work associated with positioning barges, dredging and pile driving will be during calm conditions to prevent excessive scouring and minimise smothering of marine vegetation from sediment.	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B6	Surface and underwater noise and vibration impacts on marine fauna	<p>Two safety zones will be implemented during impact or vibratory piling that will be applied around each piling location (GHD, 2022):</p> <ul style="list-style-type: none"> • Shut-down zone (PTS): the sighting of marine fauna or human divers/swimmers would trigger piling activities to be ceased as soon as reasonably practical: <ul style="list-style-type: none"> ○ 12 metres for threatened and/or protected fish and syngnathids. ○ 120 metres for threatened and/or migratory seabirds including the Little Penguin. ○ 100 metres for humans. • Observation zone (TTS): the movement zone of marine fauna or human divers/swimmers that may approach the shut-down zone would be monitored to identify any approach to the shut-down zone: <ul style="list-style-type: none"> ○ 175 metres for threatened and/or protected fish and syngnathids. ○ one kilometre for threatened and/or migratory seabirds including the Little Penguin (Note: There is no calculated TTS impact distance for diving birds/penguins. A one-kilometre observation zone has been adopted for conservatism). ○ 650 metres for humans. 	Contractor	During construction
B7	Surface and underwater noise and vibration impacts on marine fauna	<p>Standard management and mitigation procedures with respect to piling operations will be adopted as per <i>Underwater Piling Noise Guidelines</i> (Government of South Australia, 2012). This will include the following:</p> <ul style="list-style-type: none"> • Use low noise piling methods, instead of impact piling, where possible. A low noise piling method may include vibro-piling or bored piling. 	Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Consideration given to avoiding conducting impact piling activities during times when marine fauna are likely to be breeding, calving, feeding, migrating or resting in biologically important habitats located within the potential noise impact footprint. • Additional pre-summer and pre-construction inspections for Little Penguins at the historical nesting site (i.e., under the north-west corner of the wharf precinct, outside of the proposal area). If Little Penguins are observed, avoid conducting impact piling activities during times Little Penguins are likely to be breeding within the potential noise impact footprint. The Little Penguin breeding season this includes the months of June through to February. • Presence of marine fauna and human swimmers/divers will be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the impact piling procedure. • If no marine fauna and human swimmers/divers are nearby, a soft start piling procedure will be used. This involves gradually increasing the piling impact energy over a 10-minute time period. Visual observations of marine fauna and humans within the exclusion zone will be maintained by trained crew throughout the start period. • If a marine fauna or people are sighted within the observation zone during the soft start of normal operation procedures, the operator of the impact piling rig will be placed on stand-by to shut down the piling rig. <p>A record of procedures employed during the operations will be maintained by the piling contractor.</p>		

No.	Impact	Environmental safeguards	Responsibility	Timing
B8	Surface and underwater noise and vibration impacts on marine fauna.	<p>Vibro-piling should be considered the preferred piling method, where possible.</p> <p>If impact piling is required, then consideration will be given to the use of the following to reduce underwater noise and vibration:</p> <ul style="list-style-type: none"> • pile head cushion block • bubble curtain • dewatered, aerated isolation casing system and/or damped outer casings. 	Contractor	During construction
B9	Risk of vessel strike on marine fauna	<p>All work boats and barges will adhere to the 4-knot speed limit when operating within the proposal area.</p> <p>Contractors will be made aware of marine fauna that might occur in the area and report any sightings within the observation zone during works and vessel movements. Works will cease until any observed marine fauna move out of the proposal area.</p>	Contractor	During construction
B10	Removal/disturbance to threatened, migratory and protected species.	<p>A targeted microbat survey of structures proposed for removal or modification will be in accordance with <i>Microbat Management Guidelines</i> (Transport, 2021) prior to construction or as soon as feasible prior to disturbance (demolition).</p> <p>If threatened microbats are detected, a Microbat Management Plan will be developed in accordance with the <i>TfNSW Microbat Management Guidelines</i> (Transport, 2021) as part of the Construction Environment Management Plan (CEMP) and implemented by a suitably qualified bat specialist.</p>	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B11	Removal/disturbance to threatened, migratory and protected species.	The unexpected species find procedure will be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal area.	Contractor	Pre-construction
B12	Removal/disturbance to threatened, migratory and protected species.	Fauna will be managed in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction
B13	Removal/disturbance to threatened, migratory and protected species.	A targeted survey for Black Rockcod, White's Seahorse and Little Penguins, will be completed 24 hours prior to the commencement of water-based construction activities. Black Rockcod will be encouraged to move away from the study area prior to silt curtain installation. A Syngnathid Relocation Plan (Appendix K) will be finalised in consultation with NSW DPI Fisheries and be updated to address DPI Fisheries feedback. The Syngnathid Relocation Plan will be implemented to guide the collection and relocation of White's Seahorse.	Contractor	Pre-construction
B14	Removal/disturbance to threatened, migratory and protected species.	A Section 37 permit under the FM Act will be obtained to relocate syngnathids collected during the targeted preclearance survey upon approval of the Syngnathid Relocation Plansyngnathid management/relocation plan. Relocation must may be undertaken by a prequalified permit holder.	Contractor	Pre-construction
B15	Introduction/spread of weeds and/or marine pests and diseases.	Equipment and vessels will be cleaned and inspected prior to entering and departing from the proposal area.	Contractor	Pre, during and post construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B16	Introduction/spread of weeds and/or marine pests and diseases.	Weed species will be managed in accordance with Guide 6: Weed management of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction
B17	Introduction/spread of weeds and/or marine pests and diseases.	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Pre-construction
B18	Introduction/spread of weeds and/or marine pests and diseases.	Occurrence of any marine pests will be reported to NSW DPI Fisheries.	Contractor	During construction
B19	Alterations to hydrology indirectly impact	The detailed design will aim to avoid or minimise any impact to coastal processes and hydrology that would indirectly impact protected marine fauna and fauna habitat.	Transport	Detailed design
LC1	Land and coastal processes	<p>A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion, sediment scour and water pollution and describe how these risks will be addressed during construction. This will include:</p> <ul style="list-style-type: none"> • developing a work methodology to minimise sediment disturbance by progressing the work in sections to allow sediments to settle between works • conducting works associated with positioning barges, dredging, drilling and pile driving during calm conditions 	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • conducting dredging and piling works during low tide • installing silt curtains around the construction site to contain sediments • installing a moon pool sediment control device around dredge site to contain sediment • minimising the number of barge anchor points • implementing a 4-knot construction marine vessel speed limit • implementing appropriate procedures to manage the effects of potential flooding during construction. 		
LC2	Erosion and sedimentation	<p>Prior to commencement of construction activities, sediment control device (such as sediment boom and curtain) will be installed around the site to contain disturbed sediment from the water surface by allowing suspended sediments to settle back on the bottom of the seabed overtime. The silt boom and curtain is to extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work.</p> <p>Installation will be during high tide periods from a boat. The silt boom and curtain will be designed to rise and fall with the tide to prevent disturbance.</p> <p>Inspection of the silt boom and curtain device will be on a daily basis after ebbing tides, with additional inspection carried out following storm events.</p> <p>Prior to removing the silt boom and curtain, conditions within the curtain will be assessed visually and with a field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.</p>	Contractor	Construction
LC3	Erosion and sedimentation	Consideration will be given in detailed design to the use of lower impact dredging equipment such as use of a grab or clam shell dredger.	Transport / Contractor	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
LC4	Acid sulfate soils	Minimise the disturbance and exposure of sediment and/or the underlying soils to oxygen.	Contractor	Construction
LC5	Contaminated material	Any excavated sediments or soil that require disposal will be sampled, tested and classified in accordance with the <i>Waste Classification Guidelines: Part 1 Classifying Waste</i> (EPA, 2014) prior to being disposed of at a waste facility licensed to accept the relevant class of waste. Any materials classified as Hazardous Waste may require treatment or an immobilisation approach in accordance with Part 10 of the <i>Protection of the Environment Operations (Waste) Regulation 2014</i> prior to off-site disposal.	Contractor	Construction
LC6	Contaminated material	If unexpected contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport Environment Manager and/or EPA.	Contractor	Construction
WQ1	Accidental spill	<p>A spill management plan will be developed as part of the CEMP and communicated to all staff working on site.</p> <p>Appropriate land and aquatic spill kits will be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit must be appropriately sized for the volume of potentially polluting liquids stored on site.</p> <p>All workers will be advised of the location of the spill kit and will be trained in its use.</p>	Contractor	Pre-construction / Construction
WQ2	Accidental spill	If an incident (e.g., spill) occurs, the Transport <i>Environmental Incident Classification and Reporting Procedure</i> is to be followed and the Transport Contract Manager notified as soon as practicable.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
WQ3	Accidental spill	In the event of a maritime spill, the incident emergency plan will be implemented in accordance with Port Authority of NSW's response to shipping incidents and emergencies outlined in the <i>NSW State Waters Marine Oil and Chemical Spill Contingency Plan</i> (RMS, 2016c).	Contractor	Construction
WQ4	Accidental spill	Vehicles, vessels and plant will be properly maintained and regularly inspected for fluid leaks.	Contractor	Construction
WQ5	Accidental spill	No vehicle or vessel wash-down or re-fuelling will occur on site.	Contractor	Construction
WQ6	Accidental spill	Any chemicals or fuels stored at the site or equipment barges will be stored in a bunded area.	Contractor	Construction
WQ7	Pollution	An environmental work method statement (EWMS) will be developed for the removal of the existing wharf elements to minimise the risk of pollutants and debris entering the waterway. The EWMS must be approved by Transport prior to the demolition works.	Contractor	Pre-construction
WQ8	Water quality – spills and turbidity	Visual monitoring of local water quality (i.e., turbidity, hydrocarbon spills/slicks) will be on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. Results of the observations are required to be recorded. Records are required to be kept on the site and to be made available for inspection by persons authorised by Transport.	Contractor	Construction
WQ9	Mobilisation of soils, sediments and contaminants impacting on water quality	Water quality and surface sediments should be tested in the vicinity of the dredge area for contaminants, including TBT during and post-construction to determine whether there has been an increase in contaminant levels (potentially harmful to marine biota) and whether remediation action is required.	Contractor	During and post-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
LCVIA1	Landscape and visual	<p>General considerations for detailed design will include the following to further minimise potential impacts on landscape character and visual amenity:</p> <ul style="list-style-type: none"> • utilise clean, minimal design of wharf components throughout, to increase visual permeability and connection to the surrounding harbour • ensure the proposal design, siting and materiality is of high quality, sympathetic to the existing heritage context and contributes positively to the existing landscape character values • although using standard kit of parts elements, ensure the proposal design is place-specific and ensure landscape and urban design contributes positively to the existing landscape character and principles outlined in Beyond the Pavement (Transport, 2020) • consider utilising materials that complement the ‘waterfront’ character area as outlined in the Northern Beaches Council Public Space Vision & Design Guidelines (Northern Beaches Council, 2021) • avoid or minimise the use of shiny or reflective materials to minimise associated visual impacts on surrounding sensitive receivers • colours should be sympathetic and responsive to the surrounding landscape and visual context • minimise size of the service pod to maintain view lines towards Smedley’s Point and the harbour. 	Transport	Design / pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
LCVIA2	Landscape and visual	<p>Considerations for detailed design with regards to signage and services to further minimise visual impacts will include:</p> <ul style="list-style-type: none"> • minimising signage dimensions • avoiding brightly illuminated signage • locating signage on buildings rather than freestanding <p>ensuring the design and materiality of services components such as poles, signage and lighting, contributes positively to the heritage and waterfront context, and key view lines and views towards the water are open and unimpeded.</p>	Transport	Design / pre-construction
LCVIA3	Landscape and visual	<p>The CEMP will include measures to minimize visual impacts during construction, including, but not limited to:</p> <ul style="list-style-type: none"> • taking all practical measures to ensure construction equipment, storage areas, and other visible elements are located away from key views, to or from the sensitive visual receivers identified in this assessment • ensuring the site is kept tidy and general tidiness is maintained • minimising light spill during evening and night work periods • ensuring construction activities, equipment and storage areas are, where possible, located away from existing vegetation, and the dripline of canopy trees, particularly the Norfolk Island Pine trees • where works cannot be located away from trees, provide tree protection to ensure they are not damaged • all areas disturbed by construction and ancillary works are to be rehabilitated to their previous condition 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> the temporary site compound in East Esplanade Park is to employ a neat, neutral design and screening implementing measures to assist in blending into the surrounding area. Choice of screening is to be sympathetic to the existing context of the park (e.g., neutral colours or green depending on location). 		
ANV1	Stakeholder consultation	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be included in the CEMP to provide the framework for the management and mitigation of potential construction noise and vibration impacts. Potential impacts will be managed in accordance with the CNVG.</p> <p>The CNVMP will include:</p> <ul style="list-style-type: none"> standard mitigation measures from the CNVG as relevant, including management measures, source control measures and path control measures using low noise piling methods, instead of impact piling, where possible. A low noise piling method may include vibro-piling or bored piling. <ul style="list-style-type: none"> respite periods for high noise generate activities a strong justification for works taking place outside of the ICNG recommended standard hours a commitment that the proponent will apply all feasible and reasonable works practices to meet the noise management levels a commitment to negotiate with the community where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise management levels. 	Transport	Pre-construction / Construction
ANV2	Noise impact from piling	Piling will be conducted in continuous blocks not exceeding 3 hours between the hours 8 am to 5 pm Monday to Friday and 9 am to 1 pm on Saturday.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
ANV3	Heritage impacts from vibration	A dilapidation report of the historic Manly Wharf will be to determine specific vibration management levels prior to any piling works within 45 metres of the structure.	Contractor	Construction
ANV4	Heritage impacts from vibration	If the dilapidation report determines that there is a risk of cosmetic damage occurring to Manly Wharf heritage then a permanent vibration monitoring system will be installed to warn plant operators (via flashing light, audible alarm, SMS, etc) when vibration levels are approaching the cosmetic damage objective.	Contractor	Construction
ANV6	Impacts from preparation of the compound area	To avoid any vibration impacts to structures on East Esplanade, a maximum 2 tonne roller will be used during site establishment.	Contractor	Construction
ANV7	Periodic notification	Additional mitigation measures provided in the CNVG will be implemented for sensitive receivers where noise management levels have been exceeded.	Contractor	Construction
UWN1	Underwater noise	Consideration would also be given to undertaking underwater noise monitoring, should impact piling be required, at selected areas (chosen by a marine ecologist) to measure actual underwater noise levels and to refine the shutdown and observation zones, if required.	Transport / Contractor	Pre-construction
UWN2	Underwater noise	The selected contractor undertaking the piling activities would maintain a record of procedures employed during operations and would include: <ul style="list-style-type: none"> Information on any marine fauna sighted during the piling activity, and their reaction to the piling activity would be documented A report on the piling activity should, at a minimum, contain the location, date, start and completion time of the piling activity, information on the piling rig (hammer weight and drop height, pile size, number of piles, number of impacts per pile, etc.) 	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Details on the trained crew members conducting the visual observations • Times when observations were hampered by poor visibility or high winds • Times when start-up delays or shut-down procedures occurred <p>The time and distance of any marine fauna sightings.</p>		
UWN3	Underwater noise	<p>Prior to (and during) any vibratory or impact piling periods, public swimming and diving areas will be cleared where the TTS threshold may be exceeded. This includes the following areas:</p> <ul style="list-style-type: none"> • Manly Cove • East Manly Cove Beach • Delwood Beach/Federation Point <p>For other swimming and diving areas within 2 kilometres of impact piling works, visible signs should be erected containing the following information:</p> <ul style="list-style-type: none"> • the scheduled times for piling works • a warning that swimming is not recommended during impact piling works as it has the potential to cause adverse hearing effects and could be extremely unpleasant <p>The community should be notified a minimum of 7 calendar days prior to piling works regarding the dangers of swimming/diving in proximity to piling works (especially impact piling).</p> <p>To avoid significant disruptions to the community's ability to engage in recreational swimming and diving within Manly Cove for the duration of piling works, it is recommended that vibratory or impact piling works be scheduled to provide periods in which recreational swimming or diving can be conducted.</p>	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		No vibratory or impact piling works on weekends, public holidays works or during school holidays, where possible. If piling is required during these times, the contractor is required to implement the Out of Hours work protocol contained within the Construction Noise and Vibration Guidelines (RMS 2016).		
AH1	Aboriginal heritage	Should the scope of the proposed work change during detailed design or construction, further consultation with Transport’s Aboriginal Cultural Heritage Officer and regional environmental staff must be to reassess any potential impacts on Aboriginal cultural heritage.	Transport	Pre-construction
AH2	Aboriginal heritage	The <i>Unexpected Heritage Items Procedure</i> (RMS, 2015) will be followed in the event that (an) unknown or potential Aboriginal object(s), including skeletal remains, is/are found during construction. This applies where Transport does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the procedure) is not in place. Work will only restart once the requirements of that procedure have been satisfied.	Contractor	Construction
AH3	Aboriginal heritage	Design elements recommended by the ‘Connecting with Country’ design approach (WSP, 2022) will be considered for inclusion during detailed design, in consultation with the local Aboriginal community.	Transport	Detailed design
WT1	Water transport	A maritime navigation exclusion zone will be established during construction to prevent unauthorised vessels entering the area. This zone will be clearly defined to communicate access for other water users.	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
WT2	Water transport	<p>A Maritime Transport Management Plan (MTMP) will be prepared and implemented during the water based construction work. The MTMP will be prepared in consultation with Transport and approved by the Harbour Master. In addition, the proposal will:</p> <ul style="list-style-type: none"> • 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. <p>Any variation to the above will be agreed in advance with Transport and the Harbourmaster.</p>	Contractor	Pre-construction / construction
WT3	Water transport	Commercial, recreational operators and private services that use the existing wharf will be advised of the wharf closures at least two weeks prior to closure. Detail of alternative arrangements for berthing will be provided at this time.	Transport	Pre-construction / construction
WT4	Water transport	Construction of the proposal shall take place outside of the summer high period (December to February).	Contractor	Construction
LT1	Land transport and parking	A Construction Traffic Management Plan (CTMP) will be prepared and will detail the construction signage and traffic controller requirements.	Contractor	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
LT2	Land transport and parking	Each morning, prior to work commencing, ensure all temporary signage is erected in accordance with the Traffic Guidance Scheme.	Contractor	Construction
LT3	Land transport and parking	Where possible, the preferred means of transporting equipment and materials to the site will be via boat and barge over land transport to limit impacts to the local road network.	Contractor	Construction
LT4	Land transport and parking	Prior to the commencement of works on site, the Contractor is to inform neighbouring properties of proposed works, impacts and site contact information as per the Community Liaison Plan (to be developed prior to construction).	Contractor	Pre-construction
LT5	Land transport and parking	The necessary approvals will be obtained, as required by the <i>Roads Act 1993</i> and NSW traffic acts and regulations, prior to conducting any works including lane closures for deliveries, loading and unloading. The Contractor is required to seek the concurrence of the relevant road authority prior to undertaking works.	Contractor	Pre-construction
LT6	Land transport and parking	All staff and subcontractors engaged on site will be required to undergo a site induction. Additionally, the Site Manager will discuss Traffic Management Plan requirements regularly as a part of “toolbox talks”.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SE1	Impacts to local residents and businesses	<p>Transport will continue to manage and deliver a Community and Stakeholder Engagement Strategy in the lead up to and during construction of the proposal. This will help to ensure that:</p> <ul style="list-style-type: none"> • the community and stakeholders have a high level of awareness of all processes and activities • the community and stakeholder are made aware of any potential disturbances and/or disruptions well in advance of them occurring • accurate and accessible information is made available • a timely response is given to issues and concerns raised by the community • feedback from the community is encouraged • opportunities for input are provided. 	Transport	Pre-construction / construction
SE2	Impacts to local residents and businesses	<p>A proposal-specific communication management plan will be developed by the primary construction contractor in accordance with the Community and Stakeholder Engagement Strategy and implemented to define the specific requirements for engagement during construction.</p> <p>Engagement will include, and not be limited to, notifications and provision of signage.</p> <p>This will be developed and implemented to ensure that residents and businesses are notified in a timely manner about:</p> <ul style="list-style-type: none"> • works commencing and work activities • potential for impacts including changed wharf access, wharf closures, access and use of East Esplanade Park, impacts to heritage, noisy construction activities and out-of-hour work • accurate information on the proposal 	Transport	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> enquiries and complaints management. <p>The communication management plan will define the requirements for the complaints management system to be implemented throughout the duration of the proposal, including 24-hour, seven days a week phone line, postal and email address for written enquiries, and publication of contact details.</p>		
SE3	Consultation and communication with businesses	<p>Early and ongoing direct consultation with businesses will occur throughout the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations. Direct consultation will be continued throughout the construction period to understand and mitigate any access impacts.</p>	Transport	Detailed design / Pre-construction / Construction
SE4	Local and Indigenous employment and procurement	<p>As specified by Transport's Aboriginal Participation Strategy (Transport, 2021), Transport will prioritise opportunities for Indigenous workers and procurement in line with the NSW's Governments Aboriginal Procurement Policy (NSW Government, 2021).</p> <p>This will include local and Indigenous participation commitment in tender documents which will outline the sub-contracting, employment, training, Indigenous and community contributions that contractors will need to deliver.</p>	Transport	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
AQ1	Air quality	<p>Air quality during construction will be considered and addressed within the CEMP and will include methods to manage work during strong winds or other adverse weather conditions as required. As a minimum, the following measures will be included:</p> <ul style="list-style-type: none"> • covering all loaded trucks and vessels • machinery to be turned off rather than left to idle when not in use • maintenance of all vehicles, including trucks and vessels entering and leaving the site in accordance with the manufacturers specifications to comply with all relevant legislation • maintenance of all plant and equipment to ensure good operating conditions and exhaust emissions comply with the <i>Protection of the Environment Operations Act 1997</i> • maintaining the work site in a condition that minimises fugitive emissions such as minor dust. 	Contractor	Pre-construction / construction
AQ2	Sustainability	<p>During construction, the Contractor is to monitor performance of their non-road diesel plant and equipment against US EPA, EU or equivalent emissions standards using Transport <i>Air Emissions Workbook - DMS-FT-439</i>.</p>	Contractor	Construction
AQ3	Air quality	<p>All surface coatings used for the proposal would need to comply with the Australian Paint Approval Scheme (APAS) Volatile Organic Compounds (VOC) Limits where fit for purpose.</p> <p>The architectural materials and finishes register are to identify the requirement for low VOC levels for paints used on site.</p>	Contractor	Detailed design / construction

No.	Impact	Environmental safeguards	Responsibility	Timing
W1	Waste	<p>A waste management plan (WMP) will be prepared in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>. A WMP is to be prepared as part of the CEMP and would include measures to minimise waste, outline methods of disposal, reuse and recycling and monitoring, as appropriate. This is to include the following:</p> <ul style="list-style-type: none"> • appropriate measures to avoid and minimise waste associated with construction including the re-use of salvaged timber from the demolition of Wharf 3. • waste management, littering and general tidiness will be monitored during routine site inspections. 	Contractor	Pre-construction / Construction
W2	Resource use	Recycled, durable, and low embodied energy products will be considered to reduce primary resource demand in instances where the materials are cost and performance competitive and comparable in environmental performance (e.g., where quality control specifications allow).	Contractor	Detailed design
W3	Sustainability	During construction, the Contractor is to monitor waste and recycling quantities using <i>Transport Waste Data Collection Workbook – DMS-FT-436</i> to support compulsory requirement 4 of the <i>Transport Sustainable Design Guidelines version 4.0</i> .	Contractor	Construction
W4	Waste	Any excavated sediments or soil that require disposal will be sampled, tested and classified in accordance with the <i>Waste Classification Guidelines: Part 1 Classifying Waste</i> (EPA, 2014) prior to being disposed of at a waste facility licensed to accept the relevant class of waste. Any materials classified as Hazardous Waste may require treatment or an immobilisation approach in accordance with Part 10 of the <i>Protection of the Environment Operations (Waste) Regulation 2014</i> prior to off-site disposal.	Contractor	Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
HR1	Hazards and risks – navigation	<p>Consultation with stakeholders will be carried out during detailed design, commissioning and operations, including Transport Maritime Operations, Harbour Master, maritime operators and TransDev to:</p> <ul style="list-style-type: none"> • further consider navigational risk and safety during detailed design. • develop and implement boating safety campaigns and awareness/ educational tools for all wharf users. 	Transport	Pre-construction
HR2	Hazards and risks – weather events	Weather forecasts will be monitored during construction of the proposal. In the unlikely event of a major flood event or strong marine winds/waves, equipment and materials will be temporarily removed from the site, where possible.	Contractor	Construction
HR3	Hazards and risks – utilities	Further investigations and assessment of impacts to local utilities will be carried out.	Contractor	Detailed design
HR4	Hazards and risks – utilities	Onsite service location will be carried out prior to undertaking any excavation or piling works to identify any additional cables not identified during design.	Contractor	Pre-construction
HR5	Hazards and risks – pedestrian safety	Safe pedestrian access through the proposal will be managed through the installation of way-finding signage, hoarding and safety ramps to provide access over concrete lines.	Contractor	Construction
HR6	Hazards and risks – recreation	Swimming at and from Wharf 3 and the proposed Wharf 4 is to be prohibited and communicated through 'No swimming' signage to inform community members. Life buoys will be provided in the service pod in the main waiting area for use in the event of a person falling into the water. Ladders will be provided at key locations to allow a person to get out of the water.	Transport/ Contractor	Detailed design/ construction

No.	Impact	Environmental safeguards	Responsibility	Timing
CC1	Climate change	During detailed design undertake a compliant carbon footprinting exercise in accordance with the Transport Carbon Estimate and Reporting Tool Manual (Transport, 2019). The carbon footprint will be used to inform decision making in design and construction.	Transport	Detailed design / construction
CC2	Climate change	During detailed design undertake a compliant climate risk assessment in accordance with the Transport <i>Climate Risk Assessment Guidelines – DMS-SD-081</i> .	Transport	Detailed design
CC3	Climate change	<p>The detailed design process will consider adaptation measures for climate change, including the following:</p> <ul style="list-style-type: none"> • finished levels and wharf adjustment thresholds • light colour palate for wharf materials, where practical • selection of resilient materials to storm events • weather protection features • adoption of energy efficient light fittings with ambient lighting level responsive controls • concrete mixes to utilise recycled or captured water and to maximise use of Supplementary Cementitious Materials (SCM) such as Ground Granulated Blast Furnace Slag (GGBFS) and Fly Ash to replace Portland Cement • source steel from suppliers that use electric arc furnace (EAF) technology • adoption of sustainable procurement initiatives for steel and timber. 	Transport	Detailed design

No.	Impact	Environmental safeguards	Responsibility	Timing
S1	Sustainability	The Contractor shall propose a suitably qualified and experienced sustainability officer at a minimum 14 days prior to site establishment to be endorsed by Transport. The sustainability officer will be responsible for implementing the sustainability objectives for the proposal. Details of the sustainability officer, including defined responsibilities, duration and resource allocation throughout the appointment are to be submitted to Transport prior to the preparation of the Sustainability Management Plan.	Contractor	Detailed design / Construction
S2	Sustainability	Prior to commencement of construction, a Sustainability Management Plan shall be endorsed by Transport. The Plan will be provided prior to construction and include the following minimum components: <ul style="list-style-type: none"> • a completed electronic checklist demonstrating compliance with Transport's NSW <i>Sustainable Design Guidelines Version 4.0</i> (7TP-ST-114) • the Contractors sustainability goals and targets, internal procedures, and implementation strategy. 	Contractor	Detailed design / Pre-construction
S3	Sustainability	The Contractor must comply with the <i>Transport for NSW Sustainable Design Guidelines version 4.0</i> .	Contractor	Detailed design / Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
S4	Sustainability	<p>The detailed design process will consider sustainability initiatives, including the following:</p> <ul style="list-style-type: none"> • material re-use and diverting waste from landfill where appropriate and compliant with waste classifications • concrete mixes to utilise recycled or captured water and to maximise use of Supplementary Cementitious Materials (SCM) such as Ground Granulated Blast Furnace Slag (GGBFS) and Fly Ash to replace Portland Cement • source steel from suppliers that use EAF technology • adoption of sustainable procurement initiatives for steel and timber and sourcing major materials from local suppliers. 	Contractor	Detailed design
C1	Cumulative construction impacts	Consultation will include notification prior to the start of the works and updates on any delays or changes to the construction period.	Transport / Contractor	Pre-construction / construction
C2	Cumulative construction impacts	Consultation will include discussions with Northern Beaches Council on how to manage programs between the proposal and the West Esplanade activation plan.	Transports for NSW	Pre-construction
C3	Cumulative construction impacts	Transport will consider the potential for cumulative impacts when determining construction programs for the proposal and the Former Manly Sea Life project.	Transports for NSW	Pre-construction

7.3 Licensing and approvals

A summary of the licences and approval required for the proposal is provided in Table 7.2.

Table 7.2 Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Fisheries Management Act 1994 (s37)</i>	Permit to carry out translocation of any syngnathiforms.	Prior to the start of the activity.
<i>Heritage Act 1977 (s60)</i>	Permit to carry out activities to an item listed on the State Heritage Register or to which an interim heritage order applies from the Heritage Council of NSW.	Prior to start of the activity.
<i>Heritage Act 1977 (s140)</i>	Excavation permit from the Heritage Council of NSW/the Minister.	Prior to start of the activity.
<i>Roads Act 1993 (s125)</i>	Approval Northern Beaches Council for the proposed construction and installation and / or changes of any regulatory traffic control devices.	Prior to the start of the activity.
<i>Ports and Maritime Administration Regulations 2021 (s110)</i>	Written permission from the Harbour Master is required to disturb sediment in Sydney Harbour.	Prior to the start of the activity.

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 2021.

8.1 Justification

The proposal forms part of the TAP, which is an ongoing 'initiative to deliver modern, safe and accessible transport infrastructure' in NSW (Transport, 2015). As part of the TAP, Transport 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 an upgrade due to its lack of compliant accessible access and non-DSAPT compliant wharf.

Consideration of options was then carried out. The preferred design of the proposal was selected to best achieve the project objectives outlined in section 2.3, by providing improvements in access, user experience including passenger comfort and amenity, and safety. The design efficacy was determined by comparison to the doing nothing option and other options outlined in section 2.4.

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 sections provide justification through consideration of the impacts and benefits of the proposal.

8.1.1 Social factors

The proposal would result in temporary social impacts whilst being built such as noise (section 6.6) and visual impacts (section 6.5). However, all construction related impacts would be appropriately managed prior to and during construction.

There would also be some long-term social impacts such as the demolition of some heritage fabric of the Manly Pier (section 6.1) and loss of view for some businesses (section 6.5). However, the design of the proposal has been developed to reduce impacts to visual amenity and to result in a moderate positive impact to the heritage significance of the site, as far as practicable. Consultation with NSW Heritage has occurred during the preparation of the REF and would continue during detailed design to manage heritage impacts.

There is also medium potential that the sediment that would be disturbed during dredging and piling works could be contain archaeological relics from the operation of the Cargo Wharf from 1895 to 1927 (section 6.1). This could expose undiscovered relics and deposit them onto the seabed. Protection of relics would be managed through pre-construction mitigation measures.

Operation of the proposal provides justification over the above temporary impacts, as it would benefit the community through providing accessible transport, 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 (20 to 50 years). Further, the proposal would highlight the heritage of the area including the historic heritage of Manly Wharf and the Aboriginal cultural heritage within the Manly area.

8.1.2 Biophysical factors

As discussed in section 6.2, no significant biodiversity impacts have been identified as a result of the proposal. Some adverse impacts are expected due to the removal of marine vegetation during demolition and construction. Indirect impacts as a result of shading from new structures and scour from ferry operations are also anticipated. Overall, these areas of impact are a very small proportion of available habitat and works would not impact on the larger meadows of seagrass in the area or the endangered populations.

In addition, prior to any water-based construction occurring a pre-clearance survey would occur to relocate any syngnathids, including White's Seahorse, in accordance with the Syngnathid Relocation Plan contained in Appendix K.

Other minor adverse impacts from biodiversity could result from temporary increases in underwater noise and turbidity. Identified impacts would be managed through the safeguards and management measures outlined in this REF.

Works that could mobilise sediments, such as dredging and piling, could result in a temporary increase in turbidity, suspended sediments loads, and erosion. This could potentially impact on water quality. However, impacts are expected to be minor and short term, and adequately managed by safeguards and management measures.

Consultation with NSW DPI Fisheries has occurred during the preparation of the REF and specialist assessment reports. Consultation would continue during detailed design to manage biodiversity impacts.

8.1.3 Economic factors

Construction of the proposal could create temporary economic impacts for businesses at Manly Wharf due to decreased amenity during construction. However, operation of the proposal would generate long term economic benefits due to the increased accessibility and services that would be available as a result of the proposal.

Design of the wharf has also incorporated measures to decrease the maintenance required for operation which are standardised across all newly constructed Transport 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

The objects of the EP&A Act are considered in Table 8.1.

Table 8.1 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	<p>Through the assessment in Chapter 6, it has been identified that the proposal would not significantly impact on any natural or artificial resources.</p> <p>The proposal would result in community benefits through facilitation of a safe and reliable ferry services to Manly for the next 20 to 50 years.</p>
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The proposal's urban design includes high quality, durable and low impact materials to minimise ongoing maintenance requirements. This provides for a sustainable urban environment over its 20 to 50 year design life.
1.3(c) To promote the orderly and economic use and development of land.	The proposal includes continuation of the use of the area as a ferry wharf.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	A biodiversity assessment has been prepared for the proposal, which is summarised in section 6.2. The assessment concluded that no significant impact to aquatic or terrestrial ecology would result from the proposal.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	<p>A non-Aboriginal heritage assessment has been prepared for the proposal, which is summarised in section 6.1.</p> <p>The proposed works would result in a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct.</p> <p>Overall, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.</p> <p>No impacts to Aboriginal heritage are expected.</p> <p>The identified mitigation measures would minimise any potential impacts of the proposal on Aboriginal and non-Aboriginal heritage items.</p>

Object	Comment
1.3(g) To promote good design and amenity of the built environment.	The proposal has been designed to be consistent with the design objectives identified in section 2.3.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	The proposal would benefit the community through improving passenger amenity, safety, and overall user experience. The proposal aligns with this objective as it involves the maintenance of and continued safe access to the wharves.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Stakeholder consultation would continue during the public display of this REF to capture feedback. Should the proposal proceed to construction, consultation with the community and stakeholders would continue throughout the work.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

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.

In order 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:

- Conservative ‘worst case’ scenarios were considered while assessing environmental impact.
- Specialist studies were incorporated to gain a detailed understanding of the existing environment including non-Aboriginal heritage, biodiversity, landscape character and visual amenity, airborne and underwater noise and vibration, land transport, access and parking and socio-economic.

Where relevant, the safeguards and mitigation measures listed in Chapter 7 include undertaking monitoring to validate results and allow modification of safeguards and management accordingly.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would result in benefit to the community through improvements to passenger amenity, safety, and overall user experience of the Manly Wharf for the next 20 to 50 years.

Conservation of biological diversity and ecological integrity

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

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.

Improved valuation, pricing, and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things.

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

Safeguards and management measures detailed in Chapter 7, including avoiding, reusing, recycling, managing waste during construction and operation, would be implemented.

8.3 Conclusion

The proposed upgrade to Manly Wharf 3 is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

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

A number of potential environmental impacts from the 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 non-Aboriginal heritage, biodiversity, coastal processes, landscape character, and visual amenity and noise. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts.

The proposal would also provide better commuter experience through improvements to passenger amenity, safety, access for people with a disability and overall user experience of the wharves for the next 20 to 50 years, as well as contributing to unifying and standardising wharves in Sydney Harbour and Parramatta River. On balance the proposal is considered justified, and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance 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 Climate Change, Energy, the Environment and Water 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.



Belinda Crichton
Principal – Environment
Cardno

Date: 22/11/22



Jenny McKinney
Technical Director – Environment

GHD

Date: 22/11/22

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



Bob Rimac
Senior Project Manager
Transport for NSW

Date: 22 November 2022

10 References

- Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
- Artefact (2021) Manly Wharf 3 Transport Access Program update - Statement of Heritage Impact, Report prepared by Artefact on behalf of GHD, June 2022
- BESIX Watpac (2021) *Manly Wharf 3 – Concept Design – Constructability Report*. Report prepared by BESIX Watpac on behalf of GHD, November 2021.
- BoM (2021c) Monthly rainfall. Collaroy (Long Reef Golf Club). Bureau of Meteorology. Available online: <http://www.bom.gov.au/climate/data/> Accessed 10 May 2022.
- BoM (2022) Climate data online. Wedding Cake Island. Bureau of Meteorology. Available online: <http://www.bom.gov.au/climate/data/> Accessed 27 July 2022.
- British Standards (1993) Evaluation and measurement for vibration in buildings Part 2 (BS7385)
- Cardno (2021) *Manly Wharf 3 Concept Design – Met-Ocean Design Parameters Study*. Report prepared by Cardno on behalf of GHD, July 2021.
- Comber (2022) *Manly Wharf 3 Maritime Archaeological Assessment*. Report prepared by Comber Consultants on behalf of Artefact for GHD, June 2022.
- Commonwealth of Australia (2009) *National Assessment Guidelines for Dredging*. Department of the Environment, Water, Heritage and the Arts, 2009.
- DEC (2006) Assessing Vibration: a technical guideline. Department of Environment and Conservation, February 2006.
- DECC (2009) Interim Noise Construction Guideline. Department of Environment and Climate Change, July 2009.
- DECCW (2011) NSW Road Noise Policy. Department of Environment, Climate Change and Water, March 2011.
- Department of Defence (2020) *Australian National Tide Tables*.
- DPIE (2017) NSW environmental planning instrument (EPI) flood data set. Available online: <https://www.planningportal.nsw.gov.au/opendata/dataset/epi-flood>
- DPIE (2019) State of the beaches 2018-2019. Statewide summary and how to read this report. Beachwatch. Department of Planning, Industry and Environment
- DPIE (2020) State of the beaches 2019-2020. Statewide summary and how to read this report. Beachwatch. Department of Planning, Industry and Environment
- DPIE (2021a) State of the beaches 2020-2021. Statewide summary and how to read this report. Beachwatch. Department of Planning, Industry and Environment
- DPE (2022) Air quality categories (last year). NSW Air Quality Data Services. Available online: https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU&runWorkflow=AppendLayerCatalog&CatalogLayer=SEED_Catalog__EWADD.0.air_quality_sites_status,SEED_Catalog__EWADD.1.air_quality_sites_status,SEED_Catalog__EWADD.2.air_quality_sites_status,SEED_Catalog__EWADD.3.air_quality_sites_status,SEED_Catalog__EWADD.6.dustwatch_sites
- DoP (2010) NSW Coastal Planning Guidelines: Adapting to Sea Level Rise. Department of Planning, August 2010.

DSAPT (2002) Disability Standards for Accessible Public Transport.

EPA (2017) Noise Policy for Industry. Environment Protection Authority, Sydney.

Landscape Institute and Institute of Environmental Management & Assessment (2013). *Guidelines for Landscape and Visual Impact Assessment* (Third edition.). Routledge, April 2013.

NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying waste, Environment Protection Authority, Sydney.

German Standards (1999) Structural Vibration - effects of vibration on structures (DIN 4150-3)

GHD (2021) *Geotechnical and contamination assessment report*. Report prepared by GHD on behalf of Transport, November 2021.

GHD (2022b) *Manly Wharf 3. Sustainability Strategy Report*. Report prepared by GHD on behalf of Transport, April 2022.

GHD (2022c) *Maritime Basis of Design Wharf 3 Upgrade Project*

Greater Sydney Commission (2018a) *A Metropolis of Three Cities – The Greater Sydney Region Plan*.

Greater Sydney Commission (2018a) *North District Plan*.

LLS (2015) *Sydney Harbour Water Quality Improvement Plan*. Local Land Services, June 2015.

National Environmental Protection Council (NEPC) (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*. NEPC, April 2013.

Infrastructure NSW (INSW) (2018) *State Infrastructure Strategy 2018 – 2038*. INSW, 2018.

Naylor, SD, Chapman, GA, Atkinson, G, Murphy CL, Tulau MJ, Flewin TC, Milford HB, Morand DT (2011). *Guidelines for the Use of Acid Sulfate Soil Risk Maps*, 2nd ed., Department of Planning and Environment, August 2011.

Northern Beaches Council (2019) *Towards 2040 – Draft Local Strategic Planning Statement*.

Northern Beaches Council (2019b) Flood hazard map. Available online: <https://nb-climate.azurewebsites.net/climate.ashx>

NSW Government (2020) *Connecting with Country*.

OEH (2012) State of the beaches 2011-2012. Beachwatch, Harbourwatch and Partnership Programs. Office of Environment and Heritage.

OEH (2013) State of the beaches. Summary 2012-2013. Office of Environment and Heritage

OEH (2014a) State of the beaches 2013-2014. Summary and how to read this report. Beachwatch. Office of Environment and Heritage.

OEH (2014b) Metropolitan Sydney Climate change snapshot. AdaptNSW. Office of Environment and Heritage

OEH (2015) State of the beaches 2014-2015. Summary and how to read this report. Beachwatch. Office of Environment and Heritage.

OEH (2016) State of the beaches 2015-2016. Statewide summary and how to read this report. Beachwatch. Office of Environment and Heritage.

OEH (2017) State of the beaches 2016-2017. Statewide summary and how to read this report. Beachwatch. Office of Environment and Heritage.

OEH (2018) State of the beaches 2017-2018. Statewide summary and how to read this report. Beachwatch. Office of Environment and Heritage.

Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B., Lokkeborg, S., Rogers, P.H., Southall, B.L., Zeddies, D.G. and Tavolga, W.N. (2014), *Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*, ASA Press Springer

RMS (2016a) *Guideline for Biodiversity Offsets*. Transport Roads and Maritime, November 2016.

RMS (2016b) *Construction Noise and Vibration Guideline*. Transport Roads and Maritime, April 2016

Southall B. L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L. (2019), *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*, Aquatic Mammals, Vol. 45(2) pp. 125-232

Transport for NSW (Transport) (n. d.) *TAP 3*. Available online: <https://www.transport.nsw.gov.au/projects/current-projects/tap-3#:~:text=The%20third%20tranche%20of%20the%20Transport%20Access%20Program%20C,the%20Transport%20Access%20Program%20over%20the%20forward%20estimates.>

(Transport) (2012) *Long Term Transport Master Plan for NSW*, December 2012.

Transport (2013) *Sydney's Ferry Future*. Transport, May 2013.

Transport (2015) *Transport Access Program*. Transport, NSW Government.

Transport (2016) *Construction Noise and Vibration Guideline*. Roads and Maritime Services, August 2016.

Transport (2017a) *Sustainable Design Guidelines version 4.0*. Transport, May 2017.

Transport (2017b) *Disability Inclusion Action Plan 2018–2022*. Transport, December 2017.

Transport (2018) *Future Transport Strategy 2056*. Transport, March 2018.

Transport (2020) *Environmental impact assessment practice note. EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.2*. Transport, August 2020.

Transport (2021) *Manly Wharf 3 – Demand Assessment and Scope Assumptions*. Transport, June 2021.

Transport (2022a) *Manly Cove Manly Wharf 3 Upgrade and Former Manly Sea Life Consultation Summary Report*. Transport, August 2022.

Transport (2022b) *Biodiversity Policy*. Policy Number CP22004. Transport, August 2022.

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Terms and acronyms used in this REF

Term/ Acronym	Description
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal heritage impact permit
ANZAST	Environment Protection Authority
ANZECC	Australian and New Zealand Environment and Conservation Council
AOBV	Areas of Outstanding Biodiversity Value
AoS	Assessment of Significance
APAS	Australian Paint Approval Scheme
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
ASS	Acid Sulphate Soils
AVTG	Assessing Vibration: a technical guideline
BAR	Biodiversity Assessment Method
BC Act	Biodiversity Conservation Act 2016 (NSW).
BCA	Building Code of Australia
Berthing	The action or process of mooring a ship in its allotted place.
Biodiversity and Conservation SEPP	<i>State Environmental Planning Policy (Biodiversity and Conservation) 2021</i>
BoM	Bureau of Meteorology
BTEX	Benzene, toluene, ethylbenzene and xylenes
Burra Charter	Burra Charter: the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance
CAPEX	Capital expenditure of the proposal
CBD	Central Business District
CCHMP	Construction Cultural Heritage Management Plan
CCTV	Close circuit television
CEMP	Construction environmental management plan
CHL	Commonwealth Heritage List
CHS	Circular Hollow Sections
CNVG	<i>Construction Noise and Vibration Guideline</i>
CNVMP	Construction noise and vibration management plan
CPTED	Crime Prevention through Environmental Design

Term/ Acronym	Description
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTMP	Construction Traffic Management Plan
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Australian Department of Climate Change, Energy, the Environment and Water
DDA	<i>Disability Discrimination Act 1992 (Commonwealth)</i>
DOCOMOMO	Documentation and Conservation of buildings, sites and neighbourhoods of the Modernist Movement
DPC	Department of Premier and Cabinet
DPE-EES	NSW Department of Planning and Environment – Environment, Energy and Science
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and the Environment
DSAPT	Disability Standards for Accessible Public Transport
EIA	Environmental impact assessment
EMS	Environmental Management System
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental Protection Licences
ESD	Ecologically sustainable development
ETS	Electronic ticketing system
EWMS	Environmental work method statement
Fetch	An area where ocean waves are being generated by the wind.
FM Act	<i>Fisheries Management Act 1994</i>
FRP	Fibre-reinforced polymer
FWUP	Ferry Wharf Upgrade Program
Gangway	A landing used by passengers to board or exit ships/vessels
GDE	Groundwater Dependent Ecosystems
GGBFS	Ground Granulated Blast Furnace Slag
Heritage Act	Heritage Act 1977 (NSW)
HIL	Health investigation levels
HSL	Health screening levels
ICNG	<i>Interim Construction Noise Guideline</i>
Jetty	A structure extending into the harbour as part of a wharf
KFH	Key Fish Habitat
kPa	Kilopascal

Term/ Acronym	Description
KSW	Key Stakeholder Workshop
LALC	Local Aboriginal Land Council
LCVIA	Landscape Character and Visual Impact Assessment
LCZ	Landscape Character Zones
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	local government authority area
LoS	Level of Service
MAA	Maritime Archaeology Assessment
Manly LEP	<i>Manly Local Environmental Plan 2013</i>
MCA	Multi-criterion analysis
MFF	Manly Fast Ferry
MHWM	Mean high water mark
MLALC	Metropolitan Local Aboriginal Land Council
MNES	Matters of national environmental significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
MTMP	Maritime Transport Management Plan
NAGD	National Assessment Guidelines for Dredging
NCA	Noise catchment area
NEPM	National Environment Protection Measures
NHL	National Heritage List
NIMPIS	National Introduced Marine Pest Information System
NMLs	Noise management levels
NPfi	Noise Policy for Industry
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NSW	New South Wales
OCP	Organochlorine pesticides
OEH	Office Of Environment and Heritage
OPEX	Cost of operating the proposal
OPP	Organophosphorus pesticides
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAH	Polycyclic aromatic hydrocarbons
PAR	Photographic Archival Recording
PASS	Potential Acid Sulphate Soils

Term/ Acronym	Description
Piles	Foundations used to support marine structures and offshore platforms
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
PMST	Protected Matters Search Tool
PoEO Act	<i>Protection of the Environment Operations Act 1997</i>
Pontoon	A floating structure serving as a dock
PSD	Particle size distribution
PTS	Permanent Threshold Shift
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.
RBL	Rating Background Level
REF	Review of environmental factors
Resilience and Hazards SEPP	<i>State Environmental Planning Policy (Resilience and Hazards) 2021</i>
RNE	Register of the National Estate
RNP	Road Noise Policy
Roads and Maritime	NSW Roads and Maritime Services
SCM	Supplementary Cementitious Materials
SDG	Sustainable Design Guidelines
SEIA	Socio-economic Impact Assessment
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SHI	State Heritage Inventory
SHR	State Heritage Register
SOHI	Statement of Heritage Impact
SWMP	Soil and Water Management Plan
TAP	Transport Access Program
TBDC	Threatened Biodiversity Data Collection
TBT	Tributyltin
TEC	Threatened ecological communities
TGSIs	Tactile Ground Surface Indicators
TISEPP	<i>State Environmental Planning Policy (Transport and Infrastructure) 2021</i>
TRH	Total recoverable hydrocarbons
TTS	Temporary Threshold Shift

Term/ Acronym	Description
VOC	Volatile Organic Compounds
WARR Act	Waste Avoidance and Resource Recovery Act 2001
Wharf	A landing place or pier where ships may tie up and load or unload.
WHL	World Heritage List
ZFDTG	Zero of Fort Denison Tide Gauge

Appendix A
Consideration of section 171(2) factors and
matters of National Environmental Significance
and Commonwealth land

Factor	Impact
<p>Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>There would be temporary aesthetic impacts during construction of the proposal, including elevated noise levels and restricted recreational access.</p> <p>Landscape character and visual impacts have been assessed as negligible to moderate. Impacts have been reduced through design of the wharf, including retention of the wharf in its current location and removal of some roofing.</p> <p>No long-term impacts to environmental quality and value are anticipated.</p>	<p>Moderate, short term negative</p> <p>Negligible to moderate, long term negative</p> <p>Negligible long term</p>
<p>d) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>The proposed works would result in a minor positive indirect impact on the heritage significance of the overall Manly Wharf precinct SHI NO. 4920067) (including the 1940's buildings and Wharves 1 and 2) and have a major adverse direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures.</p> <p>Overall, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.</p> <p>Impact to heritage values would be minimised through implementing the safeguards and management measures identified in Chapter 7 of the REF.</p>	<p>Minor positive long term</p>
<p>e) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The assessment of biodiversity indicates there would be a minor impact to marine biodiversity during construction. The proposal would remove around 388 square metres of seagrass.</p> <p>However, removal of the old Wharf 3 structure and relocation of fast ferry operations alongside the new Wharf 3, may allow recolonisation of seagrass into areas of seabed previously shaded or disturbed by vessel scour. As such only a small residual loss of area would be expected.</p> <p>Despite the potential for White's Seahorse, Black Rockcod and Little Penguin to occur in the study area, no threatened species were observed during the field survey. While potential habitat for some threatened species occurs in the study area, no significant impacts to threatened species are anticipated.</p> <p>Impacts to biodiversity would be minimised through implementing the safeguards and management measures identified in Chapter 7 of the REF.</p>	<p>Minor, short-term negative</p> <p>Negligible, long term</p>

Factor	Impact
<p>f) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposal is unlikely to endanger any species of animal, plant or other form of life, whether living on land, in water or in the air provided safeguards and management measures identified in Chapter 7 of the REF are implemented.</p>	No impact
<p>g) Any long-term effects on the environment?</p> <p>The proposal would result in long term negligible to moderate landscape character and visual impacts. No other long-term negative effects on the environment are anticipated.</p> <p>The proposal would result in improvements in user amenity for the wharf.</p>	<p>Negligible to moderate, long term negative</p> <p>Long term positive</p>
<p>h) Any degradation of the quality of the environment?</p> <p>The proposal would result in localised sediment disturbance during demolition, dredging and piling activities, which would result in temporary impacts to water quality.</p> <p>There is potential for accidental spills/leaks of fuel, oil or other chemicals to impact water quality during construction.</p> <p>Impacts would be minor with implementation of the safeguards and management measures identified in Chapter 7 of the REF.</p>	Minor, short-term negative
<p>i) Any risk to the safety of the environment?</p> <p>Construction related activities pose potential risks to the safety of the environment through spills/leaks of fuel, oil or other chemicals.</p> <p>Impacts would be minor with implementation of the safeguards and management measures identified in section 7.1 of the REF.</p>	No impact
<p>j) Any reduction in the range of beneficial uses of the environment?</p> <p>Following construction, the proposal would not reduce the range of beneficial uses of the environment.</p>	No impact
<p>k) Any pollution of the environment?</p> <p>Construction related activities may result in pollution of the environment through spills/leaks of fuel, oil or other chemicals, air and noise emissions, and temporary increase in suspended sediments. Impacts would be minor with implementation of the safeguards and management measures identified in Chapter 7.1 of the REF.</p>	Minor, short-term negative

Factor	Impact
<p>l) Any environmental problems associated with the disposal of waste?</p> <p>All wastes generated by the proposal would be disposed of at an off-site facility which is licenced to receive such waste.</p> <p>There would be no significant environmental problems associated with waste disposal.</p>	<p>Minor, short-term negative</p>
<p>m) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>All resources required by the proposal are readily available and are not likely to become in short supply.</p>	<p>No impact</p>
<p>n) Any cumulative environmental effect with other existing or likely future activities?</p> <p>Assessment of cumulative impacts for the proposal is provided in section 6.17.</p> <p>Other projects with the same timing of this proposal include upgrade of other wharves in the ferry network, and upgrades to infrastructure in the Manly Cove area. There may be a minor increase in marine traffic, and noise impacts.</p> <p>The proposal design includes an allowance for sea level rise.</p>	<p>Minor, short-term negative</p>
<p>o) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>Consideration of coastal processes and coastal hazards is detailed in section 6.3.</p> <p>No significant impacts to these issues are anticipated for the proposal.</p>	<p>No impact</p>
<p>q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,</p> <p>The proposal aligns with the local strategic planning statements, regional strategic plans or district strategic plans described in section 2.1.</p>	<p>N / A</p>
<p>r) Other relevant environmental factors</p>	<p>In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 5 of this assessment.</p>

Matters of National Environmental Significance and Commonwealth land

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

Factor	Impact
<p>a) Any impact on a World Heritage property?</p> <p>There are no items within or in the immediate vicinity of the proposal area listed on the World Heritage List.</p>	No impact
<p>b) Any impact on a National Heritage place?</p> <p>North Head (ID: 105759) is about 800 metres south-east of the proposal area. However, no impacts to North Head are expected.</p>	No impact
<p>c) Any impact on a wetland of international importance?</p> <p>There are no nationally important wetlands or Ramsar Wetlands in the biodiversity study area or the wider study locality.</p>	No impact
<p>d) Any impact on a listed threatened species or communities?</p> <p>Three species listed under the EPBC Act were considered to have a moderate to high likelihood of occurrence in the biodiversity study area. The biodiversity assessment (refer section 6.2 and Appendix J) concluded that the proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act. A referral to the Australian Government DCCEEW is not required for biodiversity matters.</p>	Minor, short impact
<p>e) Any impacts on listed migratory species?</p> <p>All listed migratory species under the EPBC Act were considered to have no or a low likelihood occurrence in the biodiversity study area based on the absence of suitable habitat and high level of disturbance from pedestrians and dogs in the area. Impacts to these species as a result of the proposal are considered unlikely (refer Appendix J).</p>	No impact
<p>f) Any impact on a Commonwealth marine area?</p> <p>The proposal area is not within or in the vicinity of a Commonwealth marine area.</p>	No impact
<p>g) Does the proposal involve a nuclear action (including uranium mining)?</p>	Nil
<p>h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land?</p> <p>The proposal area does not contain any Commonwealth land.</p>	No impact

Appendix B

TISEPP Consultation Checklist

Certain development types

Development type	Description	Yes/No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Northern Beaches Council	TISEPP section 2.110(1)(a)
Bus Depots	Does the project propose a bus depot?	No	Northern Beaches Council	TISEPP section 2.110(1)(b)
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Northern Beaches Council	TISEPP section 2.110(1)(c)

Development within the Coastal Zone

Issue	Description	Yes/No/NA	If 'yes' consult with	TISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	N/A – mapping not available	Northern Beaches Council	TISEPP section 2.14

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

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

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
Stormwater	Is the work likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No	Northern Beaches Council	TISEPP section 2.10(1)(a)
Traffic	Is the work likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	No	Northern Beaches Council	TISEPP section 2.10(1)(b)
Sewerage system	Will the work involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No	Northern Beaches Council	TISEPP section 2.10(1)(c)
Water usage	Would the work involve connection to a council owned water supply system? If so, would this require the use of a <i>substantial</i> volume of water?	No	Northern Beaches Council	TISEPP section 2.10(1)(d)
Temporary structures	Would the work involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, would this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	Yes	Northern Beaches Council	TISEPP section 2.10(1)(e)

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
Road & footpath excavation	Would the work involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	Northern Beaches Council	TISEPP section 2.10(1)(f)

Local heritage items

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	Yes	Northern Beaches Council	TISEPP section 2.11(1)

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
Flood liable land	Is the work located on flood liable land? If so, would the work change flood patterns to more than a <i>minor</i> extent?	No	Northern Beaches Council	TISEPP section 2.12
Flood liable land	Is the work located on flood liable land? (to any extent). If so, does the work comprise more than minor alterations or additions to, or the demolition of, a building, emergency work or routine maintenance	No	State Emergency Services	TISEPP section 2.13

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

Public authorities other than councils

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
National parks and reserves	Is the work adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	No	Environment, Energy and Science, DPE	TISEPP section 2.15(2)(a)
National parks and reserves	Is the work on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment, Energy and Science, DPE	TISEPP section 2.15(2)(b)
Artificial light	Would the work increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	TISEPP section 2.15(2)(d)
Defence communications buffer land	Is the work on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	TISEPP section 2.15 (2)(e)

Issue	Potential impact	Yes/No	If 'yes' consult with	TISEPP clause
Mine subsidence land	Is the work on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	TISEPP section 2.15 (2)(f)
Bush fire prone land	Is the work for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	TISEPP 2.16(1)

Appendix C

Airborne noise and vibration impact assessment



Manly Wharf 3 Upgrade


Noise and vibration impact assessment

Transport for NSW

September 2022

→ **The Power of Commitment**



Project name		Manly Wharf 3 Upgrade					
Document title		Manly Wharf 3 Upgrade Noise and vibration impact assessment					
Project number		12547220					
File name		12547220-REP-Manly Wharf 3 NVIA.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	R. Browell	E Milton	On file	J.McKinney		14/09/2022

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1. Introduction

1.1 Project overview

Transport for NSW (TfNSW) proposes to upgrade Manly wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre. It is also located at the western end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes a ferry terminal, restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

1.2 Purpose of this report

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

The purpose of this noise and vibration impact assessment is to describe the proposal, document the likely noise and vibration impacts of the proposal on surrounding sensitive receivers during construction and operation and to detail potential mitigation and management measures to reduce impacts.

1.3 Scope

The scope of the report is to assess the potential noise and vibration impacts from construction works and operation associated with the Manly Wharf 3 upgrade, including:

- The identification of the study area, the noise catchment areas and the noise and vibration sensitive receivers for the Project. The Little Penguins habitats are also included as sensitive receiver locations.
- Conducting background and ambient noise monitoring at locations representative of residential areas in Manly to gain an understanding of the existing noise conditions in the study area for a minimum period of seven (7) days.
- Preparation of a summary of the results of the noise monitoring in the NVIA and use the noise monitoring data to establish the construction noise management levels and the project noise trigger levels for mechanical plant associated with the wharf.
- Reviewing information provided by TfNSW detailing the proposed construction staging and equipment.
- Assessment of construction noise impacts as follows:
 - Development of up to 10 indicative construction scenarios based on the construction staging and relevant construction work periods, including the required equipment for each scenario.
 - Noise modelling to predict the impacts at the identified sensitive receivers for each construction scenario.
 - Assessment of the impacts against the construction noise management levels.
- Assessment of vibration from construction activities (including piling activities) and provide buffer distances for human comfort and structural damage.
- Recommendation of reasonable and feasible in-principle noise and vibration management and mitigation measures to minimise impacts on the community in accordance with the CNVG.
- Qualitatively review of any potential noise impacts resulting from the operation of the new ferry wharf at sensitive receivers.

1.4 Limitations

This report: has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1.5 Key features and objectives of the proposal

A concept design drawing of the proposal is shown in Figure 1.1, the regional setting of the proposal is shown in Figure 1.2 and the key features of the proposal are shown in Figure 1.3.

Key features of the proposal would include:

- removal of the existing Manly wharf 3 timber wharf structure, piles and triangular concrete platform
- retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the wharf 1-2 entry to the hydraulic wharf platform at wharf 3
- a new public seating space / rest 'slow space' within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the wharf 3 hydraulic platform
- installation of a new hydraulic platform (wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- construction of a fixed structure (wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.
- construction of a new vessel arrestor at wharf 3
- construction of two new separation piles between wharves 2 and 3
- limited dredging of material at the wharf 3 berth pocket area
- upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- provision for a wharf booking information system
- providing conduits for opal readers to be installed in the future if required.

It is anticipated construction of the proposal would take eight months, commencing about 2023 and be completed by 2025.

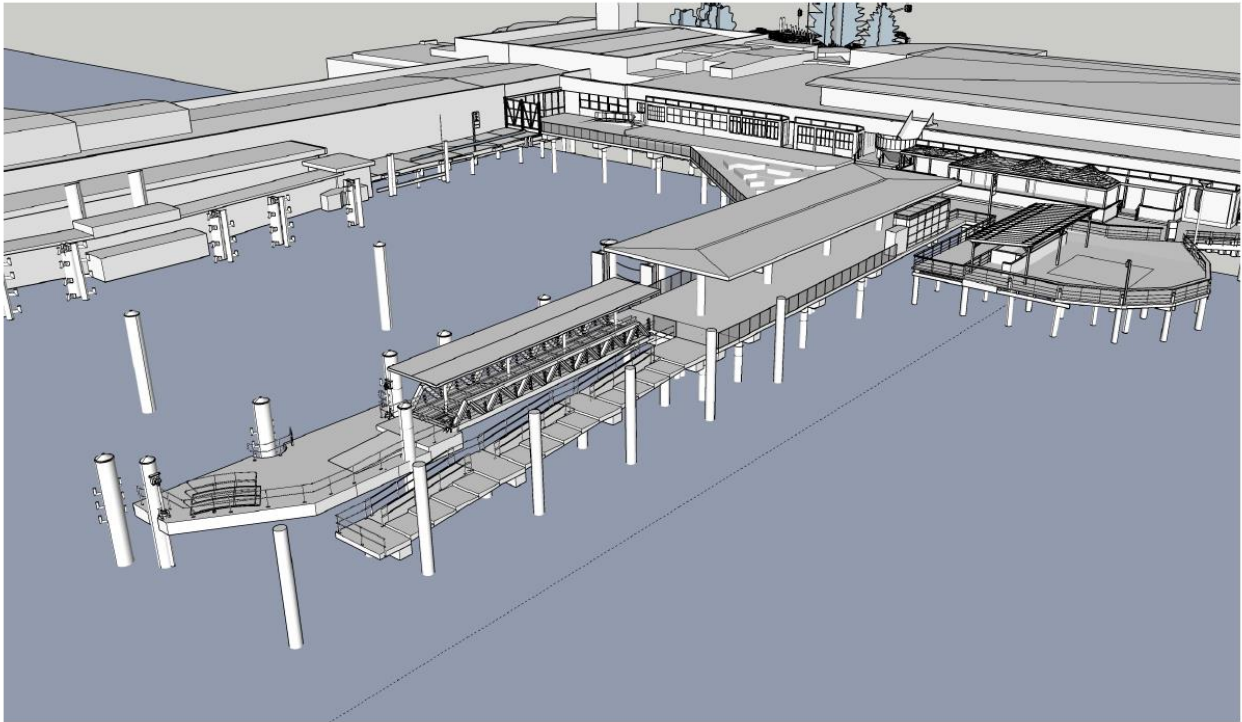


Figure 1.1 Concept design drawing – proposed Manly wharf 3 upgrade



Figure 1.2 - Regional Setting

Whilst every care has been taken to generate the structures, GHG makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

World Street Map, Woolahra Municipal Council, Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Data source: Mapbox, The Service, Created by mfrade

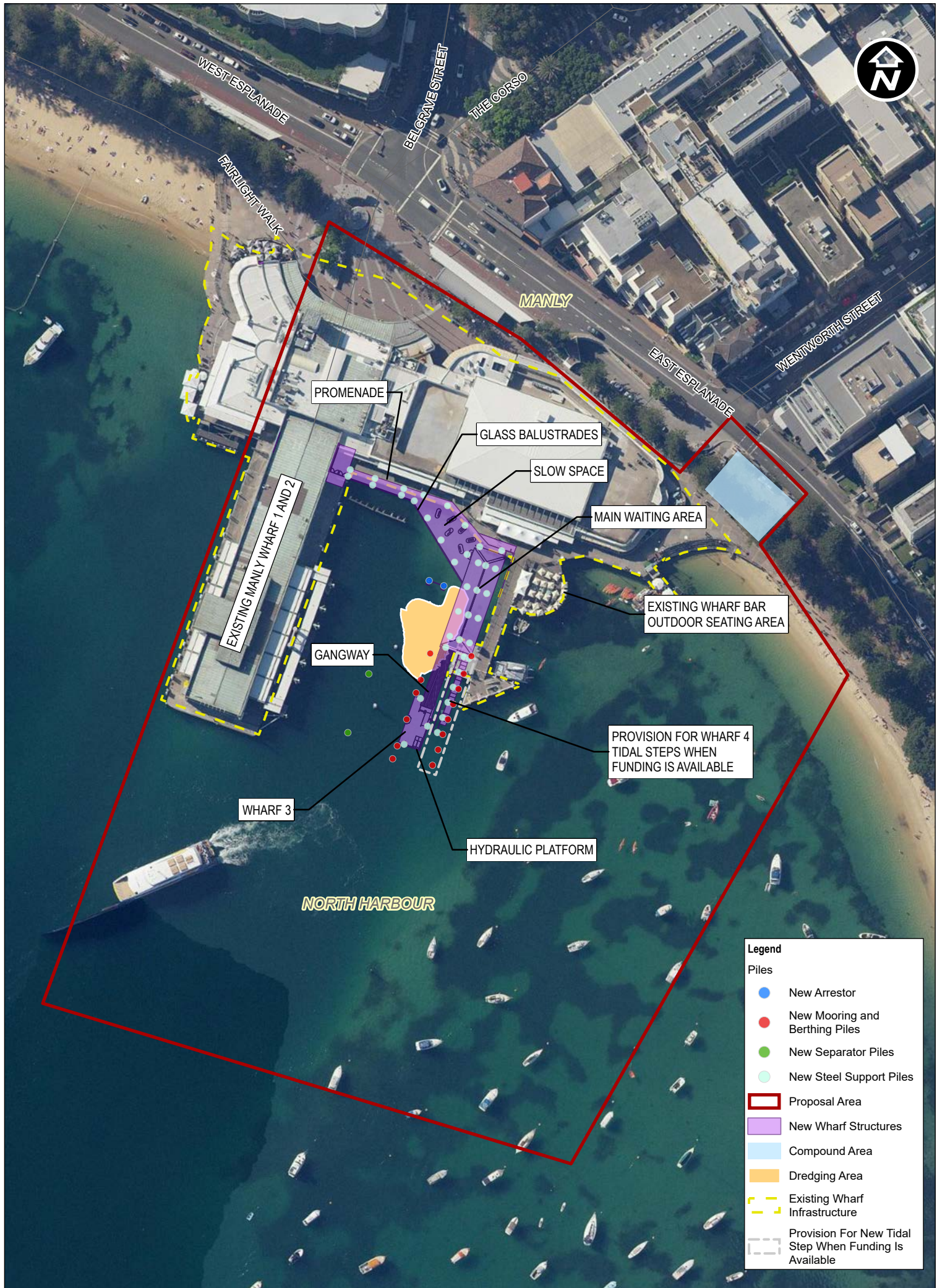


Figure 1.3 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHQ makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by metrida
 Data source: publicNSW, Imagery: © Department of Customer Service 2020

2. Assessment approach

2.1 Applicable guidelines

The applicable guidelines used in this assessment, are summarised in Table 2.1 including their relevance to this assessment.

Table 2.1 Applicable guidelines used in this assessment

Assessment guideline	Relevance to the assessment
<i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009)	Assessment of construction airborne noise impacts on sensitive receivers, including noise management levels (NMLs).
<i>Construction Noise and Vibration Guideline</i> (CNVG) (TfNSW, 2016)	Assessment of construction noise and vibration impacts for Transport for NSW projects and determination of additional mitigation measures for residual noise impacts following the application of reasonable and feasible mitigation measures.
<i>Assessing Vibration: a technical guideline</i> (AVTG) (DEC, 2006)	Assessment of human comfort vibration impacts to sensitive receivers during construction and operation.
<i>Structural Vibration - effects of vibration on structures</i> (DIN 4150-3) (German Standards, 1999)	Determining relevant criteria for cosmetic damage to vibration sensitive structures of heritage significance (if structure is found to be unsound) and buried pipework/utilities.
<i>Evaluation and measurement for vibration in buildings Part 2</i> (BS7385) (British Standards, 1993)	Determining relevant criteria for cosmetic damage to vibration sensitive (non-heritage) standard structures (e.g., residential dwellings).
<i>NSW Road Noise Policy</i> (RNP) (DECCW, 2011)	Assessment of a road traffic noise impacts associated with the proposal during construction and operation, including noise trigger levels.
<i>Noise Policy for Industry</i> (NPfl) (EPA, 2017)	Assessment of operational noise impacts from increased vessel movements and mechanical plant required for wharf operations, including noise trigger levels.

2.2 Construction noise and vibration assessment

2.2.1 Construction noise prediction method

Acoustic modelling was undertaken using SoundPlan 8.2 noise modelling software to predict the effects of construction noise generated by the proposed works. General parameters used in the model are listed in Table 2.2.

Table 2.2 Noise modelling parameters

Variable	Parameter used
Calculation method	ISO 9613- 2:1996
Meteorology	Well-developed moderate ground based temperature inversion, such as commonly occurs on clear, calm nights or 'downwind' conditions which are favourable to sound propagation.
Topography	Sourced from ELVIS GIS Australia – 5 metres elevation intervals
Receiver heights	1.5 metres above building ground level for ground floor, additional 1.5 metres for each floor above
Ground absorption	0.0 for all waterbodies in the study area 0.5 for all other areas (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)

The exact details of the construction methodology, plant or equipment for the proposal, such as the intensity of works, sound power levels or operating duration are not yet known therefore this assessment is based on a variety of conservative assumptions. This information would be refined during construction planning by the construction contractor. The magnitude of the noise levels associated with construction activities would be dependent upon a number of factors, including:

- The intensity and location of construction activities
- The type and quantity of equipment used
- Existing local noise sources
- Intervening terrain or structures
- The prevailing weather conditions.

2.2.2 Construction vibration prediction method

The method for the construction vibration assessment included:

- Identifying safe working distances to comply with the human comfort and the cosmetic damage criteria. These buffer distances have been adopted from CNVG.
- Safe working distances for vibration intensive equipment are shown in Table 2.3. The vibratory equipment associated with the proposal include excavators, piling rigs and where required vibratory rollers.
- Buildings within the safe working distances have been identified for consideration of management measures.
- The heritage buildings or structures identified in this assessment should not be assumed to be structurally unsound. Generally, the BS7385 vibration screening criteria for reinforced and unreinforced structures should apply for buildings, including items of heritage significance. The more stringent DIN4150-3 vibration screening criteria of 2.5 mm/s only applies to structures deemed to be structurally unsound, subsequent to inspection and investigation. As a conservative approach, the safe working distance to comply with the BS7385 screening criteria has been tripled, based on conservative propagation estimates, to identify whether heritage structures near vibration intensive work sites require inspection prior to construction works.

Table 2.3 Vibration safe working distances

Equipment	Human comfort (OH&E Vibration guideline)	Cosmetic damage (BS 7385)	Heritage structures (screening distance to trigger inspection)
Piling rig – Bored <800 mm	N/A	2 m (nominal)	6 m
Piling rig–Hammer (12 tonnes down force) ¹	50 m	15 m	45 m
Piling rig – Vibratory (sheet piles)	20 m	2 m to 20 m	60 m
Vibratory roller (>18 tonnes)	100 m	25 m	75 m
Vibratory roller (13-18 tonnes)	100 m	20 m	60 m
Vibratory roller (7-13 tonnes)	100 m	15 m	45 m
Vibratory roller (4-6 tonnes)	40 m	12 m	36 m
Vibratory roller (2-4 tonnes)	20 m	6 m	18 m
Vibratory roller (1-2 tonnes)	15 m to 20 m	5 m	15 m
Small hydraulic hammer 300 kg (5-12t excavator)	7 m	2 m	4 m
Medium hydraulic hammer 900 kg (12-18t excavator)	23 m	7 m	14 m
Large hydraulic hammer 1600 kg (18-34t excavator)	73 m	22 m	66 m
Jackhammer (handheld)	2 m	1 m (nominal)	3 m

Note: 1. Safe working distances for Hammer piling rig have been sourced from TfNSW's Construction Noise and Vibration Strategy (CNVS) (Transport for NSW, 2019)

2.2.3 Construction hours

Construction works have the potential to result in impacts on the local areas where the proposal is located. To minimise the potential noise and vibration amenity impacts, construction works are generally undertaken during the following ICNG recommended standard working hours:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- no works on Sundays or public holidays.

The CNVG requires construction activities with impulsive or tonal noise emissions should be limited to between 8 am to 5 pm Monday to Friday and 9 am to 1 pm on Saturday. Works may be carried out in continuous blocks not exceeding three hours each with a minimum respite from those activities and works of not less than one hour between each block.

The recommended standard hours and out-of-hours works (OOHW) are identified in the CNVG and categorised as; recommended standard hours (ICNG / CNVG), OOHW Period 1 Day, OOHW Period 1 Evening and OOHW Period 2 Night.

For safety reasons piling works, placements of the new gangway, hydraulic platform and main waiting area canopy and operation of the construction compound may need to take place late at night or early in the morning when the water is calm and the cove is least busy. Additionally, some environmental impacts from these activities may be reduced during these hours.

Hour commencing	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
	am	am	am	am	am	am	am	am	am	am	am	am	pm	pm	pm	pm	pm	pm	pm	pm	pm	pm	pm	pm
Monday	OOHW							Recommended standard construction hours											OOHW		OOHW			
Tuesday	OOHW							Recommended standard construction hours											OOHW		OOHW			
Wednesday	OOHW							Recommended standard construction hours											OOHW		OOHW			
Thursday	OOHW							Recommended standard construction hours											OOHW		OOHW			
Friday	OOHW							Recommended standard construction hours											OOHW		OOHW			
Saturday	OOHW							OOHW Period 1											OOHW		OOHW			
Sunday	OOHW							OOHW Period 1											OOHW		OOHW			
Public Holidays	OOHW							OOHW Period 1											OOHW		OOHW			

Figure 2.1 ICNG recommended standard hours, CNVS OOHW periods and primary proposal working hours

2.2.4 Indicative construction activities

Noise levels for equipment have been sourced from the CNVG, *AS 2436 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites* (Australian Standards, 2010) and the GHD internal database where sound power level data was not available. The activity sound power level assumes the two loudest items of equipment for the sub-scenario are operating simultaneously and the works are located at the nearest location between the construction area and each receiver location as illustrated in Figure 2.2. This is representative of the worst-case construction activity.

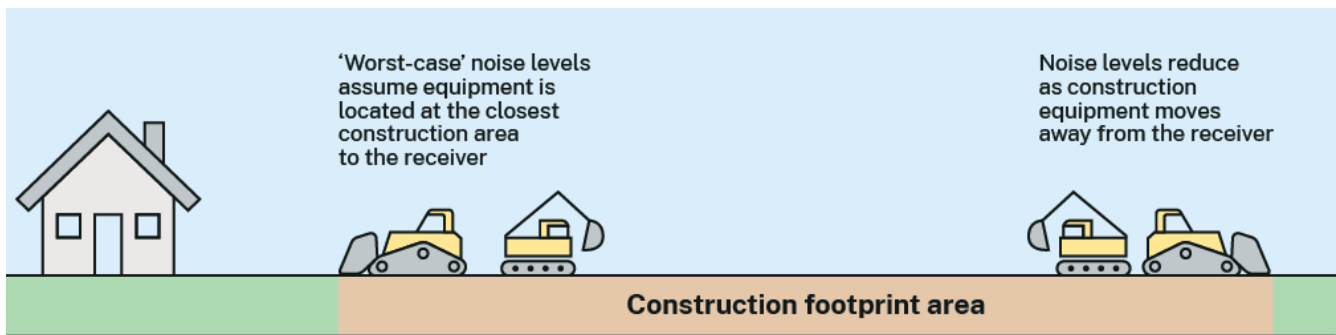


Figure 2.2 Worst-case noise levels for the construction work area

Table 2.4 outlines the indicative construction staging for the proposal. Noise generating activities within each stage have been identified and similar activities have been modelled together. Modelling scenarios are outlined in Table 2.5 and are indicated for each activity in the construction staging. The indicative list of equipment assumed for each construction scenario is listed in Table 2.6 and would be refined during the design development process and by the construction contractor.

Impact piling has been assessed as a conservative worst-case piling method for both noise and vibration impacts. Construction methodologies would be finalised by the chosen construction contractor. Noise levels for impact piling are based on measured data and have been time corrected for a typical 15 min period. Noise levels provided in the Construction Noise and Vibration Strategy (CNVS) and AS2436 are likely to be maximum noise levels for a single impact and therefore are not appropriate for a 15-minute period.

Table 2.4 Staging plan for the proposal

Stage	Operation	Works	Timing	Noise modelling scenario
1	wharf 2 closed wharf 3 open	– Site establishment including: <ul style="list-style-type: none"> • Establish site compound • Hoarding • Safe pedestrian access • Establish on-site laydown area 	7-10 days	1
		– Install piles on western side of promenade	1 day per pile	4
		– Construct western side of new promenade (in front of wharf 2 berthing area) – Construct concrete topping slab to regrade a section of existing promenade	40 days.	5
		– Construct temporary separation piles between Manly wharf 2 and proposed crane barge location at Manly wharf 3 – Remove and install separation piles -	3 days	4
2	wharf 2 open wharf 3 closed	– Construct hoarding on promenade to close wharf 3	5 days	1
		– Demolish existing wharf 3 pier – Demolish area of existing boardwalk to be removed – Remove piles below demolished pier	34 days	2
		– Dredge wharf 3 berth pocket	8 days	3
4	wharf 2 open wharf 3 closed	– Install remaining promenade / waiting area piles	1 day per pile	4
		– Construct remaining promenade structure	47 days	5
		– Construct waiting area structure		

Stage	Operation	Works	Timing	Noise modelling scenario
5	wharf 2 open wharf 3 closed	<ul style="list-style-type: none"> – Install wharf 3 platform and berthing piles – Install wharf 4 fixed structure piles – Install separation, arrestor and safety marker piles 	1 day per pile	4
		<ul style="list-style-type: none"> – Construct wharf 3 platform and install gangway – Construct wharf 4 fixed structure 	18 days	5
		<ul style="list-style-type: none"> – Promenade and Waiting Area fit out – Commission equipment and wharf (including berthing trials) 	31 days	6

Table 2.5 Noise modelling scenarios, equipment and noise levels

Scenario	Name	Working hours	Activity sound power level (SWL), dBA	
			L _{Aeq} (15 min)	L _{Amax}
1	Site establishment – land based	Standard hours	113	-
2	Demolition (including removal of piles)	Standard hours	115	-
3	Dredging	Standard hours	112	-
4	Piling (impact)	OOHW Period 2 (11 pm to 7 am)	125	136
5	Wharf construction	Standard hours OOHW Period 2 (11 pm to 7 am)	113	118
6	Finishing works / fit out	Standard hours	111	-
7	Operation of site compounds	All approved working hours	112	115

Table 2.6 Indicative required construction equipment

Equipment	Equipment sound power level (SWL), dBA	Scenario						
		1	2	3	4	5	6	7
Bob cat	105	1						
Compressor	105							1
Concrete pump	109					2		
Concrete truck (may do kibble from water)	109					4		
Crane barge	108		1		1	1		
Crane mounted vibrator (for removal of piles)	115		1					
Excavator	110	1						
Excavator barge	110			1				
Franna crane	98	1				1	1	
Hand tools	94		4			10		
Hopper and workboat	108			2				

Equipment	Equipment sound power level (SWL), dBA	Scenario						
		1	2	3	4	5	6	7
Impact piling rig / Barge pneumatic piling hammer (worst case method)	125				1			
Light vehicles	103	10	10			10	10	10
Oxy acet cutting	96		1					
Power generator	103	1				3	3	1
Scissor lift	98	1					1	
Site buildings/toilets	0	6						
Site fencing	0	2						
Storage barge	108		4		1			
Temp wiring and electricity supply	0	2						
Truck / barge	108	5	5		5	5	5	5
Tug to barge movements	105		4		3			
Vibratory roller	109	1						
Welding equipment	105					2		1
Workboat	103	10	10			10	10	

2.2.5 Construction road traffic assessment

Road traffic noise levels during construction and operation are assessed against the RNP road traffic noise criteria (see Section 4.3) to identify any potential noise impacts at residences. Noise modelling was undertaken using the TfNSW construction noise estimator tool utilising the CoRTN (Department of Transport, Welsh Office, 1988) method to assess the noise level from the construction traffic.

2.3 Operational noise assessment

A review of significant operational activities associated with the new wharf, such as vessel movements and operation of mechanical plant, determined minimal operation noise impacts are likely. A qualitative discussion of impacts is provided in Section 5.5.

3. Existing environment

3.1 Study area

The study area for the noise assessment has been identified to be 2 kilometres from the proposal site. The noise study area includes the sensitive receivers identified in each of the Noise Catchment Areas (NCAs) outlined in this Section 3.1.1 and has been selected to ensure all potential noise impacts are captured.

3.1.1 Noise catchment areas

The study area for the construction noise assessment has been divided into 4 Noise Catchment Areas. Table 3.1 provides a description of the typical land use types within each NCA.

Table 3.1 Description of Noise Catchment Areas (NCAs)

NCA	Area	Land use types within area
1	Residential area west of Manly Harbour	General Residential (R1), Public Recreation (RE1)
2	Central business area of Manly	Local Centre (B2), Medium Density Residential (R3)
3	Northern area adjacent to Pittwater Road	General Residential (R1), Medium Density Residential (R3), Neighbourhood centre (B1)
4	Residential area east of Manly Harbour and residential area in Balgowlah south of Manly Harbour	General Residential (R1), Low Density Residential (R2), Special Activities (SP1), Environmental Conservation (C2),

3.1.2 Sensitive receivers

Noise sensitive land uses are defined based on the type of occupancy and the activities performed in the land use. For the purposes of this assessment, receivers sensitive to noise and vibration have been categorised as:

- Residential, and
- Non-residential:
 - educational institutes and classrooms at schools
 - hospital wards and operating theatres (not applicable to the study area)
 - places of worship
 - passive and active recreational areas such as parks, sporting fields, golf courses. Note that these recreational areas are only considered sensitive when they are in use or occupied
 - hotels and other temporary accommodation buildings
 - commercial buildings including businesses, retail, offices, sports centres, bars/cafes etc.
 - industrial premises
 - Little penguin breeding area.

The sensitive receivers identified in the study area are shown in Figure 3.1 and listed in detail in Appendix C.

3.1.3 Heritage receivers

The study area for vibration impacts to heritage structures is identified to be 100 metres from the proposal works. The following heritage structures have been identified within this area:

- Manly wharf (Local: ID I145 and State: SHR #01434)
- Former Fun Pier, Manly wharf (Local ID I146)
- Governor Phillip Monument (Local ID I248)
- Residential building ‘Abbyleix’ at 2 Victoria Parade, Manly (Local ID I149)

- Commercial and residential buildings in Manly commercial centre including, two terrace houses (Local ID I150), commercial buildings on The Corso (Local ID I106) and the heritage conservation area (Local ID C2)

3.2 Existing noise environment

Noise monitoring was undertaken from Monday 18 July 2022 until Wednesday 27 July 2022 in 4 locations representative of residential areas to quantify and characterise the existing ambient noise environment across the study area. The long-term noise monitoring program was undertaken in accordance with *Noise Policy for Industry* (EPA, 2017) and the full noise monitoring methodology is outlined in Appendix B, along with the results of the attended noise monitoring survey at each location.

The noise monitoring locations are shown in Figure 3.1. The unattended noise monitoring results are presented in Table 3.2 for each monitoring location.

Table 3.2 Unattended noise monitoring results, dBA

Location	Rating Background Level ¹ (RBL), L _{A90} (Period)			Ambient noise descriptors ¹ L _{Aeq} (period)		
	Day	Evening	Night	Day	Evening	Night
M1	46	42	38	57	54	50
M2	55	53	48	60	57	55
M3	46	44	38	59	51	56
M4	47	46	43	57	51	49

Note: 1. The *Noise Policy for Industry (NPI)* defines day, evening and night-time periods as:

- Day: 7am to 6pm Monday to Saturday and 8am to 6pm Sunday
- Evening: 6pm to 10pm
- Night: 10pm to 7am Monday to Saturday and 10pm to 8am Sunday.

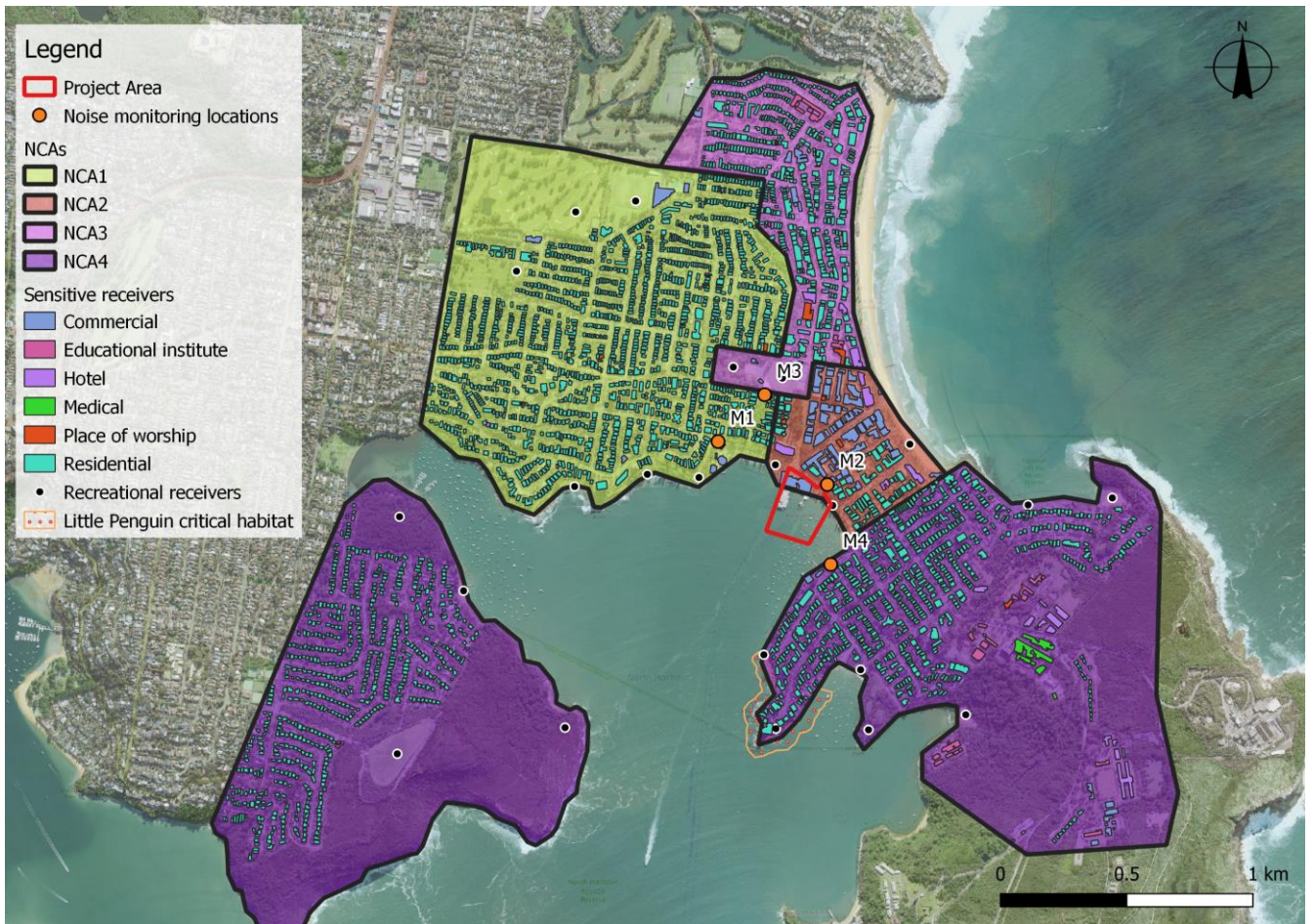


Figure 3.1 Proposal location, noise catchment areas and sensitive receivers.

4. Assessment criteria

4.1 Construction noise

4.1.1 Construction noise management levels

Construction noise management levels for residential premises and other sensitive land uses are provided in Table 2 and Table 3 of the *Interim Construction Noise Guideline*. The method to determine the noise management levels for residential receivers in accordance with the *Construction Noise and Vibration Guideline* is outlined in Table 4.1. Noise management levels for other sensitive land uses are provided in Table 4.2 and only apply when the properties are in use.

Table 4.1 Noise management levels for residential receivers

Time of day	Noise management level, $L_{Aeq}(15min)$	Application notes
Recommended standard hours	Noise affected: RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq}(15 min)$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected: RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should consult with the community. For guidance on negotiating agreements see Section 7.2.2 of the <i>Interim Construction Noise Guideline</i> .

Table 4.2 Noise management levels for other sensitive land uses

Land Use	Noise management level, $L_{Aeq}(15 min)$ dBA
Commercial premises	70 (external)
Industrial premises	75 (external)
Educational institutes	45 (internal)
Hospital wards and operating theatres	45 (internal)
Places of worship	45 (internal)
Active recreation areas	65 (external)
Passive recreation areas	60 (external)

4.1.2 Sleep disturbance

The ICNG recommends that where construction works are planned to extend over two or more consecutive nights, the Proposal should consider maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL. The potential for both sleep disturbance and awakenings should be considered in the assessment.

The NPI provides the latest EPA guidance for the assessment of sleep disturbance. The NPI recommends a maximum noise level assessment to assess the potential for sleep disturbance impacts which include awakenings and disturbance to sleep stages. An initial screening test for the maximum noise levels events should be assessed to the following levels.

- LAeq(15 min) 40 dBA or the prevailing RBL plus 5 dB, whichever is greater, and/or
- LAFmax 52 dBA or the prevailing RBL plus 15 dB, whichever is greater.

If the screening test indicates there is a potential for sleep disturbance, then a detailed maximum noise level assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

4.1.3 Proposal noise management levels

A summary of the Proposal construction noise management levels for each identified sensitive receiver type is provided in Table 4.3.

Table 4.3 Proposal construction noise management levels, dBA

Receiver type	Time of day		Management level, dBA
Residential – NCA1	Recommended standard hours		Noise affected: 56
			Highly noise affected: 75
	Outside recommended standard hours	Day	51
		Evening	47
		Night	43
			L _{AFmax} 53 sleep disturbance
Residential – NCA2	Recommended standard hours		Noise affected: 65
			Highly noise affected: 75
	Outside recommended standard hours	Day	60
		Evening	58
		Night	53
			L _{AFmax} 63 sleep disturbance
Residential – NCA3	Recommended standard hours		Noise affected: 56
			Highly noise affected: 75
	Outside recommended standard hours	Day	51
		Evening	49
		Night	43
			L _{AFmax} 53 sleep disturbance

Receiver type	Time of day	Management level, dBA	
Residential – NCA4	Recommended standard hours	Noise affected: 57	
		Highly noise affected: 75	
	Outside recommended standard hours	Day	52
		Evening	51
		Night	48
		L _{AFmax} 58 sleep disturbance	
Commercial	When in use	70 (external)	
Industrial	When in use	75 (external)	
School, hospital, POW	When in use	45 (internal)	
Recreation	When in use	60 (external)	

4.2 Construction vibration

4.2.1 Human comfort

Acceptable vibration levels for human comfort have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006) which is based on the guidelines contained in British Standard *BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*.

Typically, construction activities generate ground vibration of an intermittent nature. Intermittent vibration is assessed using the vibration dose value. Acceptable values of vibration dose are presented in Table 4.4 for sensitive receivers.

Table 4.4 Human comfort intermittent vibration limits (BS 6472-1992)

Receiver type	Period	Intermittent vibration dose value (m/s ^{1.75})	
		Preferred value	Maximum value
Residential	Day (7 am to 10 pm)	0.2	0.4
	Night (10 pm to 7 am)	0.13	0.26
Offices, schools, educational institutes and places of worship	When in use	0.4	0.8

Whilst the assessment of response to vibration in BS 6472:1992 is based on vibration dose value and weighted acceleration, for construction related vibration, it is considered more appropriate to provide guidance in terms of a peak value, since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage.

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in British Standard, *BS 5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration* and are shown below in Table 4.5.

Table 4.5 Guidance on effects of vibration levels for human comfort

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments will cause complaints but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

4.2.2 Guidelines for general structures

The effects of transient vibration on structures is considered in *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. The criteria provided in BS 7385 are presented in Table 4.6.

Table 4.6 Transient vibration guide values – minimal risk of cosmetic damage

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

The guide values in Table 4.6 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at lower frequencies, then the guide values may need to be reduced by up to 50 per cent.

The predominant vibration for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and excavators occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- reinforced or framed structures: 25.0 mm/s
- unreinforced or light framed structures: 7.5 mm/s.

4.2.3 Guidelines for vibration sensitive structures

Heritage buildings and structures would be assessed using the guide values in Table 4.6. A heritage building or structure should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) should be considered.

4.3 Construction traffic criteria

The *Road Noise Policy* provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network.

The *Road Noise Policy application notes* state that any increase in the total noise level at existing residences and other sensitive land uses affected by traffic generation on existing roads should be limited to 2 dBA above current levels. This limit only applies when the noise level without the development is within 2 dBA or exceeds the road traffic noise criterion provided in the RNP.

This has been used to identify potential impacts as a result of noise produced by construction traffic. If road traffic noise increases as a result of construction works within 2 dBA of current levels, then the objectives of the RNP are considered to be met and no specific mitigation measures would be required.

Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment against the road traffic noise criteria in Table 4.7 is required.

Table 4.7 Road traffic noise criteria, dBA

Type of development	Day, $L_{Aeq}(15 \text{ hour})$ 7 am to 10 pm	Night, $L_{Aeq}(9 \text{ hour})$ 10 pm to 7 am
Existing residence affected by additional traffic on freeway/arterial/sub-arterial roads	60	55
Existing residence affected by additional traffic on local roads	55	50

4.4 Operational noise

4.4.1 Vessel noise

There are no noise criteria for vessels. Part 5, clause 35 of the Protection of the Environment Operations (Noise Control) Regulation 2017, states that a person must not cause a vessel to be used on navigable waters in such a way as to emit offensive noise.

4.4.2 Noise Policy for Industry

Operational noise emanating from the wharf including any mechanical plant would be designed to comply with the project noise trigger levels (PNTL) in the NPI. The proposal's noise trigger level is the lower value of the intrusiveness noise level and the amenity noise level. The intrusiveness noise aims to protect against significant changes in noise levels and the amenity noise level aims to protect against cumulative noise impacts from existing industry and noise sources within the area. The PNTL for residential receivers is presented below in Table 4.8 and non-residential receivers Table 4.9.

Table 4.8 NPI operational criteria for residential receivers

Time of day	Intrusiveness noise criteria $L_{Aeq}(15 \text{ min})$ BG ¹ +5), dBA	Amenity noise criteria $L_{Aeq}(15 \text{ min})$, dBA ^{2,3}	PNTL $L_{Aeq}(15 \text{ min})$, dBA
Day (7 am to 6 pm)	45	53	45
Evening (6 pm to 10 pm)	45	43	43
Night (10 pm to 7 am)	41	38	38

- Notes:
1. Background noise level $L_{Aeq}(15 \text{ min})$
 2. The amenity noise criteria is defined as the recommended amenity level minus 5 dB. The recommended amenity $L_{Aeq}(\text{period})$ noise level for residential suburban is defined as:
 - Day: 55 dBA
 - Evening: 45 dBA
 - Night: 40 dBA
 3. A – 3 dB correction is applied to convert the $L_{Aeq}(\text{period})$ descriptor to the $L_{Aeq}(15 \text{ min})$ descriptor

Table 4.9 NPI operational criteria for non-residential receivers

Receiver Type	Time of day	PNTL $L_{Aeq}(15 \text{ min})$, dBA
Commercial	When in use	63 ¹
Industrial	When in use	68 ¹
Educational	Noisiest 1 hour	35 (internal) 45 (external)

Receiver Type	Time of day	PNTL L _{Aeq(15 min)} , dBA
Hospital / medical	When in use	35 (internal) 45 (external)
Place of worship	When in use	48 ¹

Note: 1. A + 3 dB correction has been applied to convert L_{Aeq(15 min)} to L_{Aeq(15 min)}

4.5 Hearing sensitivity of Little Penguins

Certain fauna that are potentially present in the study area could be impacted by construction noise. A review of the Manly wharf 3 Upgrade - Biodiversity Assessment Report (Cardno, 2022) identified the presence of a breeding area for Little Penguins classified as an Area of Outstanding Biodiversity Value (AOBV) being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline which is approximately .

Different species of fauna have different hearing sensitivities, depending on the evolutionary structure of the hearing organ. Three noise zones are identified based on the behavioural or physical response of fauna as follows:

- **Permanent Threshold Shift (PTS)** – a permanent reduction in hearing sensitivity caused by irreversible damage to the sensory hair cells of the ear.
- **Temporary Threshold Shift (TTS)** – a temporary reduction in hearing sensitivity as a result of exposure to sound. Exposure to high levels of sound over relatively short time periods can cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The duration of TTS varies depending on the nature of the stimulus.
- **Behavioural response** – a response that does not cause damage or harm, but may cause animals to behave in a manner unnatural to their behaviour in the absence of the noise source. This is due to the masking of biologically important sounds relied upon by the fauna.

Effects of Noise on Aquatic Life (Hawkins and Popper, 2012) provides noise levels for these zones for penguins in air and are provided in Table 4.10. Noise levels have been predicted to the nearest provided nesting location of the Little Penguins in the study area shown on Figure 3.1.

Table 4.10 Threshold levels for hearing sensitivity of Little Penguins

Zone	Noise level
PTS	110 dBA (continuous)
TTS	90-95 dBA (continuous)
Behavioural	80 dB

5. Impact assessment

5.1 Construction noise impacts

Predicted construction noise levels during standard hours from the construction scenarios outlined in Table 2.5 are presented in Appendix C. Construction noise contours for each modelled scenario are provided in Appendix D. A summary of the number of exceedances of the noise management levels for all receivers is presented in Table 5.1 and Table 5.2 for impacts during standard hours and night works respectively.

Exceedances of the construction noise management levels are typical for construction projects of this scale. The noise impacts would be limited to the construction period only and would not have lasting effects on the community. The maximum noise impacts would be expected during the required impact piling works. Furthermore, all construction equipment would be operational intermittently and not continuously. As such, impacts on nearby sensitive receivers would only occur over a short duration over the approximate 8 month construction period.

All feasible and reasonable work practices would be applied to minimise noise during construction. It is unlikely, without changing the source noise levels, however that mitigation measures would reduce the construction noise levels to below the noise management levels. The magnitude of construction noise impacts are dependent upon a number of factors including the intensity and location of activities, the type of equipment used, background noise levels during the construction period and weather conditions. Based on these parameters, the predicted construction noise levels are generally conservative and do not represent a constant noise emission that would be experienced by the community on a daily basis throughout the proposal construction period.

These impacts can be minimised by implementing noise management controls and standard noise mitigation measures documented in the CNVG. Further details of the recommended noise mitigation measures are detailed in Section 6.

5.1.1 Impacts during standard hours

Table 5.1 outlines the number of exceedances and highest predicted noise levels at residential receivers within each of the NCAs for each construction scenario. No impacts are predicted at residential receivers during demolition works (S02), dredging (S03), wharf construction (S05) and fit out works (S06) during standard hours.

During site establishment (S01) three residences within NCA1 and five residences within NCA2 are predicted to experience noise levels above the noise management levels, with predicted noise levels above the highly noise affected level, shown in red in Table 5.1, at 37-38 East Esplanade, Manly (R2875). Operation of the construction compound (S07) is predicted to result in four exceedances of the NMLs within NCA2 during standard hours.

Although impact piling works (S04) are proposed to occur only during OOHV Period 2, noise impacts during standard hours have been predicted. Impacts at a large number of residences within NCA1, NCA2 and NCA4 are predicted, however, no receivers are expected to be highly noise affected (ie experience levels above 75 dBA).

Table 5.1, similarly, outlines the number of exceedances and highest predicted noise levels at non-residential receivers within the study area for each construction scenario. No impacts are predicted at any active recreation, educational institutions or medical facilities within the study area for any scenario. Minimal impacts are predicted at other non-residential receivers, with site establishment (S01) resulting in the highest number of impacts.

These noise impacts would be managed during the construction period with the mitigation and management measures outlined in Section 6

Table 5.1 Summary of construction scenario exceedances during standard hours, $L_{Aeq}(15 \text{ min})$

Receiver Type		NML, dBA		S01	S02	S03	S04	S05	S06	S07
Residential	NCA1	56	Number of exceedances	3	-	-	109	-	-	-
			Highest noise level, dBA	60	54	52	66	52	50	52
	NCA2	65	Number of exceedances	5	-	-	15	-	-	4
			Highest noise level, dBA	77	65	61	74	63	61	74
	NCA3	56	Number of exceedances	-	-	-	-	-	-	-
			Highest noise level, dBA	48	44	41	54	42	40	40
	NCA4	57	Number of exceedances	-	-	-	140	-	-	-
			Highest noise level, dBA	55	57	54	67	55	53	54
Commercial		70	Number of exceedances	4	1	1	3	1	1	1
			Highest noise level, dBA	84	87	72	107	85	83	76
Hotel		50	Number of exceedances	1	1	-	4	1	-	1
			Highest noise level, dBA	69	53	47	63	51	49	56
Educational institute		45	Number of exceedances	-	-	-	18	-	-	-
			Highest noise level, dBA	42	42	39	52	40	38	36
Medical		45	Number of exceedances	-	-	-	5	-	-	-
			Highest noise level, dBA	37	38	35	48	36	34	34
Place of Worship		45	Number of exceedances	2	1	-	7	-	-	-
			Highest noise level, dBA	46	48	41	58	45	43	45
Active recreation		65	Number of exceedances	-	-	-	-	-	-	-
			Highest noise level, dBA	44	41	38	52	39	37	37
Passive recreation		60	Number of exceedances	2	1	1	4	1	0	1
			Highest noise level, dBA	68	65	61	74	62	60	67

5.1.2 Impacts outside standard hours

For safety and environmental reasons, impact piling works (S04) are proposed between the hours 11 pm and 7 am, during OOHW Period 2. Additionally, construction of the new gangway, hydraulic platform and main waiting area canopy (S05) and operation of the construction compound (S07) are required during OOHW Period 2. Table 5.2 provides a summary of the impacts at residential receivers during the proposed OOHW periods and includes an assessment of the L_{Amax} noise levels against the sleep disturbance criteria.

Due to the loud nature of the works proposed during the night, a large number of receivers are predicted to experience noise levels above the NMLs during any night works. This includes sleep disturbance impacts assessed against the sleep disturbance screening criteria. A total of 1277 receivers are predicted to experience noise levels above the OOHW Period 2 NML during impact piling works, however no receivers are expected to perceive highly intrusive levels greater than 25 dBA above the NML.

All reasonable and feasible mitigation measure should be implemented to reduce the number of impacts to residents during these works. Where reasonable and feasible, impact piling works should be completed during less sensitive time periods with consideration for respite. Additionally, alternative piling methods should be considered. Should impact piling be required during OOHW periods, justification should be provided in accordance with the CNVG for OOHW work and additional mitigation measures outlined in Section 6.4 should be implemented.

Table 5.2 Summary of construction scenario exceedances during OOHW Period 2

Receiver Type		NML		S04		S05		S07	
Assessment				$L_{Aeq}(15 \text{ min})$	L_{Amax}	$L_{Aeq}(15 \text{ min})$	L_{Amax}	$L_{Aeq}(15 \text{ min})$	L_{Amax}
Residential	NCA1	$L_{Aeq}(15 \text{ min})$ 43 L_{Amax} 53	Number of exceedances	640	675	120	31	40	3
			Highest noise level, dBA	66	77	52	57	52	55
	NCA2	$L_{Aeq}(15 \text{ min})$ 53 L_{Amax} 43	Number of exceedances	54	58	15	4	11	6
			Highest noise level, dBA	74	85	63	68	74	77
	NCA3	$L_{Aeq}(15 \text{ min})$ 43 L_{Amax} 53	Number of exceedances	102	131	-	-	-	-
			Highest noise level, dBA	54	65	42	47	40	43
	NCA4	$L_{Aeq}(15 \text{ min})$ 48 L_{Amax} 58	Number of exceedances	481	541	62	11	24	-
			Highest noise level, dBA	67	78	55	60	54	57

5.2 Construction vibration impacts

5.2.1 Vibration intensive equipment

The worst- case vibration intensive equipment proposed to be used during construction are identified in Table 5.3. The relevant construction sub-scenarios where each item would be used is also shown along with the adopted safe working distances.

Table 5.3 Vibration intensive equipment and safe working distances – sub-scenario specific

Equipment	Construction sub-scenarios with vibratory intensive equipment	Human comfort (AVTG guideline)	Damage to standard structures (BS 7385)	Vibration screening distance for heritage structures
Impact piling rig	S4 – Piling	50 m	15 m	45 m
Vibratory roller (1-2 tonnes)	S1 – Site establishment of landside compound area	15 m to 20 m	5 m	15 m

5.2.2 Standard structures within safe working distances

With consideration to the safe working distances provided in Table 5.3, no structures are expected to experience structural damage or human comfort vibration impacts. Should a vibratory roller be required for the site establishment of the construction compound it should not exceed a limit of 2 tonnes in order to avoid human comfort vibration impact to structures on East Esplanade.

5.2.3 Heritage and sensitive infrastructure items within safe working distances

Impact piling works have the potential to cause vibration impacts to the heritage structure of Manly wharf within 45 metres if found to be structurally unsound. Since piles are required to reconstruct the foundation of the wharf, piling will be required within this distance of the heritage wharf and therefore the structural integrity of the wharf should be confirmed prior to construction. Vibration monitoring may be required if the works are within the cosmetic damage buffer distances.

5.3 Construction traffic impacts

The RNP recommends that “any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding ‘without construction’ scenario.” Construction would generate heavy vehicle movements associated with the transportation of construction machinery, equipment and materials to the site. Light vehicle movements would be associated with employees and smaller deliveries.

The main access to the proposal site is via Sydney Road and East Esplanade. Traffic generation from the proposal has been estimated to be 5 heavy vehicles and 10 light vehicles.

No existing traffic numbers are available for these routes, however for the traffic generation to increase the traffic noise by 2 dB the number of vehicles would need to be less than 16 light vehicles and 8 heavy vehicles in the day.

Existing traffic volumes are significantly greater than the construction traffic generation, therefore no impacts are predicted due to construction traffic along the proposed route.

5.4 Potential noise impacts to Little Penguins

A high-level noise assessment has been undertaken for transient construction activities that may cause adverse responses for the Little Penguins in Manly. Noise levels have been predicted at the nearest known nesting location of the Little Penguin shown on Figure 3.1 and assessed against the levels outlined in Section 4.5.

The loudest noise level predicted is 54 dBA and 67 dBZ (unweighted) during impact piling works. This is well below the proposed noise levels in the Biodiversity Assessment Report for the PTS and TTS zones and behavioural impacts. The predicted levels indicate that potential impacts on Little Penguins from construction noise are unlikely.

5.5 Operational noise impacts

The operation of Manly wharf, with respect to timetabled ferry movements, is expected to remain unchanged. As such operational noise impacts are not anticipated and have not been quantitatively assessed. Part 5, clause 35 of the Protection of the Environment Operations (Noise Control) Regulation 2017, states that a person must not cause a vessel to be used on navigable waters in such a way as to emit offensive noise. It is expected all vessels would be operated so as not to emit offensive noise.

The main potential operational noise generating sources from the upgrade of Manly wharf are any mechanical plant, if required to be operated at the wharf. Should such plant items be required they will need to be designed to meet the project noise trigger levels outlined in Section 4.4.

6. Mitigation measures

6.1 Approach

The ICNG acknowledges that due to the nature of construction projects in urban areas it is inevitable that there would be noise impacts near construction sites. The NMLs have been established to represent the level at which there may be some community reaction to noise. Where the predicted or measured noise level is greater than the NML, the proponent would apply all feasible and reasonable work practices to meet the noise affected level and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.

Where the highly noise affected level is exceeded, respite periods (restricting the hours that very noisy activities would occur) may be required. When scheduling respite periods, the following should be taken into account:

1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)
2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction time.

For works outside the ICNG recommended standard hours:

- A strong justification would be required for these works.
- The proponent should apply all feasible and reasonable works practices to meet the NML.
- Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the NML, the proponent should negotiate with the community.

A Construction Environmental Management Plan (CEMP) would be prepared by the construction contractor and implemented through all construction activities. A Construction Noise and Vibration Management Plan (CNVMP) would be included in the CEMP to provide the framework for the management and mitigation of potential construction noise and vibration impacts.

Potential impacts would be managed in accordance with the CNVG, which aims to manage noise levels through reasonable and feasible measures. The CNVG provides a process for the development of site or activity specific Construction Noise and Vibration Impact Statements (CNVIS), standard mitigation measures and additional mitigation measures to be implemented based on NMLs.

6.2 CNVG standard mitigation measures

The CNVMP would consider the following CNVG mitigation measures outlined in Table 6.1.

Table 6.1 Construction noise mitigation measures

Action required	Details
Management measures	
Implementation of any Proposal specific mitigation measures required	In addition to the measures set out in this table, any Proposal specific mitigation measures identified in the REF must be implemented.
Implement stakeholder consultation measures	<p>Periodic notification (monthly letterbox drop and website notification) detailing all upcoming construction activities delivered to sensitive receivers at least seven days prior to commencement of relevant works.</p> <p>In addition to periodic notification, the following strategies may be adopted on a case-by-case basis:</p> <ul style="list-style-type: none"> – Proposal specific website – Proposal Infoline – construction response line – email distribution list

Action required	Details
	<ul style="list-style-type: none"> – web-based surveys – social media – community and stakeholder meetings and – community based forums (if required by approval conditions).
Register of noise and vibration sensitive receivers	<p>A register of most affected noise and vibration sensitive receivers (NVSRs) would be kept on site. The register would include the following details for each NVSR:</p> <ul style="list-style-type: none"> – address of receiver – category of receiver – contact name and phone number. <p>The register may be included as part of the Proposal's Community Liaison Plan or similar document and maintained in accordance with the requirements of this plan.</p>
Construction hours and scheduling	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating noise with special audible characteristics and/or vibration levels should be scheduled during less sensitive time periods.
Construction respite period	<p>Noise with special audible characteristics and vibration generating activities (including jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.</p> <p>'Continuous' includes any period during which there is less than 1 hour respite between ceasing and recommencing any of the work.</p> <p>No more than two consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same Noise Catchment Area (NCA) over any 7-day period, unless otherwise approved by the relevant authority.</p>
Site inductions	<p>All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:</p> <ul style="list-style-type: none"> – all relevant Proposal specific and standard noise and vibration mitigation measures – relevant licence and approval conditions – permissible hours of work – any limitations on noise generating activities with special audible characteristics – location of nearest sensitive receivers – construction employee parking areas – designated loading/unloading areas and procedures – site opening/closing times (including deliveries) – environmental incident procedures.
Behavioural practices	<p>No swearing or unnecessary shouting or loud stereos/radios on site.</p> <p>No dropping of materials from height, throwing of metal items and slamming of doors.</p> <p>No excessive revving of plant and vehicle engines.</p> <p>Controlled release of compressed air.</p>
Monitoring	A noise monitoring program should be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Source control measures	
Plan worksites and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Equipment selection	<p>Use quieter and less vibration emitting construction methods where feasible and reasonable.</p> <p>For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits.</p>
Maximum noise levels	The noise of plant and equipment must have operating Sound Power or Sound Pressure Levels compliant with the allowable noise levels in Appendix C of the <i>Construction Noise and Vibration Strategy</i> (TfNSW, 2019).

Action required	Details
Use and siting of plant	<p>Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided.</p> <p>The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.</p> <p>Plant used intermittently to be throttled down or shut down.</p> <p>Noise-emitting plant to be directed away from sensitive receivers.</p>
Non-tonal reversing alarms	<p>Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work, including delivery vehicles.</p>
Minimise disturbance arising from delivery of goods to construction sites	<p>Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</p> <p>Select site access points and roads as far as possible away from sensitive receivers.</p> <p>Dedicated loading/unloading areas to be shielded if close to sensitive receivers.</p> <p>Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.</p>
Construction related traffic	<p>Schedule and route vehicle movements away from sensitive receivers and during less sensitive times.</p> <p>Limit the speed of vehicles and avoid the use of engine compression brakes.</p> <p>Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.</p>
Silencers on mobile plant	<p>Where possible reduce noise from mobile plant through additional fittings including:</p> <ul style="list-style-type: none"> – residential grade mufflers – damped hammers such as “City” Model Rammer Hammers – air parking brake engagement is silenced.
Prefabrication of materials off-site	<p>Where practicable, pre-fabricate and/or prepare materials off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation.</p>
Engine compression brakes	<p>Limit the use of engine compression brakes at night and in residential areas.</p> <p>Ensure vehicles are fitted with a maintained original equipment manufacturer exhaust silencer that complies with the National Transport Commissions ‘in-service test procedure’ and standard.</p>
Path control measures	
Shield stationary noise sources such as pumps	<p>Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436:1981 lists materials suitable for shielding</p>
Shield sensitive receivers from noisy activities	<p>Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when siting plant.</p>

6.3 Project specific mitigation measures

In addition to the standard mitigation measures provided in the CNVG, project specific measures have been developed to reduce noise and vibration impacts identified in the assessment. These measures are outlined in Table 6.2 below.

Table 6.2 Project specific mitigation measures

Mitigation I.D	Mitigation / management measure	Description of measure
NV1	Piling would be conducted during less sensitive time periods, where possible	To reduce the number and extent of noise impacts piling should be conducted in continuous blocks not exceeding 3 hours between the hours 8 am to 5 pm Monday to Friday and 9 am to 1 pm on Saturday
NV2	Use low noise piling methods, instead of impact piling, where possible	Vibratory piling can reduce noise levels by approximately 4 dBA and should be used rather than impact piling where reasonable and feasible. Bored piling can reduce noise levels by approximately 13 dBA and should be used rather than vibratory or impact piling where reasonable and feasible.
NV3	Additional mitigation measures should be implemented, particularly for piling works, to reduce impacts	Additional mitigation measures provided in the CNVG would be implemented as outlined in Section 6.4.
NV4	Structural integrity of the wharf would be determined prior to vibration intensive works	A dilapidation report of the historic Manly wharf would be undertaken to determine specific vibration management levels prior to piling works within 45 metres of the structure.
NV5	Vibration monitoring	If there is any risk of exceedance of the cosmetic damage objective, after completion of the dilapidation report, a permanent vibration monitoring system should be installed, to warn plant operators (via flashing light, audible alarm, SMS, etc) when vibration levels are approaching the cosmetic damage objective.
NV6	Vibratory rolling would be conducted using a maximum 2 tonne roller	To avoid any vibration impacts to structures on East Esplanade, a maximum 2 tonnes roller would be used during the site establishment.

6.4 Additional mitigation measures

The CNVG provides the following information regarding further mitigation measures for certain receivers exceeding noise management levels and are presented below in Table 6.3. As part of the CNVMP, the Additional Mitigation Measures Matrices, presented below in Table 6.4, would be used to determine the additional measures after the application of standard mitigation measures where reasonable and feasible.

Additional mitigation measures for residents have been determined for impact piling works during OOHW Period 2 and are shown on Figure 6.1 which would represent a worst case construction noise scenario. Additionally, the number of receivers within each mitigation category is shown on the figure. A total of 1277 receivers are predicted to experience noise levels above the NML during these works, however no receivers are expected to perceive highly intrusive levels greater than 25 dBA above the NML.

Table 6.3 Additional management measures

Measure	Description	Abbreviation
Periodic notification	For each Transport for NSW Infrastructure and Place (IP) project, a notification entitled 'Project Update', or 'Construction Update' is produced and distributed to stakeholders via letterbox drop and distributed to the Proposal postal and/or email mailing lists. Periodic notifications provide an overview of current and upcoming works across the Proposal and other topics of interest. The objective is to engage, inform and provide Proposal-specific messages. Advanced warning of potential disruptions (eg traffic changes or noisy works) can assist in reducing the impact on stakeholders. The approval conditions for projects specify requirements for notification to sensitive receivers where works may impact on them. Content and length are determined on a project-by-project basis and must be approved by Transport for NSW prior to distribution.	PN

Measure	Description	Abbreviation
	<p>Most projects distribute notifications on a monthly basis. Each notification is graphically designed within a branded template. In certain circumstances media advertising may also be used to supplement Periodic Notifications, where considered effective.</p> <p>Periodic Notification may be advised by the IP Community Engagement Team in cases where additional management measures are not triggered as shown in Tables 9 to 11, for example where community impacts extend beyond noise and vibration (traffic, light spill, parking etc). In these circumstances the IP Community Engagement Team will determine the community engagement strategy on a case-by-case basis.</p>	
Verification Monitoring	<p>Verification monitoring of noise and/or vibration during construction may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver has been identified). Monitoring can be in the form of either unattended logging (ie for vibration provided there is an immediate feedback mechanism such as SMS capabilities) or operator attended surveys (ie for specific periods of construction noise).</p> <p>The purpose of monitoring is to confirm that:</p> <ul style="list-style-type: none"> – construction noise and vibration from the Proposal are consistent with the predictions in the noise assessment – mitigation and management of construction noise and vibration is appropriate for receivers affected by the works. <p>Where noise monitoring finds that the actual noise levels exceed those predicted in the noise assessment then immediate refinement of mitigation measures may be required and the Construction Noise and Vibration Impact Statement (CNVIS) amended.</p>	V
Specific Notification	<p>Specific notifications are in the form of a personalised letter or phone call to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. Alternatively (or in addition to), communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing.</p> <ul style="list-style-type: none"> – letters may be letterbox dropped or hand distributed – phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific needs – individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that will be implemented. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Proposal. <p>Specific notifications are used to support periodic notifications, or to advertise unscheduled works and must be approved by Transport for NSW prior to implementation/distribution.</p>	SN
Respite Offer	<p>The purpose of a Proposal specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact. The offer could comprise prepurchased movie tickets, bowling activities, meal vouchers or similar offer. This measure is determined on a case-by-case basis and may not be applicable to all IP projects.</p>	RO
Alternative Accommodation	<p>Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts. Alternative accommodation will be determined on a case-by-case basis and should provide a like-for-like replacement for permanent residents, including provisions for pets, where reasonable and feasible.</p>	AA
Alternative construction methodology	<p>Where the vibration assessment identifies that the proposed construction method has a high risk of causing structural damage to buildings near the works, the proponent will need to consider alternative construction options that achieve compliance with the Vibration Management Level (VMLs) for building damage. For example, replace large rock breaker with smaller rock breakers or rock saws.</p>	AC

Measure	Description	Abbreviation
Respite Period	OOHW during evening and night periods will be restricted so that receivers are impacted for no more than 3 consecutive evenings and no more than 2 consecutive nights in the same NCA in any one week. A minimum respite period of 4 evenings/5 nights shall be implemented between periods of evening and/or night works. Strong justification must be provided where it is not reasonable and feasible to implement these period restrictions (eg to minimise impacts to rail operations), and approval must be given by Transport for NSW through the OOHW Approval Protocol. Note: this management measure does not apply to OOHW Period 1 – Days.	RP
Duration Reduction	Where Respite Periods (see management measure above) are considered to be counterproductive to reducing noise and vibration impacts to the community it may be beneficial to increase the number of consecutive evenings and/or nights through Duration Reduction to minimise the duration of the activity. This measure is determined on a project-by-project basis and may not be applicable to all IP projects. Impacted receivers must be consulted and evidence of community support for the Duration Reduction must be provided as justification for the Duration Reduction. A community engagement strategy must be agreed with and implemented in consultation with IP Community Engagement Representatives.	DR

Table 6.4 Triggers for additional mitigation measures – airborne noise

Construction hours	Receiver perception	dBA above RBL ¹	dBA above NML	Additional management measures
Standard Hours: Mon – Fri (7am – 6pm), Sat (8am – 1pm), Sun/Public Holiday (Nil)	Noticeable	5 to 10	0	-
	Clearly audible	> 10 to 20	< 10	-
	Moderately intrusive	> 20 to 30	> 10 to 20	PN, V
	Highly intrusive	> 30	> 0	PN, V
	75 dB(A) or greater	N/A	N/A	PN, V, SN
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 1pm – 10pm), Sun/Public Holiday (8am – 6pm)	Noticeable	5 to 10	< 5	-
	Clearly audible	> 10 to 20	5 to 15	PN, RP ² , DR ²
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RO, RP ² , DR ²
	Highly intrusive	> 30	> 25	PN, V, SN, RO, RP ² , DR ²
OOHW Period 2: Mon – Sat (12am – 7am), Sun/Pub Holiday (12am – 8am, 6pm – 12am)	Noticeable	5 to 10	< 5	PN
	Clearly audible	> 10 to 20	5 to 15	PN, V, SN, RO ³ , RP ² , DR ²
	Moderately intrusive	> 20 to 30	> 15 to 25	PN, V, SN, RO ³ , RP ² , DR ²
	Highly intrusive	> 30	> 25	PN, V, SN, RO ³ , AA ² , RP ² , DR

Notes:

- SWLs used for the purpose of estimating noise impact shall be increased by 5dB(A) where works will include: power saws for the cutting of timber, masonry & steel; grinding of metal, concrete or masonry; rock/line drilling; bitumen milling & profiling; jack hammering, rock hammering & rock breaking; or impact piling as a correction factor for noise with special audible characteristics. It is noted that this correction factor is automatically calculate under Step 2 of the Construction Noise Estimator Tool (see Appendix E).
- Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (ie Saturday 6am - 7am & 1pm - 6pm, Sundays / public holidays 8am - 6pm).
- Respite offers during OOHW Period 2 are only applicable for evening periods (ie Sundays / Public Holidays 6pm - 10pm) and may not be required if a respite offer has already been made for the immediately preceding OOHW Period 1.



Figure 6.1 Additional mitigation required for impact piling (S04) during OOHW Period 2

7. Conclusion

7.1 Construction noise

Construction of the proposal is expected to commence in 2023 and take up to 8 months to complete. Construction is proposed to be undertaken mainly during standard construction hours, with some works requiring out of hours work.

The predicated noise levels are expected to exceed the noise management level in some scenarios with one receiver exceeding the highly noise affected management level. Traffic noise impacts are not expected due to the minimal traffic generation and high levels of existing traffic. A large number of noise impacts are predicted during proposed OOHW Period 2, including sleep disturbance impacts. Additional mitigation measure would be implemented to control these impacts.

It is typical for construction projects to exceed the construction noise management levels. Any impacts due to construction works are temporary in nature and would not represent a permanent impact on the community and surrounding environment. The predicted noise levels are generally conservative and would only be experienced for limited periods during construction. Impacts may be reduced through the introduction of feasible and reasonable mitigation measures which have been recommended in Section 6.

7.2 Construction vibration

Safe working distances for vibration activities have been identified for standard structures and heritage listed structures, which includes the existing Manly wharf 3 as a heritage listed structure. A dilapidation report should be prepared for the heritage wharf and site-specific safe working distances are to be established prior to works commencing. The vibratory roller, which could potentially be used to establish the site compound, should not exceed 2 tonnes to avoid any vibration impacts to structures along East Esplanade.

7.3 Operational noise

The operation of Manly wharf 3, with respect to ferry vessel movements, is expected to remain unchanged. As such operational noise impacts are not anticipated. Any required mechanical plant should be designed to comply with the project noise trigger levels.

Appendix A

Acoustical terms and definitions

Acoustic concepts and terminology

Definition of 'noise'

Sound may be defined as any pressure variation that the human ear can detect. The terms "sound" and "noise" are more or less interchangeable however, "noise" is generally often referred to as unwanted sound.

Factors that contribute the environmental noise

Noise from an activity such as construction noise or noise during the operation of a facility at a given receiver location can be affected by a number of different factors, including:

- How loud the source activity is and the type of source:
 - Point (e.g. a pump or motor)
 - Line (e.g. a road or railway line)
 - Area (e.g. the external façades of an industrial building)
- The distance from the source to receiver
- The type of ground between the sound and receiver locations (e.g. hard surfaces or porous ground)
- The ground topography between the source and the receiver, e.g. is it flat or hilly? Blocking the line of sight will generally reduce the noise level for the receiver
- Obstacles that may block the line of sight between the source and the receiver (e.g. buildings or noise walls)
- Atmospheric absorption (dependent on humidity and temperature)
- Meteorological conditions that may increase or reduce environmental sound propagation (e.g. wind direction or temperature inversions)

Noise measurements

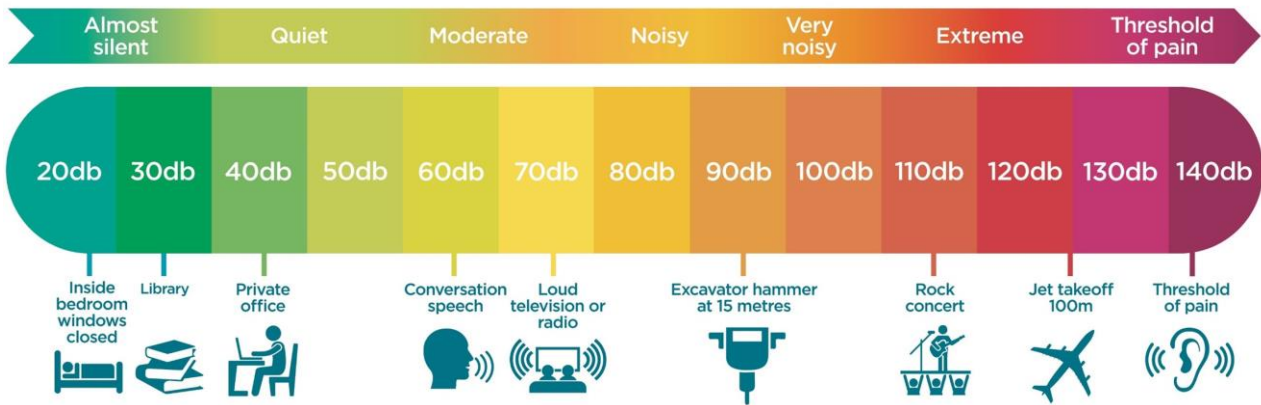
Noise is generally measured using a specially designed 'sound level meter' (SLM) and must meet internationally recognized performance standards. To avoid expressing sound or noise in terms of Pa, which could involve some unmanageable numbers, the logarithmic decibel or dB scale is used. The scale uses the hearing threshold of 20 μ Pa or 20×10^{-6} Pa as the reference level and is defined as 0 dB.

Typical noise levels

The figure below presents typical noise sources for each various sound pressure levels and a corresponding subjective noise level description.

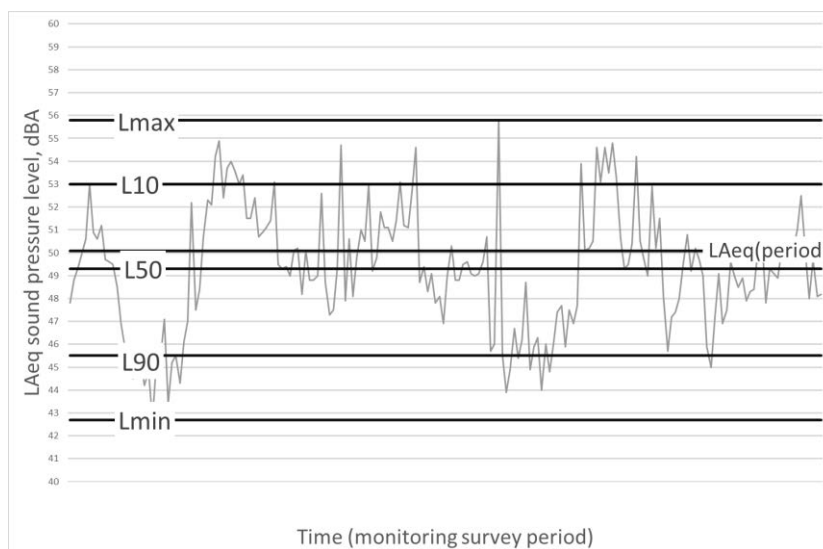
Noise level comparisons

People's perception of noise is strongly influenced by their environment. A noise level that is perceived as loud in one situation may appear quiet in another.



Typical noise descriptors

Noise is represented by the descriptor L_{AN} , representing a statistical sound measurement recorded on the 'A' weighted scale. A typical noise monitoring chart is shown in the graph below along with the noise descriptors.



Where:

- L_{Amax} : The maximum sound level recorded during the measurement period.
- L_{Amin} : The minimum sound level recorded during the measurement period.
- $L_{A10(period)}$: The A-weighted sound pressure level that is exceeded for 10% of the measurement period.
- $L_{Aeq(period)}$: Equivalent sound pressure level, the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
- $L_{A90(period)}$: The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15min)}$.

Changes in noise levels

The table below presents a qualitative description of average human responses to changes in noise levels.

Difference	Human response
Difference of 2 dBA	Generally imperceptible by the human ear
Difference of 5 dBA	Considered significant
Difference of 10 dBA	Perceived as a doubling (or halving) of the noise source
Addition of two identical noise levels	Increase levels by 3 dBA
Addition of second noise level of similar character	If the secondary noise level is a minimum 8 dBA below the primary noise level, the noise level will not significantly increase
Doubling of distance between source and receiver	Results in a 3 dBA decrease for a line source and 6 dBA for a point source
A doubling of traffic volume	Results in a 3 dBA increase in noise

Audibility of noise

The table below presents quantitative guidance and qualitative descriptions regarding the audibility of noise.

Audibility	Description
Inaudible	Noise source cannot be heard. The noise level is generally less than the background noise level, potentially by more than 10 dBA or greater
Barely audible	Characteristics of the noise is difficult to define or masked by extraneous noise. The noise level is generally 5-7 dBA below the background noise or ambient noise level, depending on the nature of the noise e.g. constant or intermittent
Just audible	Characteristics of the noise can be defined but extraneous noise sources are also contributing to the received noise. The noise level is typically below the background and ambient noise level.
Audible	Characteristics of the noise can be easily defined. The noise level may be at the level of the background noise and above.
Dominant	The noise source is significantly 'louder' than all other noise sources. The noise level will likely be significantly greater than the background noise level.

Types of noise sources

The table below offers a qualitative description of various noise types and provides the noise descriptor that is typically used to measure the type of noise.

Duration of the noise	Description
Continuous noise	Continuous noise is produced by equipment or activities that operates without interruption in the same mode, for e.g. blowers, pumps and processing equipment. Measuring for just a few minutes with hand-held equipment is sufficient to determine the noise level. If tones or low frequencies are heard, the frequency spectrum can be measured for documentation and further analysis. Continuous noise sources are generally captured by the L_{90} noise descriptor.
Intermittent noise	Intermittent noise is a noise level that increases and decreases rapidly. This might be caused by a train passing by, factory equipment that operates in cycles, or aircraft flying above. Intermittent noise is measured in a similar way to continuous noise, with a sound level meter. The duration of each occurrence and the time between each event is important to note. To gain a more reliable estimate of the noise level, multiple occurrences of the noise source is measured to gain a reliable estimate. Intermittent noise sources are generally captured by the L_{eq} noise descriptor.

Duration of the noise	Description
Impulsive noise	The noise from impacts or explosions, for e.g. from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of sound pressure level. To quantify the impulsiveness of noise, the difference between a quickly responding and a slowly responding parameter can be used. Impulsive noise sources are generally captured by the L_{max} or L_{peak} noise descriptor.
Frequency content	Description
Low frequency	Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum
Tonal noise	Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than 'broad band' noise
Defining characteristic	Description
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Subject noise	The noise in question removed from any extraneous noise in the area
Offensive noise	The definition of offensive noise in the POEO Act is noise: (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances: (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

Frequency analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers. The units for frequency are Hertz (Hz), which represent the number of cycles per second. Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (3 bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

Vibration

Definition of 'vibration'

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity.

Vibration descriptors

These may be expressed in terms of 'peak' velocity or 'rms' velocity. The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period. Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse. The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V , expressed in mm/s can be converted to decibels by the formula $20 \log (V/V_0)$, where V_0 is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organisations.

Types of vibration

Vibration in buildings can be caused by many different external sources, including industrial, construction and transportation activities. The vibration may be continuous (with magnitudes varying or remaining constant with time), impulsive (such as in shocks) or intermittent (with the magnitude of each event being either constant or varying with time). A description of each vibration type including examples are presented in the table below.

Vibration type	Description	Examples
Continuous vibration	Vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted rms acceleration values	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery)
Impulsive vibration	A vibration source (continuous or intermittent) which has a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). This type of vibration is assessed on the basis of weighted rms acceleration values	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Interrupted periods of continuous (for e.g. a drill) or repeated periods of impulsive vibration (for e.g. a pile driver), or continuous vibration that varies significantly in magnitude. This type of vibration is assessed on the basis of vibration dose values	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria

How humans perceive vibration

People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

Typical vibration levels

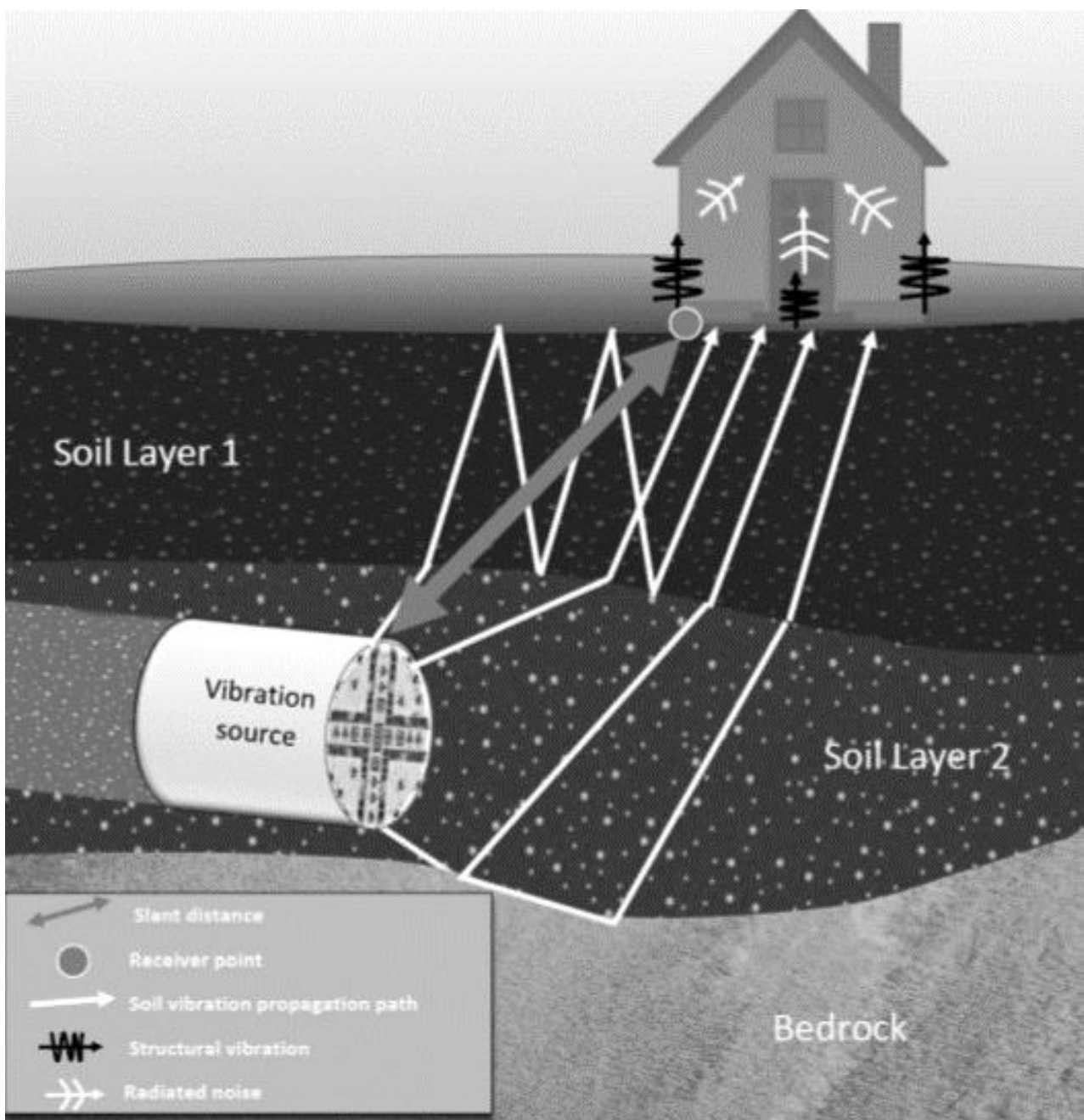
Typical ground vibration from civil construction activities occurs in the frequency range of approximately 8 Hz to 100 Hz. Within this frequency range, building contents such as blinds and pictures would commence visible movement at 0.5 mm/s. At vibration levels higher than 0.9 mm/s, rattling of windows, crockery or loose objects would be audible and annoying.

Velocity level (mm/s)	Typical source	Response
0.01	Typical background vibration level	Scanning electron microscopes to 50000 x amplification
0.03		500x amplification bench microscopes
0.1	Average passenger train vibration	Approximate threshold for human perception of vibration
0.3	Average freight train vibration Max passenger train vibration	Approx. residential annoyance for train passbys
1	Large rock breaker	Vibration level that will generally result in complaints
3	Blasting/ Impact pile driving	Threshold for minor cosmetic damage

Ground-borne noise and vibration

Noise that propagates through a structure as vibration and is radiated by vibrating wall, ceiling and floor surfaces is termed “ground-borne noise”, “regenerated noise”, or sometimes “structure borne noise”. Ground-borne noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air. Typical sources of ground-borne noise include tunnelling construction works or underground railway operations.

The figure below presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities that occur below the ground level (for e.g. a tunnel boring machine).



Acronyms and abbreviations

Term	Definition
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
dBZ or dBL	The unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear.
CEMP	Construction Environmental Management Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EPA	Environmental Protection Authority
ICNG	<i>Interim Construction Noise Guideline</i> (DECC, 2009).
NPfl	<i>Noise Policy for Industry</i> (EPA, 2017).
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The absolute maximum noise level in a noise sample
NSW	New South Wales
OOHW	Out-of-hours Works
PPV	Peak particle velocity is the maximum vector sum of three orthogonal time-synchronized velocity components regardless of whether these component maxima occurred simultaneously.
RBL	Rating Background Level . The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
rms	Root Mean Square Amplitude (rms) is the square root of the average of the squared values of the waveform. In the case of the sine wave, the RMS value is 0.707 times the peak value, but this is only true in the case of the sine wave.
RNP	<i>Road Noise Policy</i> (DECCW, 2011).
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
SWL	Sound Power Level
SWRO	Seawater Reverse Osmosis
Rw	Weighted Sound Reduction Index which provides a single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies
TBM	Tunnel Boring Machine
VDV	Vibration dose value - As defined in BS6472 – 2008, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.
WFP	Water Filtration Plant

Common Terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Determining authority	Defined by Section 110 of the <i>Environmental Planning and Assessment Act 1979</i> as 'a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.'
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous
EIS	Environmental Impact Assessment
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: - Noise mitigation benefits (amount of noise reduction provided, number of people protected); Cost of mitigation (cost of mitigation versus benefit provided); Community views (aesthetic impacts and community wishes); Noise levels for affected land uses (existing and future levels, and changes in noise levels)
Ground-borne noise	Noise heard within a building that is generated by vibration transmitted through the ground into the structure from construction works, sometimes referred to as 'regenerated noise' or 'structure-borne noise'. Ground-borne noise can be more noticeable than airborne noise for underground works such as tunnelling. The ground-borne noise levels are only applicable when ground-borne noise levels are higher than airborne noise levels.
Ground-borne vibration	Vibration transmitted from a source to a receptor via the ground
Hertz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
Maximum noise event	The loudest event or events within a given period of time. This is generally described using the L_{max} descriptor
Meteorological conditions	Wind and temperature inversion conditions
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.

Term	Definition
Noise management level	The Noise Management Level (NML) as defined as the EPA's ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive receiver	An area or place potentially affected by noise which includes: a residential dwelling an educational institution, library, childcare centre or kindergarten a hospital, surgery or other medical institution an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area commercial or industrial premises a place of worship.
Non-compliance	Development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB)
Octave	A division of the frequency range into bands, the upper frequency limit
Project noise trigger level	Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
Proposal	The construction and operation of the SWRO site, the modifications to the Illawarra WFP site and associated infrastructure including the power route, the delivery pipeline, the se and the intake and outlet tunnels.
proposal site	The immediate location of the proposal, which is the area that has the potential to be directly disturbed by construction and operation.
Resonance	Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts.
Study area	Land in the vicinity of, and including, the proposal site. The 'study area' is the wider area surrounding the proposal site.
Temperature inversion	An atmospheric condition in which temperature increases with height above the ground.
Third-octave	Single octave bands divided into three parts.

Appendix B

Noise monitoring methodology

Long-term noise monitoring was undertaken between 18 July 2022 and 22 July 2022 at 4 locations representative of residences.

Attended noise monitoring was also undertaken at each noise logger location to characterise the existing noise environment and describe the contribution of the various roads noise sources in the area. L_{A1} , L_{Aeq} , L_{A10} and L_{A90} noise levels were measured during the 15-minute monitoring period.

The methodology for the noise monitoring program included the following:

- Noise monitoring was undertaken using 1 Svan 977 and 3 Rion NL52 Type 1 environmental noise loggers. All noise loggers were programmed to accumulate L_{A90} , L_{A10} and L_{Aeq} noise descriptors continuously over the entire monitoring period. Details and results of the noise monitoring equipment are provided in the tables below
- A calibration check was performed on the noise monitoring equipment using a sound level calibrator. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The noise loggers were found to be within the acceptable tolerance of ± 0.5 dBA,
- All monitoring activities were undertaken with consideration of the specifications outlined in Australian Standard AS1055 (1997) *Description and Measurement of Environmental Noise*
- Meteorological data (wind speed, wind direction, rainfall, temperature and humidity) was sourced from the Bureau of Meteorology's Sydney Observatory Hill weather station (station number 066214).
- The data collected by the noise loggers was downloaded and analysed to determine invalid data due to adverse weather conditions. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s, or when rainfall occurred.
- Attended noise measurements were undertaken using a Svan 979 Type 1 environmental sound level meter (SLM) (Serial no. 27100). A calibration check was performed on the SLM using a sound level calibrator. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The noise logger was found to be within the acceptable tolerance of ± 0.5 dBA

The monitoring details and results are presented in Table 7.1 to Table 7.4 for M1 to M4 respectively.

Noise monitoring could not be undertaken within residential properties and as such monitoring locations were chosen, with agreement from TfNSW, to be the most representative of the worst affected residence. A description of the location is provided alongside the monitoring results.

Table 7.1 Logger M1



Equipment details		Equipment settings		Location description		Logger photo	
Rion NL52 Type 1 SN: 131631 1.5 m above ground Free field IEC 61672-3:2013 Compliant Manufactured prior 2019		A-weighted Fast time response 15 minute intervals Pre and post calibration variation: -0.2 dBA Svantek SV30A Class 1 Sound level calibrator SN: 39467 AS 60942:2003 Compliant Manufactured prior 2017		<ul style="list-style-type: none"> – Vegetated area behind Manly Art Gallery – Representative of residence on Commonwealth Parade – Noise environment includes noise from traffic, pedestrians, and Manly Cove 			
Ambient and background noise monitoring results						Logger location	
Period	Noise level						
	RBL	LAeq	L10				
Daytime	46	57	58				
Evening	42	54	54				
Night	38	50	48				
Road traffic noise levels (weekdays)							
LAeq(24 hour)		LAeq(15hour)		LAeq(9hour)			
55		57		50			
Attended noise measurements							
Date	Time	Noise level					
		LA90	LAeq	LA10	LA1		
18/07/2022	11:38 am	47	55	56	63		
							

Table 7.2 Logger M2



Equipment details		Equipment settings		Location description		Logger photo	
Svan 977 Type 1 SN: 97591 1.5 m above ground Free field IEC 61672-3:2013 Compliant Manufactured prior 2019		A-weighted Fast time response 15 minute intervals Pre and post calibration variation: -0.3 dBA Svantek SV30A Class 1 Sound level calibrator SN: 39467 AS 60942:2003 Compliant Manufactured prior 2017		<ul style="list-style-type: none"> 5th Floor balcony of 39 E Esplanade, Manly Representative of residences in commercial centre of Manly Noise environment dominated by traffic noise on East Esplanade 			
Ambient and background noise monitoring results						Logger location	
Period	Noise level						
	RBL	LAeq	L10				
Daytime	55	60	61				
Evening	53	57	59				
Night	48	55	55				
Road traffic noise levels (weekdays)							
LAeq(24 hour)		LAeq(15hour)		LAeq(9hour)			
58		60		55			
Attended noise measurements							
Date	Time	Noise level					
		LA90	LAeq	LA10	LA1		
18/07/2022	10:31 AM	56	59	61	65		
							

Table 7.3 Logger M3




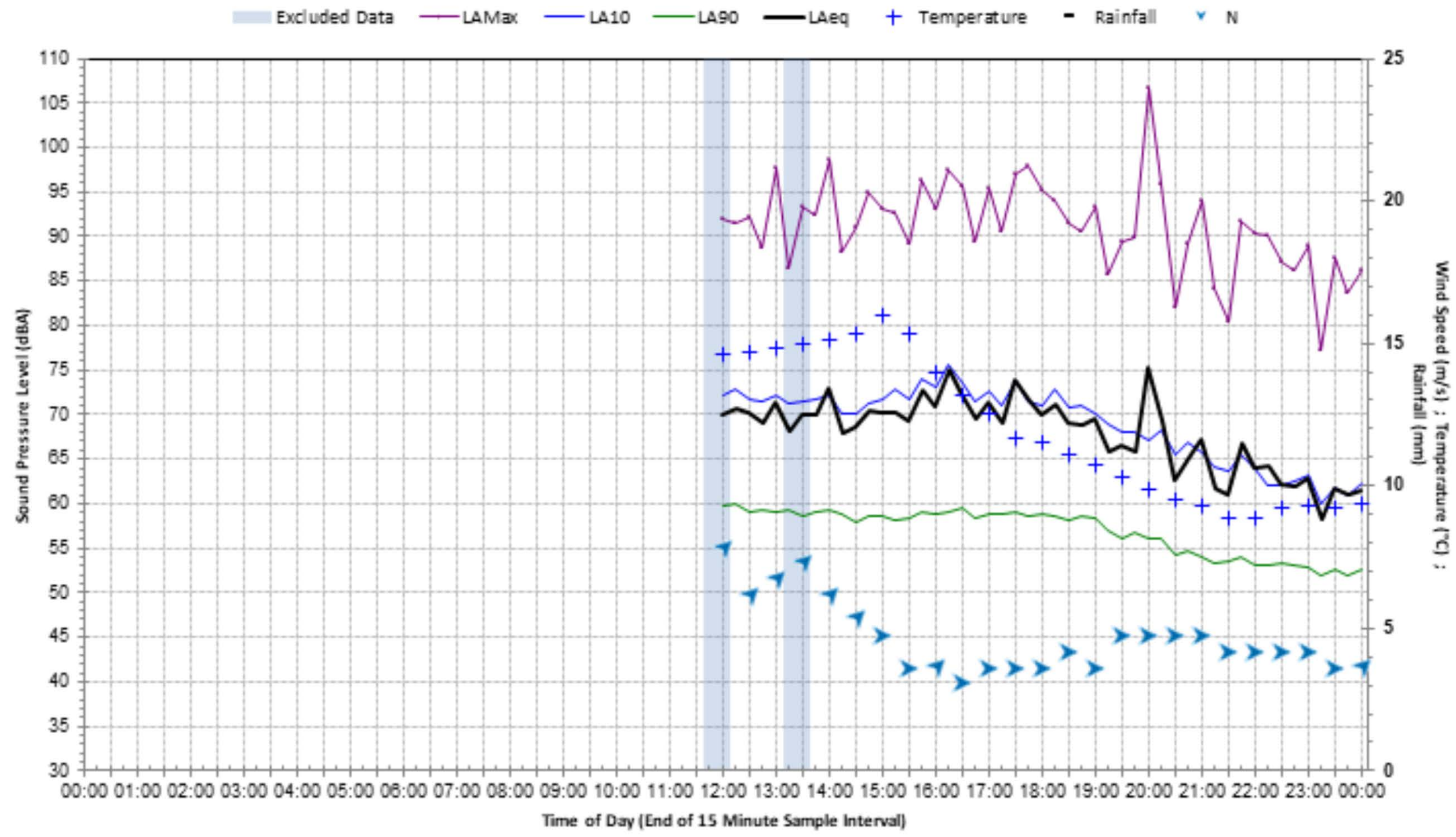
Equipment details		Equipment settings		Attended notes		Logger photo	
Rion NL52 Type 1 SN: 131629 1.5 m above ground Free field IEC 61672-3:2013 Compliant Manufactured prior 2019		A-weighted Fast time response 15 minute intervals Pre and post calibration variation: 0.3 dBA Svantek SV30A Class 1 Sound level calibrator SN: 39467 AS 60942:2003 Compliant Manufactured prior 2017		<ul style="list-style-type: none"> – Vegetated area within Tower Hill Park – Representative of residence on Eustace Street – Noise environment includes noise from traffic on Sydney Road and sports events at Manly oval 			
Ambient and background noise monitoring results						Logger location	
Period	Noise level						
	RBL	LAeq	L10				
Daytime	46	59	55				
Evening	44	51	52				
Night	38	56	48				
Road traffic noise levels (weekdays)							
LAeq(24 hour)		LAeq(15hour)		LAeq(9hour)			
58		58		56			
Attended noise measurements							
Date	Time	Noise level					
		LA90	LAeq	LA10	LA1		
18/07/2022	12:23 PM	46	54	56	65		
							

Table 7.4 *Logger M4*

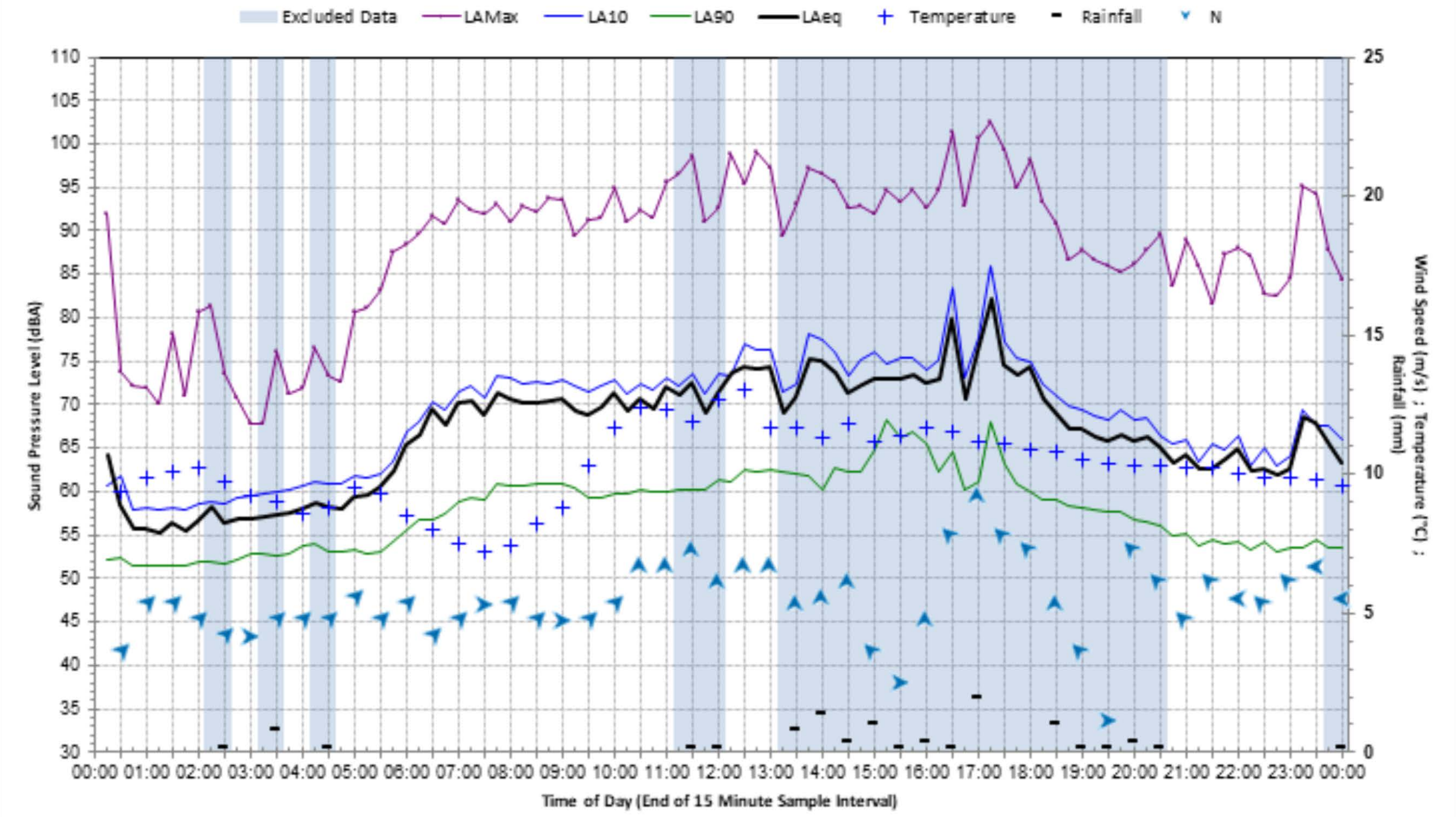
Equipment details		Equipment settings		Location description		Logger photo	
Rion NL52 Type 1 SN: 131632 1.5 m above ground Free field IEC 61672-3:2013 Compliant Manufactured prior 2019		A-weighted Fast time response 15 minute intervals Pre and post calibration variation: -0.8 dBA Svantek SV30A Class 1 Sound level calibrator SN: 39467 AS 60942:2003 Compliant Manufactured prior 2017		<ul style="list-style-type: none"> – Vegetated area behind Manly Launch Club – Representative of residence on East Esplanade – Noise environment includes noise from traffic, pedestrians, and Manly Cove 			
Ambient and background noise monitoring results						Logger location	
Period	Noise level						
	RBL	LAeq	L10				
Daytime	47	57	55				
Evening	46	51	52				
Night	43	49	49				
Road traffic noise levels (weekdays)							
LAeq(24 hour)		LAeq(15hour)		LAeq(9hour)			
55		56		49			
Attended noise measurements							
Date	Time	Noise level					
		LA90	LAeq	LA10	LA1		
18/07/2022	9:39 AM	46	52	54	61		

M1

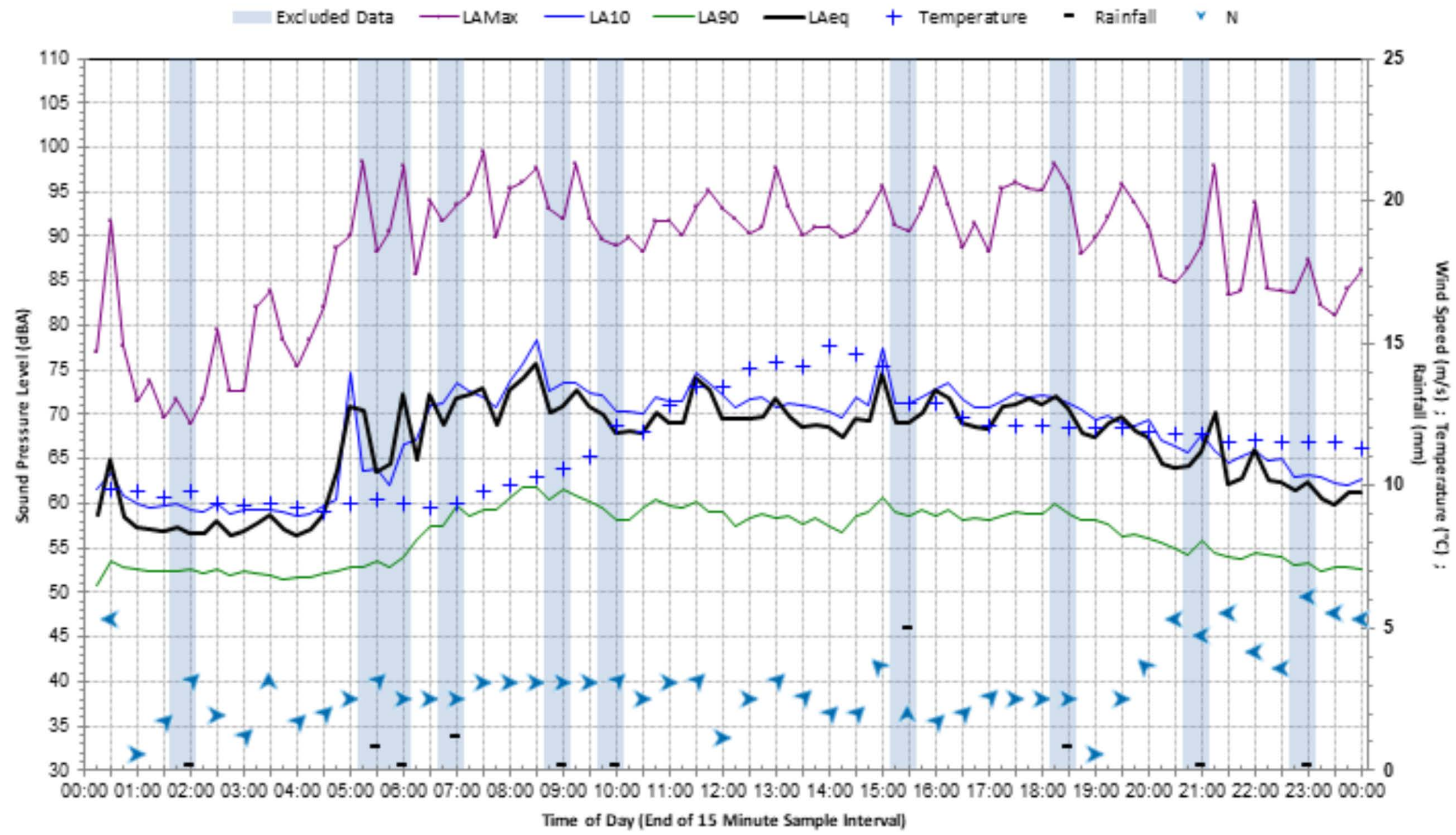
**M1 - Statistical Ambient Noise Levels
Monday 18 July 2022**



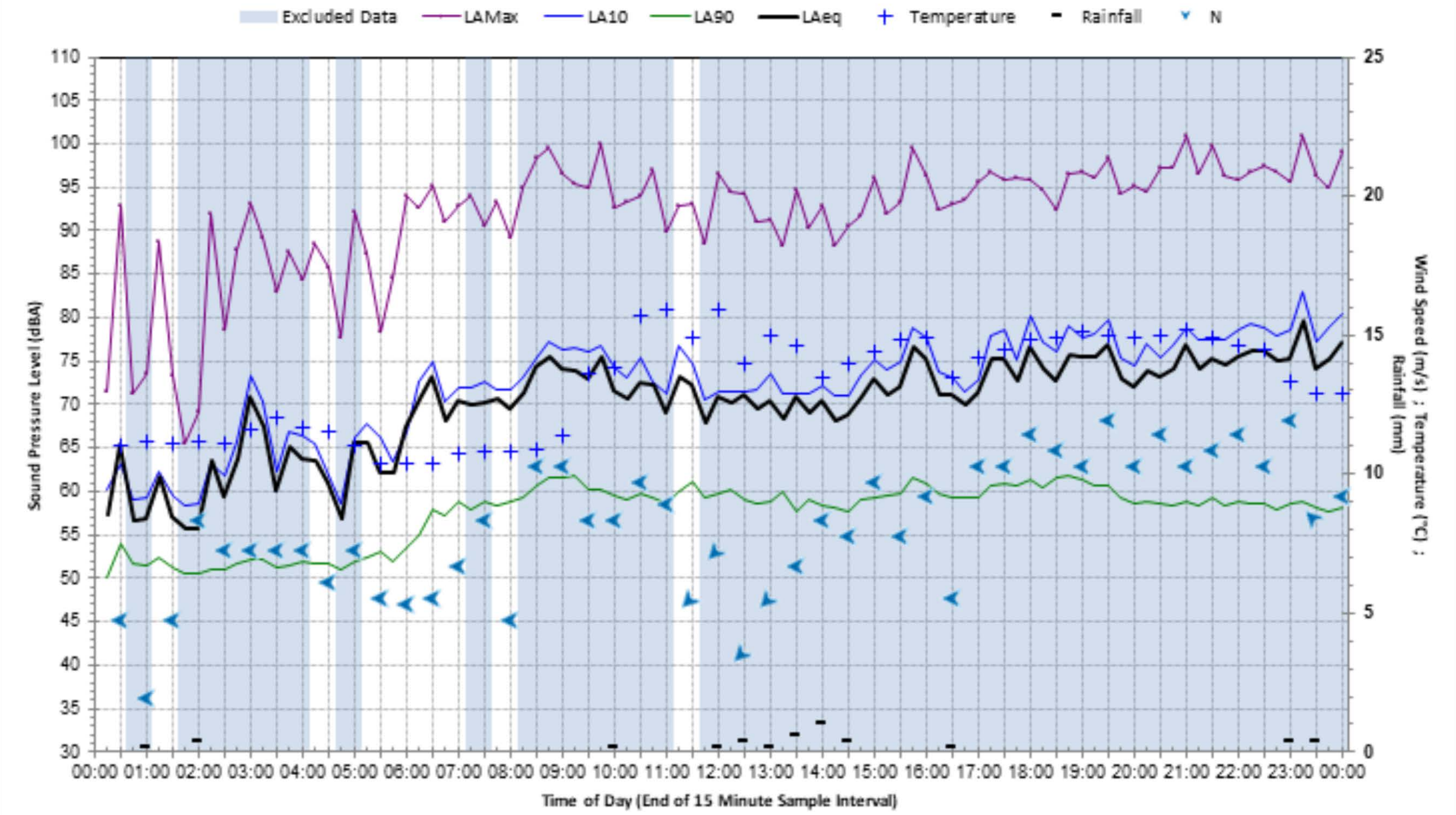
**M1 - Statistical Ambient Noise Levels
Tuesday 19 July 2022**



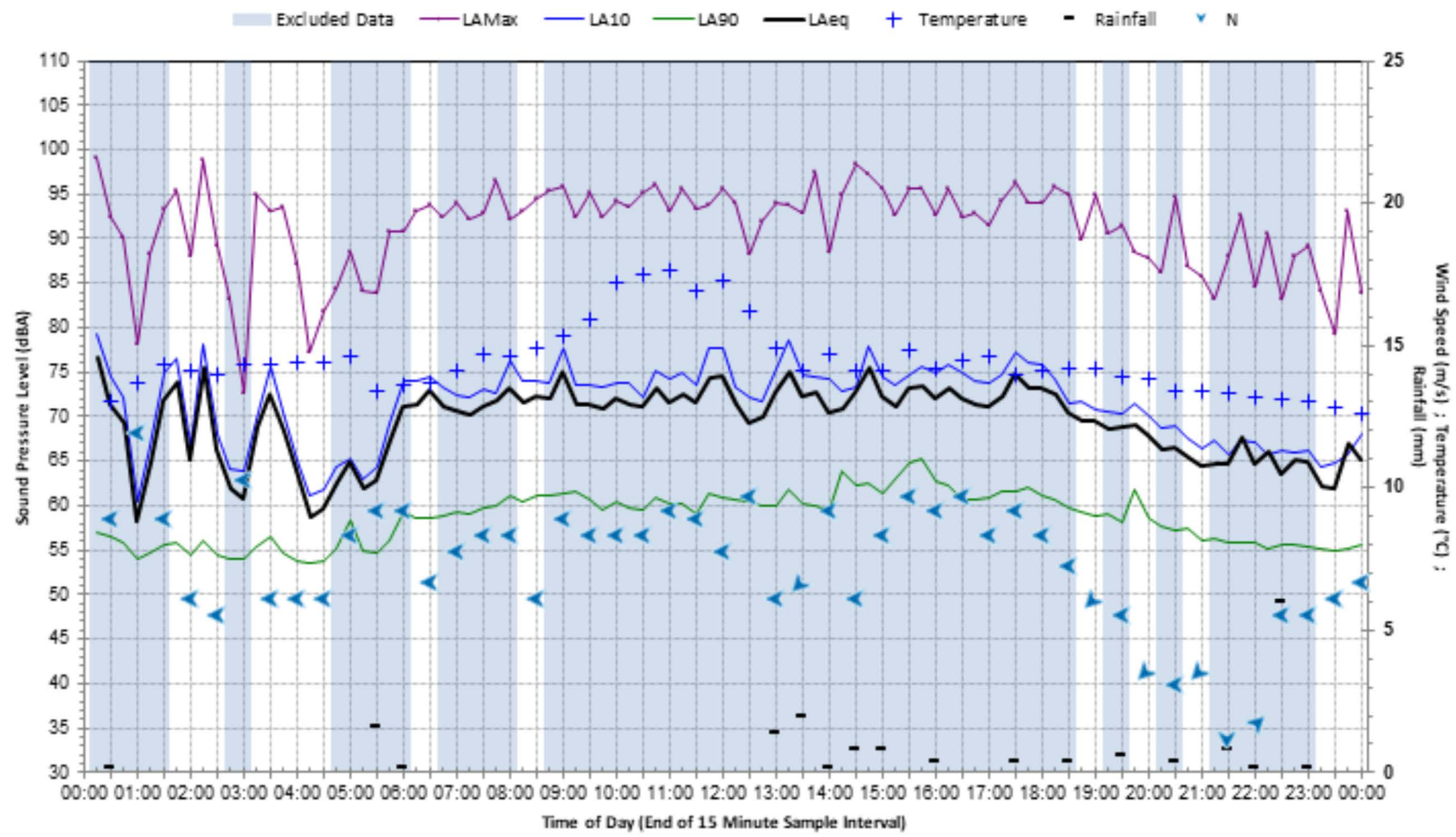
**M1 - Statistical Ambient Noise Levels
Wednesday 20 July 2022**



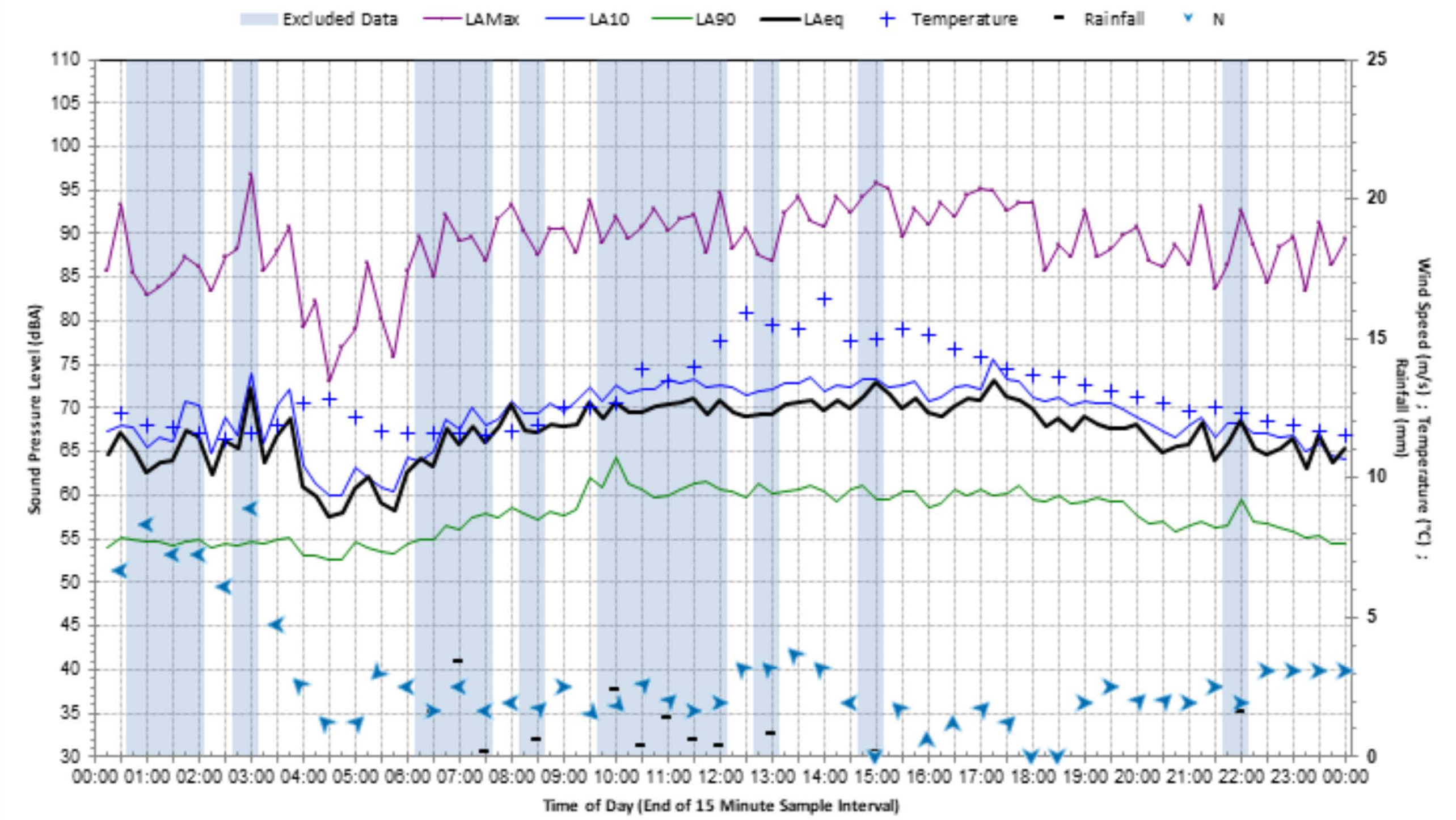
**M1 - Statistical Ambient Noise Levels
Thursday 21 July 2022**



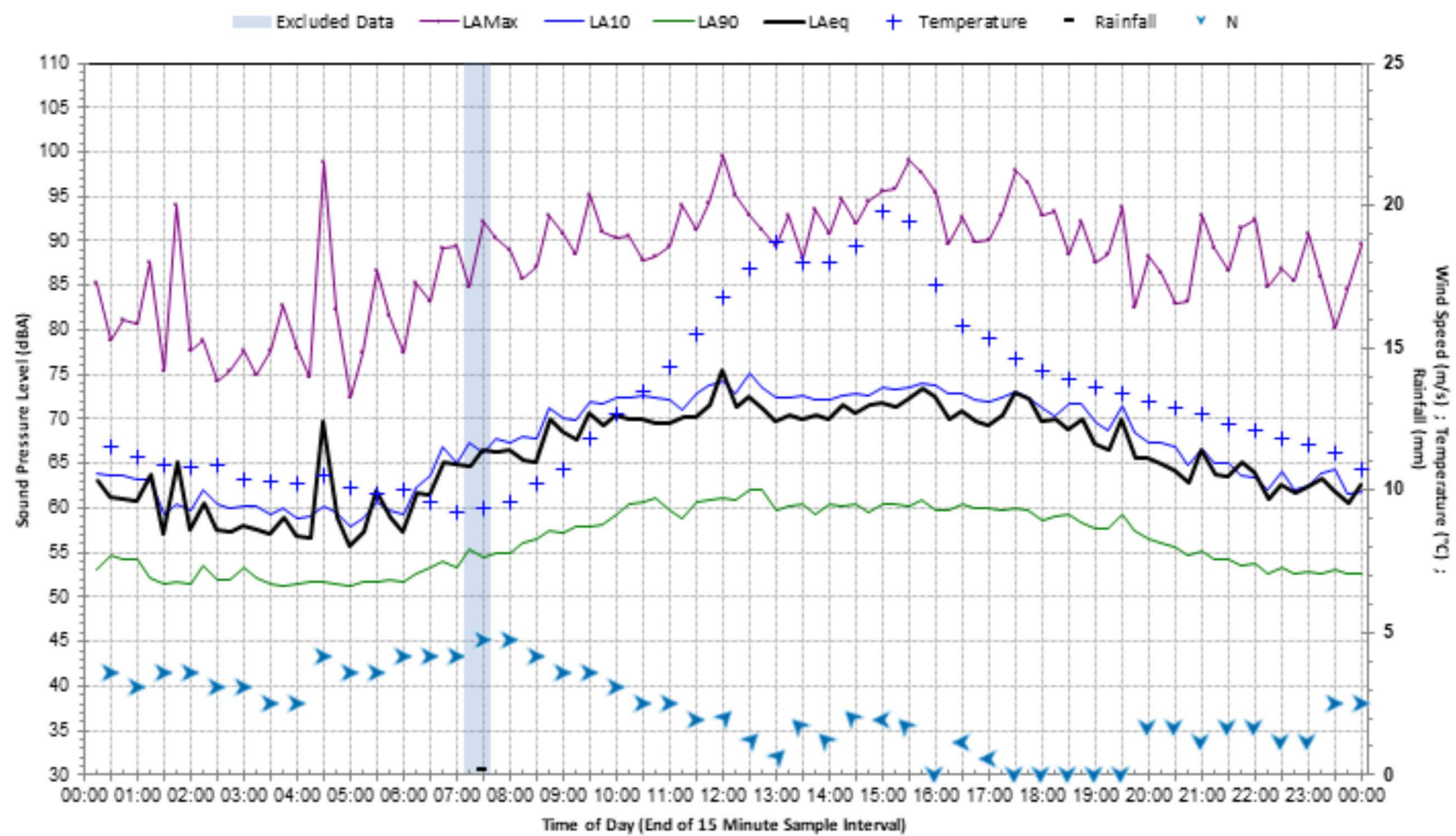
**M1 - Statistical Ambient Noise Levels
Friday 22 July 2022**



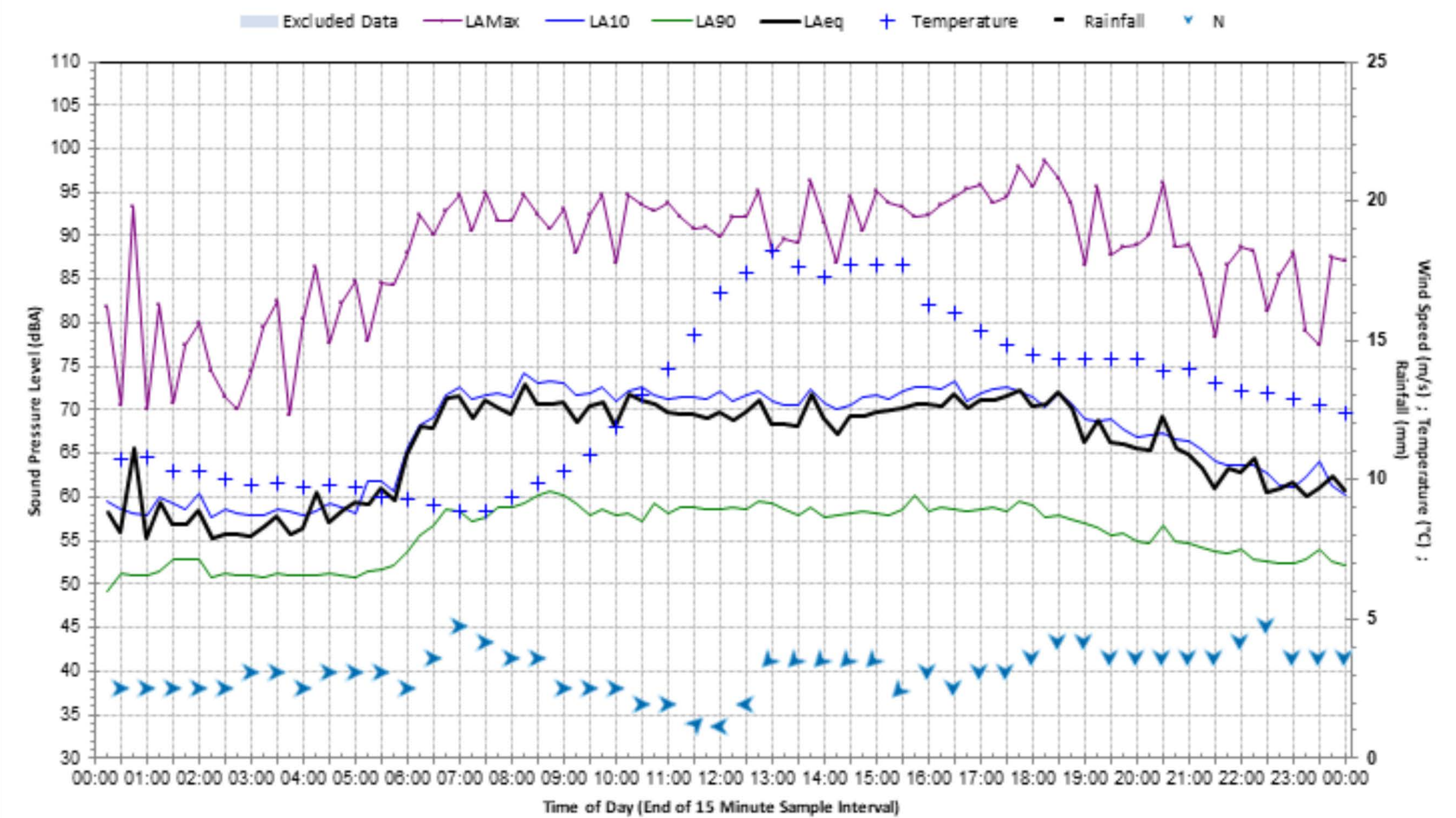
**M1 - Statistical Ambient Noise Levels
Saturday 23 July 2022**



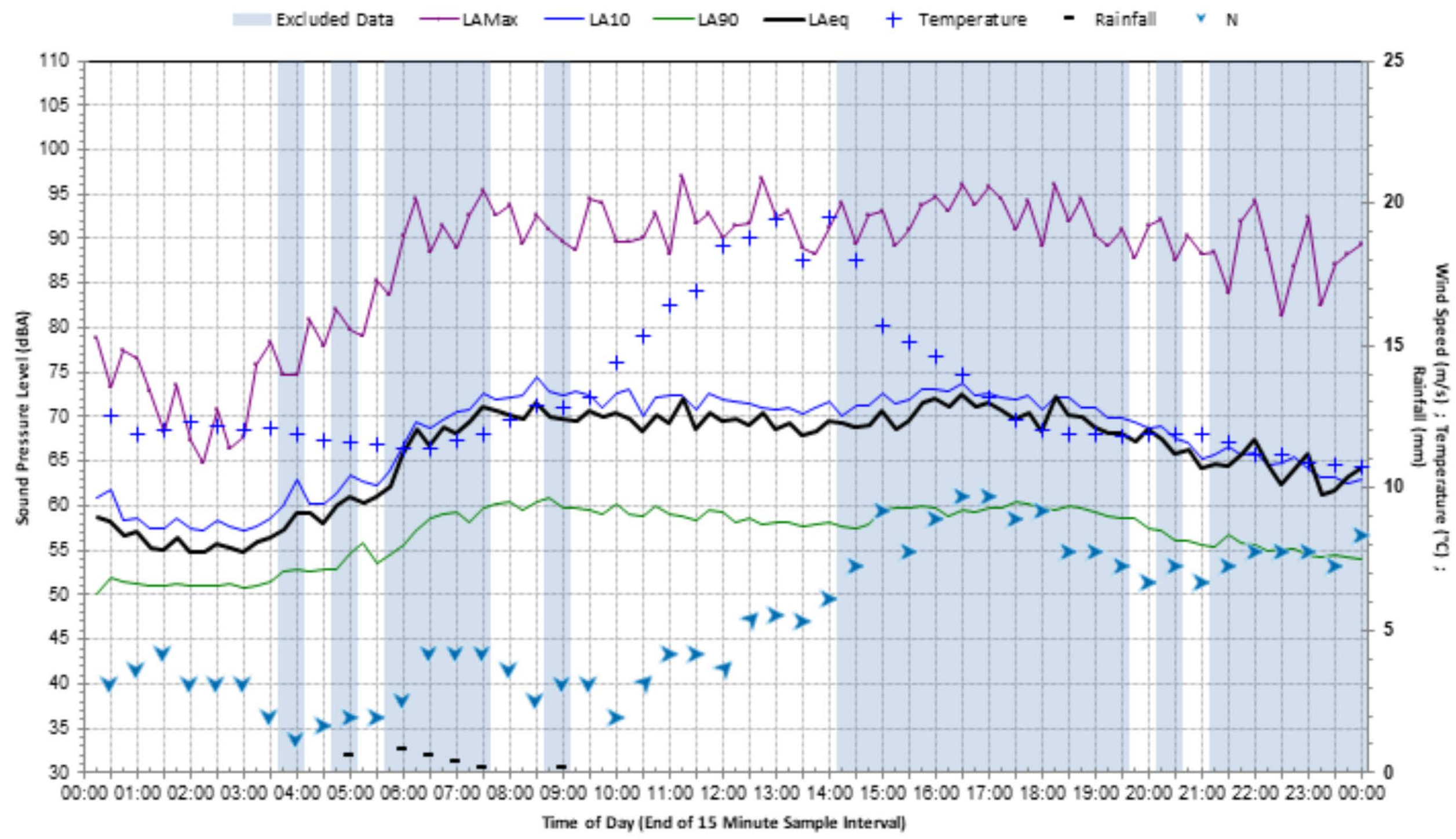
**M1 - Statistical Ambient Noise Levels
Sunday 24 July 2022**



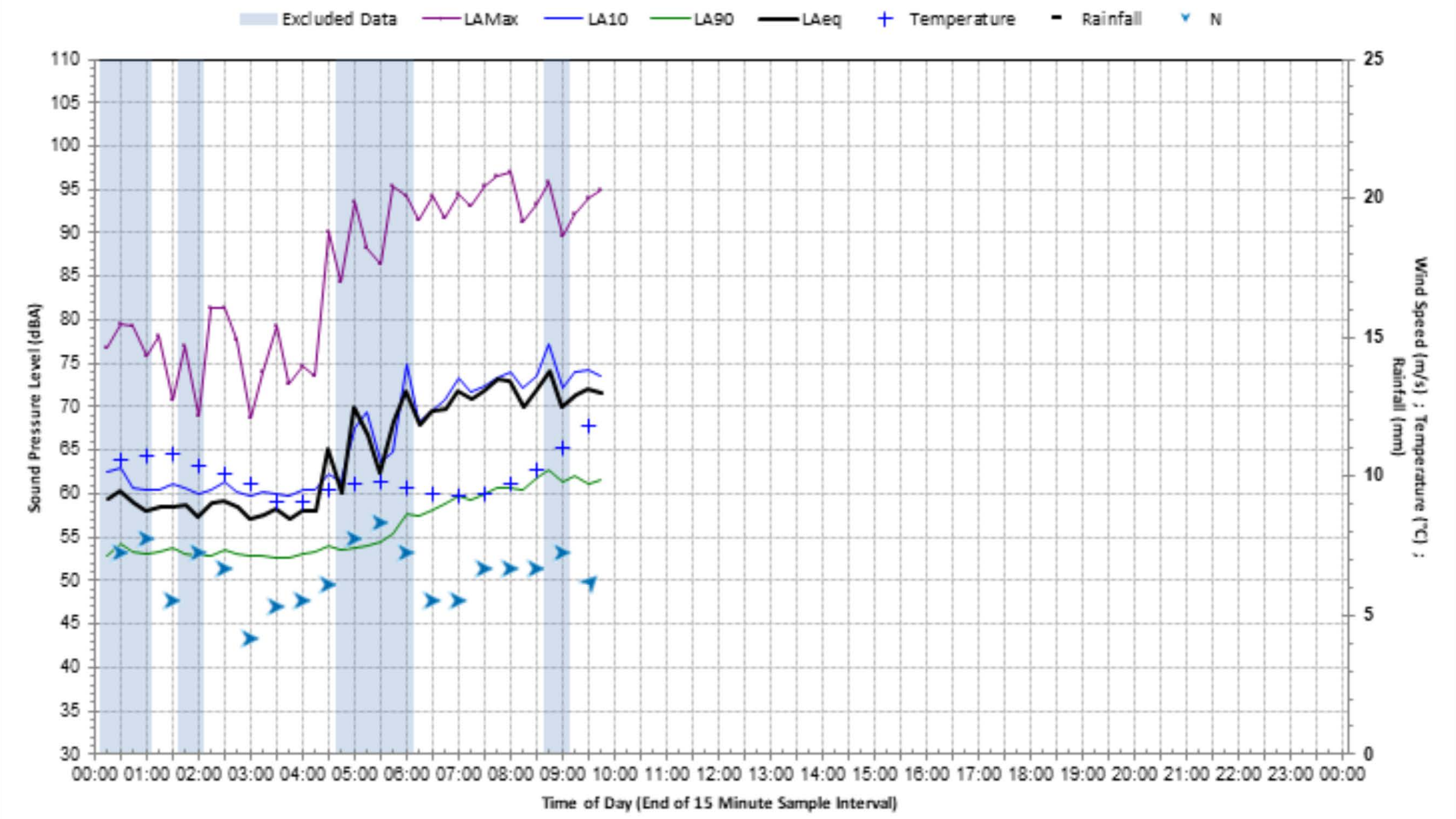
**M1 - Statistical Ambient Noise Levels
Monday 25 July 2022**



M1 - Statistical Ambient Noise Levels Tuesday 26 July 2022

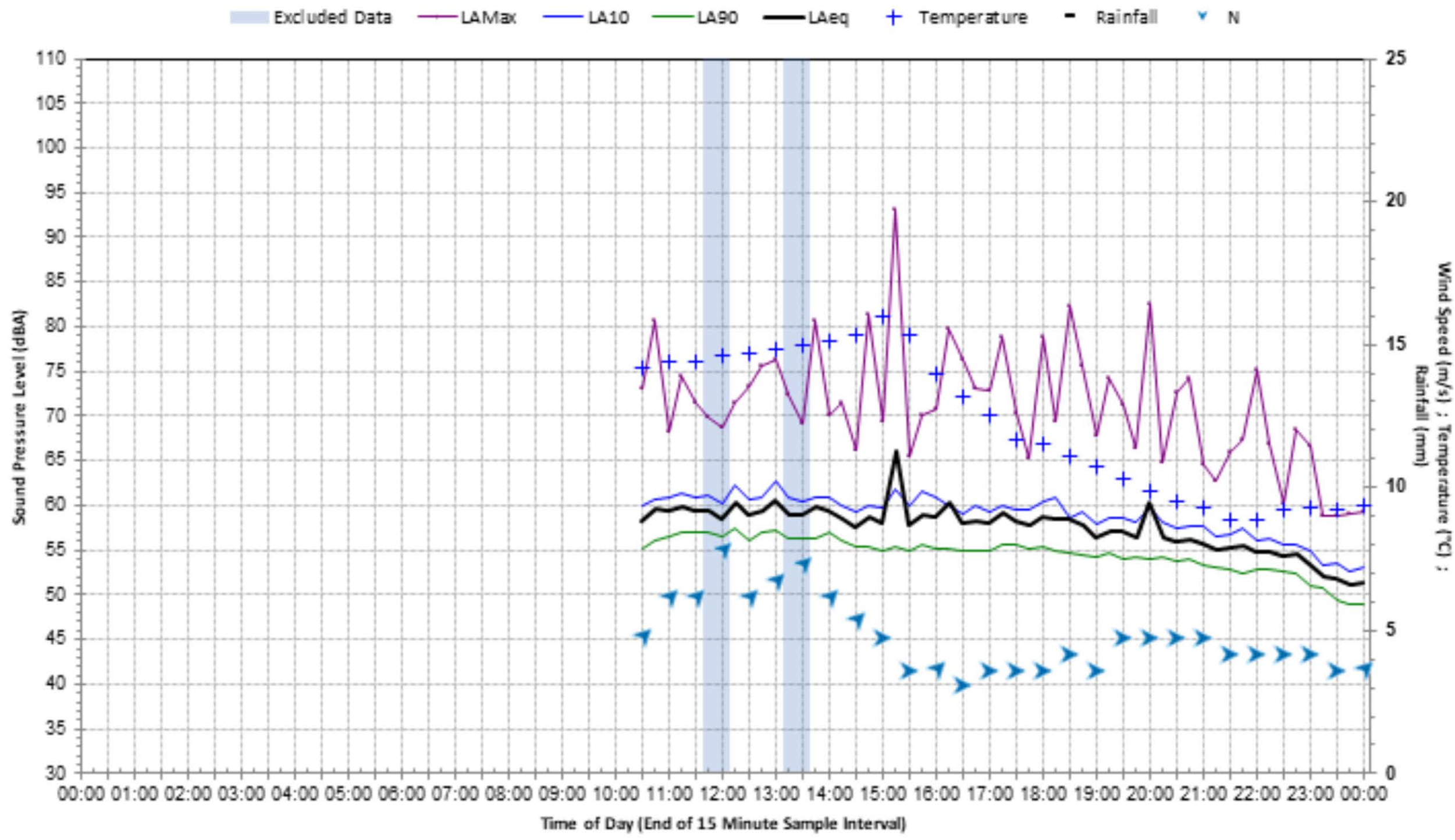


M1 - Statistical Ambient Noise Levels Wednesday 27 July 2022

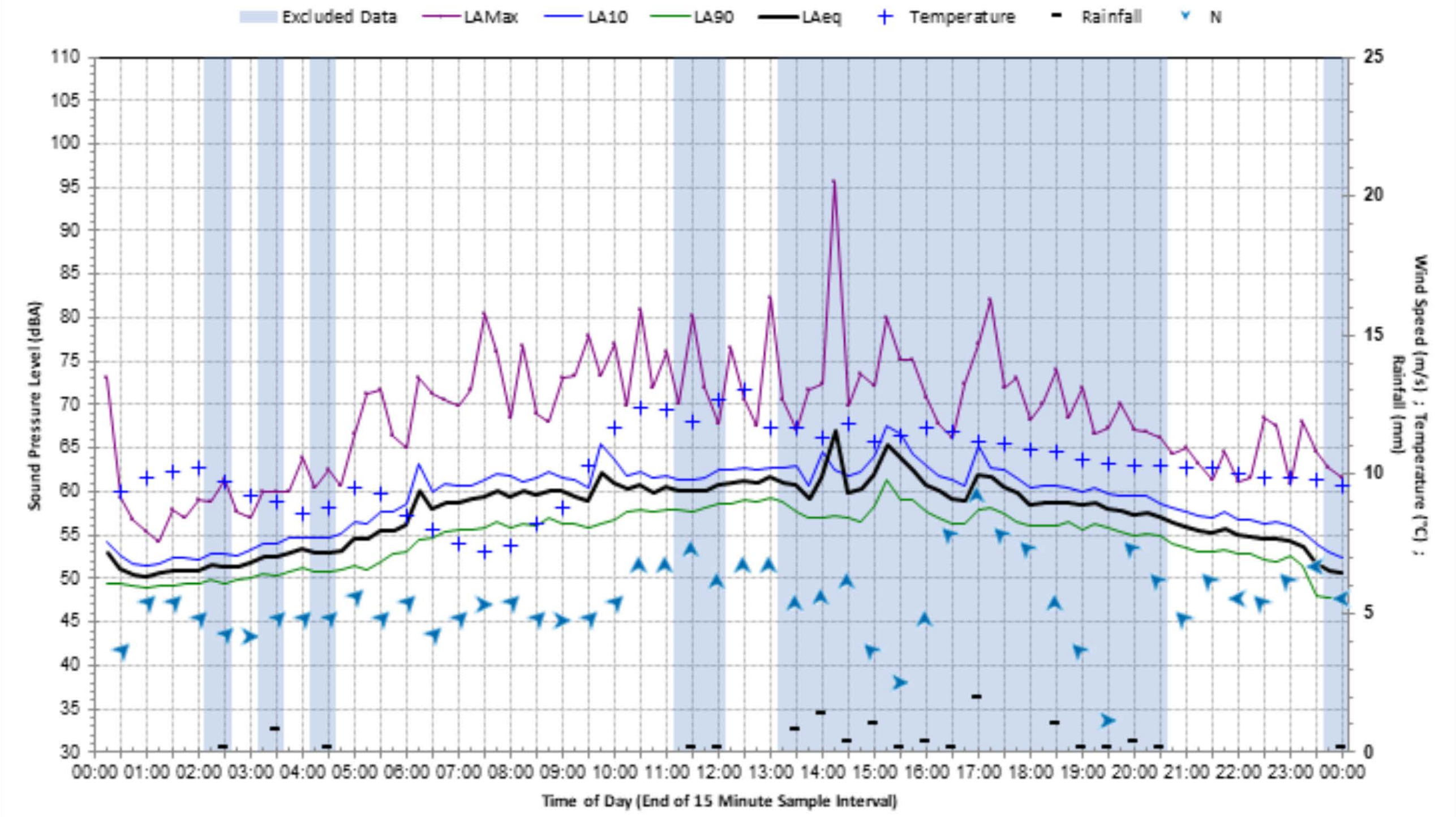


M2

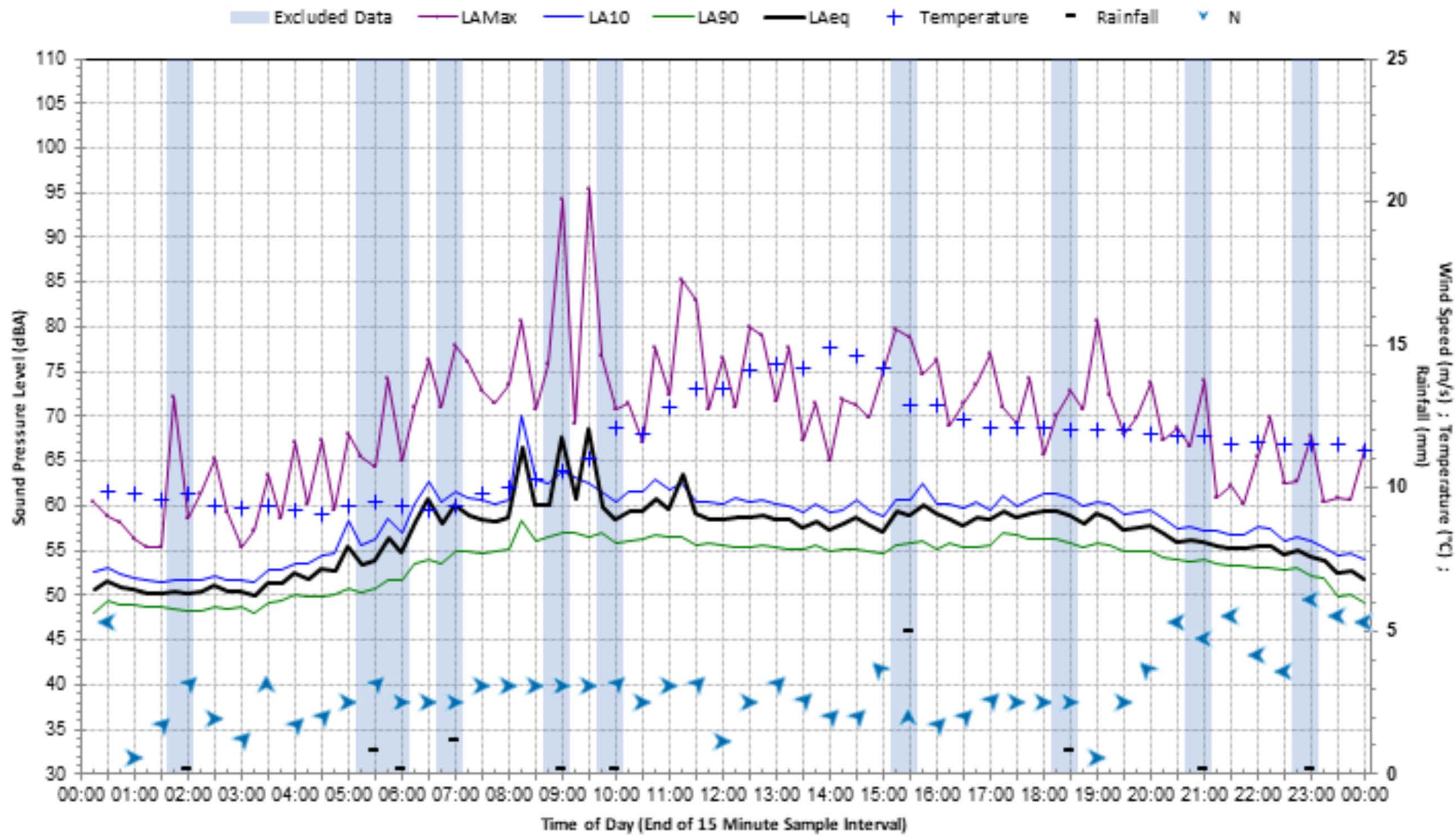
M2 - Statistical Ambient Noise Levels Monday 18 July 2022



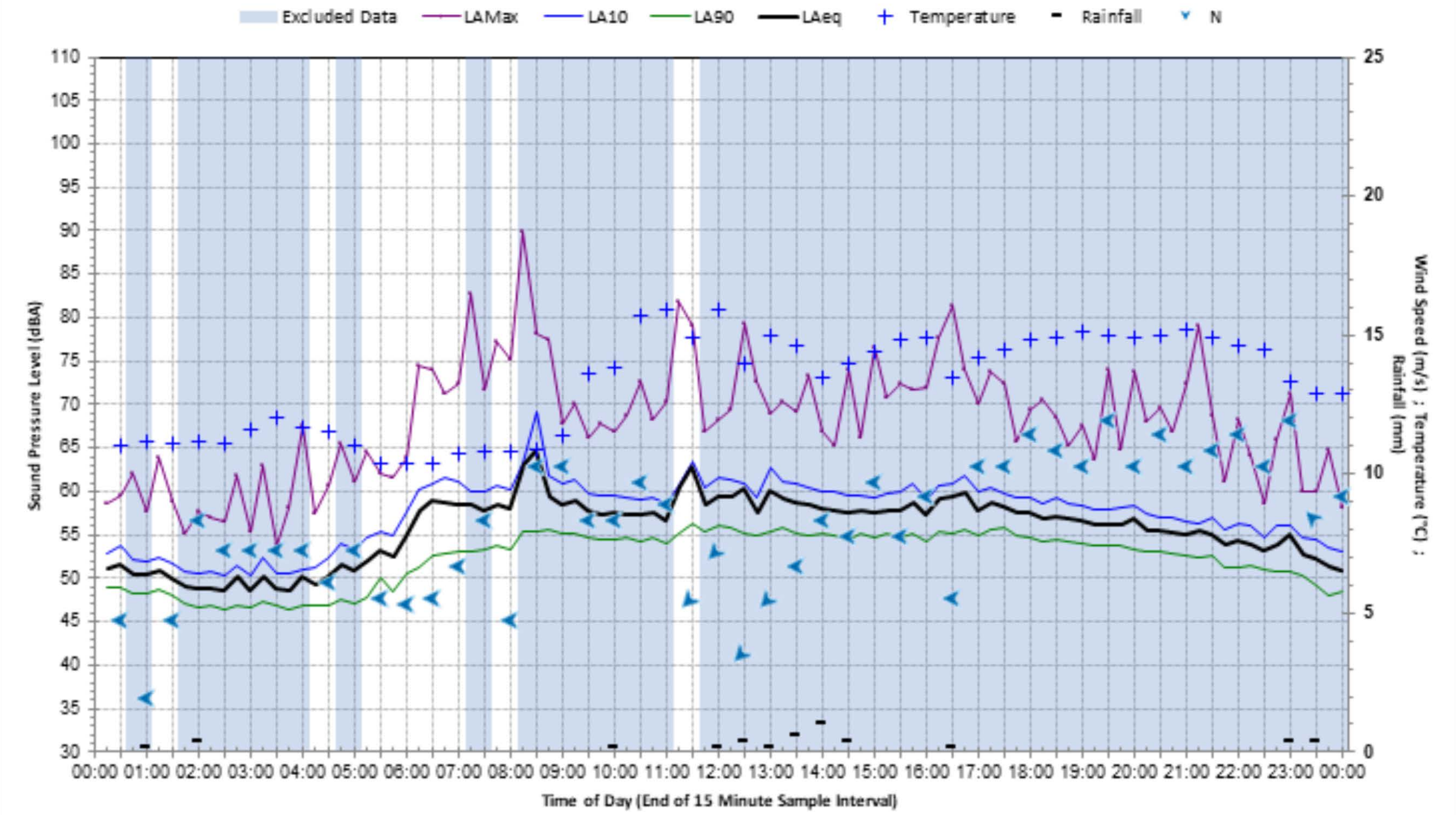
M2 - Statistical Ambient Noise Levels Tuesday 19 July 2022



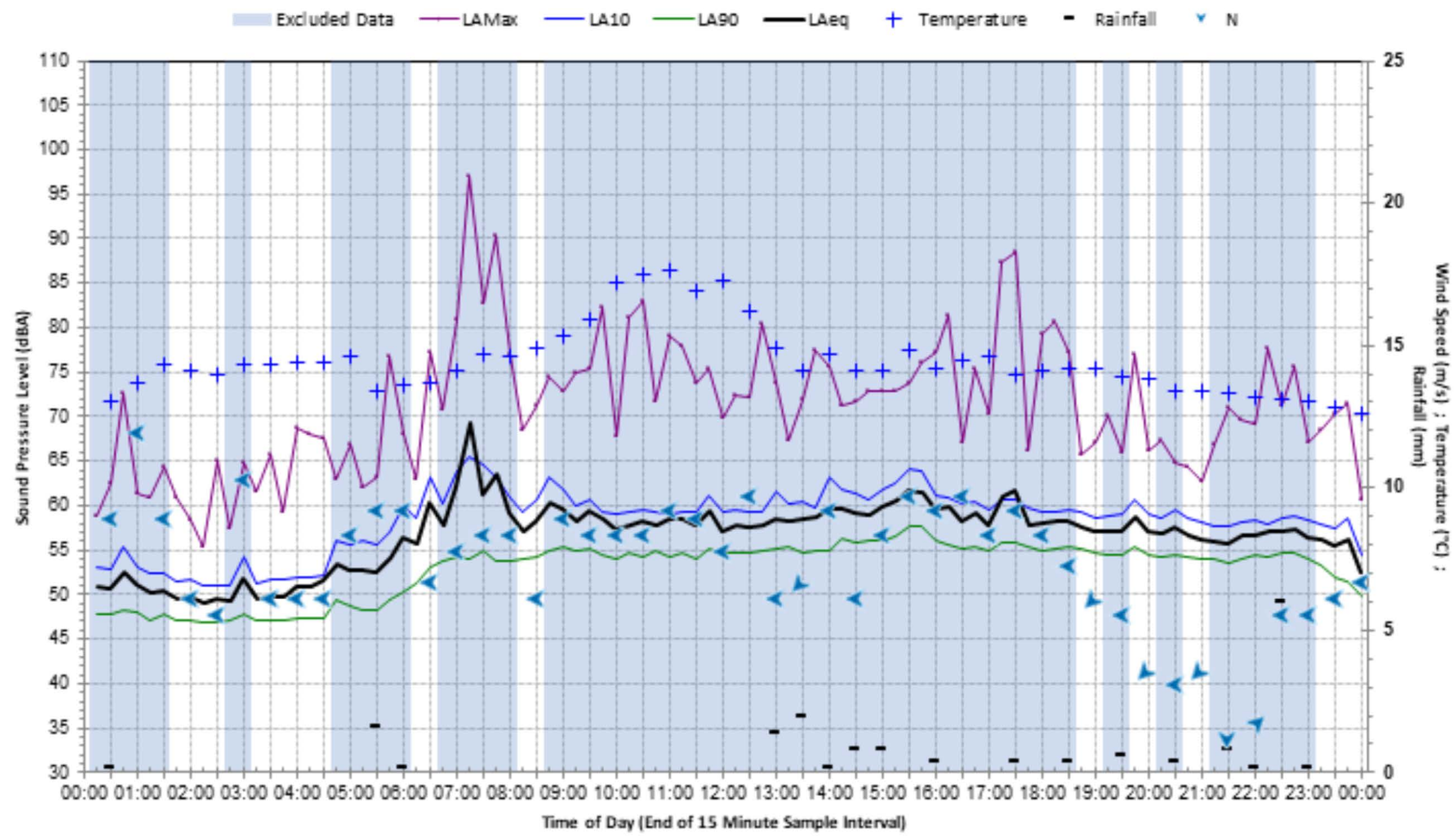
M2 - Statistical Ambient Noise Levels Wednesday 20 July 2022



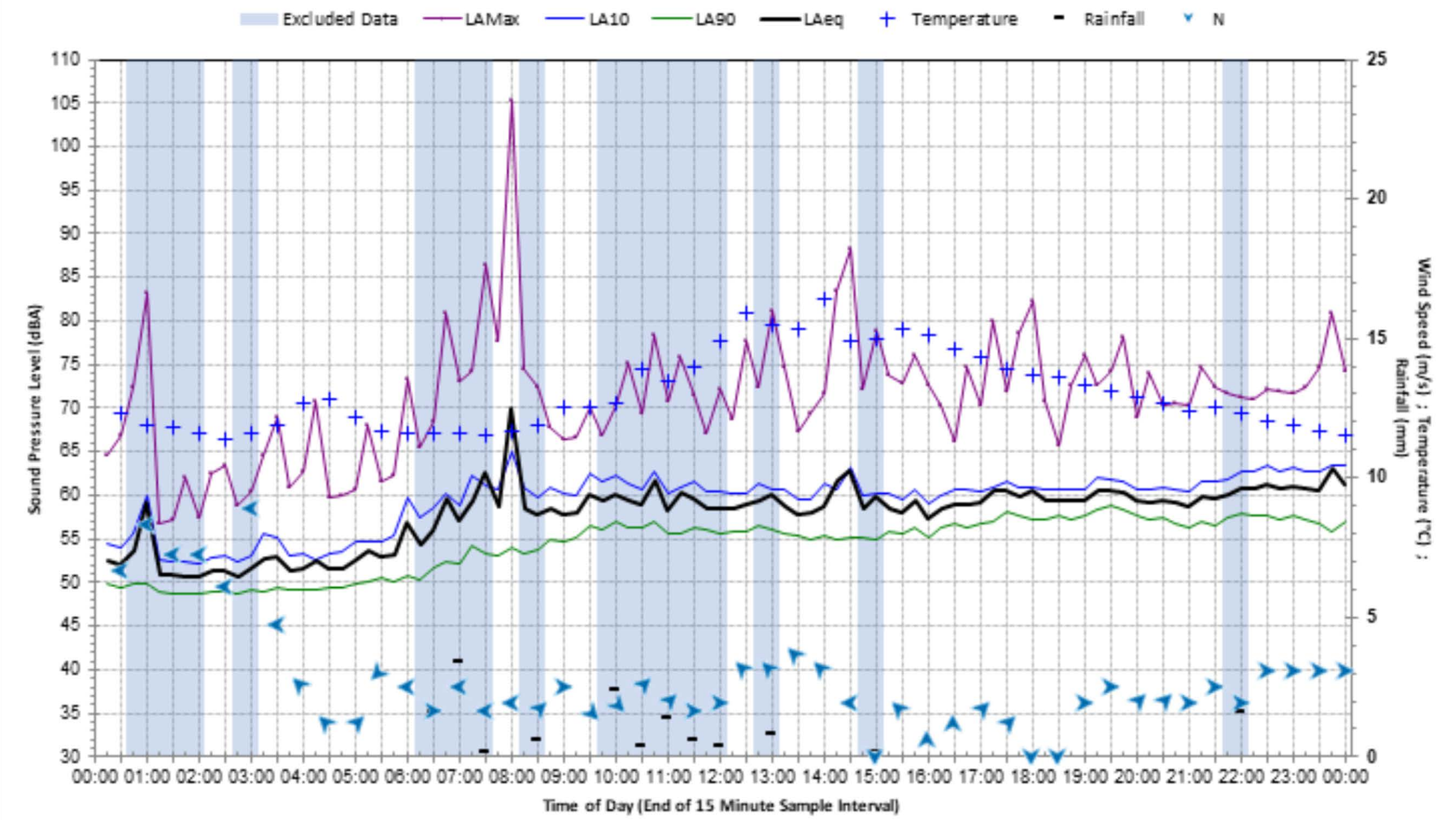
M2 - Statistical Ambient Noise Levels Thursday 21 July 2022



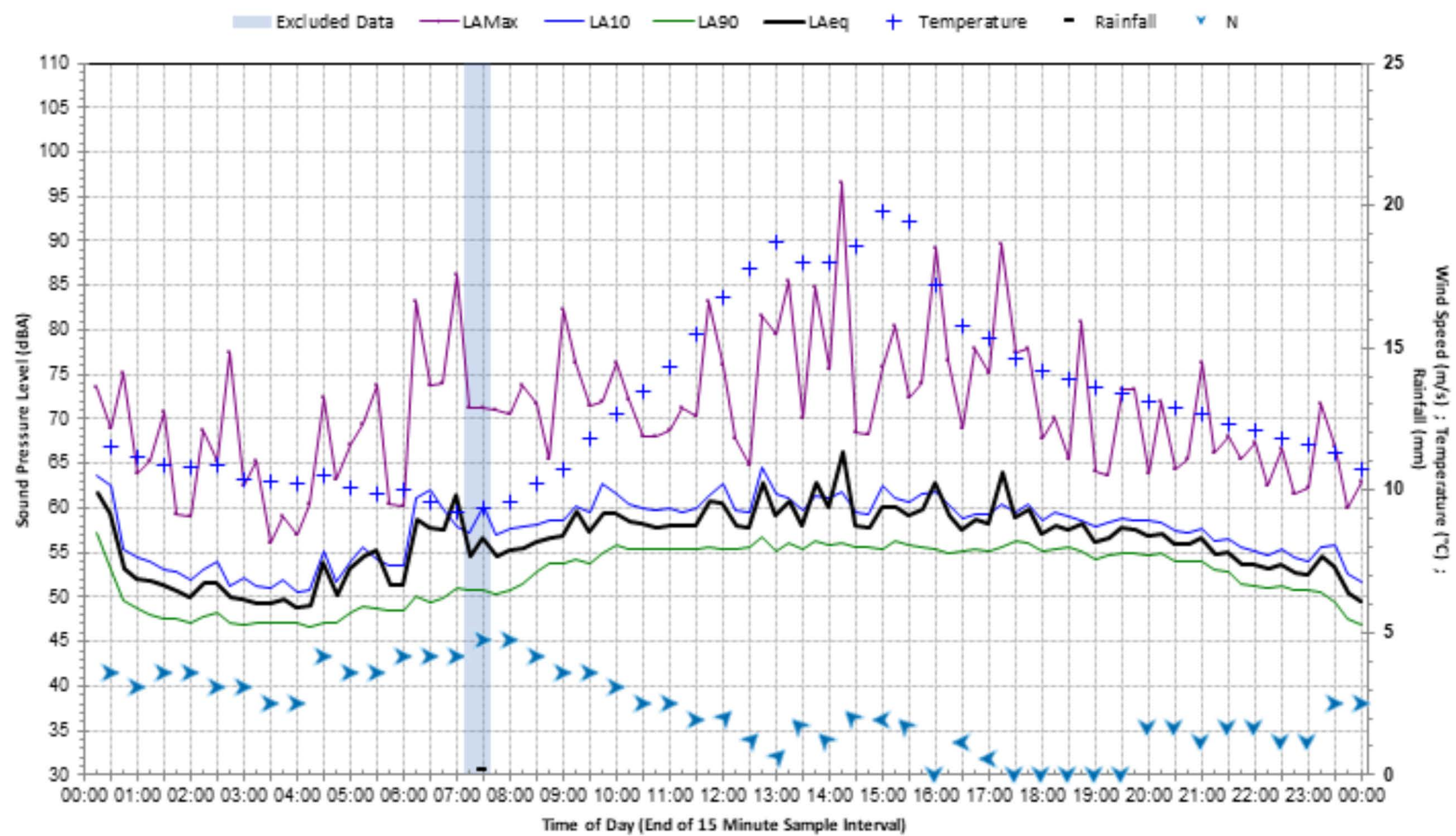
**M2 - Statistical Ambient Noise Levels
Friday 22 July 2022**



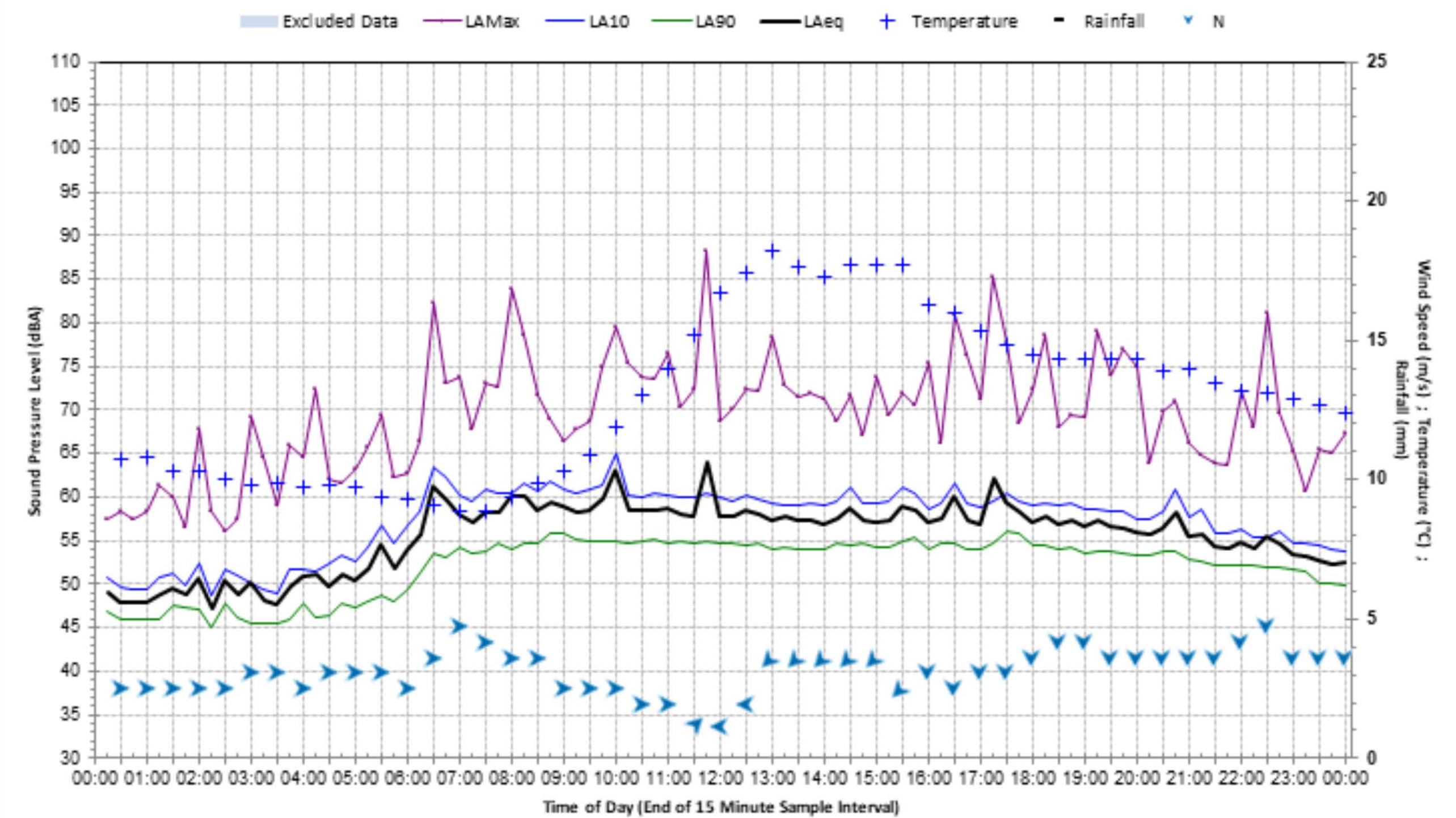
**M2 - Statistical Ambient Noise Levels
Saturday 23 July 2022**



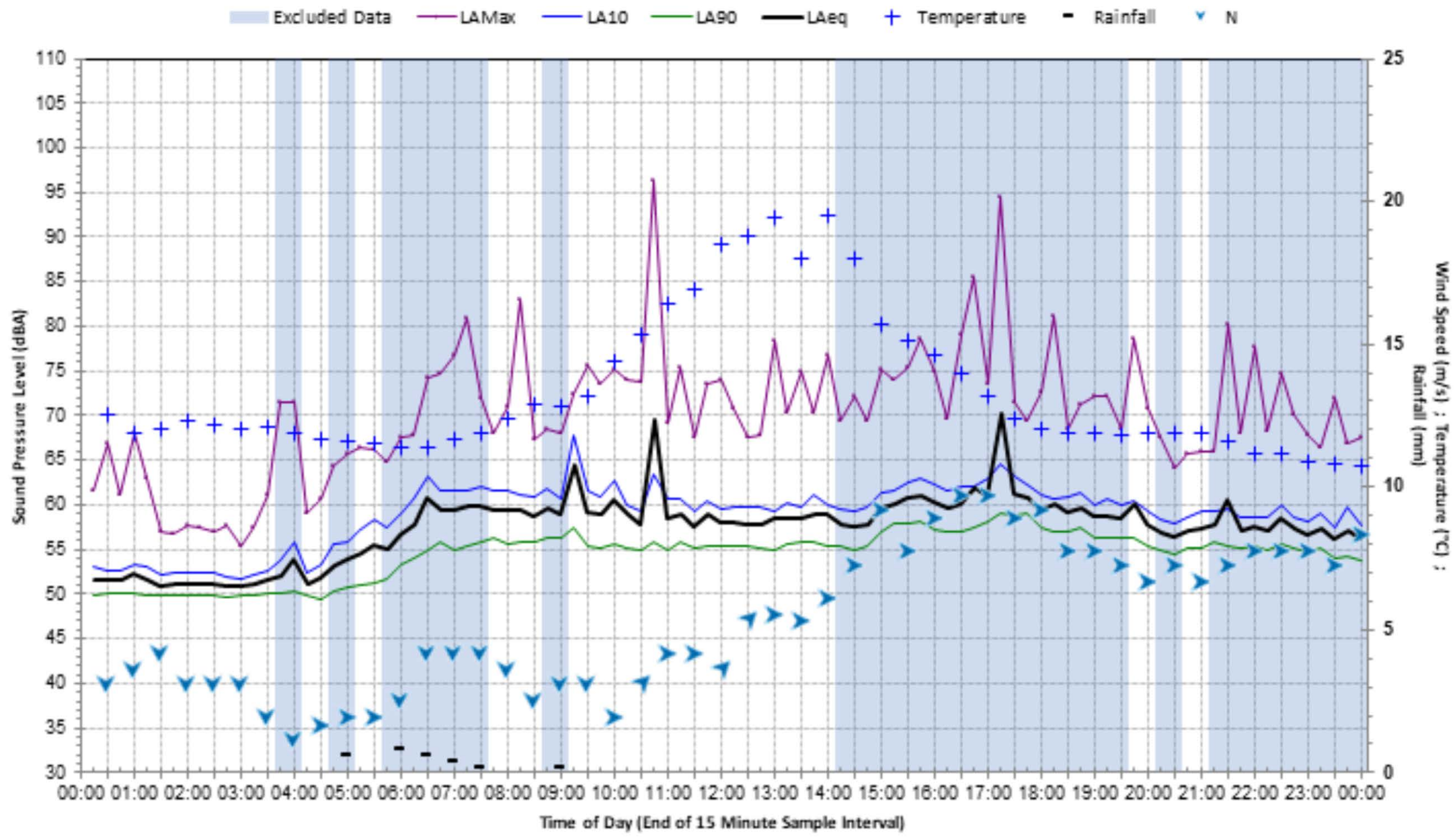
**M2 - Statistical Ambient Noise Levels
Sunday 24 July 2022**



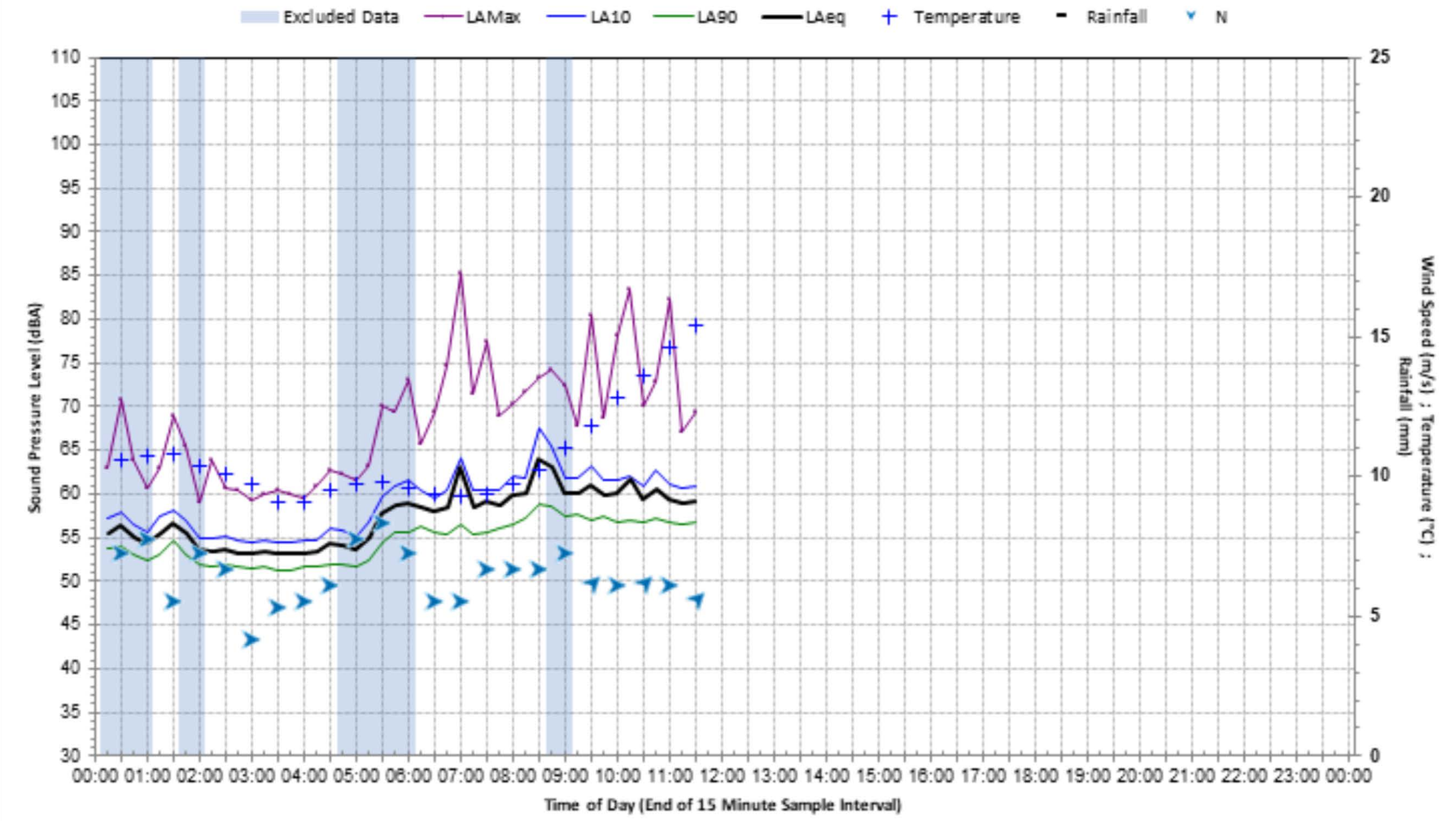
**M2 - Statistical Ambient Noise Levels
Monday 25 July 2022**



M2 - Statistical Ambient Noise Levels Tuesday 26 July 2022

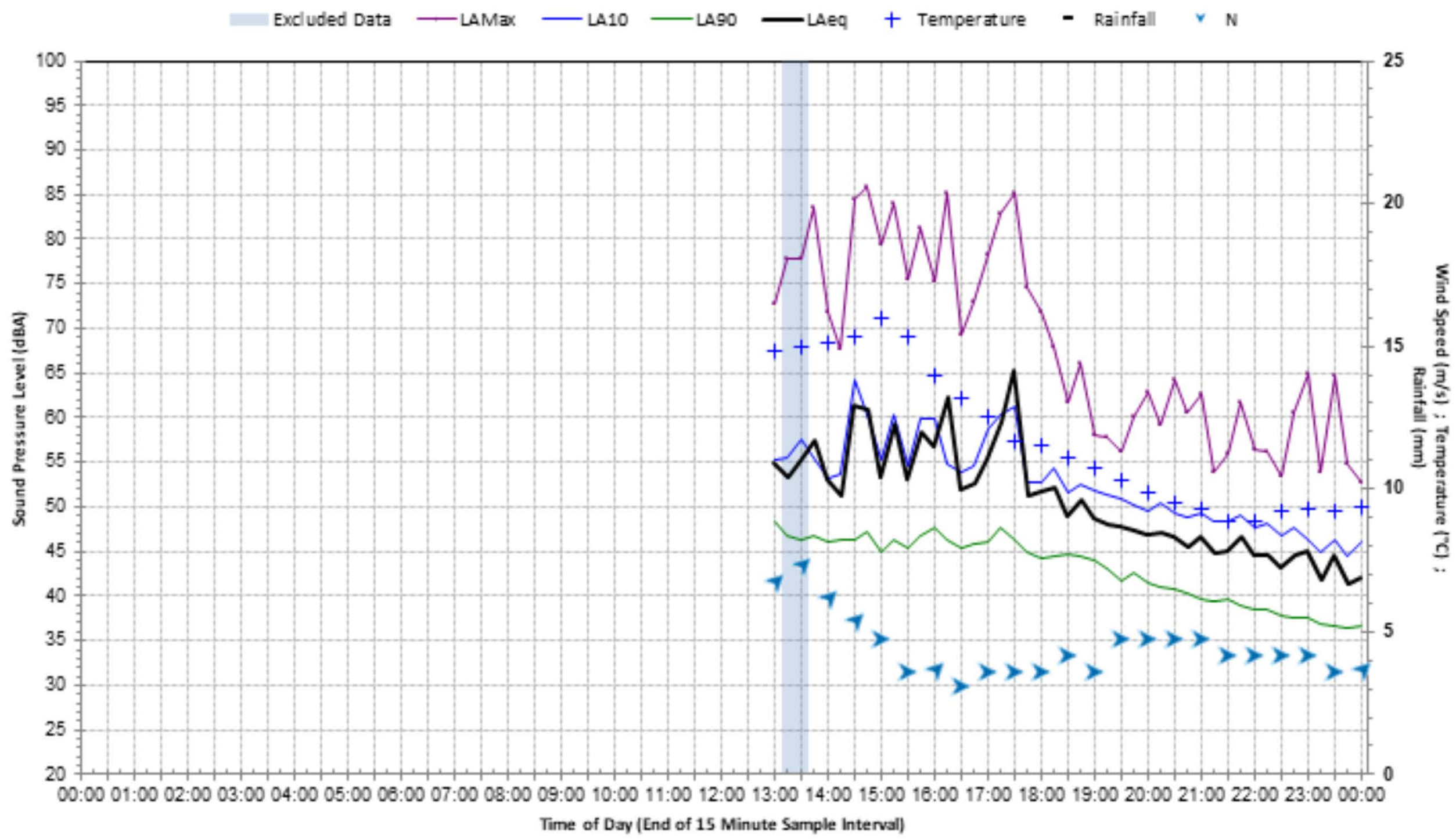


M2 - Statistical Ambient Noise Levels Wednesday 27 July 2022

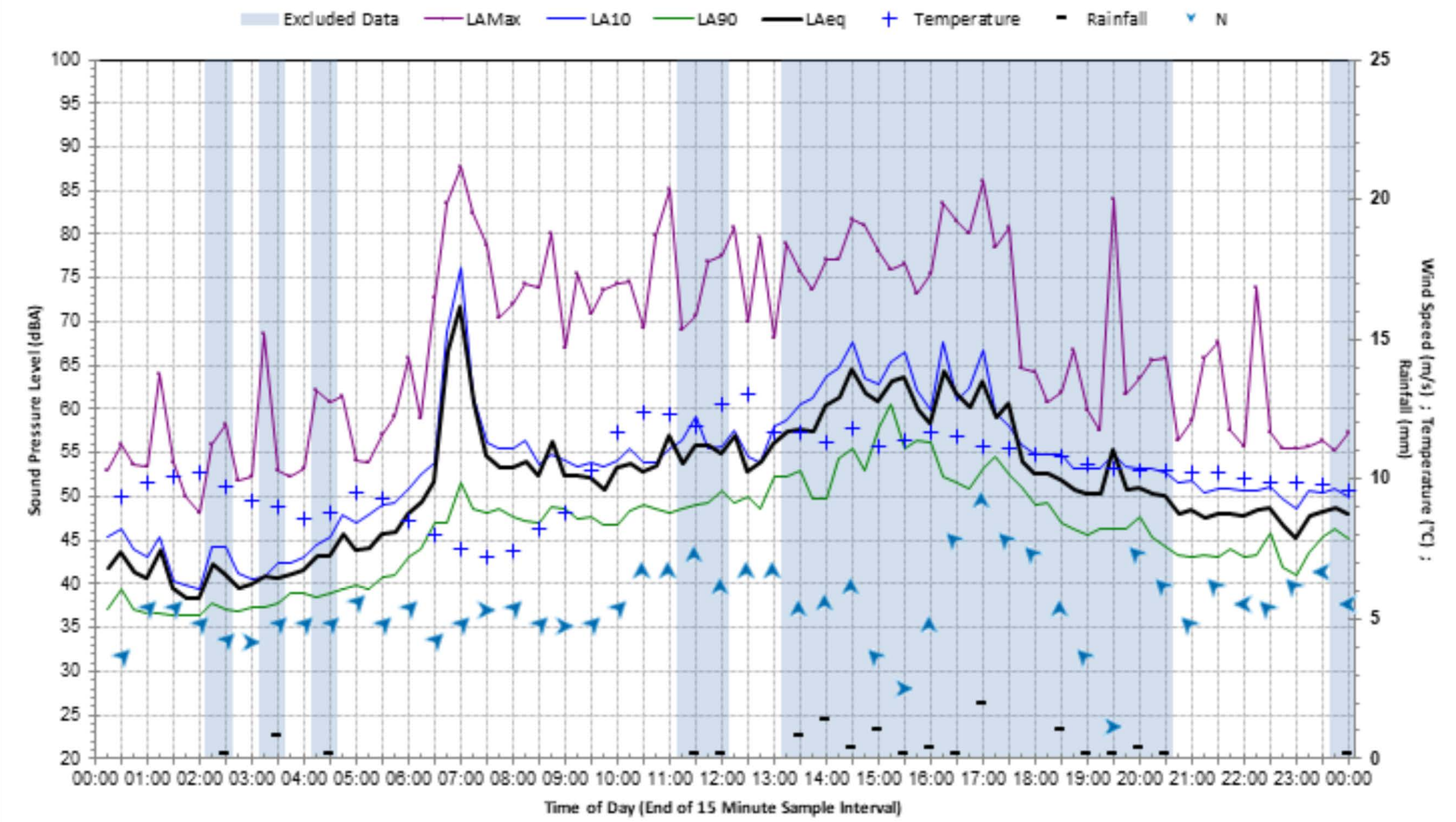


M3

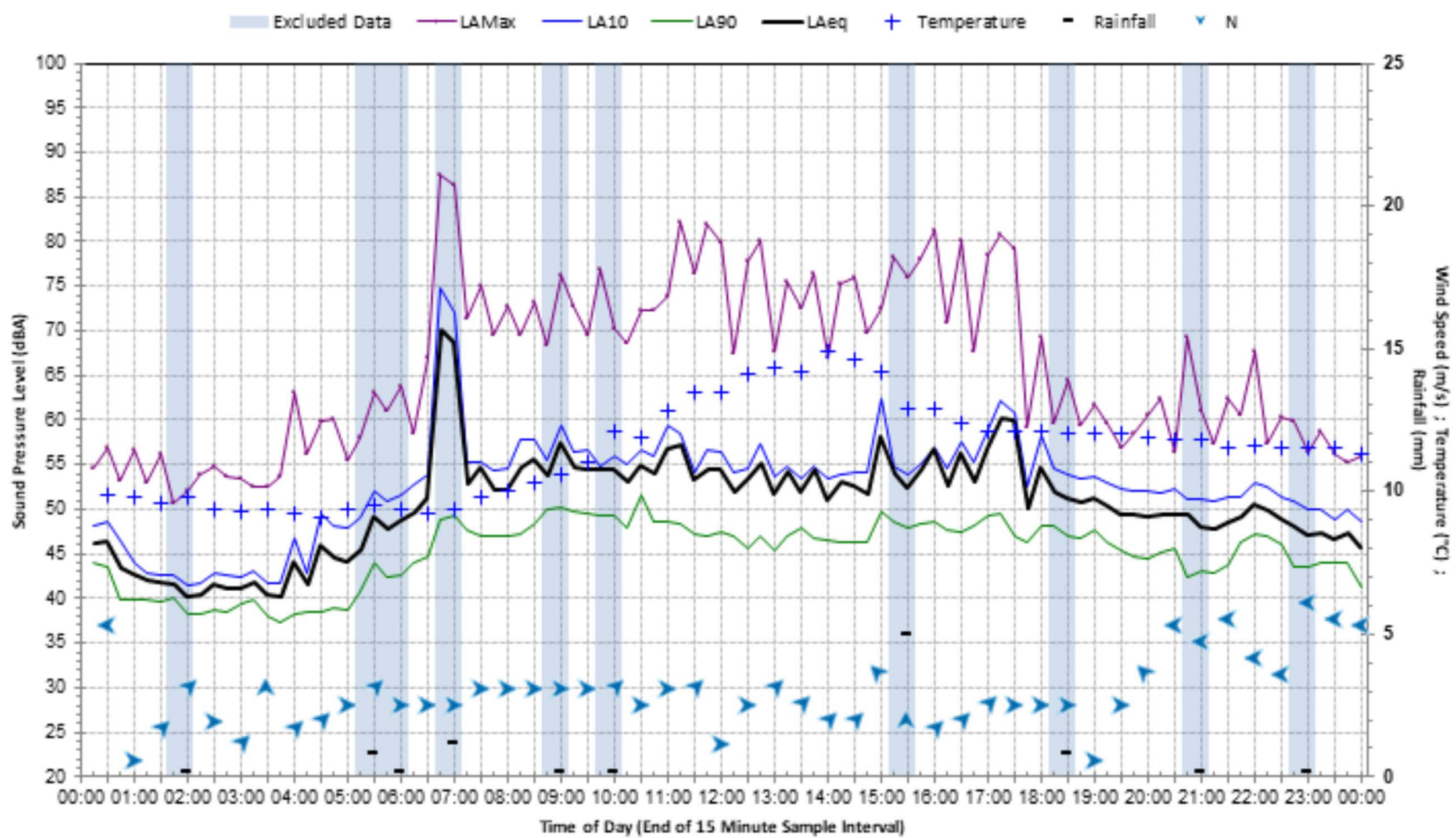
**M3 - Statistical Ambient Noise Levels
Monday 18 July 2022**



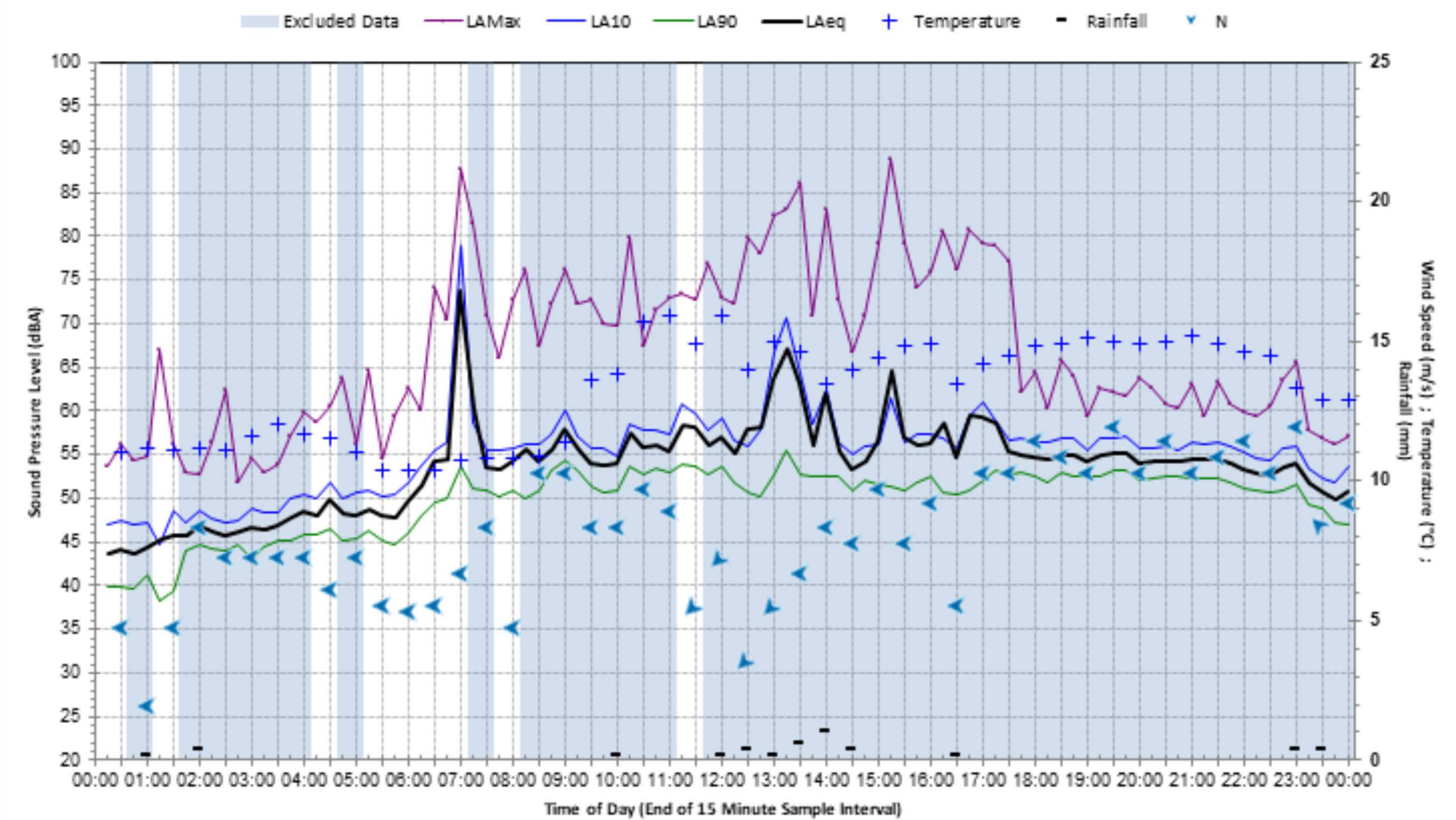
**M3 - Statistical Ambient Noise Levels
Tuesday 19 July 2022**



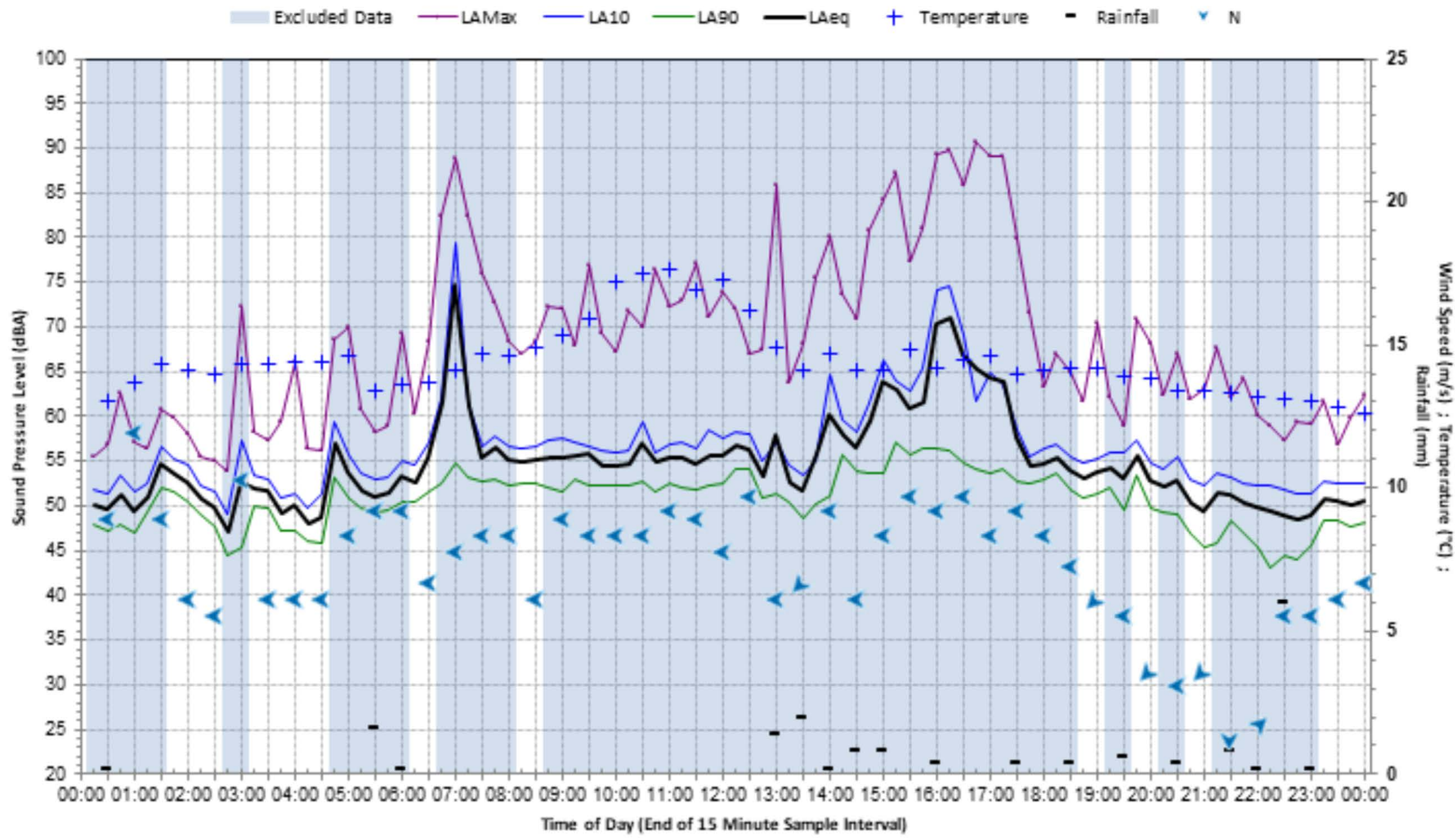
**M3 - Statistical Ambient Noise Levels
Wednesday 20 July 2022**



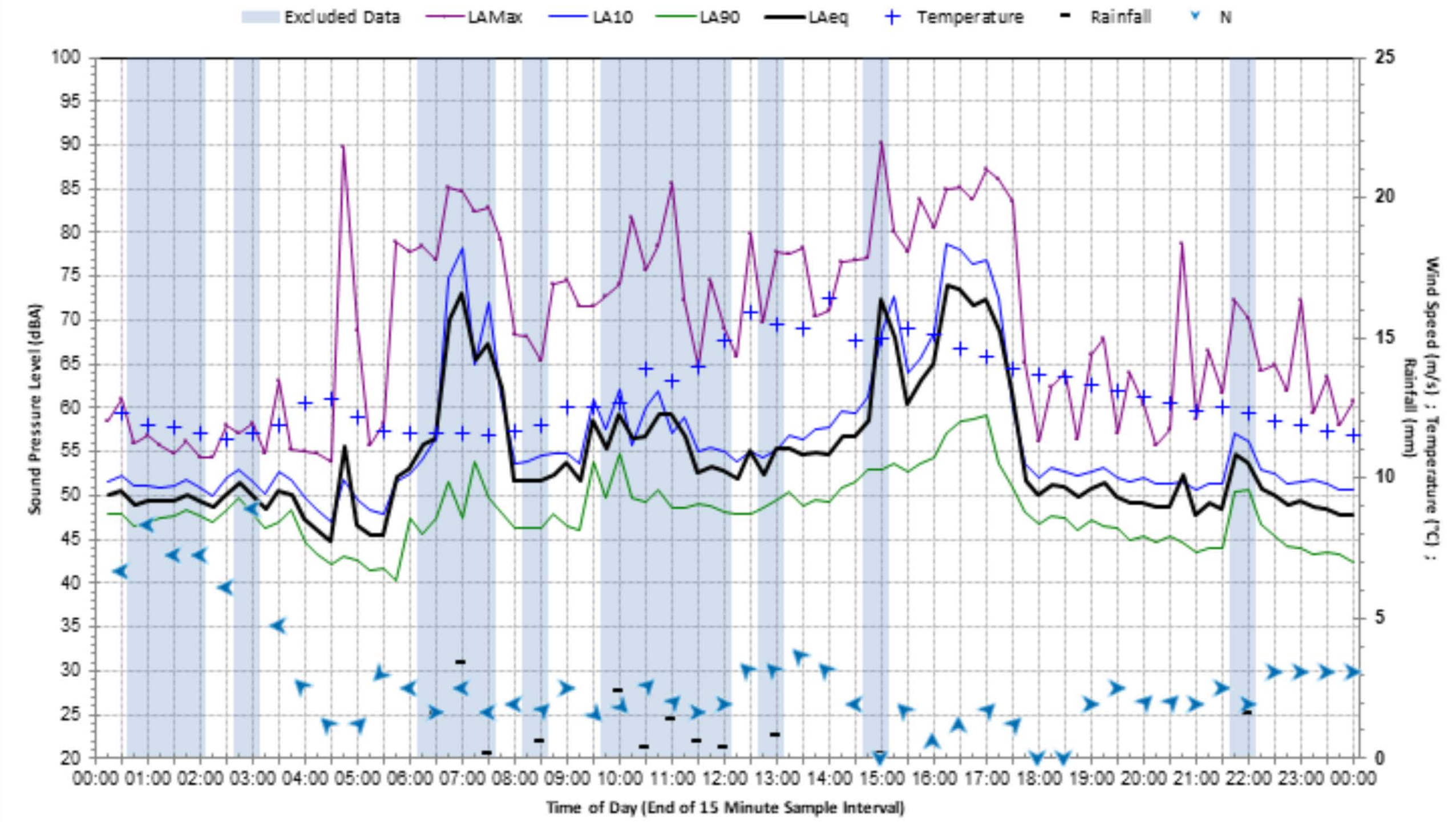
**M3 - Statistical Ambient Noise Levels
Thursday 21 July 2022**



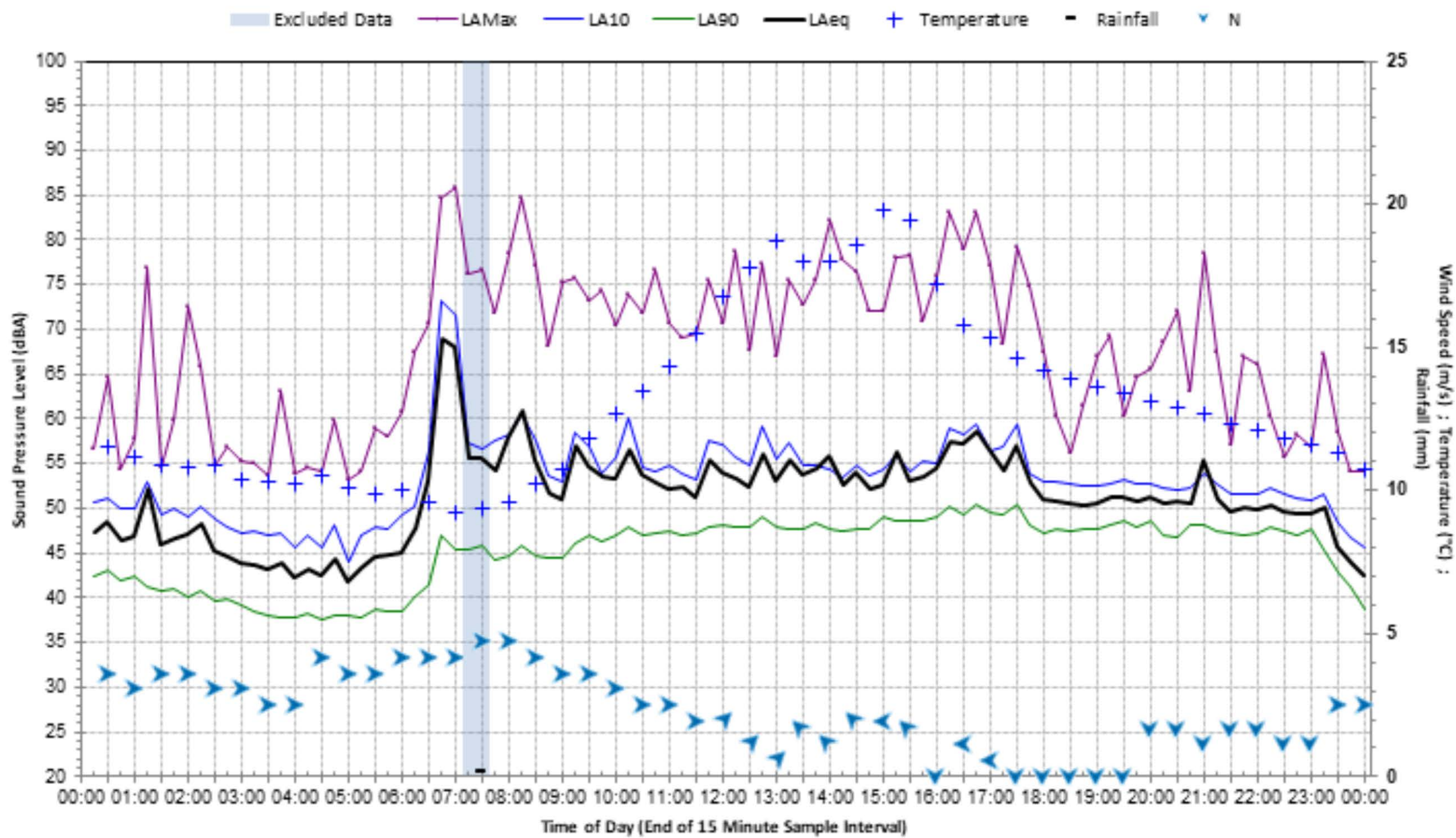
**M3 - Statistical Ambient Noise Levels
Friday 22 July 2022**



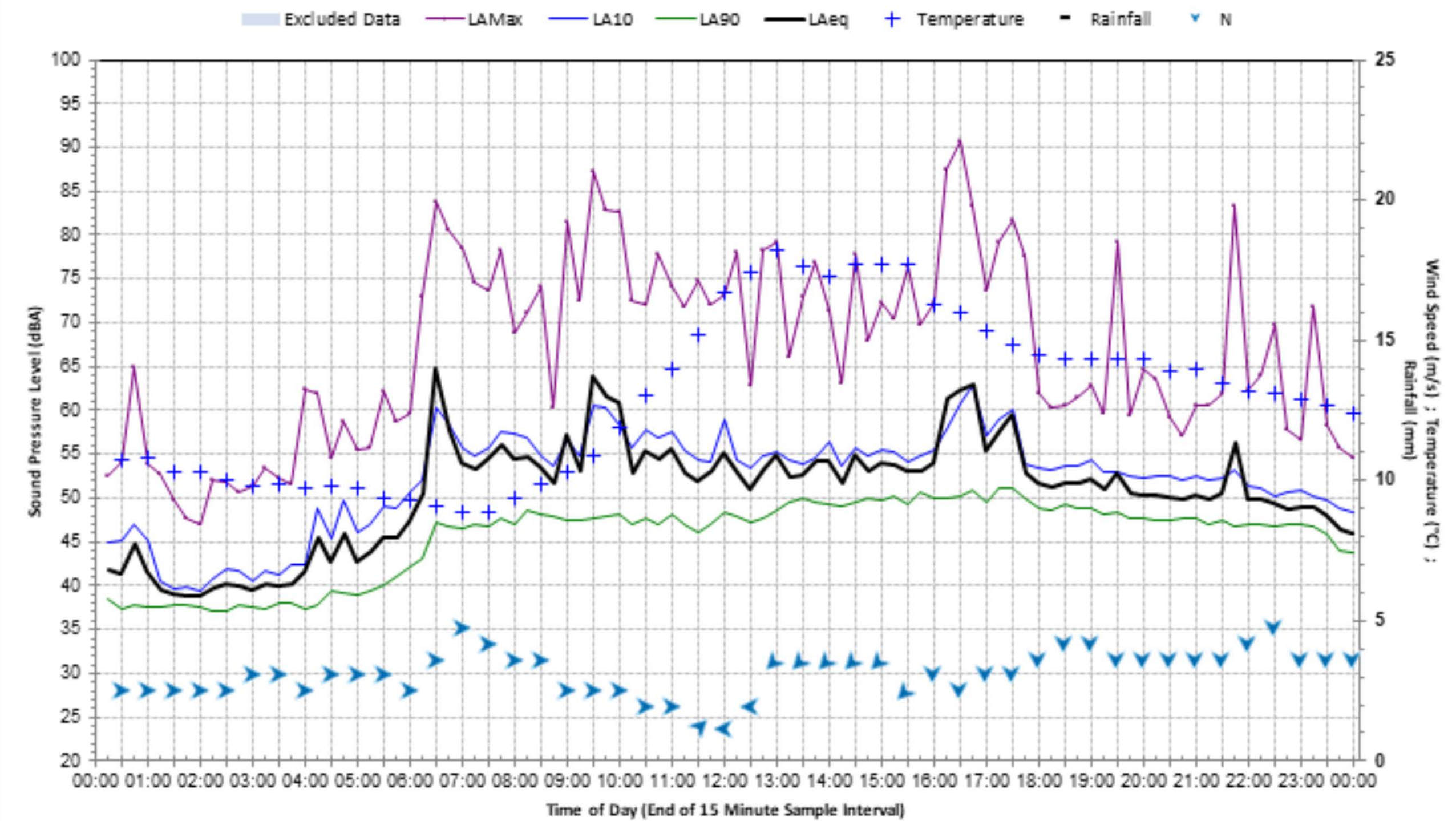
**M3 - Statistical Ambient Noise Levels
Saturday 23 July 2022**



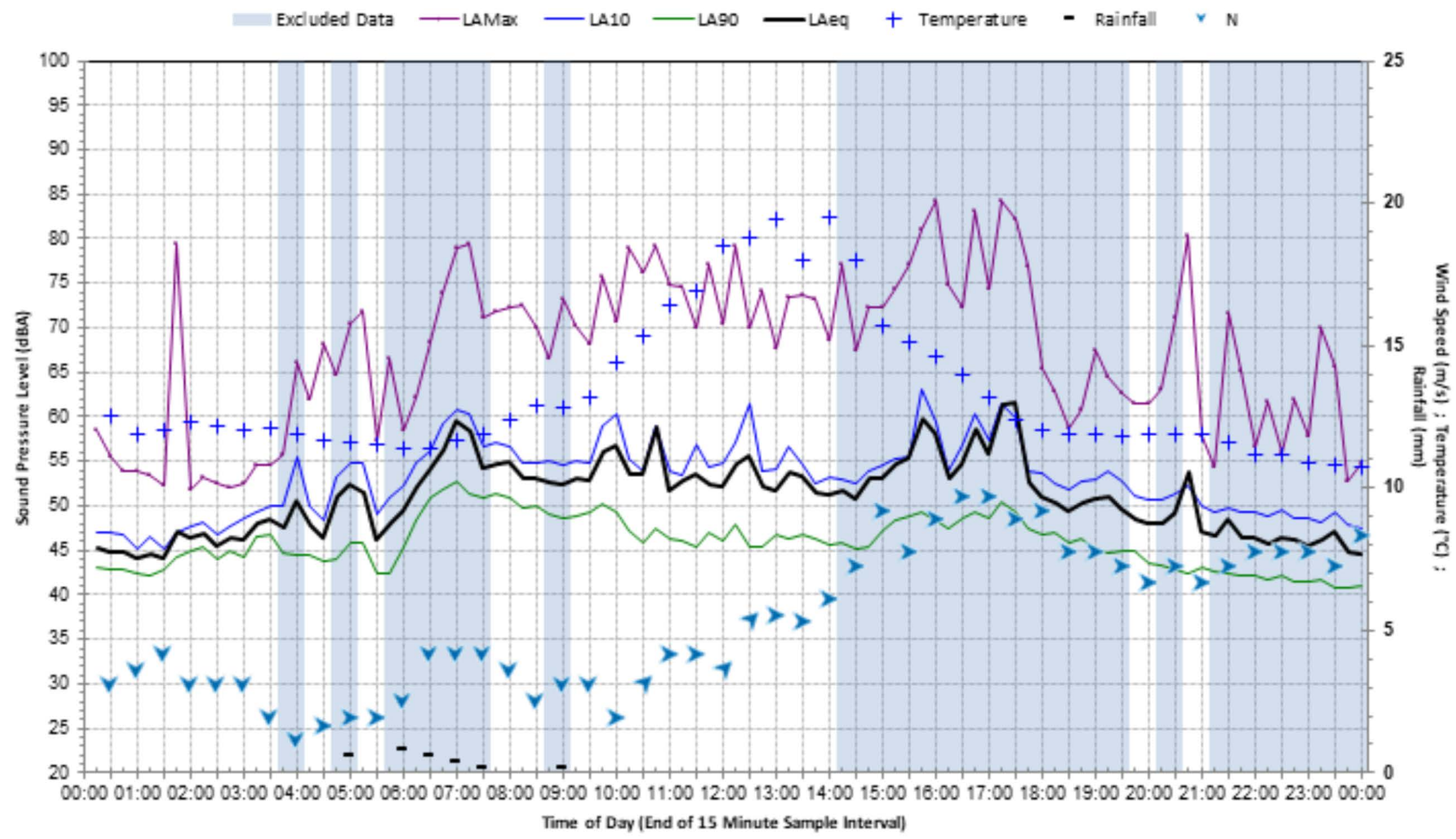
**M3 - Statistical Ambient Noise Levels
Sunday 24 July 2022**



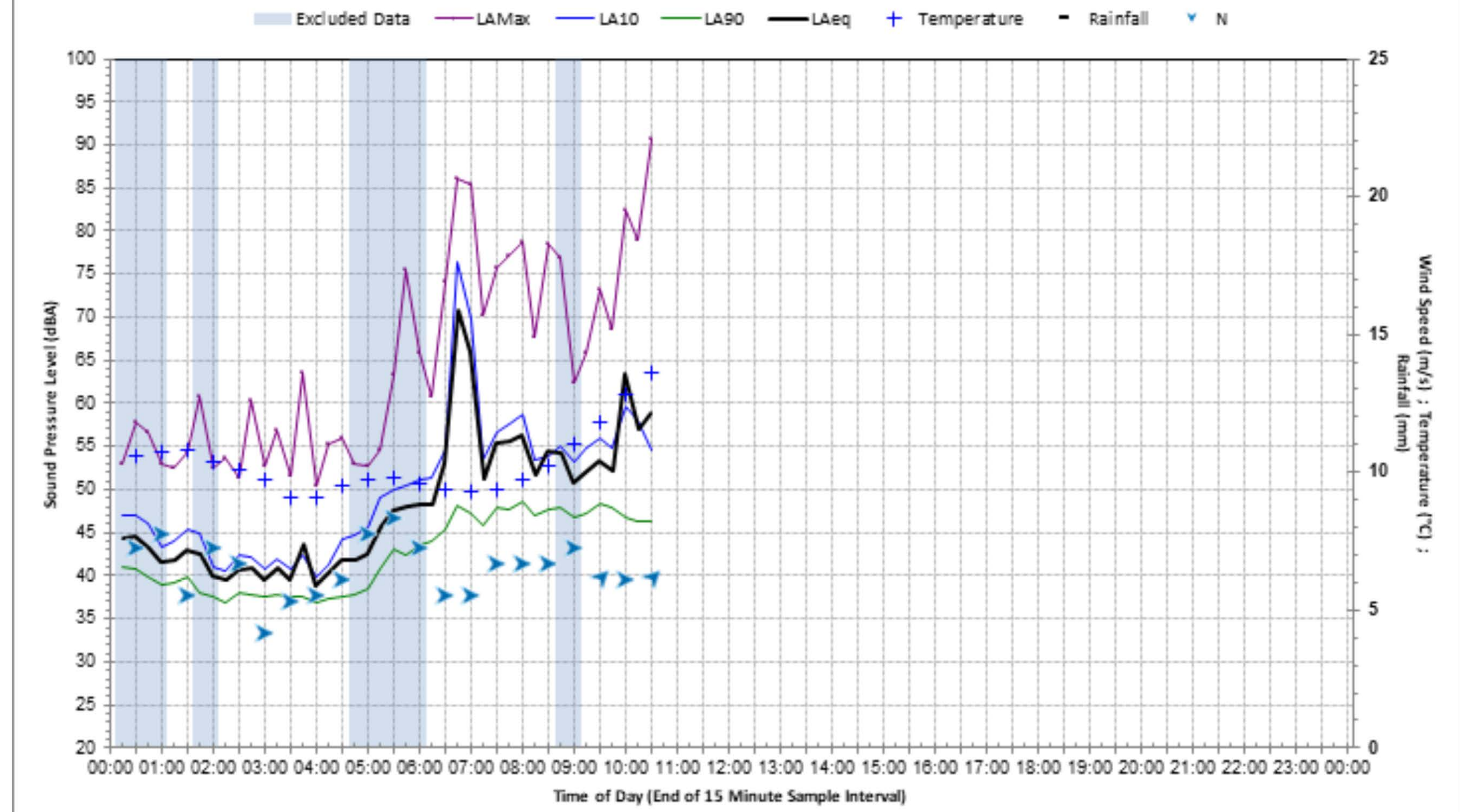
**M3 - Statistical Ambient Noise Levels
Monday 25 July 2022**



M3 - Statistical Ambient Noise Levels Tuesday 26 July 2022

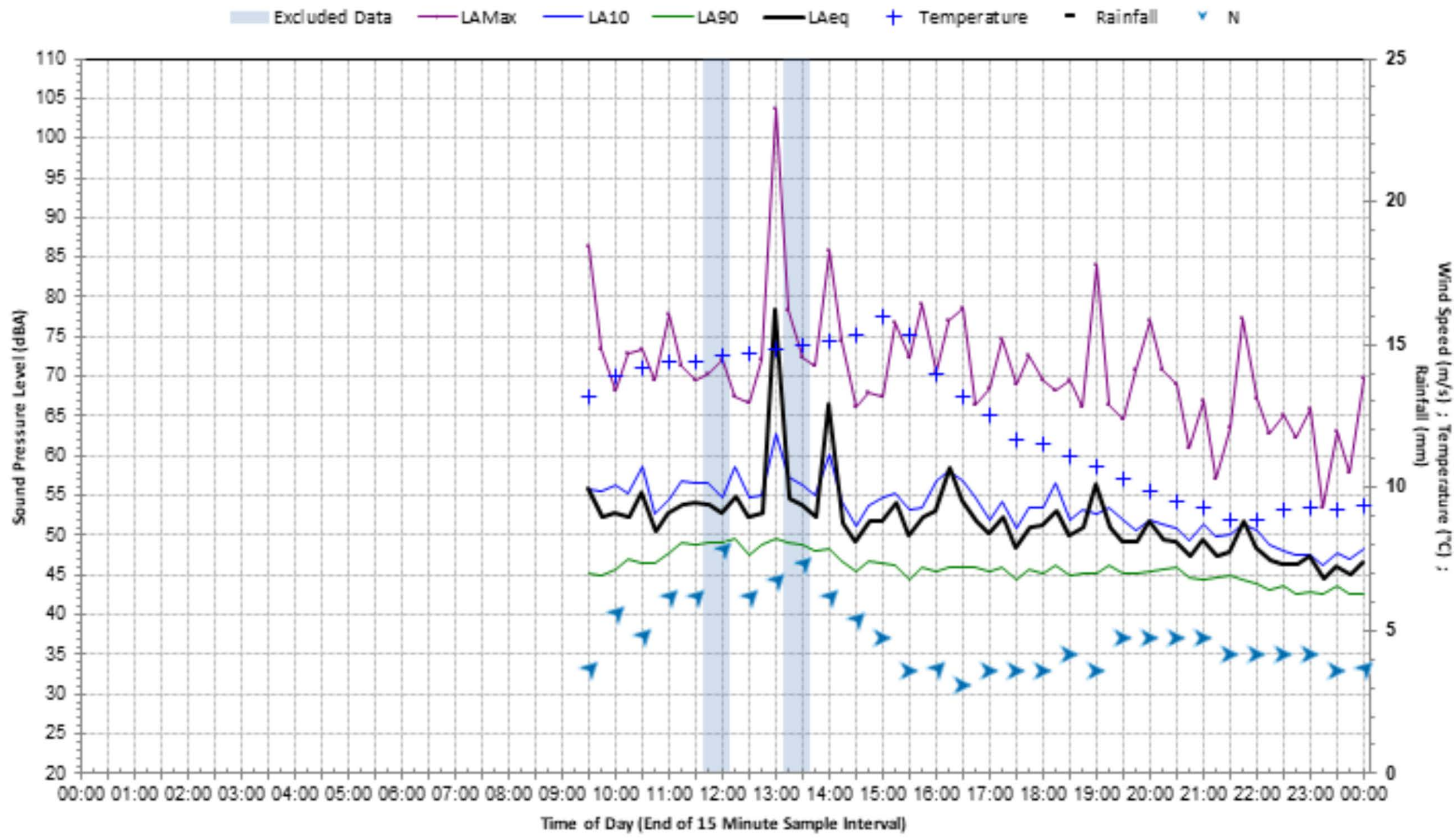


M3 - Statistical Ambient Noise Levels Wednesday 27 July 2022

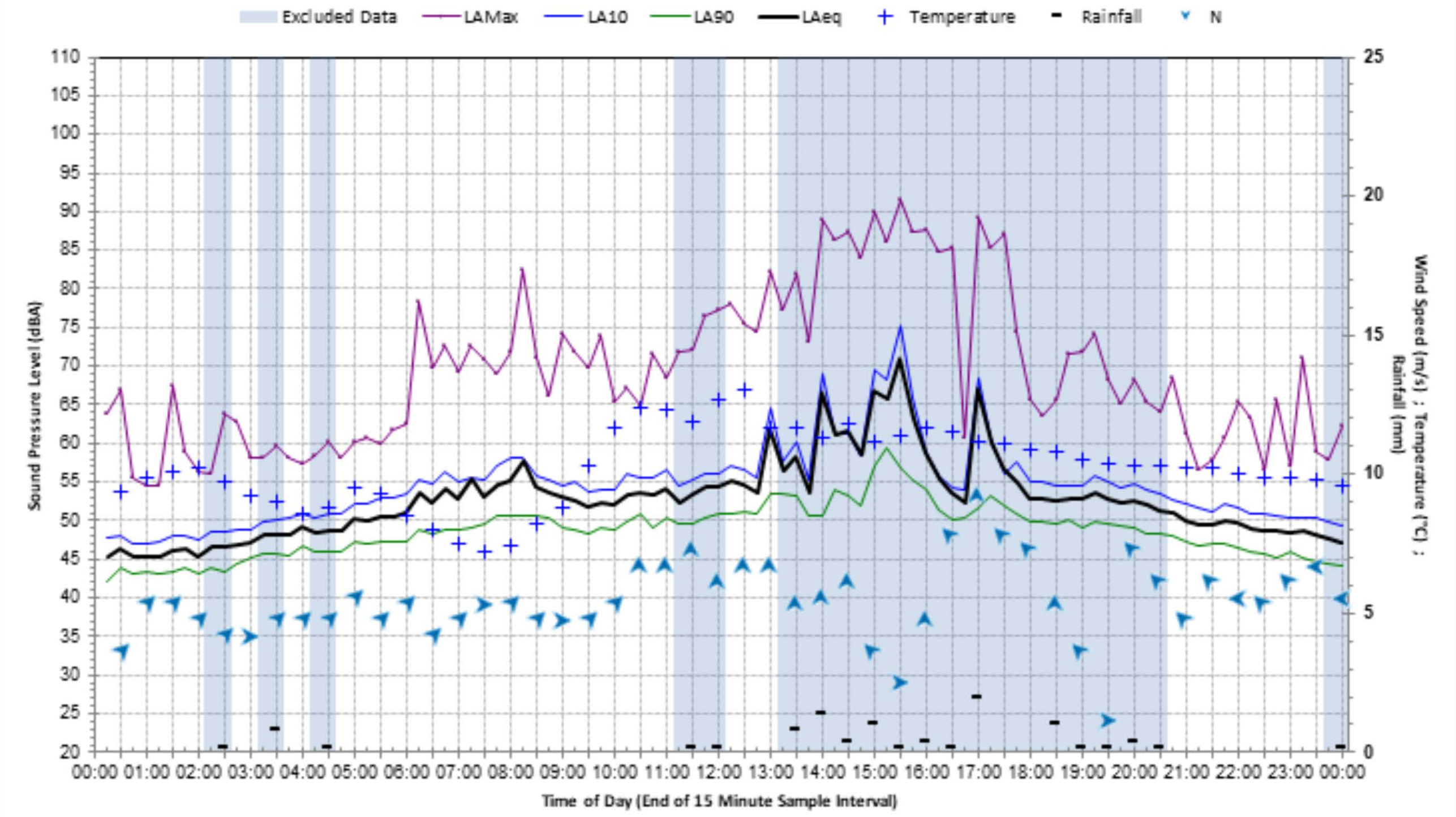


M4

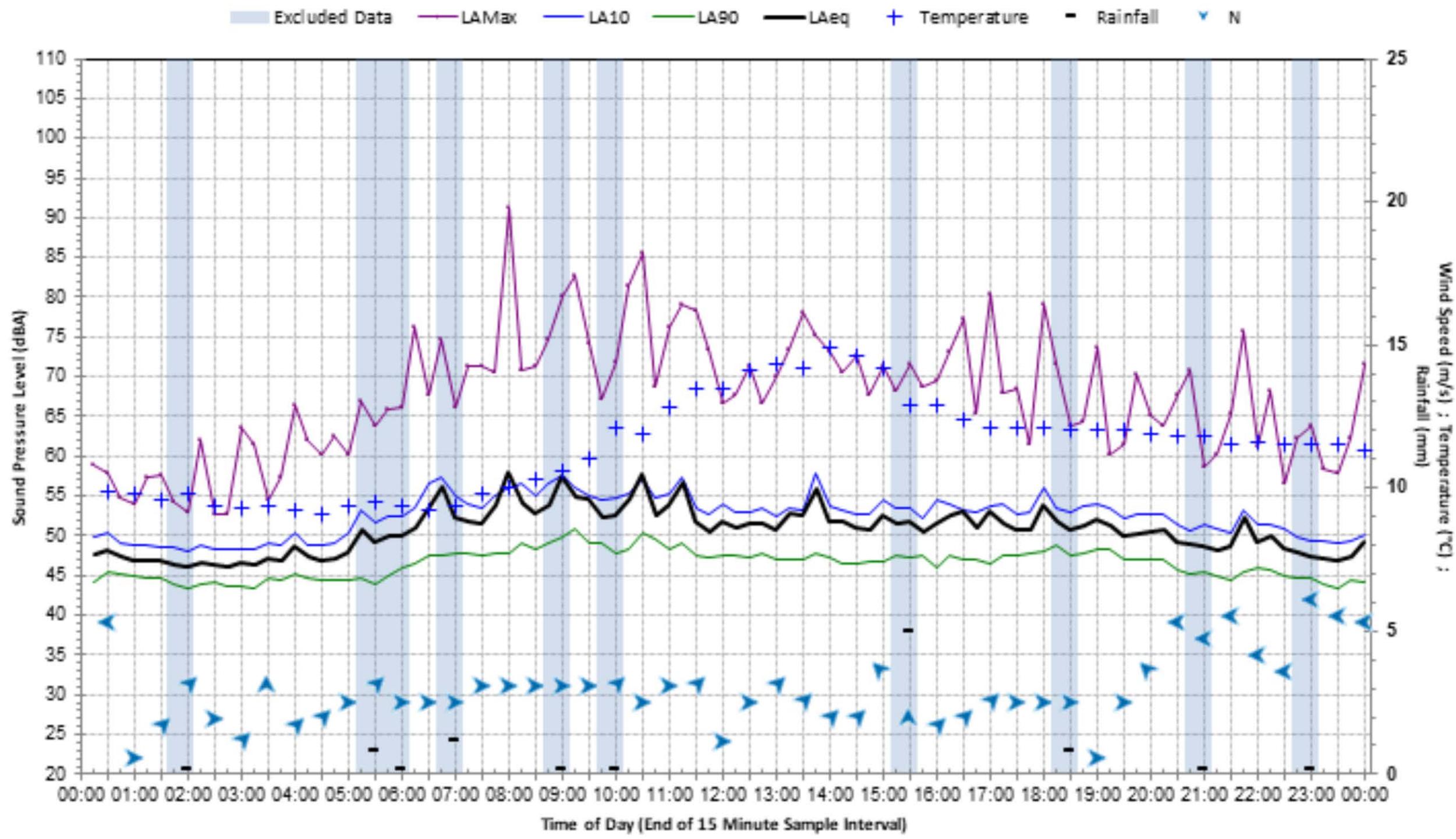
**M4 - Statistical Ambient Noise Levels
Monday 18 July 2022**



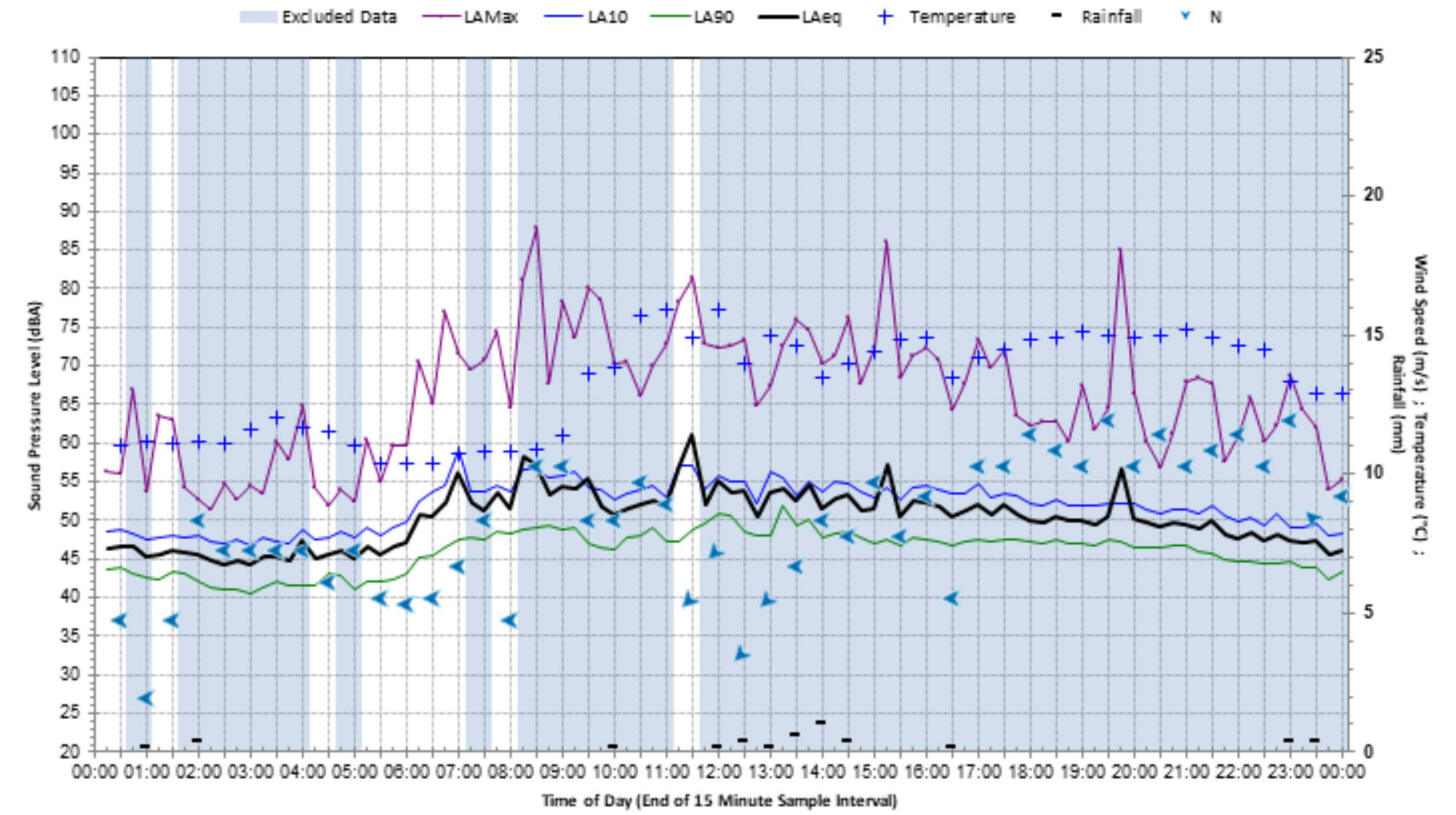
**M4 - Statistical Ambient Noise Levels
Tuesday 19 July 2022**



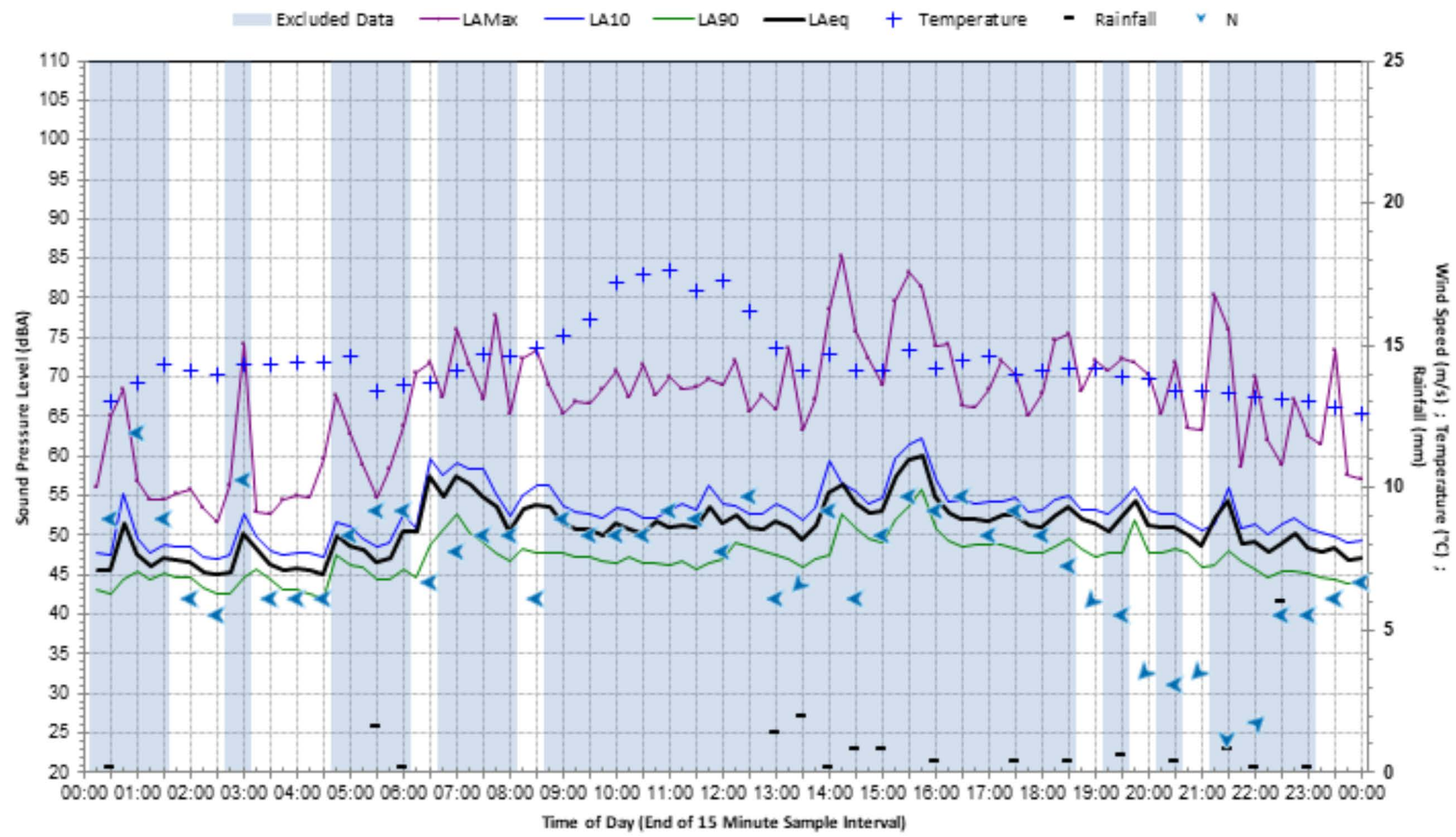
**M4 - Statistical Ambient Noise Levels
Wednesday 20 July 2022**



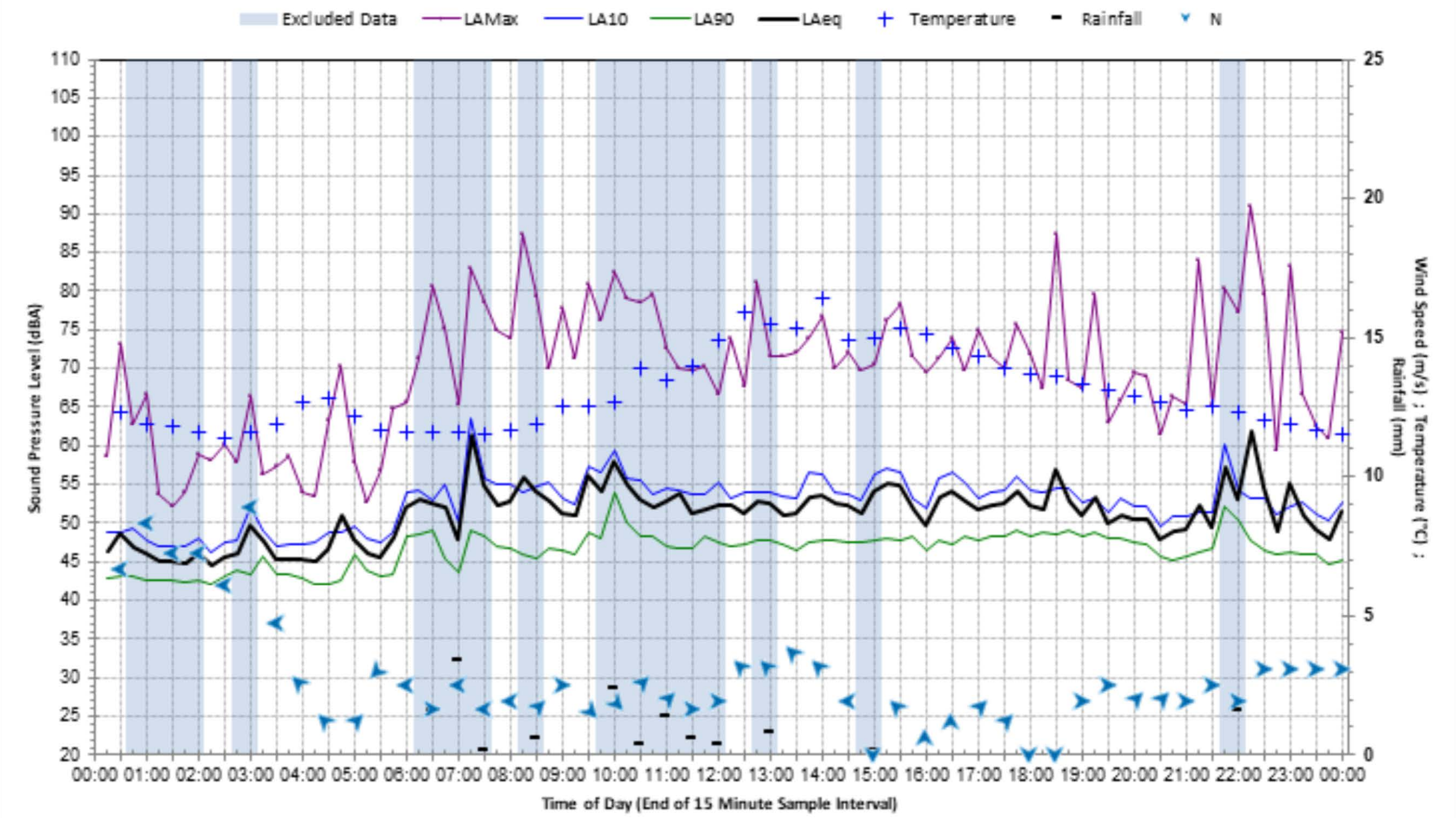
**M4 - Statistical Ambient Noise Levels
Thursday 21 July 2022**



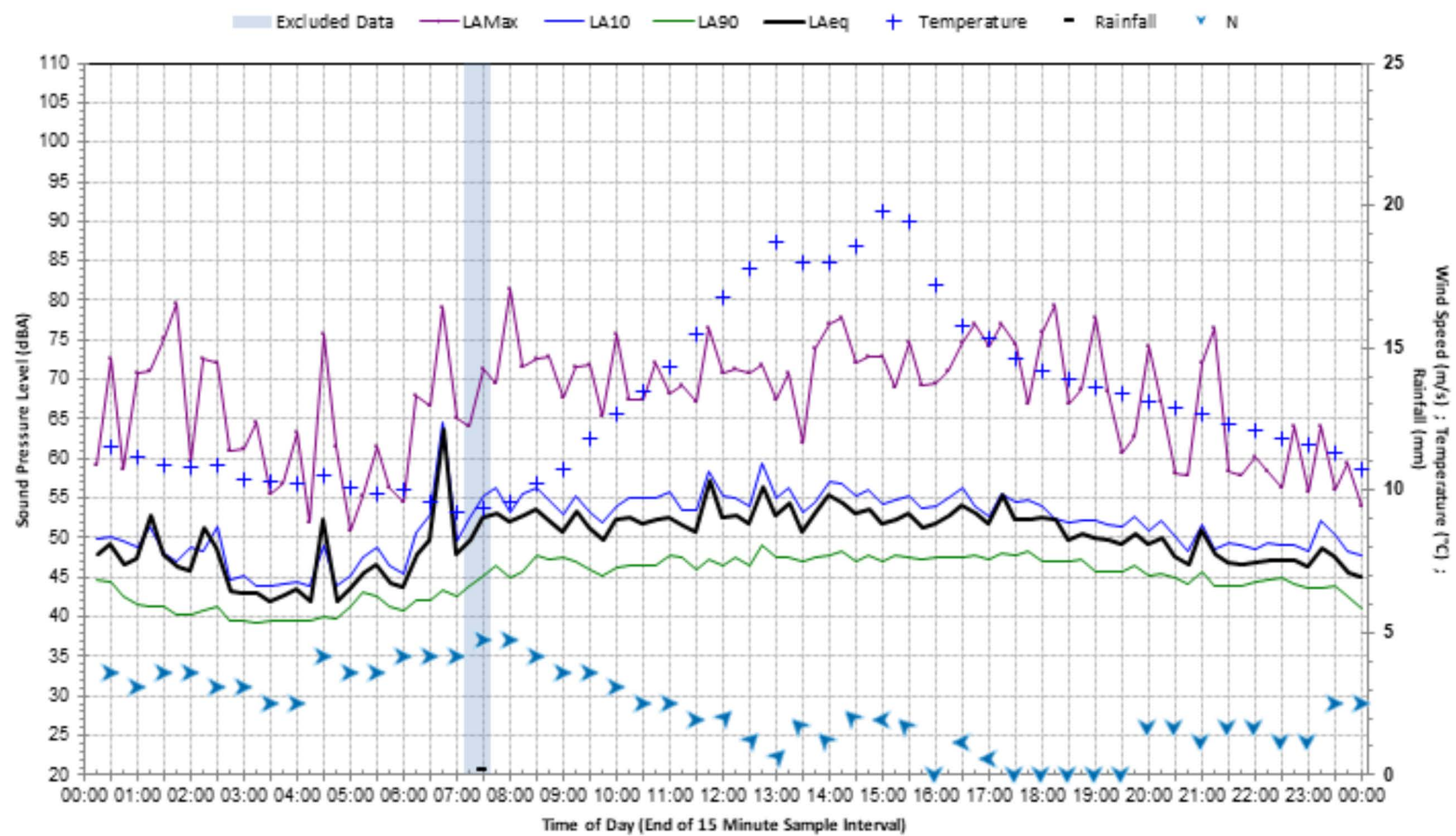
**M4 - Statistical Ambient Noise Levels
Friday 22 July 2022**



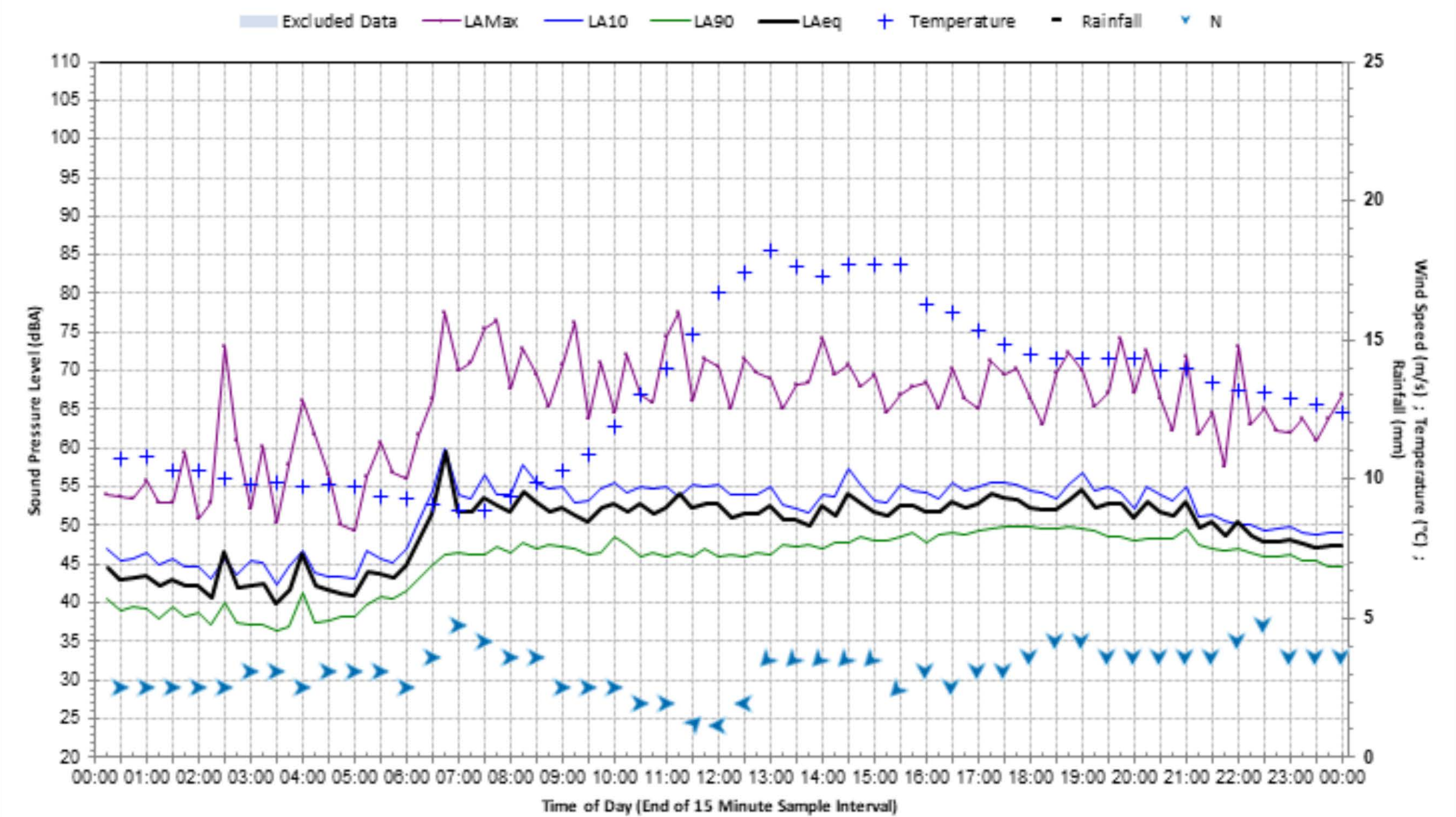
**M4 - Statistical Ambient Noise Levels
Saturday 23 July 2022**



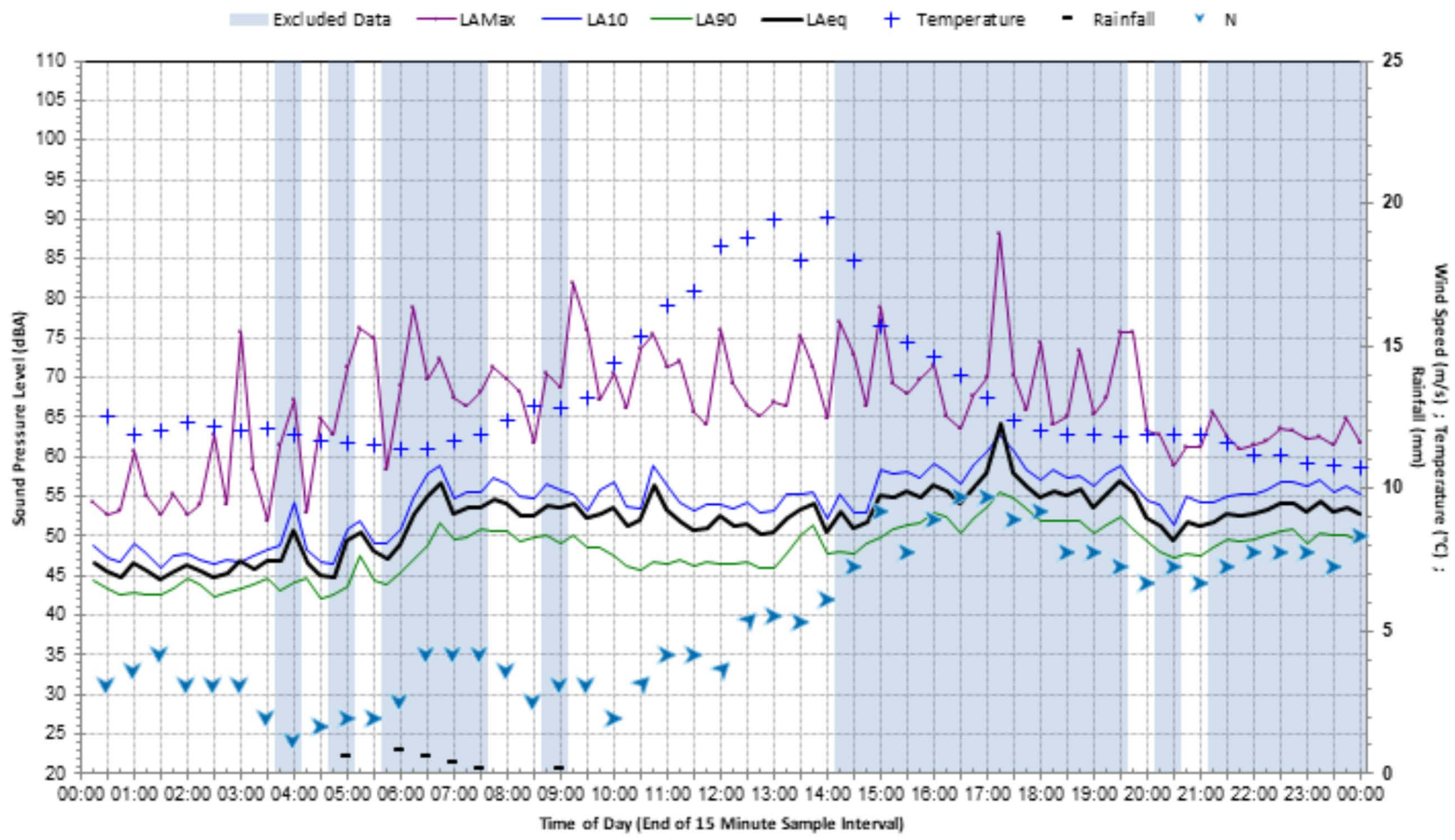
**M4 - Statistical Ambient Noise Levels
Sunday 24 July 2022**



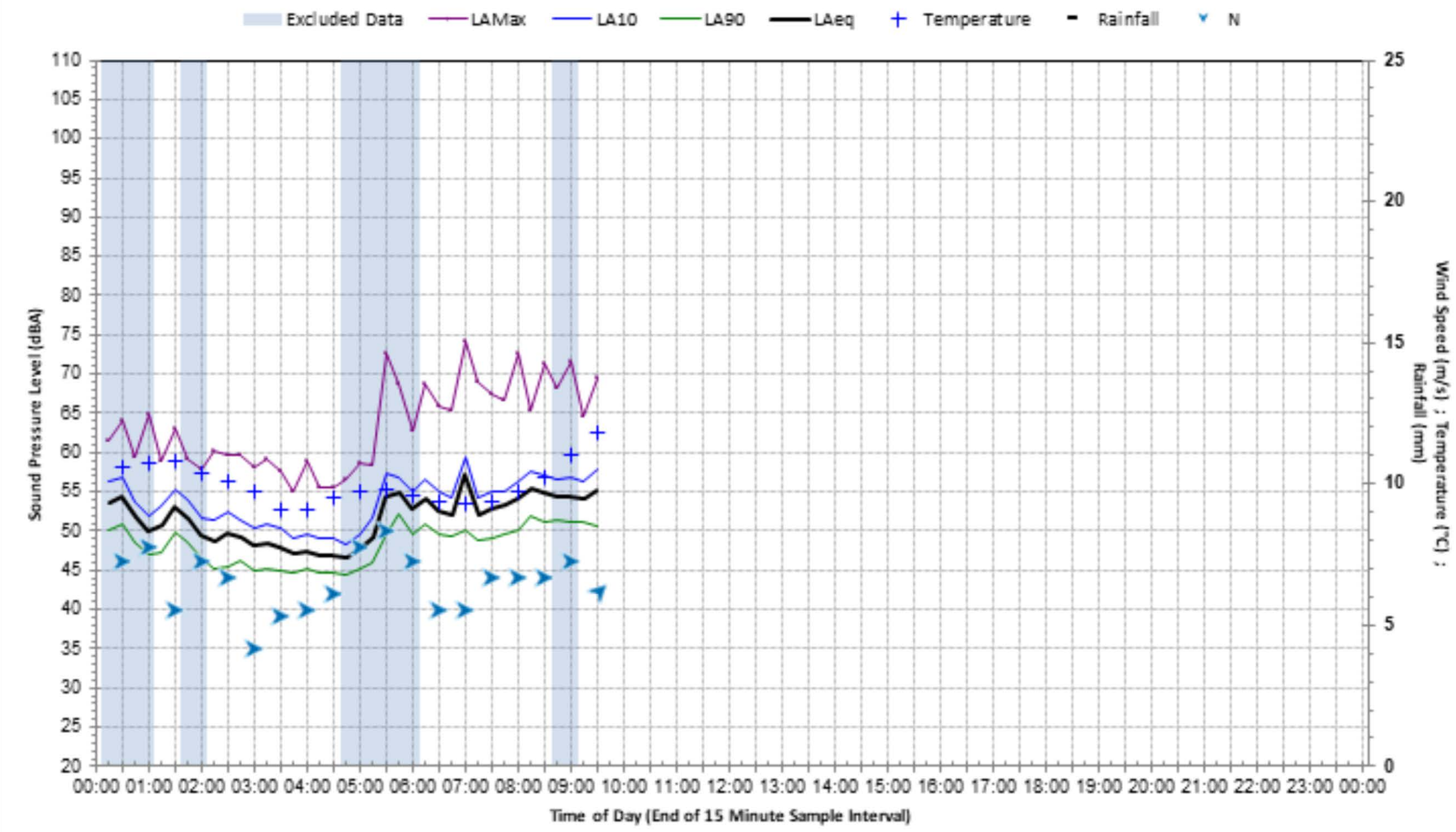
**M4 - Statistical Ambient Noise Levels
Monday 25 July 2022**



M4 - Statistical Ambient Noise Levels Tuesday 26 July 2022



M4 - Statistical Ambient Noise Levels Wednesday 27 July 2022



Appendix C

Detailed construction results

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0001	341059.8	6258925	2 Gilbert St, Manly	Residential	NCA1	56	43	46	43	40	54	41	39	43
R0002	338931.21	6257390.1	17 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	11	13	10	23	11	9	10
R0003	338939.67	6257385.9	15 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	11	13	10	23	11	9	10
R0004	338948.29	6257462.3	24 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0005	338967.27	6257503.8	39 Cutler Rd, Clontarf	Residential	NCA4	57	48	15	17	14	27	15	13	14
R0006	338960.99	6257384.2	11 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	5	7	4	17	5	3	3
R0007	338956.21	6257454.7	20 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	5	6	3	16	4	2	3
R0008	338965.48	6257486.4	39A Cutler Rd, Clontarf	Residential	NCA4	57	48	6	8	5	18	6	4	4
R0009	338971.78	6257448.6	18 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0010	338973.2	6257393.3	9 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	9	23	10	8	9
R0011	338979.32	6257499.1	37 Cutler Rd, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0012	338987.49	6257441.6	16 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	13
R0013	338987.33	6257399.3	7 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0014	338988.67	6257580.6	50 Cutler Rd, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0015	338990.05	6257501.2	35 Cutler Rd, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0016	338992.05	6257441.1	14 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0017	338997.13	6257401.9	5 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	8	22	10	8	8
R0018	339001.27	6257495.7	33 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0019	339001.27	6257584.4	48 Cutler Rd, Clontarf	Residential	NCA4	57	48	20	22	18	32	20	18	18
R0020	339005.68	6257401.1	3 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0021	339010.96	6257447.9	12 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	20	22	13	32	20	18	13
R0022	339009.47	6257481	31 Cutler Rd, Clontarf	Residential	NCA4	57	48	6	8	5	18	6	4	4
R0023	339027.23	6257610.6	1C Vista Av, Balgowlah Heights	Residential	NCA4	57	48	16	18	15	28	16	14	15
R0024	339016.22	6257636.4	8 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	18	20	16	30	18	16	16
R0025	339011.34	6257581.7	46 Cutler Rd, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0026	339021.23	6257389.1	11 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	18
R0027	339029.72	6257648.4	8 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0028	339024.72	6257443.1	10 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	7	9	6	19	7	5	5
R0029	339042.11	6257667.8	7 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	14	15	12	25	13	11	12
R0030	339033.44	6257247	5 Barrabooka St, Clontarf	Residential	NCA4	57	48	6	8	5	18	6	4	5
R0031	339035.43	6257498.2	29 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0032	339049.92	6257216	1 Barrabooka St, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0033	339037.88	6257581.5	44 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0034	339043.31	6257685.3	6 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	17	19	16	29	17	15	16
R0035	339040.99	6257450.2	8A Ogilvy Rd, Clontarf	Residential	NCA4	57	48	9	11	8	21	9	7	8
R0036	339050.29	6257702.7	5 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	19
R0037	339045.8	6257342	23 Barrabooka St, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0038	339050.67	6257494.9	27 Cutler Rd, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0039	339054.96	6257572	42 Cutler Rd, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0040	339065.29	6257248.2	7 Barrabooka St, Clontarf	Residential	NCA4	57	48	12	14	11	24	12	10	11
R0041	339054.63	6257265	7 Barrabooka St, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0042	339057.95	6257301.9	15-17 Barrabooka St, Clontarf	Residential	NCA4	57	48	22	24	21	34	22	20	20
R0043	339066.58	6257426.5	6A Ogilvy Rd, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0044	339058.42	6257284.7	11 Barrabooka St, Clontarf	Residential	NCA4	57	48	22	24	21	34	22	20	21
R0045	339070.18	6257312.3	19 Barrabooka St, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0046	339068.33	6257556.9	40 Cutler Rd, Clontarf	Residential	NCA4	57	48	10	12	9	22	10	8	8
R0047	339074.52	6257446.3	6 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	21	20	17	30	18	16	17
R0048	339064.32	6257735.8	4 Adrian Pl, Balgowlah Heights	Residential	NCA4	57	48	23	25	22	35	23	21	22
R0049	339069.95	6257360.4	27 Barrabooka St, Clontarf	Residential	NCA4	57	48	5	6	3	17	4	2	3
R0050	339080.34	6257464.2	25A Cutler Rd, Clontarf	Residential	NCA4	57	48	9	11	8	21	9	7	8
R0051	339075.8	6257325.8	21 Barrabooka St, Clontarf	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0052	339081.85	6257697.2	11 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	22
R0053	339066.9	6257393.5	31 Barrabooka St, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0054	339084.68	6257675.4	9 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	22
R0055	339082.64	6257347.5	25 Barrabooka St, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0056	339077.5	6257555.9	38 Cutler Rd, Clontarf	Residential	NCA4	57	48	15	17	14	27	15	13	13
R0057	339064.14	6257480.6	25 Cutler Rd, Clontarf	Residential	NCA4	57	48	6	8	5	18	6	4	4
R0058	339077.39	6257646.6	5 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	20
R0059	339082.84	6257663.8	7 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0060	339085.02	6257570.5	1C Vista Av, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0061	339083.69	6257431.1	2 Ogilvy Rd, Clontarf	Residential	NCA4	57	48	12	14	11	24	12	10	11
R0062	339076.21	6257444.6	4A Ogilvy Rd, Clontarf	Residential	NCA4	57	48	5	7	4	17	5	3	3
R0063	339093.96	6257714.9	13 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0064	339098.05	6257799.3	19 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0065	339105.93	6257748	17 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0066	339094.49	6257739	15 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0067	339100.2	6257486.8	23 Cutler Rd, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0068	339109.57	6257760.4	19 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0069	339108.75	6257784.7	21 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0070	339117.57	6257289	4 Barrabooka St, Clontarf	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0071	339110.86	6257431.6	33 Barrabooka St, Clontarf	Residential	NCA4	57	48	18	19	16	29	17	15	16
R0072	339119.07	6257835.8	23 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	38	25	23	24
R0073	339109.66	6257317.6	6 Barrabooka St, Clontarf	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0074	339119.56	6257793.7	18 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0075	339121.71	6257265.5	2 Barrabooka St, Clontarf	Residential	NCA4	57	48	21	23	20	34	21	19	20
R0076	339122.07	6257855.8	25 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	38	25	23	24
R0077	339125.9	6257867.1	27 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0078	339125.47	6257885.5	29 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0079	339124.87	6257322.5	8 Barrabooka St, Clontarf	Residential	NCA4	57	48	12	14	11	24	12	10	11
R0080	339129.56	6257900.5	31 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0081	339123.56	6257582	21 Mulgowie Cr, Balgowlah Heights	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0082	339135.45	6257380.8	14 Barrabooka St, Clontarf	Residential	NCA4	57	48	12	12	9	22	10	8	9
R0083	339126.63	6257617.4	20 Mulgowie Cr, Balgowlah Heights	Residential	NCA4	57	48	23	25	22	35	23	21	22
R0084	339126.98	6257351.3	10 Barrabooka St, Clontarf	Residential	NCA4	57	48	11	13	10	23	11	9	10
R0085	339131.2	6257409.9	16 Barrabooka St, Clontarf	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0086	339140.33	6257674.7	19 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0087	339133.81	6257536.3	32 Cutler Rd, Clontarf	Residential	NCA4	57	48	15	16	13	26	14	12	13
R0088	339139.55	6257655.1	10 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	21	23	19	33	21	19	19
R0089	339150.29	6257633.8	8 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	24	25	22	36	23	21	22
R0090	339136.27	6257573.3	19 Mulgowie Cr, Balgowlah Heights	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0091	339149.31	6257475.4	21 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0092	339146.27	6257720.9	12 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0093	339151.96	6												

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0105	339162.57	6257317.2	3 Cutter Rd, Clontarf	Residential	NCA4	57	48	19	21	14	31	19	17	15
R0106	339170.27	6257348.6	7 Cutter Rd, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0107	339164.72	6257874	20 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0108	339171.85	6257369	9 Cutter Rd, Clontarf	Residential	NCA4	57	48	18	20	17	30	18	16	17
R0109	339167.56	6257475.9	19 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0110	339170.89	6257781.9	16 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0111	339170.54	6257622.4	16 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0112	339175.27	6257903.4	22 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0113	339177.95	6257518.2	28 Cutler Rd, Clontarf	Residential	NCA4	57	48	16	17	14	27	15	13	15
R0114	339179.39	6257408.3	13 Cutler Rd, Clontarf	Residential	NCA4	57	48	13	15	12	25	13	11	12
R0115	339176.52	6257443.1	17 Cutler Rd, Clontarf	Residential	NCA4	57	48	16	18	15	28	16	14	15
R0116	339169.09	6257561	15 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0117	339180.82	6257675.2	15 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	25	27	23	37	25	23	23
R0118	339178.92	6257719.8	20 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0119	339183.94	6257959.3	26 Vista Av, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0120	339188.09	6257941.1	34 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0121	339181.78	6257437.4	15 Cutler Rd, Clontarf	Residential	NCA4	57	48	20	22	16	32	20	18	16
R0122	339186.57	6258029.9	13 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0123	339196.66	6257977.3	8 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	25
R0124	339187.03	6257617.2	14 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0125	339190.33	6257769.5	15 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0126	339195.45	6258068.1	29 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	25	39	27	25	25
R0127	339194.76	6257506.8	26 Cutler Rd, Clontarf	Residential	NCA4	57	48	22	23	21	34	22	20	20
R0128	339197.96	6257897	31 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0129	339184.8	6257556.3	13 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0130	339192.23	6257861.3	28 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0131	339195.23	6257669.7	13 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0132	339199.72	6257720.7	18 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	38	25	23	24
R0133	339206.22	6258020.5	15 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0134	339197.93	6257614.7	12 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0135	339201.75	6257944.2	32 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0136	339205.15	6257765.6	14 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0137	339212.07	6257548.1	11 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	19
R0138	339206.11	6258074.6	27 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0139	339208.08	6257978.8	10 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0140	339218.06	6257340.9	8 Cutler Rd, Clontarf	Residential	NCA4	57	48	15	17	14	27	15	13	14
R0141	339216.15	6257712.9	16 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0142	339214.98	6257665.1	11 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	24
R0143	339221.46	6258019.9	17 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0144	339214.78	6257858.6	26 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0145	339219.61	6257757	13 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0146	339219.82	6257398.7	14 Cutler Rd, Clontarf	Residential	NCA4	57	48	14	16	13	26	14	12	13
R0147	339219.32	6257383.3	12 Cutler Rd, Clontarf	Residential	NCA4	57	48	16	18	15	28	16	14	15
R0148	339218.09	6258072.9	25 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0149	339212.13	6257545.7	7 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	10	12	9	22	10	8	9
R0150	339223.86	6257896.5	29-33 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0151	339215.25	6257328.3	6 Cutler Rd, Clontarf	Residential	NCA4	57	48	17	19	16	29	17	15	16
R0152	339229.04	6257608.2	10 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	23	25	22	35	23	21	22
R0153	339228.84	6257938	30 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	25
R0154	339222.45	6257444.9	18 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0155	339222.93	6257427.1	16 Cutler Rd, Clontarf	Residential	NCA4	57	48	19	21	18	31	19	17	18
R0156	339227.49	6258120	22 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0157	339230.14	6257656.6	9 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0158	339229.19	6257975.3	12 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0159	339232.85	6257754.6	12 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0160	339231.58	6258026.1	19 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0161	339234.62	6257710.2	14 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0162	339234.19	6258065.7	23 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0163	339239	6257599.2	8 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0164	339246.62	6257848	24 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0165	339244.55	6257649.4	7 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	38	25	23	24
R0166	339243.5	6257934.8	28 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	26	39	27	25	25
R0167	339245.03	6257893.5	27 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0168	339245.41	6257749.1	11 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0169	339245.57	6258028.2	21 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0170	339254.04	6257297	1 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0171	339252.77	6257696.6	12 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0172	339250.99	6258124.5	20 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0173	339247.29	6257974	14 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0174	339248.81	6257326.1	3 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	23	25	21	35	23	21	21
R0175	339254.78	6257339.8	5 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0176	339258.24	6257359.2	7 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0177	339249.54	6258070.8	21 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0178	339244.63	6257587.3	6 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	15	17	13	27	15	13	13
R0179	339259.19	6257372.6	9 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	21	23	20	33	21	19	20
R0180	339260.13	6257504.2	3 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	22
R0181	339264.45	6257411.1	13 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	21
R0182	339263.31	6257387.8	11 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	21
R0183	339259.64	6257642.7	5 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0184	339261.01	6258196.4	23A Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0185	339263.12	6257848.2	22 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0186	339258.81	6258024.7	23 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0187	339266.84	6257429.6	15 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	23	25	22	35	23	21	22
R0188	339263.63	6257742	10 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0189	339261.46	6257887.2	25 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	27	25	25
R0190	339266.12	6257445.2	17 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	21
R0191	339262.54	6257933.1	26 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0192	339263.67	6258122.2	18 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0193	339264.51	6257692.1	10 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0194	339255.5	6257491.5	1 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	11	13	10	23	11	9	9
R0195	339270.14	6257463.7	19 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	23	25	21	35	23	21	21
R0196	33													

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0209	339279.23	6258117.6	16 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0210	339278.89	6258063.3	17 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0211	339279.93	6257925	24 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0212	339281.52	6257552.7	2 Mulgowrie Cr, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0213	339285.27	6257581.9	25 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0214	339285.27	6258162.2	11 Glade St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0215	339286.31	6257609.6	27 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0216	339286.4	6257964.4	18 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0217	339290.15	6257838.4	18 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0218	339289.84	6258020.7	27 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0219	339289.84	6258020.7	27 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0220	339293.12	6258203.7	14 Glade St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0221	339291.73	6257732.8	8 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0222	339293.76	6257879.2	21 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0223	339295.04	6258120	14 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0224	339300.33	6258239.7	19 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0225	339296.99	6257309.8	4 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	19	21	18	31	19	17	19
R0226	339305.17	6257292.4	2 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0227	339297.27	6258063.3	15 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0228	339298.5	6257676.3	6 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0229	339305.27	6257326	6 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0230	339301.46	6257923.7	22 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0231	339303.99	6257829.8	16 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0232	339307.16	6258013.8	29 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0233	339307.16	6258013.8	29 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0234	339310.33	6257340.7	8 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0235	339312.44	6258153.1	9 Glade St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	40	27	25	25
R0236	339313.39	6257412	16 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0237	339311.8	6257376.1	12 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0238	339307.95	6258192.4	12 Glade St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0239	339307.82	6257958.3	20 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0240	339314.24	6257357.4	10 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0241	339315.75	6257393.7	14 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0242	339311.57	6257723.9	7 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	39	26	24	25
R0243	339307.73	6258115.5	12 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0244	339310.6	6257875.8	19 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0245	339314.24	6257428.4	20 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	23
R0246	339312.77	6258061.1	13 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0247	339318.29	6257462.7	22 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	37	25	23	24
R0248	339313.39	6258240.4	17 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0249	339320.02	6257479.6	24 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	24	38	25	23	24
R0250	339315.64	6257668.5	4 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0251	339321.66	6257829.2	14 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0252	339319.98	6257920	20 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0253	339318.98	6258000.1	31 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0254	339318.98	6258000.1	31 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0255	339330.48	6257515.1	28 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0256	339332.35	6257532.1	30 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0257	339323.7	6258109.6	10 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0258	339325.9	6257717.3	6 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0259	339329.51	6257867.1	17 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0260	339329.01	6257955.3	22 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0261	339330.66	6258054.9	11 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0262	339332.88	6257582.1	36 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0263	339339.09	6257552.3	32 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0264	339327.47	6258238.6	15 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	26
R0265	339327.45	6257503.6	26 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	27	25	38	26	24	24
R0266	339335.63	6257567.5	34 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0267	339331.15	6257806.9	12 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	25
R0268	339341.86	6257596.6	38 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0269	339334.29	6257998.3	33 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0270	339333.68	6257609.1	40 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	16	18	15	28	16	14	15
R0271	339337.8	6257918	18 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0272	339340.93	6257658.6	2 Willawa St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0273	339341.43	6257711.4	5 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0274	339341.6	6257861.3	15 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0275	339341.48	6258117.7	8 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0276	339341.64	6258153.4	7 Glade St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0277	339342.17	6258232.3	13 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0278	339342.65	6258057.2	9 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0279	339343.37	6257952.4	24 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0280	339343.15	6257655.3	44 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0281	339347.95	6257812.3	10 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0282	339357.97	6257631.8	42 Tabalum Rd, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0283	339350.92	6258315.1	5 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	24	26	22	35	24	22	22
R0284	339353.75	6258003	35 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0285	339353.75	6258003	35 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0286	339356.8	6257904	16 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0287	339349.59	6258178.4	8 Glade St, Balgowlah Heights	Residential	NCA4	57	48	13	14	11	24	12	10	10
R0288	339354.8	6258282.3	1 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	23	25	20	35	23	21	20
R0289	339361.77	6257694.8	4 Bareena Dr, Balgowlah Heights	Residential	NCA4	57	48	27	28	26	39	27	25	25
R0290	339360.73	6258104.9	6 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	21
R0291	339357.79	6257857.6	13 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0292	339357.49	6258053.9	7 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0293	339356.95	6258234.4	11 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0294	339362.06	6257943.6	26 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0295	339370.89	6258324.2	7 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	23	25	21	34	23	21	21
R0296	339359.09	6258148	5 Glade St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	25
R0297	339365.43	6258290.8	3 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0298	339362.99	6257809.2	8 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0299	339362.04	6258313.4	5 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R030														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0313	339381.46	6258399.6	17 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	23	25	21	35	23	21	21
R0314	339378.66	6258042.5	5 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	27	29	25	39	27	25	25
R0315	339375.89	6257801.7	6 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0316	339375.33	6257945.3	28 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0317	339373.94	6258233.3	9 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	26
R0318	339375.09	6258146.4	3 Glade St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0319	339378.21	6258421.1	19 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	24
R0320	339385.04	6258463.2	29 New St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	27
R0321	339378.41	6258438.7	21 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0322	339379.19	6257990	39 Curban St, Balgowlah Heights	Residential	NCA4	57	48	23	25	21	35	23	21	21
R0323	339388.22	6257663.1	2 Bareena Dr, Balgowlah Heights	Educational	NCA4	45	Non Res	27	28	26	39	27	25	25
R0324	339384.82	6258179.5	4 Glade St, Balgowlah Heights	Residential	NCA4	57	48	14	15	12	25	13	11	12
R0325	339383.71	6257898.8	12 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0326	339383.82	6257688.1	2 Bareena Dr, Balgowlah Heights	Educational	NCA4	45	Non Res	27	29	26	39	27	25	25
R0327	339383.16	6258105.7	2 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	21	23	17	33	21	19	17
R0328	339392.08	6258198.2	7 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	24	39	27	25	24
R0329	339388.91	6257795.4	4 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0330	339388.31	6257844.4	9 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0331	339387.9	6258039.2	3 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	25
R0332	339396.3	6258135.8	1 Glade St, Balgowlah Heights	Residential	NCA4	57	48	22	24	20	33	22	20	20
R0333	339389.33	6257941.3	30 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	26	40	28	26	26
R0334	339395.82	6258523.5	2 New St, Balgowlah	Residential	NCA4	57	48	24	26	22	36	24	22	22
R0335	339394.47	6257999.4	41 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0336	339394.47	6257999.4	41 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0337	339401.9	6258175.2	4 Glade St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	39	27	25	25
R0338	339397.12	6257889.4	10 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0339	339398.58	6257686.9	2 Bareena Dr, Balgowlah Heights	Educational	NCA4	45	Non Res	27	29	26	39	27	25	25
R0340	339403.52	6257790.1	2 Nolan Pl, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0341	339404.34	6257838.8	7 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0342	339410.05	6258282.9	4B Hogan St, Balgowlah Heights	Residential	NCA4	57	48	22	24	20	34	22	20	20
R0343	339400.8	6258054.3	1 Ernest St, Balgowlah Heights	Residential	NCA4	57	48	25	26	23	36	24	22	23
R0344	339405.38	6258229.5	5 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0345	339411.64	6257933.5	32 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0346	339405.55	6258305.1	6 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	28	30	22	40	28	26	22
R0347	339412.7	6258314	8 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	23
R0348	339404.44	6257997.6	43 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0349	339424	6258326.9	10 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	26
R0350	339413.27	6258353.2	12 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	27
R0351	339417.38	6257879.4	8 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0352	339414.67	6258366.5	14 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0353	339416.03	6258383.8	16 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0354	339417.53	6258501.8	1 Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0355	339417.11	6258580.9	1 Clarence St, Balgowlah	Residential	NCA4	57	48	29	31	23	41	29	27	22
R0356	339410.51	6257780.7	1 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	22	23	20	33	21	19	20
R0357	339417.43	6258399.1	18 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	31	27	41	29	27	27
R0358	339420.62	6257832.6	5 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0359	339420.16	6258513.7	2 Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0360	339430.32	6258406.8	20 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	31	27	41	29	27	27
R0361	339421.53	6258528.1	4 Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0362	339423.16	6258526.6	3 Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0363	339422.78	6258552.1	5A Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0364	339424.57	6258458.4	24 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0365	339434.24	6258421.3	22 Hogan St, Balgowlah Heights	Residential	NCA4	57	48	29	30	28	41	29	27	26
R0366	339430.31	6258117.4	8 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0367	339433.04	6258063.4	2 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	17	19	16	29	17	15	15
R0368	339428.99	6257989.3	45 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0369	339428.99	6257989.3	45 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0370	339436.77	6258136.9	10 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	26	28	24	38	26	24	24
R0371	339439.37	6257952.9	34 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0372	339438.5	6257899.8	5 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0373	339429.63	6258159.6	12 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	25
R0374	339435.6	6257790.6	3 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0375	339431.62	6258109.9	6 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	20	22	19	32	20	18	19
R0376	339439.82	6257884.1	3 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0377	339434.76	6258203.2	16 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	19	21	18	31	19	17	17
R0378	339435.15	6258266.5	2 Valley Rd, Balgowlah Heights	Residential	NCA4	57	48	19	21	16	31	19	17	16
R0379	339431.92	6258075.2	4 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	12	13	10	23	11	9	10
R0380	339445.46	6257814.4	3 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	28	26	26
R0381	339442.62	6258227.3	18 Glenside St, Balgowlah Heights	Residential	NCA4	57	48	25	26	23	36	24	22	23
R0382	339441.76	6258581.7	7 Gourlay Av, Balgowlah	Hotel	NCA4	50	Non Res	29	31	28	41	29	27	27
R0383	339445.06	6257795.7	5 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0384	339445.49	6258455.9	27 New St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0385	339450.3	6258594	8B Gourlay Av, Balgowlah	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0386	339451.24	6258619.3	9 Gourlay Av, Balgowlah	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0387	339458.22	6258008.4	47 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	26
R0388	339454.58	6257966.5	36 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0389	339464.54	6258304.1	79 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0390	339451.79	6258017	49 Curban St, Balgowlah Heights	Residential	NCA4	57	48	16	17	14	27	15	13	14
R0391	339459.55	6258449.3	25 New St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0392	339457.66	6258282.7	75 Curban St, Balgowlah Heights	Residential	NCA4	57	48	26	28	24	38	26	24	24
R0393	339466.46	6257746.1	2 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0394	339456.61	6258296.2	77 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0395	339467.37	6258039.6	51 Curban St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0396	339459.6	6258263.4	73 Curban St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	25
R0397	339459.03	6258156.9	65 Curban St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0398	339465.78	6258194	69 Curban St, Balgowlah Heights	Residential	NCA4	57	48	22	24	21	34	22	20	20
R0399	339453.42	6257812.9	1 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	17	19	15	28	17	15	15
R0400	339459.64	6258182.3	67 Curban St, Balgowlah Heights	Residential	NCA4	57	48	26	28	24	38	26	24	23
R0401	339461.79	6258220.9	71A Curban St, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	24
R0402	339461.11	6258106.8	59 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0403	339464.37	6258144.2	61 Curban St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0404	339461.													

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0417	339487.45	6258379.6	89 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0418	339490.28	6257766.8	6 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0419	339482.69	6257902.5	6 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0420	339486.45	6257920.7	8 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0421	339496.84	6257930.2	10 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	27	29	26	39	27	25	25
R0422	339487.62	6258446.9	21 New St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0423	339498.83	6257774.5	8 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0424	339483.93	6257941.6	12 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	15	17	14	27	15	13	13
R0425	339495.51	6257960.6	14 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	40	27	25	26
R0426	339506.92	6257850.6	2 Dobroyd Rd, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0427	339505.76	6257972.1	16 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0428	339509.69	6257987.5	18 Beaconview St, Balgowlah Heights	Residential	NCA4	57	48	25	27	24	37	25	23	23
R0429	339502.56	6258447.1	19 New St, Balgowlah Heights	Residential	NCA4	57	48	30	32	28	42	29	27	28
R0430	339511.61	6257997.6	38 Curban St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0431	339511.61	6257997.6	38 Curban St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0432	339509.28	6257783.9	10 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0433	339505.75	6258022.4	40 Curban St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0434	339516.83	6258046.3	42 Curban St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0435	339518.26	6258082.1	44 Curban St, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0436	339513.14	6258235.9	62 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0437	339517.75	6257853.9	7 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0438	339519.04	6257798.2	12 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	27	29	27	40	28	26	26
R0439	339528.62	6258209.2	60 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0440	339524.88	6258119.1	48 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0441	339527.52	6258134.6	50 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0442	339517.94	6258153.8	52 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0443	339519.99	6258252.2	62 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0444	339521.59	6258109.7	46 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0445	339531.81	6258181.9	56 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0446	339529.73	6258166.7	54 Curban St, Balgowlah Heights	Residential	NCA4	57	48	32	34	31	44	32	30	30
R0447	339522.52	6258285.6	68 Curban St, Balgowlah Heights	Residential	NCA4	57	48	23	25	22	35	23	21	21
R0448	339521.93	6258079.7	44 Curban St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0449	339527.1	6257910.9	11 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0450	339534.56	6258290.9	68 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	28
R0451	339525.6	6258314.3	72A Curban St, Balgowlah Heights	Residential	NCA4	57	48	26	28	24	38	26	24	24
R0452	339533.22	6258197.2	58 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	27
R0453	339529.65	6257803.3	14 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	26	28	24	38	26	24	24
R0454	339528.45	6257884.2	9 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0455	339534.68	6257921.5	15 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0456	339534.32	6258260.4	66A Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	27
R0457	339531.47	6258348	76 Curban St, Balgowlah Heights	Residential	NCA4	57	48	26	28	25	38	26	24	25
R0458	339531.88	6258082.4	1 Concise St, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0459	339539.41	6257936.9	17 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	26	40	28	26	26
R0460	339533.48	6258043.7	4 Concise St, Balgowlah Heights	Residential	NCA4	57	48	30	32	28	41	30	28	27
R0461	339541.16	6257950.1	19 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	28	30	27	40	28	26	26
R0462	339534.98	6257970	21 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	41	28	26	27
R0463	339535.81	6258433.6	84 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0464	339535.96	6258359.5	78 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	31	29	42	30	28	28
R0465	339546.9	6257982	23 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0466	339544.49	6257818.1	16 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0467	339547.46	6257994.7	25 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	27
R0468	339547.46	6257994.7	25 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	27
R0469	339546.48	6258013.5	27 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0470	339542.08	6258081.1	1 Concise St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0471	339551.11	6258368.4	80 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0472	339552.5	6258380.6	82 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0473	339551.43	6258429.1	15 New St, Balgowlah Heights	Residential	NCA4	57	48	27	28	25	38	26	24	24
R0474	339554.4	6258039	2 Concise St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0475	339558.88	6258273.6	68A Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	46	30	28	28
R0476	339552.51	6258297.4	72 Curban St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	22
R0477	339554.77	6257832.3	1 Elevation Av, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	40	28	26	26
R0478	339565.64	6258285	68A Curban St, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	29
R0479	339567.01	6258093.7	33 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0480	339562.23	6258086.2	31 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0481	339568.69	6258318.5	74 Curban St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0482	339568.7	6258107.5	35 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	28
R0483	339573.16	6258123.6	37 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	32	33	29	43	31	29	28
R0484	339565.48	6258157.9	41 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0485	339566.51	6258340.8	76A Curban St, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	29
R0486	339577.47	6258345.9	78A Curban St, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	29
R0487	339569.81	6258432.4	13 New St, Balgowlah Heights	Residential	NCA4	57	48	24	26	23	36	24	22	23
R0488	339572.2	6258141	39 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	29
R0489	339577.83	6258168.9	43 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0490	339577.65	6257902.2	26 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0491	339579.34	6257872	22 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	28	41	29	27	27
R0492	339583.1	6257856.1	20 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	41	28	26	27
R0493	339579.26	6257887.9	24 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0494	339583.63	6257919.1	28 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	29	31	28	41	29	27	27
R0495	339590.82	6257927.3	30 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0496	339585.44	6258429.6	11 New St, Balgowlah Heights	Residential	NCA4	57	48	31	33	29	43	31	29	30
R0497	339589.31	6257963.3	34 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	28
R0498	339592.53	6257944.5	32 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0499	339599.44	6257976.9	36 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	28
R0500	339604.2	6257989.7	38 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0501	339596.72	6258428.1	9 New St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0502	339606.78	6258003.8	40 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	29	27	27
R0503	339602.24	6258035.4	44 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	28
R0504	339605.68	6258023.9	42 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	32	34	31	44	32	30	30
R0505	339612.76	6258054.6	46 Heathcliff Cr, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	45	30	28	30
R0506	339613.4	6258264.6	5 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0507	339616.41	6258245.7	3 Tutus St, Balgowlah Heights	Residential	NCA4									

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0521	339629.1	6257886.5	7 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0522	339635.88	6257868.9	5 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	41	29	27	27
R0523	339621.36	6258332.3	15 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	28	29	26	39	27	25	25
R0524	339627.84	6258402	5 New St, Balgowlah Heights	Residential	NCA4	57	48	34	35	32	46	33	31	31
R0525	339638.04	6257903	9 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	30	32	29	42	30	28	28
R0526	339641.45	6258351.8	17 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0527	339627.23	6258019	23A Fisher St, Balgowlah Heights	Residential	NCA4	57	48	29	31	27	41	29	27	27
R0528	339637.81	6258370.6	19 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0529	339646.39	6257911.9	11 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	33	34	31	44	32	30	30
R0530	339640.48	6258048.9	25 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	43	30	28	30
R0531	339638.15	6258088.1	43 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	31
R0532	339649.8	6258384.8	21 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	47	34	32	32
R0533	339651.39	6257927.6	13 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	34	34	31	45	32	30	30
R0534	339652.93	6258407.7	23 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	38	34	48	36	34	34
R0535	339657.65	6257956.7	17 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	31	33	29	43	31	29	28
R0536	339654.21	6257942.8	15 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	28
R0537	339649.86	6258083.4	43 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	35	37	34	47	35	33	33
R0538	339662.17	6257972.6	19 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	34	36	33	46	34	32	32
R0539	339660.84	6257988.4	21 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	33	35	32	45	33	31	31
R0540	339656.91	6258177.7	47 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0541	339653.88	6258144.1	45B Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0542	339659.82	6258119.4	43A Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0543	339651.92	6258142.9	45 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0544	339658.05	6258014.5	23 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	33	34	31	45	33	31	30
R0545	339658.05	6258014.5	23 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	33	34	31	45	33	31	30
R0546	339652.72	6258081.1	41 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	35	37	34	47	35	33	33
R0547	339663.14	6258034.3	25 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	29
R0548	339670.12	6257863.4	15 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	28
R0549	339680.49	6258072.6	39 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0550	339685.46	6258243.6	12 Geddes St, Balgowlah Heights	Residential	NCA4	57	48	36	38	34	48	36	34	34
R0551	339689.49	6257856	13 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	28
R0552	339694.29	6258296.6	4B Tutus St, Balgowlah Heights	Residential	NCA4	57	48	35	37	34	47	35	33	33
R0553	339690.63	6258062	37 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0554	339688.08	6257928.5	16 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0555	339699.42	6258314.7	6 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0556	339685.3	6258337	8 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	31	32	29	42	30	28	28
R0557	339700.71	6258052	35 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0558	339702.3	6258220.8	10 Geddes St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0559	339708.42	6258362	12 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0560	339697.18	6258371.7	14 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	29	30	27	41	29	27	26
R0561	339698.72	6258269.3	2 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	36	37	35	48	36	34	34
R0562	339711.57	6258276.4	4A Tutus St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0563	339701.66	6257857.7	11 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	32	34	31	44	32	30	30
R0564	339705.23	6257975.3	4 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	35	37	34	47	35	33	33
R0565	339704.7	6257914.1	14 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	32	34	30	44	32	30	30
R0566	339711.81	6258346.5	10 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0567	339709.92	6258038.7	29 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0568	339708.54	6257954	2 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	32	33	30	43	31	29	29
R0569	339716.81	6258395.7	16 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0570	339724.21	6258408.1	18 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	49	36	34	34
R0571	339720.64	6258290.6	4 Tutus St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0572	339721.03	6258175.8	4 Geddes St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0573	339721.16	6257861.1	9 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	47	34	32	32
R0574	339724.02	6258032	31 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0575	339720.49	6257911.2	12 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	33	35	32	46	33	31	31
R0576	339727.4	6258155.2	2 Geddes St, Balgowlah Heights	Residential	NCA4	57	48	34	36	32	45	34	32	31
R0577	339730.98	6258201.2	6 Geddes St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0578	339738.72	6258012.8	33 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0579	339732.1	6257856.1	7 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	47	34	32	32
R0580	339731.29	6258992.9	90 Lauderdale Av, Fairlight	Residential	NCA1	56	43	29	30	27	41	29	27	12
R0581	339735.79	6258100.3	24 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	35	48	36	34	34
R0582	339736.12	6257966.7	6 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	35	37	33	47	35	33	32
R0583	339736.3	6258292.4	33 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0584	339743.02	6257905.5	10 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	34	36	33	46	34	32	32
R0585	339744.68	6258226.1	25 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0586	339744.68	6258235.2	25 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0587	339749.35	6258403	47 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0588	339741.05	6259057	14-14 Wilyama Av, Fairlight	Residential	NCA1	56	43	29	29	26	40	28	26	13
R0589	339744.76	6258198.1	23A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0590	339746.96	6258377.4	14A Tutus St, Balgowlah Heights	Residential	NCA4	57	48	34	35	32	45	33	31	31
R0591	339757.12	6258383.4	45 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0592	339749.98	6258295.6	33A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	34	36	32	46	34	32	31
R0593	339747.01	6257854.1	5 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	36	34	47	35	33	33
R0594	339746.24	6258258.4	31 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0595	339753.07	6258308.6	35 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	49	36	34	34
R0596	339748.94	6258178.4	23 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	32
R0597	339753.54	6257946.8	8 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0598	339751.67	6258946	93 Lauderdale Av, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	10
R0599	339749.95	6258991.5	88 Lauderdale Av, Fairlight	Residential	NCA1	56	43	29	30	27	41	28	26	11
R0600	339756.63	6259094.9	17 Rosedale Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	11
R0601	339761.03	6258137	19A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0602	339754.73	6258079.9	22 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0603	339759.92	6258322.6	37 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0604	339754.03	6259016.9	11 Wilyama Av, Fairlight	Residential	NCA1	56	43	24	25	19	35	23	21	13
R0605	339757.55	6257902.3	8 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	46	34	32	32
R0606	339759.22	6258300.6	33A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	35	49	37	35	34
R0607	339760.72	6258356.8	41 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0608	339757.58	6259070.3	15 Rosedale Av, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	14
R0609	339765.68	6258337.2	37 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0610	339762.08	6257851.3	3 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	35	37	34	47	35	33	33
R0611	339770.96	6257940.5	10 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0612	339769.13</													

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0625	339787.47	6259236.9	250 Sydney Rd, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	15
R0626	339783.65	6257902.4	Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	21	22	19	33	20	18	19
R0627	339784.58	6258023.2	14 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	33	35	31	45	33	31	30
R0628	339792.03	6258955.2	89 Lauderdale Av, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	12
R0629	339797.87	6258189	24B Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0630	339791.23	6259127.3	46 Rosedale Av, Fairlight	Residential	NCA1	56	43	18	18	15	29	17	15	11
R0631	339785.8	6259037.6	9 Wilyama Av, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	12
R0632	339826.16	6258306.6	34 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0633	339794.18	6258220.8	28 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	30	31	28	42	30	28	27
R0634	339801.99	6258261.4	30 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0635	339794.26	6259183.2	275 Sydney Rd, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	14
R0636	339798.79	6257920.2	4 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	47	35	33	33
R0637	339804.29	6259264.1	2 Hill St, Fairlight	Residential	NCA1	56	43	16	17	14	28	16	14	10
R0638	339795.16	6259046.1	6B Wilyama Av, Fairlight	Residential	NCA1	56	43	26	27	24	38	26	24	14
R0639	339797.47	6258323.6	36 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0640	339809.76	6258332.1	368 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0641	339804.23	6257993.5	12 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0642	339804.23	6257993.5	12 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0643	339807.51	6259270.7	4 Hill St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	14
R0644	339797.23	6259235.5	248 Sydney Rd, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	14
R0645	339806.77	6258202.9	26A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0646	339809.17	6258346.2	40 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0647	339810.57	6258362.8	42 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0648	339803.83	6258058.4	11 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	32	33	30	43	31	29	29
R0649	339801.07	6259075.1	9 Rosedale Av, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	12
R0650	339802.92	6259303.4	8 Hill St, Fairlight	Residential	NCA1	56	43	13	15	11	25	13	11	10
R0651	339813.19	6258182.8	24 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0652	339813.2	6259284.6	6 Hill St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	13
R0653	339809.65	6259310	10 Hill St, Fairlight	Residential	NCA1	56	43	27	28	25	39	26	24	13
R0654	339802.81	6258980.6	80 Lauderdale Av, Fairlight	Residential	NCA1	56	43	27	30	27	40	28	26	11
R0655	339798.75	6259135.9	44 Rosedale Av, Fairlight	Residential	NCA1	56	43	13	15	11	25	13	11	10
R0656	339808.51	6258946.7	85-87 Lauderdale Av, Fairlight	Residential	NCA1	56	43	23	22	19	35	23	21	11
R0657	339804.69	6259317.8	12 Hill St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	13
R0658	339809.75	6257986.3	12 Fisher St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0659	339805.82	6259181.4	269 Sydney Rd, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	14
R0660	339815.49	6259020.7	7 Wilyama Av, Fairlight	Residential	NCA1	56	43	21	22	19	33	21	19	12
R0661	339818.46	6258375.1	44 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0662	339808.51	6259328.8	16 Hill St, Fairlight	Residential	NCA1	56	43	26	27	25	38	26	24	13
R0663	339814.62	6257906.7	2 Jellicoe St, Balgowlah Heights	Residential	NCA4	57	48	36	37	34	48	35	33	33
R0664	339810.31	6259042.7	4 Wilyama Av, Fairlight	Residential	NCA1	56	43	26	27	24	38	26	24	14
R0665	339811.14	6259119.5	42 Rosedale Av, Fairlight	Residential	NCA1	56	43	15	16	13	26	14	12	11
R0666	339811.67	6259236.6	246 Sydney Rd, Fairlight	Residential	NCA1	56	43	28	31	28	41	29	27	14
R0667	339826.42	6259346.6	18 Hill St, Fairlight	Residential	NCA1	56	43	26	28	24	37	26	24	13
R0668	339819.02	6258059.7	9 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0669	339810.41	6259080.5	7 Rosedale Av, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R0670	339815.92	6259291.7	8 Hill St, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	13
R0671	339829.87	6259361.1	24 Hill St, Fairlight	Residential	NCA1	56	43	27	30	27	40	28	26	25
R0672	339816.42	6258914.3	85-87 Lauderdale Av, Fairlight	Residential	NCA1	56	43	20	21	18	32	19	17	14
R0673	339820.6	6259380.4	26 Hill St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0674	339820.33	6259188.6	267 Sydney Rd, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	10
R0675	339836.97	6258147.8	16 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0676	339831.46	6259386.8	28A Hill St, Fairlight	Residential	NCA1	56	43	29	29	26	39	27	25	23
R0677	339832.87	6259400.2	30A Hill St, Fairlight	Residential	NCA1	56	43	28	29	26	40	28	26	13
R0678	339825.58	6259011.1	78 Lauderdale Av, Fairlight	Residential	NCA1	56	43	17	19	15	29	17	15	11
R0679	339834.6	6259413.2	32 Hill St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	25
R0680	339823.79	6259145.9	40 Rosedale Av, Fairlight	Residential	NCA1	56	43	26	27	24	37	25	23	14
R0681	339835.46	6259422.6	34 Hill St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	25
R0682	339822.03	6259234.9	244 Sydney Rd, Fairlight	Residential	NCA1	56	43	27	29	26	40	28	26	13
R0683	339825.72	6258268.6	30A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0684	339829.99	6257980.4	3A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0685	339836.14	6258277.4	32 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0686	339827.36	6258228.8	28A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	35	36	33	47	35	33	32
R0687	339832.67	6258047.4	7 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0688	339829.74	6259063.3	5 Rosedale Av, Fairlight	Residential	NCA1	56	43	24	26	22	36	24	22	13
R0689	339840.48	6258128.1	14 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0690	339832.85	6257936.2	1B Beatty St, Balgowlah Heights	Residential	NCA4	57	48	36	38	35	48	36	34	34
R0691	339844.09	6259435	36 Hill St, Fairlight	Residential	NCA1	56	43	28	17	14	40	28	26	12
R0692	339832.24	6259051.4	2 Wilyama Av, Fairlight	Residential	NCA1	56	43	15	17	12	27	15	13	11
R0693	339830.86	6259180.8	265 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	13
R0694	339840.39	6258919.5	81 Lauderdale Av, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	16
R0695	339835.83	6259452.2	38 Hill St, Fairlight	Residential	NCA1	56	43	28	29	26	40	28	26	25
R0696	339836.62	6259238	242 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	13
R0697	339847.83	6258107.1	12 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0698	339843.41	6259063.3	3 Rosedale Av, Fairlight	Residential	NCA1	56	43	22	21	18	34	19	17	12
R0699	339847.56	6258038.1	5A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0700	339839.08	6259139.2	36 Rosedale Av, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	14
R0701	339843.55	6258979.4	76 Lauderdale Av, Fairlight	Residential	NCA1	56	43	30	29	26	42	29	27	15
R0702	339836.08	6257965.5	1A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	27	29	25	39	27	25	24
R0703	339844.67	6259178.1	261 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	13
R0704	339846.45	6258918.2	79B Lauderdale Av, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	15
R0705	339846.57	6258227.8	24A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0706	339853.9	6258180.5	22 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0707	339848.8	6259236.9	240 Sydney Rd, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	13
R0708	339855.21	6259035.8	1 Rosedale Av, Fairlight	Residential	NCA1	56	43	26	27	24	37	25	23	14
R0709	339851.8	6258940.3	79A Lauderdale Av, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	14
R0710	339846.37	6259292.9	5 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	10
R0711	339847	6259307.2	7 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	10
R0712	339856.77	6258199.1	24A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0713	339845.4	6259318.3	9 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	10	24	12	10	9
R0714	339855.5	6259652	131 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	12
R0715	339861.39	6258025.7	3 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	48	36	34	34
R0716	339860.13	6258996.4	74 Lauderdale Av, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	14
R0717	3398													

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0729	339866.45	6258134.5	10 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0730	339877.44	6259400	23 La Perouse St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	24
R0731	339875.95	6258857	73 Lauderdale Av, Fairlight	Residential	NCA1	56	43	33	34	30	44	32	30	23
R0732	339867.15	6259648	129 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	13	16	13	26	14	12	11
R0733	339881.61	6259422.2	27 La Perouse St, Fairlight	Residential	NCA1	56	43	28	28	25	40	26	24	25
R0734	339877.41	6259392.8	23 La Perouse St, Fairlight	Residential	NCA1	56	43	26	18	15	38	26	24	14
R0735	339860.46	6259411.6	25 La Perouse St, Fairlight	Residential	NCA1	56	43	12	13	10	24	11	9	9
R0736	339876.49	6258988.4	72 Lauderdale Av, Fairlight	Residential	NCA1	56	43	23	24	22	35	23	21	14
R0737	339872.73	6259185.2	255 Sydney Rd, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	11
R0738	339881.42	6258021.1	1 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	49	37	35	34
R0739	339881.42	6258021.1	1 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	38	35	49	37	35	34
R0740	339864.85	6259436.9	29 La Perouse St, Fairlight	Residential	NCA1	56	43	12	13	10	23	11	9	8
R0741	339887.55	6259450.7	31 La Perouse St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R0742	339875.13	6259079.3	30 Rosedale Av, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	12
R0743	339876.43	6259122.5	25 Hilltop Cr, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	11
R0744	339887	6258072	4 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0745	339877.09	6259655.9	127 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	10	12	9	22	10	8	7
R0746	339891.94	6258104.8	8A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	49	37	35	35
R0747	339888.98	6258163.5	10 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	40	37	50	38	36	36
R0748	339885.67	6258906.7	71 Lauderdale Av, Fairlight	Residential	NCA1	56	43	32	34	29	44	32	30	23
R0749	339892.29	6259071.5	28 Rosedale Av, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	11
R0750	339878.95	6259243.8	238 Sydney Rd, Fairlight	Residential	NCA1	56	43	13	14	11	24	12	10	10
R0751	339882.17	6259184.6	251 Sydney Rd, Fairlight	Residential	NCA1	56	43	16	19	15	28	16	14	12
R0752	339886.55	6258842.1	67 Lauderdale Av, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	15
R0753	339892.97	6258858.1	67 Lauderdale Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	19
R0754	339883.71	6258961.4	70 Lauderdale Av, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	12
R0755	339890.38	6259141.2	23 Hilltop Cr, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	14
R0756	339902.1	6259170.5	56 Hilltop Cr, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	14
R0757	339889.95	6258867.4	67 Lauderdale Av, Fairlight	Residential	NCA1	56	43	25	26	23	38	26	24	17
R0758	339901	6258053	4 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	37	39	36	49	37	35	35
R0759	339893.81	6259259.8	2 La Perouse St, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	11
R0760	339895.84	6259119.9	1 Kru St, Fairlight	Residential	NCA1	56	43	16	18	14	27	15	13	12
R0761	339904.4	6259046.9	24 Rosedale Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	11
R0762	339906.98	6259272.2	4 La Perouse St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	12
R0763	339896.86	6259623.7	125 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	26	29	25	39	27	25	24
R0764	339899.3	6259236	236 Sydney Rd, Fairlight	Residential	NCA1	56	43	23	24	21	34	22	20	13
R0765	339903.09	6259054.1	26 Rosedale Av, Fairlight	Residential	NCA1	56	43	22	23	20	34	22	20	14
R0766	339890.73	6259289.5	6 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	10
R0767	339909.91	6259299.2	8 La Perouse St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	11
R0768	339902.53	6259205.9	249 Sydney Rd, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	11
R0769	339900.93	6258837.4	63 Lauderdale Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	22
R0770	339895.6	6259034.3	22 Rosedale Av, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R0771	339892.73	6259313.9	10 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	10
R0772	339910.17	6259339.5	14 La Perouse St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R0773	339910.36	6258145.8	8B Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	40	37	50	38	36	36
R0774	339914.41	6259324.6	12 La Perouse St, Fairlight	Residential	NCA1	56	43	16	17	14	28	16	14	13
R0775	339915.05	6258945.6	68 Lauderdale Av, Fairlight	Residential	NCA1	56	43	29	27	24	41	25	23	15
R0776	339898.88	6259347.2	16 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0777	339905.57	6258871.4	65 Lauderdale Av, Fairlight	Residential	NCA1	56	43	33	33	30	44	32	30	22
R0778	339899.4	6259025.1	20 Rosedale Av, Fairlight	Residential	NCA1	56	43	15	17	13	27	15	13	11
R0779	339911.19	6259080.6	2 Kru St, Fairlight	Residential	NCA1	56	43	30	32	28	42	30	28	14
R0780	339920.72	6259356.2	18 La Perouse St, Fairlight	Residential	NCA1	56	43	15	18	14	28	16	14	13
R0781	339919.06	6259023.1	18 Rosedale Av, Fairlight	Residential	NCA1	56	43	16	17	15	28	15	13	11
R0782	339910.55	6259236.3	234 Sydney Rd, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	12
R0783	339902.21	6259389.6	22 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0784	339915.46	6258103.5	2 Beatty St, Balgowlah Heights	Residential	NCA4	57	48	38	39	36	50	37	35	35
R0785	339923.01	6259189	54A Hilltop Cr, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	14
R0786	339922.91	6259015.5	16 Rosedale Av, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	13
R0787	339915.95	6259631.2	123 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	20
R0788	339905.68	6259373.3	20 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0789	339916.8	6258855.2	63 Esplanade Park Pde, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	17
R0790	339917.52	6259401.9	24 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0791	339910.12	6259409.5	26 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0792	339918.01	6258858.2	61-61 Lauderdale Av, Fairlight	Residential	NCA1	56	43	33	34	31	44	32	30	23
R0793	339918.34	6259425.6	28 La Perouse St, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0794	339927.16	6259007.6	14 Rosedale Av, Fairlight	Residential	NCA1	56	43	18	19	16	30	17	15	12
R0795	339928.36	6259432.1	30 La Perouse St, Fairlight	Residential	NCA1	56	43	26	29	25	39	27	25	13
R0796	339922.72	6258880.3	59-61 Lauderdale Av, Fairlight	Residential	NCA1	56	43	28	29	26	40	28	26	18
R0797	339923.9	6259237.4	232 Sydney Rd, Fairlight	Residential	NCA1	56	43	21	20	17	30	18	16	12
R0798	339915.74	6259446.5	61 Griffiths St, Fairlight	Residential	NCA1	56	43	12	13	10	24	11	9	8
R0799	339923.31	6259077.8	3 Kru St, Fairlight	Residential	NCA1	56	43	29	22	19	40	28	26	15
R0800	339932.28	6259064.9	83 Fairlight St, Fairlight	Residential	NCA1	56	43	28	29	26	40	28	26	18
R0801	339932.38	6258996.9	12 Rosedale Av, Fairlight	Residential	NCA1	56	43	24	26	23	37	25	23	12
R0802	339925.88	6259633.1	121 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	20
R0803	339929.05	6258104	2A Beatty St, Balgowlah Heights	Residential	NCA4	57	48	31	33	30	43	31	29	29
R0804	339938	6259056.1	83 Fairlight St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	16
R0805	339932.81	6258843.8	53 Lauderdale Av, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	19
R0806	339932.04	6259188.7	245 Sydney Rd, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R0807	339940.03	6259168.4	54 Hilltop Cr, Fairlight	Residential	NCA1	56	43	27	28	25	40	28	26	15
R0808	339936.45	6258978.9	10 Rosedale Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	19
R0809	339934.11	6259237.7	230 Sydney Rd, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	12
R0810	339944.94	6258974.8	8 Rosedale Av, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	18
R0811	339946.21	6259051.2	81 Fairlight St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	16
R0812	339938.17	6259638.6	119 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R0813	339940.85	6259071.3	4 Kru St, Fairlight	Residential	NCA1	56	43	31	33	29	43	31	29	21
R0814	339936.38	6258897.9	57 Lauderdale Av, Fairlight	Residential	NCA1	56	43	33	35	31	45	33	31	23
R0815	339941.05	6259183.9	1A Austin St, Fairlight	Residential	NCA1	56	43	27	27	24	39	25	23	14
R0816	339952.58	6259041.6	79 Fairlight St, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	18
R0817	339930.91	6259293	7 Austin St, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R0818	339944.65	6259265.2	3 Austin St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R0819	339956.16	6259034.8	77 Fairlight St, Fairlight	Residential	NCA1	56	43	33	34	31	44	32	30	19
R0820	339957.38	6259279.4	5 Austin St, Fairlight	Residential	NCA1	56	43	18	21	17	30	19	17	16
R0821	339948.34	6259241.3	228 Sydney Rd, Fairlight	Residential	NCA1	56	43							

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0833	339976.97	6259401.1	25 Austin St, Fairlight	Residential	NCA1	56	43	17	18	15	29	17	15	13
R0834	339974.83	6259388.8	23 Austin St, Fairlight	Residential	NCA1	56	43	17	18	15	29	16	14	14
R0835	339965.06	6258859.1	51 Lauderdale Av, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	29
R0836	339965.36	6258818.2	1A Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	22
R0837	339963.69	6259637.7	113 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	11	13	10	23	11	9	8
R0838	339968.6	6259428.3	29 Austin St, Fairlight	Residential	NCA1	56	43	13	14	11	24	12	10	9
R0839	339970.14	6259417.8	27 Austin St, Fairlight	Residential	NCA1	56	43	13	14	11	25	13	11	9
R0840	339972.85	6259038	75 Fairlight St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	16
R0841	339967.9	6259073.8	72 Fairlight St, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	23
R0842	339982.31	6259435.4	31 Austin St, Fairlight	Residential	NCA1	56	43	16	26	23	36	24	22	13
R0843	339972.29	6258988.7	54 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	18
R0844	339972.97	6258930.7	55 Upper Clifford Av, Fairlight	Hotel	NCA1	50	Non Res	24	25	22	36	24	22	17
R0845	339975.9	6259195.3	239 Sydney Rd, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	12
R0846	339986.83	6259120.9	6 Kru St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	13
R0847	339983.55	6259238.8	226 Sydney Rd, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	12
R0848	339984.3	6259074.6	70 Fairlight St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	17
R0849	339986.06	6259168.7	50 Hilltop Cr, Fairlight	Residential	NCA1	56	43	30	28	25	42	30	28	13
R0850	339993.27	6259273.8	2 Austin St, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	17
R0851	339991.12	6259606.5	105 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	20	22	19	33	20	18	19
R0852	339989.48	6259199.5	235 Sydney Rd, Fairlight	Residential	NCA1	56	43	24	20	17	30	18	16	13
R0853	339990.27	6258925.6	64 Lauderdale Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	20
R0854	339990.9	6259032.8	71 Fairlight St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	18
R0855	339992.25	6259237.5	224 Sydney Rd, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	12
R0856	339994.09	6259070.3	70 Fairlight St, Fairlight	Residential	NCA1	56	43	33	35	31	45	33	31	25
R0857	339993.98	6258865.5	45 Lauderdale Av, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	25
R0858	339993.98	6258865.5	45 Lauderdale Av, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	25
R0859	340003.62	6259289.6	4 Austin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R0860	340003.62	6259289.6	4 Austin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R0861	339996.24	6259165	48 Hilltop Cr, Fairlight	Residential	NCA1	56	43	30	28	25	42	30	28	14
R0862	339996.24	6259165	48 Hilltop Cr, Fairlight	Residential	NCA1	56	43	30	28	25	42	30	28	14
R0863	340006.47	6259302.2	6 Austin St, Fairlight	Residential	NCA1	56	43	18	20	18	31	19	17	15
R0864	340006.47	6259302.2	6 Austin St, Fairlight	Residential	NCA1	56	43	18	20	18	31	19	17	15
R0865	339998.01	6259002	52 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	17
R0866	339998.01	6259002	52 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	17
R0867	340006.59	6259098.8	68 Fairlight St, Fairlight	Residential	NCA1	56	43	30	32	28	42	30	28	20
R0868	340006.59	6259098.8	68 Fairlight St, Fairlight	Residential	NCA1	56	43	30	32	28	42	30	28	20
R0869	340001.07	6258804.3	3 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	21
R0870	340001.07	6258804.3	3 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	21
R0871	340002.02	6259196.4	233 Sydney Rd, Fairlight	Residential	NCA1	56	43	21	24	20	34	22	20	15
R0872	340002.02	6259196.4	233 Sydney Rd, Fairlight	Residential	NCA1	56	43	21	24	20	34	22	20	15
R0873	340015.05	6259323.6	12 Austin St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	15
R0874	340015.05	6259323.6	12 Austin St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	15
R0875	340018.2	6259312.2	10 Austin St, Fairlight	Residential	NCA1	56	43	20	20	16	29	18	16	19
R0876	340018.2	6259312.2	10 Austin St, Fairlight	Residential	NCA1	56	43	20	20	16	29	18	16	19
R0877	340003.91	6259024.6	69 Fairlight St, Fairlight	Residential	NCA1	56	43	25	27	24	37	26	24	19
R0878	340003.91	6259024.6	69 Fairlight St, Fairlight	Residential	NCA1	56	43	25	27	24	37	26	24	19
R0879	339984.01	6259641.4	105 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	11	13	10	23	11	9	8
R0880	339984.01	6259641.4	105 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	11	13	10	23	11	9	8
R0881	340004.16	6258923.8	47 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	22
R0882	340004.16	6258923.8	47 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	22
R0883	340014.55	6259346.7	14-16 Austin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R0884	340014.55	6259346.7	14-16 Austin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R0885	340000.01	6259278.6	1 Melbourne St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	11
R0886	340014.04	6259251.8	222 Sydney Rd, Fairlight	Residential	NCA1	56	43	21	24	20	33	22	20	19
R0887	340007.53	6258864.4	43 Lauderdale Av, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	23
R0888	340009.7	6259381.9	22 Austin St, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	12
R0889	340008.14	6259161.2	46 Hilltop Cr, Fairlight	Residential	NCA1	56	43	31	20	17	39	19	17	14
R0890	340009.45	6259368.1	20 Austin St, Fairlight	Residential	NCA1	56	43	14	15	13	26	14	12	11
R0891	340010.47	6259071.1	66 Fairlight St, Fairlight	Residential	NCA1	56	43	33	35	32	45	33	31	30
R0892	340010.47	6259071.1	66 Fairlight St, Fairlight	Residential	NCA1	56	43	33	35	32	45	33	31	30
R0893	340017.19	6259399.5	24 Austin St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R0894	340017.96	6259410.4	26 Austin St, Fairlight	Residential	NCA1	56	43	22	25	21	35	22	20	20
R0895	340011.25	6259356.3	18 Austin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R0896	340014.09	6259198.6	231 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	25	22	38	23	21	15
R0897	340014.24	6259417.6	28 Austin St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	11
R0898	340015.1	6259099.2	21 Hilltop Cr, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	19
R0899	340014.64	6258802.3	5 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	20
R0900	340014.86	6259603.6	105 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	21	22	20	33	21	19	19
R0901	340025.45	6259432.5	30 Austin St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R0902	340017.11	6259017.6	65 Fairlight St, Fairlight	Residential	NCA1	56	43	33	34	31	44	32	30	25
R0903	340017.75	6259156.4	44 Hilltop Cr, Fairlight	Residential	NCA1	56	43	31	29	25	39	27	25	15
R0904	340028.83	6258369.1	17 Melbourne St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	17
R0905	340024.02	6258868.9	41 Lauderdale Av, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	21
R0906	340021.64	6258737.9	41 Fairlight Cr, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	23
R0907	340024.63	6259379.3	19 Melbourne St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R0908	340025.28	6258972	48 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	26	27	24	37	25	23	18
R0909	340033.05	6259395.2	21 Melbourne St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R0910	340027.66	6259204.8	229 Sydney Rd, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	15
R0911	340026.77	6258790.8	7 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	35	36	33	46	34	32	29
R0912	340030.31	6259092.5	19 Hilltop Cr, Fairlight	Residential	NCA1	56	43	32	29	26	44	32	30	23
R0913	340033.39	6259041.6	63 Fairlight St, Fairlight	Residential	NCA1	56	43	33	34	31	44	32	30	24
R0914	340029.81	6258925.1	43 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	21	22	19	33	20	18	13
R0915	340040.64	6259417.6	23 Melbourne St, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	19
R0916	340037.2	6259177	42 Hilltop Cr, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	16
R0917	340035.07	6259601.7	103 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	19
R0918	340040.58	6258859.1	39 Lauderdale Av, Fairlight	Residential	NCA1	56	43	34	35	33	46	34	32	21
R0919	340035.29	6258964.5	46 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	34	36	32	46	34	32	31
R0920	340048.45	6258732.3	39 Fairlight Cr, Fairlight	Residential	NCA1	56	43	32	33	30	44	31	29	21
R0921	340040.17	6259206	227 Sydney Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R0922	340041.15	6259068.9	62 Fairlight St, Fairlight	Residential	NCA1	56	43	34	35	32	45	33	31	31
R0923	340044.26	6259002.7	1 Ashley Pde, Fairlight	Residential	NCA1	56	43	34	36	32	46	34	32	31
R0924	340050.64	6259020	61 Fairlight St, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	27
R0925	340044.45	6258813.7	9A Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	32	34	31	44	32		

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R0937	340057.21	6259301.7	4 Melbourne St, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	17
R0938	340057.69	6259255.1	218 Sydney Rd, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R0939	340059.35	6258786.7	11 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	35	36	33	46	34	32	27
R0940	340069.76	6259314.2	8 Melbourne St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R0941	340067.14	6258897.2	54 Lauderdale Av, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	32
R0942	340071.29	6259326.9	10 Melbourne St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R0943	340061.3	6259598.2	99 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	20	20	17	32	18	16	16
R0944	340061.91	6258961.8	44 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	32
R0945	340071.53	6259339.8	12 Melbourne St, Fairlight	Residential	NCA1	56	43	18	19	16	30	17	15	15
R0946	340066.81	6258715.2	37 Fairlight Cr, Fairlight	Residential	NCA1	56	43	35	36	33	47	34	32	32
R0947	340065	6258835.7	35 Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	36	33	47	34	32	32
R0948	340065.02	6259623.6	99 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	13	14	11	25	12	10	10
R0949	340065.13	6258918.1	39 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	32	33	30	44	31	29	21
R0950	340064.58	6259206.7	223 Sydney Rd, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	18
R0951	340073.77	6259377	20 Melbourne St, Fairlight	Residential	NCA1	56	43	19	22	19	32	20	18	14
R0952	340076.93	6258707.6	35 Fairlight Cr, Fairlight	Residential	NCA1	56	43	35	36	33	47	35	33	32
R0953	340077.46	6259350.5	14 Melbourne St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R0954	340078.5	6259358.9	16 Melbourne St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R0955	340074	6259156.4	36 Hilltop Cr, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	15
R0956	340078.83	6259363.4	18 Melbourne St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R0957	340068.76	6259404.1	24 Melbourne St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R0958	340084.08	6258689	33 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	38	36	35
R0959	340072.04	6259258	214 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	24
R0960	340072.56	6258786.1	13 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	35	36	33	46	34	32	28
R0961	340073.24	6258960.8	42 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	32
R0962	340081.75	6258887.9	52 Lauderdale Av, Fairlight	Residential	NCA1	56	43	38	39	36	50	38	36	32
R0963	340073.54	6259596.4	97 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R0964	340078.75	6258659.6	31 Fairlight Cr, Fairlight	Residential	NCA1	56	43	28	30	26	40	28	26	26
R0965	340077.3	6259067.6	13 Hilltop Cr, Fairlight	Residential	NCA1	56	43	29	31	27	41	29	27	22
R0966	340079.74	6258831.4	33 Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	36	33	47	34	32	32
R0967	340076.83	6259205.8	221 Sydney Rd, Fairlight	Residential	NCA1	56	43	28	31	28	41	29	27	18
R0968	340080.38	6259130	34 Hilltop Cr, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	16
R0969	340079.78	6258913.6	37 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	40	38	51	38	36	32
R0970	340082.99	6258958.9	40 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	40	38	51	38	36	32
R0971	340082.25	6259258	212 Sydney Rd, Fairlight	Residential	NCA1	56	43	26	28	25	39	26	24	24
R0972	340082.41	6259164	1 Bellevue St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	16
R0973	340084.06	6259016.3	59 Fairlight St, Fairlight	Residential	NCA1	56	43	36	36	34	47	35	33	25
R0974	340092.92	6259060.6	11 Hilltop Cr, Fairlight	Residential	NCA1	56	43	34	36	33	46	34	32	32
R0975	340088.95	6259465.9	94 Griffiths St, Fairlight	Residential	NCA1	56	43	24	27	24	37	25	23	22
R0976	340095.68	6259215.2	217 Sydney Rd, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	26
R0977	340088.22	6259122.3	32 Hilltop Cr, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	22
R0978	340090.01	6258792.3	15 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	35	36	34	47	35	33	30
R0979	340094.03	6259398	57 Griffiths St, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	13
R0980	340100.1	6259170.3	1 Bellevue St, Fairlight	Residential	NCA1	56	43	32	34	30	44	32	30	22
R0981	340099.08	6258661.2	27 Fairlight Cr, Fairlight	Residential	NCA1	56	43	36	37	34	48	35	33	33
R0982	340103.36	6258921	35 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	40	38	51	39	37	32
R0983	340106.2	6258723.2	22 Fairlight Cr, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	28
R0984	340099.87	6259464.3	92 Griffiths St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	22
R0985	340099.53	6259202.1	213 Sydney Rd, Fairlight	Residential	NCA1	56	43	27	33	28	43	31	29	25
R0986	340116.81	6259294	13 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R0987	340102.29	6258955.5	38 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	41	38	51	39	37	32
R0988	340103.7	6258804.3	17 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	36	36	34	47	35	33	21
R0989	340112	6259258.5	5 Bellevue St, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	18
R0990	340118.16	6259305.6	15 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R0991	340103.07	6259023	59 Fairlight St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	17
R0992	340114.26	6259268.4	7 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	17
R0993	340115.97	6259280.8	9 Bellevue St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	16
R0994	340108.76	6259394.5	49-51 Griffiths St, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	12
R0995	340099.16	6259320.9	19A Bellevue St, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R0996	340117.07	6258738.2	2A Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	32
R0997	340122.04	6259330.6	21 Bellevue St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R0998	340112.6	6259349	23 Bellevue St, Fairlight	Residential	NCA1	56	43	15	16	13	26	14	12	11
R0999	340104.87	6259356.1	25 Bellevue St, Fairlight	Residential	NCA1	56	43	14	15	12	26	13	11	10
R1000	340111.31	6259006.2	59 Fairlight St, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	27
R1001	340112.26	6259461.6	90 Griffiths St, Fairlight	Residential	NCA1	56	43	25	27	24	38	25	23	23
R1002	340116.09	6258650.3	25 Fairlight Cr, Fairlight	Residential	NCA1	56	43	36	37	34	48	35	33	33
R1003	340125.45	6259368.6	27 Bellevue St, Fairlight	Residential	NCA1	56	43	17	20	17	30	18	16	14
R1004	340122.54	6258965	36 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	36	38	34	48	36	34	32
R1005	340108.67	6259094.4	30 Hilltop Cr, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	17
R1006	340123.58	6258809.6	19 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	32
R1007	340129.21	6258696.1	18 Fairlight Cr, Fairlight	Residential	NCA1	56	43	41	42	39	52	40	38	34
R1008	340118.42	6258385.9	29 Bellevue St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R1009	340117.64	6258912.1	33 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	33
R1010	340120.65	6259490.4	45 Jamieson Av, Fairlight	Residential	NCA1	56	43	25	22	25	38	26	24	17
R1011	340129.84	6258748.1	4 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	37	37	35	48	35	33	32
R1012	340122.3	6259108.3	2 Bellevue St, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	21
R1013	340121.86	6259587.3	87-95 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R1014	340130.69	6259399.8	51 Griffiths St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	16
R1015	340131.88	6259409.6	51 Griffiths St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	20
R1016	340126.36	6259013.9	57 Fairlight St, Fairlight	Residential	NCA1	56	43	31	33	29	43	31	29	24
R1017	340130.86	6259066.8	28 Hilltop Cr, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	32
R1018	340128.62	6259454.8	88 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	37	24	22	23
R1019	340143.33	6258867.3	44-46 Lauderdale Av, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	33
R1020	340135.21	6258953.9	34 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	29
R1021	340136.06	6258700.2	16 Fairlight Cr, Fairlight	Residential	NCA1	56	43	41	42	38	52	40	38	34
R1022	340141.67	6259158.1	12 Bellevue St, Fairlight	Residential	NCA1	56	43	28	25	22	35	23	21	17
R1023	340140.37	6258758.1	8 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1024	340126.86	6259205.2	21 Sydney Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1025	340132.29	6259485.3	43 Jamieson Av, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	17
R1026	340143.6	6258622.4	23 Fairlight Cr, Fairlight	Residential	NCA1	56	43	42	43	40	53	41	39	38
R1027	340135.87	6259113.6	4 Bellevue St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	16
R1028	340137.79	6258921.3	31 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	33
R1029	340135.3	6259143	10 Bellevue St, Fairlight	Residential	NCA1	56	43	29	31	28				

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1041	340145.97	6259194.8	209 Sydney Rd, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	15
R1042	340148.49	6259478.4	41 Jamieson Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1043	340159.02	6259276.4	20 Bellevue St, Fairlight	Residential	NCA1	56	43	24	27	24	37	25	23	18
R1044	340154.32	6259580	3 Harland Rd, Fairlight	Residential	NCA1	56	43	18	19	16	30	17	15	17
R1045	340151.68	6259102.4	6 Bellevue St, Fairlight	Residential	NCA1	56	43	34	36	33	46	34	32	26
R1046	340151.44	6259899.1	53 Fairlight St, Fairlight	Residential	NCA1	56	43	38	40	35	50	38	36	32
R1047	340163.37	6259287	22 Bellevue St, Fairlight	Residential	NCA1	56	43	22	23	20	33	21	19	19
R1048	340152.03	6259238.2	208 Sydney Rd, Fairlight	Residential	NCA1	56	43	28	31	28	41	29	27	27
R1049	340148.43	6259618	85 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	12	14	11	24	12	10	9
R1050	340163.78	6259297.7	24 Bellevue St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1051	340153	6258899.6	29 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	39	40	37	51	38	36	33
R1052	340161.02	6259537.5	32 Jamieson Av, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	20
R1053	340154.57	6259448.3	84 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	37	24	22	21
R1054	340157.84	6259662.4	26 Balgowlah Rd, Fairlight	Commercial	NCA1	70	Non Res	22	25	22	35	23	21	10
R1055	340164.97	6258718.7	12 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	35	49	37	35	34
R1056	340167.93	6259321.5	30 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1057	340162.2	6258780.6	14 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	37	37	35	48	36	34	33
R1058	340174.14	6259307.5	26-28 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1059	340168.49	6259347.5	34 Bellevue St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1060	340160.82	6259181.4	201-207 Sydney Rd, Fairlight	Residential	NCA1	56	43	28	29	25	40	26	24	21
R1061	340161.05	6259483.9	39 Jamieson Av, Fairlight	Residential	NCA1	56	43	19	21	18	32	20	18	17
R1062	340163.59	6259329.8	32 Bellevue St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	15
R1063	340168.68	6258961.6	30 Upper Clifford Av, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	33
R1064	340164.27	6259579.5	1 Harland Rd, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	18
R1065	340166.7	6258644.1	19 Fairlight Cr, Fairlight	Residential	NCA1	56	43	42	43	40	53	41	39	38
R1066	340176.3	6259358.8	38 Bellevue St, Fairlight	Residential	NCA1	56	43	18	19	17	30	18	16	14
R1067	340167.61	6259066.2	10 Hilltop Cr, Fairlight	Residential	NCA1	56	43	38	39	36	50	38	36	27
R1068	340165.88	6259236.9	204 Sydney Rd, Fairlight	Residential	NCA1	56	43	29	32	28	41	30	28	28
R1069	340166.11	6258982.5	23 Bolingbroke Pde, Fairlight	Residential	NCA1	56	43	40	40	37	51	39	37	33
R1070	340166.9	6259198.1	209 Sydney Rd, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	18
R1071	340175.95	6258727.3	10 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1072	340178.16	6259370.2	42 Bellevue St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	13
R1073	340164.12	6259614.1	83 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	13	14	11	24	12	10	9
R1074	340169.09	6259001.2	51 Fairlight St, Fairlight	Residential	NCA1	56	43	37	40	35	50	37	35	33
R1075	340168.69	6259446.4	82 Griffiths St, Fairlight	Residential	NCA1	56	43	24	27	24	37	25	23	22
R1076	340178.97	6258805.7	25 Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	36	33	47	35	33	26
R1077	340174.7	6259143.6	201-207 Sydney Rd, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	19
R1078	340175.61	6259388.4	43 Griffiths St, Fairlight	Residential	NCA1	56	43	19	22	19	32	20	18	17
R1079	340177.17	6259503	37 Jamieson Av, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R1080	340176.98	6259236.1	202 Sydney Rd, Fairlight	Residential	NCA1	56	43	30	32	29	42	31	29	28
R1081	340184.19	6258651.5	17 Fairlight Cr, Fairlight	Residential	NCA1	56	43	42	43	40	53	41	39	36
R1082	340183.72	6258865.9	40 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	38	34	48	36	34	32
R1083	340170.98	6259165.3	201-207 Sydney Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1084	340181.23	6259525.7	28 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	19
R1085	340182.38	6259440.4	78 Griffiths St, Fairlight	Residential	NCA1	56	43	24	27	24	37	25	23	22
R1086	340189.28	6258740.3	8 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	35	49	36	34	32
R1087	340174.11	6259180.6	201-207 Sydney Rd, Fairlight	Residential	NCA1	56	43	17	18	15	28	16	14	14
R1088	340189.95	6258788.7	23 Lauderdale Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1089	340187.17	6259390.2	41 Griffiths St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1090	340187.81	6259195	201-207 Sydney Rd, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R1091	340187.75	6258896.2	27B Clifford Av, Fairlight	Residential	NCA1	56	43	38	40	37	50	38	36	33
R1092	340195.99	6258661.2	15 Fairlight Cr, Fairlight	Residential	NCA1	56	43	42	42	39	53	41	39	36
R1093	340189.47	6259235.1	200 Sydney Rd, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	25
R1094	340189.81	6259476.8	35 Jamieson Av, Fairlight	Residential	NCA1	56	43	18	21	18	30	19	17	17
R1095	340193.45	6258830.8	38 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	32
R1096	340195.52	6259521	26 Jamieson Av, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	19
R1097	340194.13	6259564.5	39 Wattle Av, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R1098	340208.84	6259087.5	10A Hilltop Cr, Fairlight	Residential	NCA1	56	43	37	37	34	47	35	33	33
R1099	340204.7	6258749.9	6 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	36	49	36	34	32
R1100	340198.32	6259948.6	47-49 Fairlight St, Fairlight	Residential	NCA1	56	43	40	41	38	52	39	37	33
R1101	340210.38	6259288.7	3 Brisbane St, Fairlight	Residential	NCA1	56	43	22	23	20	33	21	19	18
R1102	340200.02	6259385	39 Griffiths St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	11
R1103	340209.19	6258671.6	13 Fairlight Cr, Fairlight	Residential	NCA1	56	43	40	40	37	51	39	37	35
R1104	340200.55	6259272	1B Brisbane St, Fairlight	Residential	NCA1	56	43	24	24	21	36	22	20	20
R1105	340201.45	6259233.2	196B Sydney Rd, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	23
R1106	340215.28	6259298.4	5 Brisbane St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1107	340204.51	6259000.6	47-49 Fairlight St, Fairlight	Residential	NCA1	56	43	32	34	30	44	32	30	25
R1108	340208.98	6259062.2	10H Hilltop Cr, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	33
R1109	340202.82	6259476.1	33 Jamieson Av, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	14
R1110	340217.4	6259313.1	7 Brisbane St, Fairlight	Residential	NCA1	56	43	20	22	19	33	20	18	17
R1111	340204.79	6259176	199 Sydney Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1112	340217.08	6259325.2	11-13 Brisbane St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1113	340204.42	6259251.1	196A Sydney Rd, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	21
R1114	340206.91	6259561.7	35 Wattle Av, Fairlight	Residential	NCA1	56	43	17	20	17	30	18	16	16
R1115	340215.27	6258760	4 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1116	340214.18	6258853.4	36 Lauderdale Av, Fairlight	Residential	NCA1	56	43	32	33	29	44	31	29	24
R1117	340208.24	6259437.1	74 Griffiths St, Fairlight	Residential	NCA1	56	43	25	28	25	38	26	24	23
R1118	340209.92	6259518.8	24 Jamieson Av, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	20
R1119	340209.75	6259602.5	4 Harland Rd, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	17
R1120	340209.66	6259379.5	35 Griffiths St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	15
R1121	340218.24	6259336.5	53 Esplanade Park Pde, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1122	340221.97	6259349.6	17 Brisbane St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	16
R1123	340221.74	6259626.3	2 Harland Rd, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	11
R1124	340212.52	6258951.3	47-49 Fairlight St, Fairlight	Residential	NCA1	56	43	40	41	38	52	39	37	33
R1125	340222.83	6258901.2	21-25 Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	36	49	36	34	33
R1126	340218.54	6258694.3	11 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	34
R1127	340215.27	6258772.6	2 Fairlight Cr, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	33
R1128	340213.36	6258975.2	47-49 Fairlight St, Fairlight	Residential	NCA1	56	43	40	42	38	52	40	38	33
R1129	340213.95	6259637.5	2 Harland Rd, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1130	340215.22	6259158.5	197 Sydney Rd, Fairlight	Residential	NCA1	56	43	28	25	22	40	27	25	19
R1131	340215.54	6259468.7	31 Jamieson Av, Fairlight	Residential	NCA1	56	43	27	28	25	38	26	24	22
R1132	340227.08	6258698.4	9 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	34
R1133	340215.59	6259569.1	33 Wattle Av, Fairlight	Residential	NCA1									

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1145	340239.09	6258714.5	7 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	34
R1146	340230.21	6259551.2	31 Wattle Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	16
R1147	340232.89	6259431.8	70 Griffiths St, Fairlight	Residential	NCA1	56	43	25	26	25	38	26	24	23
R1148	340229.93	6258993.7	45 Fairlight St, Fairlight	Residential	NCA1	56	43	40	41	38	52	39	37	33
R1149	340246.69	6259639.5	79 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	18
R1150	340234.31	6259515.9	20 Jamieson Av, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	20
R1151	340237.58	6259149.4	193 Sydney Rd, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	19
R1152	340239.1	6259467.6	27 Jamieson Av, Fairlight	Residential	NCA1	56	43	22	18	15	34	22	20	14
R1153	340240.75	6259115.5	189 Sydney Rd, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	24
R1154	340241.61	6259218.3	190 Sydney Rd, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	18
R1155	340239.89	6259601.3	26 Wattle Av, Fairlight	Residential	NCA1	56	43	17	20	17	30	18	16	15
R1156	340250.58	6258724.7	5 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	29
R1157	340244.33	6258963.9	20A Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	33
R1158	340241.19	6259552.8	29 Wattle Av, Fairlight	Residential	NCA1	56	43	17	20	17	30	18	16	16
R1159	340242.9	6259427.8	68 Griffiths St, Fairlight	Residential	NCA1	56	43	25	26	23	37	24	22	22
R1160	340256.15	6259244.9	2 Brisbane St, Fairlight	Residential	NCA1	56	43	29	28	24	41	26	24	20
R1161	340246.24	6259514.1	18 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	19
R1162	340261.27	6259257.5	4 Brisbane St, Fairlight	Residential	NCA1	56	43	23	26	23	36	24	22	21
R1163	340251.78	6258764.9	1 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	31
R1164	340260.64	6259269.1	6 Brisbane St, Fairlight	Residential	NCA1	56	43	24	27	24	37	25	23	21
R1165	340248.02	6258986.8	43 Fairlight St, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	33
R1166	340258.34	6258902.5	17 Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	31
R1167	340260.1	6258840.4	28-30 Lauderdale Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	28
R1168	340250.92	6259460.5	25 Jamieson Av, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	20
R1169	340262.75	6259280.3	8 Brisbane St, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	20
R1170	340241.23	6259295.8	12 Brisbane St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1171	340263.91	6259316.1	18 Brisbane St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1172	340247.08	6259330.4	20 Brisbane St, Fairlight	Residential	NCA1	56	43	16	17	14	28	15	13	12
R1173	340252.63	6259597.5	24 Wattle Av, Fairlight	Residential	NCA1	56	43	17	20	17	30	18	16	15
R1174	340262.71	6258737.2	3 Fairlight Cr, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	29
R1175	340243.84	6259307.9	16 Brisbane St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1176	340250.62	6259372.8	29 Griffiths St, Fairlight	Residential	NCA1	56	43	15	16	13	27	14	12	11
R1177	340256.46	6259423.2	66 Griffiths St, Fairlight	Residential	NCA1	56	43	24	25	22	36	23	21	22
R1178	340285.3	6259341.8	22 Brisbane St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1179	340255.06	6259130.2	187 Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	28
R1180	340256.36	6258941.3	18 Clifford Av, Fairlight	Residential	NCA1	56	43	38	38	35	49	36	34	33
R1181	340258.15	6259510.7	14 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	19
R1182	340261.65	6258774.6	21 Lauderdale Av, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	23
R1183	340253.79	6259647.8	77 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	13	14	11	24	12	10	10
R1184	340261.9	6258907	15 Clifford Av, Fairlight	Residential	NCA1	56	43	32	33	30	43	31	29	24
R1185	340255.79	6259210.4	190 Sydney Rd, Fairlight	Residential	NCA1	56	43	19	20	17	31	19	17	15
R1186	340260.83	6258976.6	41 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	36	51	39	37	34
R1187	340263.58	6259027.9	9A Hilltop Cr, Fairlight	Residential	NCA1	56	43	40	41	39	52	39	37	34
R1188	340265.87	6259598	22 Wattle Av, Fairlight	Residential	NCA1	56	43	16	19	16	29	17	15	14
R1189	340264.45	6258874	13 Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	29
R1190	340264.96	6258823.2	26 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	37	34	48	35	33	22
R1191	340265.6	6259418.9	64 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	22	35	24	22	22
R1192	340263.53	6259560.8	25 Wattle Av, Fairlight	Residential	NCA1	56	43	14	16	13	26	13	11	11
R1193	340268.08	6259135.5	187 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	35	32	47	33	31	30
R1194	340281.31	6259087.7	4-8 Hilltop Cr, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	33
R1195	340270.13	6259507.9	12 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	18
R1196	340275.56	6258767.9	19 Lauderdale Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	31
R1197	340275.48	6259639	75 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1198	340273.74	6258939.3	16 Clifford Av, Fairlight	Residential	NCA1	56	43	37	39	35	49	37	35	33
R1199	340280.12	6258732.6	17 Lauderdale Av, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	24
R1200	340277.24	6258843.8	24 Lauderdale Av, Fairlight	Residential	NCA1	56	43	26	27	24	38	25	23	20
R1201	340276.83	6259452.3	19 Jamieson Av, Fairlight	Residential	NCA1	56	43	22	24	20	34	22	20	21
R1202	340277.49	6258975.1	39 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	34
R1203	340283.55	6259602.7	20 Wattle Av, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R1204	340278.87	6259133.1	185 Sydney Rd, Fairlight	Residential	NCA1	56	43	29	30	27	41	29	27	22
R1205	340279.26	6258886.1	11 Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	24
R1206	340279.01	6259548.7	23 Wattle Av, Fairlight	Residential	NCA1	56	43	18	20	17	31	18	16	16
R1207	340281.06	6259029.9	56 Fairlight St, Fairlight	Residential	NCA1	56	43	40	42	39	52	40	38	34
R1208	340282.21	6259415.3	62 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1209	340283.85	6259223.7	184 Sydney Rd, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1210	340283.06	6259506.2	10 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	19
R1211	340283.45	6259638.6	73 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1212	340288.02	6258844.6	22 Lauderdale Av, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	21
R1213	340286.56	6258942.7	14 Clifford Av, Fairlight	Residential	NCA1	56	43	37	39	35	49	37	35	34
R1214	340288.88	6259452.1	17 Jamieson Av, Fairlight	Residential	NCA1	56	43	23	24	21	34	22	20	21
R1215	340295.41	6259138.9	181 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	38	34	48	36	34	32
R1216	340284.95	6258352.2	23 Griffiths St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	12
R1217	340290.58	6259319.8	21A Cohen St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1218	340293.31	6259207.6	180 Sydney Rd, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1219	340290.42	6259598	18 Wattle Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	15
R1220	340290.22	6259545.7	21 Wattle Av, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1221	340294.53	6258790.7	11A Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	24
R1222	340293.73	6258884.7	9 Clifford Av, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	23
R1223	340294.39	6259409.1	60 Griffiths St, Fairlight	Residential	NCA1	56	43	23	26	23	36	24	22	14
R1224	340293.75	6258973.2	37 Fairlight St, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	34
R1225	340292.49	6258754.9	15 Lauderdale Av, Fairlight	Residential	NCA1	56	43	29	30	27	41	28	26	22
R1226	340297.98	6259503.3	8 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	19
R1227	340298.56	6259634	71 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	15	18	15	28	16	14	14
R1228	340298.36	6259096.2	2 Hilltop Cr, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	34
R1229	340299.13	6259225.2	3A Cohen St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1230	340297.33	6259029.3	52-54 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	39	52	39	37	34
R1231	340299.86	6259135.6	179 Sydney Rd, Fairlight	Residential	NCA1	56	43	31	32	29	43	31	29	28
R1232	340298.43	6258815.8	20 Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	26
R1233	340324.22	6259302	17 Cohen St, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	27
R1234	340306.8	6259201.1	178A Sydney Rd, Fairlight	Residential	NCA1	56	43	34	36	33	46	34	32	31
R1235	340302.8	6258926.4	12 Clifford Av, Fairlight	Residential	NCA1	56	43	37	39	35	49	37	35	32
R1236	340298.06	6259599.9	16A Wattle Av, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1237	340302.42	6259545.7	19 Wattle Av, Fairlight	Residential	NCA1	56	43	18	21	17	31			

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1249	340310.44	6259500.9	6 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	19
R1250	340320.02	6259242.9	7 Cohen St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1251	340310.49	6259633.1	69 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	16	17	14	27	15	13	13
R1252	340329.86	6259349.2	25 Cohen St, Fairlight	Residential	NCA1	56	43	23	22	19	35	21	19	18
R1253	340310.84	6259602.2	14 Wattle Av, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1254	340319.56	6258847.4	18 Lauderdale Av, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	22
R1255	340328.26	6259337.3	23 Cohen St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	22
R1256	340315.72	6259542.7	17 Wattle Av, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	17
R1257	340310.32	6259321.2	21 Cohen St, Fairlight	Residential	NCA1	56	43	17	18	16	29	16	14	13
R1258	340316.19	6259026.1	50B Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	38	51	39	37	34
R1259	340315.37	6259444.8	11 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	18
R1260	340317.71	6258927.4	10 Clifford Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	33
R1261	340317.55	6259395.8	56 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1262	340317.34	6259122.6	173A Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	26
R1263	340319.8	6258877.2	5 Clifford Av, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	24
R1264	340324.23	6258772.5	9 Lauderdale Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	23
R1265	340319.72	6259629.1	67 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	12
R1266	340322.84	6259062	5B Hilltop Cr, Fairlight	Residential	NCA1	56	43	39	39	36	50	38	36	26
R1267	340322.95	6258976.3	33 Fairlight St, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	29
R1268	340325.83	6259498.1	4 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	19
R1269	340327.24	6259542.2	15 Wattle Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1270	340339.77	6259582.8	12 Wattle Av, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	17
R1271	340328.69	6258809	14 Lauderdale Av, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	22
R1272	340330.14	6259117.5	171 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	38	34	48	36	34	32
R1273	340332.24	6259442.4	9 Jamieson Av, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	18
R1274	340329.57	6259023.1	48 Fairlight St, Fairlight	Residential	NCA1	56	43	37	40	38	50	39	37	34
R1275	340331.68	6259390.9	54 Griffiths St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	16
R1276	340330.68	6258930.9	8 Clifford Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	32
R1277	340332.54	6259627.3	65 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1278	340336.83	6259057.4	5A Hilltop Cr, Fairlight	Residential	NCA1	56	43	37	39	36	50	37	35	24
R1279	340341.33	6258763.2	7 Lauderdale Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	38
R1280	340333.71	6259505.6	2A Jamieson Av, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	12
R1281	340344.79	6259593.1	10 Wattle Av, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R1282	340339.5	6258968.2	31 Fairlight St, Fairlight	Residential	NCA1	56	43	38	39	36	50	38	36	34
R1283	340340.25	6259541.9	13 Wattle Av, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1284	340338.45	6258859.9	1-3 Clifford Av, Fairlight	Residential	NCA1	56	43	37	38	35	48	37	35	28
R1285	340334.55	6259208.3	2 Cohen St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	15
R1286	340341.96	6259113.7	167 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	32
R1287	340344.81	6259448.9	5 Jamieson Av, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R1288	340347.77	6258829.1	12 Lauderdale Av, Fairlight	Residential	NCA1	56	43	30	31	28	41	29	27	22
R1289	340341.72	6259638.2	63 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1290	340350.92	6258947.8	6 Clifford Av, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	22
R1291	340352.1	6259408.5	52 Griffiths St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1292	340350.5	6259582.9	8 Wattle Av, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	18
R1293	340351.72	6259531.8	11 Wattle Av, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1294	340364.59	6259422.2	1 Suwarrow St, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	21
R1295	340353.65	6258969.2	29A Fairlight St, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	34
R1296	340356.37	6259223.5	4 Cohen St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1297	340353.3	6259054.9	3-5 Hilltop Cr, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1298	340356.17	6259288.3	12 Charles St, Fairlight	Residential	NCA1	56	43	28	28	25	41	29	27	24
R1299	340357.64	6259042.3	48 Fairlight St, Fairlight	Residential	NCA1	56	43	24	25	21	35	23	21	19
R1300	340356.29	6259172.3	172 Sydney Rd, Fairlight	Residential	NCA1	56	43	34	36	33	46	34	32	32
R1301	340366.33	6259434.6	3 Suwarrow St, Fairlight	Residential	NCA1	56	43	29	30	22	41	23	21	27
R1302	340357.21	6259449.6	3 Jamieson Av, Fairlight	Residential	NCA1	56	43	23	23	20	35	21	19	19
R1303	340357.67	6259627.3	61 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1304	340359.48	6258759.9	5 Lauderdale Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	28
R1305	340353.45	6259335.21	Griffiths St, Fairlight	Residential	NCA1	56	43	17	19	15	29	16	14	14
R1306	340358.9	6259118.8	165 Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	32
R1307	340361.26	6259488.7	5 Suwarrow St, Fairlight	Residential	NCA1	56	43	27	25	22	35	23	21	27
R1308	340361.8	6259922.6	4 Clifford Av, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	31
R1309	340364.08	6259579.9	6 Wattle Av, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	18
R1310	340363.77	6259225.5	6-8 Cohen St, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	28
R1311	340380.11	6259249.6	12 Cohen St, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	22
R1312	340375.66	6259503	7 Suwarrow St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1313	340365.77	6259286.1	11 Charles St, Fairlight	Residential	NCA1	56	43	26	29	25	39	26	24	23
R1314	340366.25	6259529.5	5 Wattle Av, Fairlight	Residential	NCA1	56	43	17	18	16	29	16	14	14
R1315	340374.46	6259455	1 Jamieson Av, Fairlight	Residential	NCA1	56	43	20	22	19	33	20	18	18
R1316	340380.21	6258839	1 Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	36	50	38	36	21
R1317	340359.44	6259516.2	9 Suwarrow St, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	12
R1318	340377.11	6258976.8	27 Fairlight St, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	32
R1319	340379.44	6258821.8	8 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	24
R1320	340366	6259634.3	59 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R1321	340372.48	6259071.3	1 Hilltop Cr, Fairlight	Residential	NCA1	56	43	39	39	36	49	37	35	28
R1322	340377.33	6258755.1	3B Lauderdale Av, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	28
R1323	340375.06	6258872.2	3 Woods Pde, Fairlight	Residential	NCA1	56	43	27	28	25	38	26	24	21
R1324	340373.02	6259576.7	4 Wattle Av, Fairlight	Residential	NCA1	56	43	22	22	19	32	20	18	21
R1325	340373.77	6259285.5	10 Charles St, Fairlight	Residential	NCA1	56	43	26	27	24	38	26	24	22
R1326	340368.51	6259192.1	168 Sydney Rd, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	16
R1327	340374.19	6259117.3	165 Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	32
R1328	340376.03	6259327.5	15A Griffiths St, Fairlight	Residential	NCA1	56	43	23	26	23	36	24	22	22
R1329	340379.59	6259524.2	1 Wattle Av, Fairlight	Residential	NCA1	56	43	21	21	20	33	21	19	17
R1330	340380.23	6259284.1	9 Charles St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1331	340387.31	6259632.2	57 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	20	20	17	31	18	16	18
R1332	340381.75	6258872.6	5B Woods Pde, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	25
R1333	340395.86	6258916.3	7 Woods Pde, Fairlight	Residential	NCA1	56	43	35	37	33	47	35	33	30
R1334	340387.72	6258722.3	3 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	26
R1335	340393.87	6259584.5	2 Wattle Av, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	21
R1336	340388.03	6259668	34 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	25	25	23	36	24	22	21
R1337	340387.2	6258924.9	9 Woods Pde, Fairlight	Residential	NCA1	56	43	38	39	36	50	37	35	29
R1338	340386.35	6259164.4	164 Sydney Rd, Fairlight	Residential	NCA1	56	43	34	37	34	47	35	33	32
R1339	340378.13	6258940.9	11 Woods Pde, Fairlight	Residential	NCA1	56	43	24	25	23	36	24	22	20
R1340	340387.72	6259282.6	8 Charles St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1341	340388.95	6259116.4	161 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1353	340402.63	6259319.7	11 Griffiths St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	21
R1354	340401.23	6259158.7	162 Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	26
R1355	340401.44	6259458.1	18 Edwin St, Fairlight	Residential	NCA1	56	43	27	24	21	34	22	20	26
R1356	340403.33	6259060.5	27 Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	36	50	38	36	35
R1357	340404.8	6259407.7	21 Edwin St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	20
R1358	340408.82	6258784.1	6 Lauderdale Av, Fairlight	Residential	NCA1	56	43	35	37	33	46	34	32	26
R1359	340408.12	6259282.5	5 Charles St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R1360	340408.32	6259120.3	153 Sydney Rd, Fairlight	Residential	NCA1	56	43	37	38	36	49	37	35	33
R1361	340424.97	6259095.6	31 Woods Pde, Fairlight	Residential	NCA1	56	43	38	39	36	50	37	35	34
R1362	340408.09	6259362	46 Griffiths St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	21
R1363	340402.66	6259210.8	3 William St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	16
R1364	340408.41	6259495.3	17 Baltic St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	17
R1365	340409.15	6259033.9	21 Woods Pde, Fairlight	Residential	NCA1	56	43	38	40	37	50	38	36	32
R1366	340420.61	6259079.4	29 Woods Pde, Fairlight	Residential	NCA1	56	43	38	40	36	50	38	36	33
R1367	340412.16	6259319.4	7 Griffiths St, Fairlight	Residential	NCA1	56	43	25	25	22	35	23	21	24
R1368	340413.59	6258787.5	2 Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	37	51	39	37	27
R1369	340411.83	6259454.6	16 Edwin St, Fairlight	Residential	NCA1	56	43	27	24	21	34	22	20	26
R1370	340414.64	6259153.8	158 Sydney Rd, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	21
R1371	340414.91	6259407.6	19 Edwin St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	20
R1372	340413.95	6259188.1	1 William St, Fairlight	Residential	NCA1	56	43	28	29	26	40	27	25	24
R1373	340417.4	6258813.5	6 Woods Pde, Fairlight	Residential	NCA1	56	43	40	41	36	51	39	37	33
R1374	340418.79	6258799.8	4 Woods Pde, Fairlight	Residential	NCA1	56	43	42	44	40	54	42	40	34
R1375	340419.53	6259281.5	4 Charles St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1376	340419.86	6259499.9	15 Baltic St, Fairlight	Residential	NCA1	56	43	19	22	19	32	20	18	18
R1377	340422.37	6258779.6	4 Lauderdale Av, Fairlight	Residential	NCA1	56	43	36	37	34	47	35	33	26
R1378	340433.09	6259225.1	5 William St, Fairlight	Residential	NCA1	56	43	25	30	25	40	28	26	23
R1379	340434.34	6259237.3	7 William St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1380	340425.51	6259202.2	3 William St, Fairlight	Place of wo	NCA1	45	Non Res	28	30	27	40	28	26	24
R1381	340427.66	6259154.9	156 Sydney Rd, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	26
R1382	340423.56	6259455.1	14 Edwin St, Fairlight	Residential	NCA1	56	43	21	23	21	34	22	20	19
R1383	340424.15	6259409	17 Edwin St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	20
R1384	340423.72	6259361	44A Griffiths St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	25
R1385	340427.21	6258683.6	11 Lauderdale Av, Fairlight	Residential	NCA1	56	43	46	47	43	57	45	43	42
R1386	340425.1	6259318.8	5 Griffiths St, Fairlight	Residential	NCA1	56	43	25	26	23	37	25	23	24
R1387	340435.99	6259247.9	9 William St, Fairlight	Residential	NCA1	56	43	26	27	24	37	25	23	23
R1388	340426.02	6259280.2	3 Charles St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1389	340424.78	6259551.7	18 Baltic St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	15
R1390	340427.83	6258860.4	16 Woods Pde, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	36
R1391	340435.61	6258836.3	12-12 Woods Pde, Fairlight	Residential	NCA1	56	43	40	41	38	52	39	37	32
R1392	340429.71	6259594.3	4 Suwarrow St, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R1393	340428.12	6259498.6	13 Baltic St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	18
R1394	340429.88	6258874.3	18 Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	37	51	38	36	33
R1395	340430.8	6259455.4	12 Edwin St, Fairlight	Residential	NCA1	56	43	26	23	20	34	22	20	19
R1396	340433.47	6259625.8	8 Suwarrow St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R1397	340430.95	6258756.3	2 Lauderdale Av, Fairlight	Residential	NCA1	56	43	40	40	37	51	38	36	30
R1398	340431.87	6259599.4	6 Suwarrow St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	11
R1399	340431.96	6259318.1	3 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1400	340433.22	6259407.3	15 Edwin St, Fairlight	Residential	NCA1	56	43	21	24	21	34	22	20	20
R1401	340434	6259280.3	2 Charles St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1402	340435.41	6258958	25 Fairlight St, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1403	340435.9	6258889	20B Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	33
R1404	340435.76	6259358.1	42 Griffiths St, Fairlight	Residential	NCA1	56	43	24	28	25	38	26	24	22
R1405	340442.59	6259636.2	10-12 Suwarrow St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	12
R1406	340437.24	6259498.8	11 Baltic St, Fairlight	Residential	NCA1	56	43	19	22	19	32	20	18	17
R1407	340437.97	6258905.4	22 Woods Pde, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	34
R1408	340437.48	6259685.5	53 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	18	23	20	33	21	19	15
R1409	340440.86	6259452.7	10 Edwin St, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	25
R1410	340449.35	6258934.7	24 Woods Pde, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	33
R1411	340442.55	6259279	1 Charles St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	21
R1412	340442.16	6259549.8	16 Baltic St, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	14
R1413	340442.77	6259405.5	13 Edwin St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R1414	340442.28	6259008.9	40 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	38	51	39	37	36
R1415	340444.31	6259355.7	40 Griffiths St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	22
R1416	340450.82	6259324	1 Griffiths St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	22
R1417	340445.39	6258955.7	23 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	35
R1418	340446.18	6259500.3	9 Baltic St, Fairlight	Residential	NCA1	56	43	24	22	19	32	20	18	23
R1419	340449.29	6259454	8 Edwin St, Fairlight	Residential	NCA1	56	43	21	24	21	34	22	20	19
R1420	340450.58	6259398.7	11 Edwin St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	20
R1421	340451.3	6259547.7	14 Baltic St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	14
R1422	340451.62	6259141.4	154 Sydney Rd, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	33
R1423	340462.19	6259586.5	4 Suwarrow St, Fairlight	Residential	NCA1	56	43	16	17	15	28	15	13	12
R1424	340454.99	6258765.4	1 Margaret St, Fairlight	Residential	NCA1	56	43	42	43	39	53	41	39	35
R1425	340462.06	6259658.1	53A Balgowlah Rd, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	12
R1426	340456.85	6259501.8	17 Baltic St, Fairlight	Residential	NCA1	56	43	20	23	20	33	21	19	17
R1427	340463.39	6259188	2A William St, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	23
R1428	340456.52	6259354.1	36 Griffiths St, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	21
R1429	340456.23	6259450.1	6 Edwin St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	19
R1430	340459.17	6258958.5	21 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	35
R1431	340460.36	6259399.1	9 Edwin St, Fairlight	Residential	NCA1	56	43	25	28	25	38	26	24	24
R1432	340463.53	6259637.1	10-12 Suwarrow St, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	10
R1433	340463.51	6259562.8	12 Baltic St, Fairlight	Residential	NCA1	56	43	15	16	13	26	14	12	11
R1434	340462.13	6258769.2	3 Margaret St, Fairlight	Residential	NCA1	56	43	45	47	40	57	45	43	38
R1435	340477.9	6258796.9	7 Margaret St, Fairlight	Residential	NCA1	56	43	42	42	39	53	41	39	35
R1436	340474.06	6258786.3	5A Margaret St, Fairlight	Residential	NCA1	56	43	45	46	43	56	44	42	38
R1437	340465.27	6259496.2	5 Baltic St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	16
R1438	340471.41	6259090.5	149-153 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	39	37	50	38	36	34
R1439	340466.7	6259140.5	148 Sydney Rd, Fairlight	Residential	NCA1	56	43	37	38	35	49	36	34	33
R1440	340467.11	6259448.3	4 Edwin St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	23
R1441	340467.78	6258838	13 Margaret St, Fairlight	Residential	NCA1	56	43	45	46	43	56	44	42	37
R1442	340468.59	6259229.6	8 William St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	17
R1443	340468.1	6258936.8	7 Edwin St, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	24
R1444	340473.79	6259035.3	28 Woods Pde, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	36
R1445	340482.32	6259209.3	6 William St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R1446	340479.39	6258812												

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1457	340476.95	6259447	2 Edwin St, Fairlight	Residential	NCA1	56	43	24	25	22	36	23	21	23
R1458	340474.64	6259550.6	10 Baltic St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	14
R1459	340487.94	6259280.8	18 William St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1460	340490.49	6259271.2	22 William St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1461	340474.31	6259667.2	49 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	16	17	14	27	15	13	10
R1462	340478.4	6259139.5	144 Sydney Rd, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1463	340491.7	6258903.2	21 Margaret St, Fairlight	Residential	NCA1	56	43	43	45	38	55	43	41	37
R1464	340489.99	6259295.2	26 William St, Fairlight	Residential	NCA1	56	43	23	26	23	36	24	22	21
R1465	340490.81	6259284.9	24 William St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1466	340476.32	6259409	5 Edwin St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1467	340480.58	6259349.6	30 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1468	340481.06	6258914.7	23 Margaret St, Fairlight	Residential	NCA1	56	43	42	42	39	53	40	38	36
R1469	340488.24	6259501.4	1 Baltic St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	13
R1470	340496.11	6258965.6	29 Margaret St, Fairlight	Residential	NCA1	56	43	40	42	39	52	40	38	34
R1471	340493.6	6259307.6	28 William St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	21
R1472	340482.73	6258929.3	25 Margaret St, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	34
R1473	340484.29	6259091.4	147 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1474	340485.87	6259139.5	142 Sydney Rd, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1475	340497.18	6259319.1	30 William St, Fairlight	Residential	NCA1	56	43	23	26	23	36	24	22	22
R1476	340492.16	6259665.8	47 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	14	16	13	26	14	12	11
R1477	340488.1	6259001.3	32 Fairlight St, Fairlight	Residential	NCA1	56	43	43	44	41	54	42	40	36
R1478	340492.01	6259560.3	8 Baltic St, Fairlight	Residential	NCA1	56	43	15	16	13	26	14	12	11
R1479	340498.23	6259041.1	2-3 Berry Av, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	36
R1480	340472.04	6259185.8	3 Thornton St, Fairlight	Residential	NCA1	56	43	22	23	20	33	21	19	18
R1481	340498.94	6259356.8	28 Griffiths St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	22
R1482	340499.12	6259675.9	45 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	14	15	12	25	13	11	11
R1483	340493.01	6259390.4	3 Edwin St, Fairlight	Residential	NCA1	56	43	22	19	16	29	17	15	14
R1484	340494.59	6259443.5	3 Daintrey St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1485	340497	6259059.6	2-3 Berry Av, Fairlight	Residential	NCA1	56	43	41	44	39	53	41	39	37
R1486	340499.07	6259093.6	145A Sydney Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1487	340510.51	6259461.4	5 Daintrey St, Fairlight	Residential	NCA1	56	43	21	22	19	33	20	18	16
R1488	340507.6	6259408.8	1 Edwin St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1489	340500.87	6259138.4	134 Sydney Rd, Fairlight	Residential	NCA1	56	43	38	39	37	50	37	35	34
R1490	340500.83	6259001.3	32 Fairlight St, Fairlight	Residential	NCA1	56	43	42	44	40	54	42	40	37
R1491	340515.95	6259476.7	9 Daintrey St, Fairlight	Residential	NCA1	56	43	21	21	18	32	20	18	15
R1492	340503.35	6259541.6	6 Baltic St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	16
R1493	340500.47	6259573.1	15-21 Daintrey St, Fairlight	Residential	NCA1	56	43	22	25	22	35	23	21	16
R1494	340515.77	6259168	1 Thornton St, Fairlight	Residential	NCA1	56	43	30	32	29	42	30	28	27
R1495	340526.52	6258762.1	55-59 The Crescent, Fairlight	Residential	NCA1	56	43	46	48	44	58	46	44	39
R1496	340515.41	6259491.3	11 Daintrey St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	15
R1497	340511.82	6259681.4	33 Daintrey St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	12
R1498	340516.69	6259503.2	13 Daintrey St, Fairlight	Residential	NCA1	56	43	19	21	18	31	19	17	15
R1499	340518.95	6259192.8	5 Thornton St, Fairlight	Residential	NCA1	56	43	29	30	27	41	28	26	25
R1500	340519.01	6259204.1	9 Thornton St, Fairlight	Residential	NCA1	56	43	29	30	27	40	28	26	26
R1501	340515.18	6259105.2	143 Sydney Rd, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1502	340500.35	6259218.1	11 Thornton St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1503	340512.2	6259054.8	2-3 Berry Av, Fairlight	Residential	NCA1	56	43	42	44	38	54	41	39	38
R1504	340522.02	6259229.6	13 Thornton St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	25
R1505	340498.43	6259244.8	15 Thornton St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	17
R1506	340503.94	6258788.3	38 The Crescent, Fairlight	Commercial	NCA1	70	Non Res	37	37	34	48	35	33	26
R1507	340524.22	6259253.6	17 Thornton St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	24
R1508	340528.19	6259285.8	19 Thornton St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	23
R1509	340518.82	6259024.4	30 Fairlight St, Fairlight	Residential	NCA1	56	43	29	30	27	40	28	26	24
R1510	340531.2	6259289.2	25 Thornton St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	24
R1511	340526.83	6259652.1	29 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1512	340532.37	6259606.1	23 Daintrey St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	14
R1513	340534.22	6259620.2	25 Daintrey St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	14
R1514	340520.74	6258843.1	4 Margaret St, Fairlight	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1515	340514.37	6259547.8	2 Baltic St, Fairlight	Residential	NCA1	56	43	15	17	14	27	15	13	12
R1516	340531.34	6258871.9	6 Margaret St, Fairlight	Residential	NCA1	56	43	43	43	39	54	41	39	38
R1517	340536.57	6259630.3	27 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	13
R1518	340525.04	6258828.6	2A Margaret St, Fairlight	Residential	NCA1	56	43	46	46	44	57	45	43	37
R1519	340524.9	6259348.7	26 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	22
R1520	340525.2	6258880.1	8 Margaret St, Fairlight	Residential	NCA1	56	43	42	43	39	53	41	39	37
R1521	340534.19	6259300.9	27 Thornton St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	22
R1522	340535.63	6259312.4	29 Thornton St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	21
R1523	340528.82	6259053.4	1 Berry Av, Fairlight	Residential	NCA1	56	43	42	42	39	53	40	38	34
R1524	340529.22	6259096.2	139 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	35
R1525	340530.11	6258893.3	12 Margaret St, Fairlight	Residential	NCA1	56	43	45	46	41	56	44	42	37
R1526	340527.78	6259699.8	41 Balgowlah Rd, Fairlight	Residential	NCA1	56	43	16	17	14	28	16	14	10
R1527	340534.07	6259362.8	24 Griffiths St, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	15
R1528	340533.62	6258926.1	20 Margaret St, Fairlight	Residential	NCA1	56	43	41	45	42	55	43	41	37
R1529	340530.94	6259152.3	128 Sydney Rd, Fairlight	Residential	NCA1	56	43	25	26	23	36	24	22	20
R1530	340549.09	6258957.9	24 Margaret St, Fairlight	Residential	NCA1	56	43	41	43	39	53	41	39	36
R1531	340536.43	6258937.3	22 Margaret St, Fairlight	Residential	NCA1	56	43	42	44	40	54	42	40	36
R1532	340539.1	6259390.2	2 Daintrey St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R1533	340544.02	6259709.6	39 Balgowlah Rd, Manly	Residential	NCA1	56	43	14	15	13	26	13	11	11
R1534	340550.24	6259395.7	4 Daintrey St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	18
R1535	340550.02	6259407.8	6 Daintrey St, Fairlight	Residential	NCA1	56	43	22	23	20	34	22	20	18
R1536	340540.01	6259135.9	128 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1537	340544.41	6259363.2	22 Griffiths St, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	16
R1538	340541.88	6258998.8	26-28 Fairlight St, Fairlight	Residential	NCA1	56	43	43	43	41	54	42	40	31
R1539	340545.33	6259423.9	8 Daintrey St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	14
R1540	340542.93	6259437.2	10 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1541	340545.73	6259168.6	2 Thornton St, Fairlight	Residential	NCA1	56	43	29	30	27	40	28	26	25
R1542	340555.35	6259480.7	18 Daintrey St, Fairlight	Residential	NCA1	56	43	20	21	18	32	19	17	14
R1543	340557.84	6259455.5	14 Daintrey St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	15
R1544	340544.29	6259709.6	37 Balgowlah Rd, Manly	Residential	NCA1	56	43	14	15	13	26	14	12	11
R1545	340558.43	6259465.8	16 Daintrey St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	15
R1546	340559.49	6259186.8	4 Thornton St, Fairlight	Residential	NCA1	56	43	37	36	33	46	34	32	34
R1547	340560.27	6259442.6	12 Daintrey St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	15
R1548	340560.06	6259198.9	6 Thornton St, Fairlight	Residential	NCA1	56	43	33	34	31	45	33	31	30
R1549	340550.62	6259339.7	20 Griffiths St, Fairlight	Residential	NCA1	56	43	24	26	23	37	24	22	

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1562	340570.06	6259259.8	20 Thornton St, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	27
R1563	340560.78	6258822.1	1 Laurence St, Manly	Residential	NCA1	56	43	46	47	44	57	45	43	38
R1564	340559.26	6259338.7	18 Griffiths St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	23
R1565	340571.13	6259272.4	24 Thornton St, Fairlight	Residential	NCA1	56	43	29	31	28	42	29	27	26
R1566	340568.63	6259284.5	28 Thornton St, Fairlight	Residential	NCA1	56	43	28	31	28	41	29	27	25
R1567	340572.14	6259544.9	32 Daintrey St, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	15
R1568	340557.6	6259134.9	124 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	41	37	51	38	36	35
R1569	340574.1	6259294.9	30 Thornton St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	25
R1570	340577.16	6259307.5	34 Thornton St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	24
R1571	340578.28	6259563.1	36 Daintrey St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	15
R1572	340574.54	6258865.5	5 Laurence St, Manly	Residential	NCA1	56	43	42	43	40	53	41	39	37
R1573	340575.06	6259726.5	33 Balgowlah Rd, Manly	Residential	NCA1	56	43	15	17	13	27	15	13	12
R1574	340557.08	6258864.6	9 Laurence St, Manly	Residential	NCA1	56	43	28	29	26	39	27	25	23
R1575	340581.2	6259693.3	52-58 Daintrey St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	14
R1576	340581.85	6259009.2	24 Fairlight St, Fairlight	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1577	340571.15	6258941.9	19 Fairlight St, Manly	Residential	NCA1	56	43	44	46	42	56	44	42	37
R1578	340583.04	6259574.3	38 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1579	340582.12	6259585.2	38-40 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	14
R1580	340577.82	6259600.4	44 Daintrey St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	14
R1581	340578.59	6259639.3	48 Daintrey St, Fairlight	Residential	NCA1	56	43	17	19	16	29	17	15	13
R1582	340583.65	6259621.5	46 Daintrey St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	13
R1583	340571.76	6259337.1	16 Griffiths St, Fairlight	Residential	NCA1	56	43	26	28	25	38	26	24	24
R1584	340581.76	6258766.6	49 The Crescent, Manly	Residential	NCA1	56	43	47	48	45	58	46	44	39
R1585	340575.42	6258887.6	11 Laurence St, Manly	Residential	NCA1	56	43	42	43	40	53	41	39	38
R1586	340586.21	6259364.8	1 Francis St, Fairlight	Residential	NCA1	56	43	31	26	23	38	24	22	21
R1587	340584.87	6259731.9	29 Balgowlah Rd, Manly	Residential	NCA1	56	43	16	16	13	27	14	12	13
R1588	340579.67	6259069.9	133 Sydney Rd, Fairlight	Residential	NCA1	56	43	43	43	39	54	40	38	37
R1589	340591.11	6259375.7	3 Francis St, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	18
R1590	340582.52	6258916.9	15 Laurence St, Manly	Residential	NCA1	56	43	41	43	39	53	41	39	37
R1591	340592.92	6259387.9	5 Francis St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	20
R1592	340588.28	6259344.7	14 Griffiths St, Fairlight	Residential	NCA1	56	43	32	34	31	44	32	30	29
R1593	340583.89	6259405.2	7 Francis St, Fairlight	Residential	NCA1	56	43	19	21	17	31	19	17	15
R1594	340593.25	6259412.6	9 Francis St, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	19
R1595	340585.47	6259174.7	1 Crescent St, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1596	340593.06	6259149.7	122 Sydney Rd, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	35
R1597	340590.95	6258778.8	47 The Crescent, Manly	Residential	NCA1	56	43	47	48	45	58	46	44	39
R1598	340581.93	6259645.8	50 Daintrey St, Fairlight	Residential	NCA1	56	43	15	16	13	26	14	12	11
R1599	340583.51	6259733.9	27 Balgowlah Rd, Manly	Residential	NCA1	56	43	15	16	13	27	14	12	12
R1600	340586.43	6258935.7	17 Laurence St, Manly	Residential	NCA1	56	43	44	45	40	55	43	41	38
R1601	340587.97	6259045.3	129 Sydney Rd, Fairlight	Residential	NCA1	56	43	43	42	40	54	41	39	37
R1602	340597.89	6259227.6	9B Crescent St, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1603	340596.41	6259435.7	13 Francis St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	19
R1604	340589.57	6259417.9	11 Francis St, Fairlight	Residential	NCA1	56	43	27	28	25	39	27	25	21
R1605	340591.38	6259442.1	15 Francis St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	21
R1606	340600.61	6259209.7	7 Crescent St, Fairlight	Residential	NCA1	56	43	37	38	36	49	37	35	34
R1607	340605.86	6259241.1	11 Crescent St, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	33
R1608	340599.84	6259732.1	25 Balgowlah Rd, Manly	Residential	NCA1	56	43	16	17	14	27	15	13	15
R1609	340600.07	6259253.5	15 Crescent St, Fairlight	Residential	NCA1	56	43	36	38	35	49	36	34	33
R1610	340605.44	6259468.7	17A Francis St, Fairlight	Residential	NCA1	56	43	26	27	25	38	26	24	19
R1611	340607.47	6259493.8	23 Francis St, Fairlight	Residential	NCA1	56	43	23	24	22	35	23	21	18
R1612	340603.81	6259457.7	15 Francis St, Fairlight	Residential	NCA1	56	43	27	27	24	38	26	24	20
R1613	340606.05	6259481.2	21 Francis St, Fairlight	Residential	NCA1	56	43	25	25	22	37	24	22	18
R1614	340609.4	6259270.9	17 Crescent St, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	33
R1615	340604.7	6258782.7	45 The Crescent, Manly	Residential	NCA1	56	43	47	48	45	58	46	44	39
R1616	340604.06	6259041.1	129 Sydney Rd, Fairlight	Residential	NCA1	56	43	43	43	40	53	41	39	38
R1617	340609.11	6259513.3	27 Francis St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1618	340605.65	6259749.8	23 Balgowlah Rd, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R1619	340612.67	6259287.6	19 Crescent St, Fairlight	Residential	NCA1	56	43	34	37	34	47	35	33	32
R1620	340607.07	6259057.9	129 Sydney Rd, Fairlight	Residential	NCA1	56	43	41	42	39	52	40	38	36
R1621	340611.95	6259001.7	20-22 Fairlight St, Fairlight	Residential	NCA1	56	43	39	41	38	51	39	37	33
R1622	340616.03	6259300.5	23 Crescent St, Fairlight	Residential	NCA1	56	43	34	37	34	47	35	33	32
R1623	340615.61	6259569.1	35 Francis St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	15
R1624	340614.69	6259558.3	33 Francis St, Fairlight	Residential	NCA1	56	43	20	21	19	32	20	18	16
R1625	340615.47	6259542.9	31 Francis St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	17
R1626	340615.24	6259529.7	29 Francis St, Fairlight	Residential	NCA1	56	43	21	23	20	33	21	19	18
R1627	340610.82	6259087.1	131 Sydney Rd, Fairlight	Residential	NCA1	56	43	41	42	38	52	40	38	38
R1628	340608.83	6259681.3	55 Francis St, Manly	Residential	NCA1	56	43	14	16	12	26	14	12	11
R1629	340619.22	6259701.2	61 Francis St, Manly	Residential	NCA1	56	43	17	17	14	28	15	13	14
R1630	340619.21	6259580.6	37 Francis St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	15
R1631	340621.15	6259592.7	39 Francis St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	15
R1632	340618.29	6258782.9	43 The Crescent, Manly	Residential	NCA1	56	43	48	48	45	59	46	44	40
R1633	340623.26	6258610.5	43 Francis St, Fairlight	Residential	NCA1	56	43	21	22	19	33	21	19	18
R1634	340618.05	6259752.8	21 Balgowlah Rd, Manly	Residential	NCA1	56	43	17	17	14	27	15	13	11
R1635	340629.27	6259666.7	53 Francis St, Manly	Residential	NCA1	56	43	20	18	16	30	17	15	14
R1636	340611.65	6258833.5	32 The Crescent, Manly	Residential	NCA1	56	43	45	44	41	55	42	40	38
R1637	340626.37	6259624.9	45 Francis St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	15
R1638	340625.8	6259639.3	47 Francis St, Manly	Residential	NCA1	56	43	20	20	15	32	17	15	16
R1639	340625.74	6259647.9	49 Francis St, Manly	Residential	NCA1	56	43	20	20	16	30	18	16	19
R1640	340626.01	6259657.2	51 Francis St, Manly	Residential	NCA1	56	43	20	19	16	30	17	15	18
R1641	340622.57	6259329.9	10 Griffiths St, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	33
R1642	340621.53	6259714.2	63 Francis St, Manly	Residential	NCA1	56	43	17	17	14	27	15	13	14
R1643	340629.05	6259045.5	11 Griffin St, Manly	Residential	NCA1	56	43	40	41	38	51	39	37	36
R1644	340622.24	6259144.8	120 Sydney Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1645	340623.22	6258860.1	4 Laurence St, Manly	Residential	NCA1	56	43	40	42	38	52	40	38	32
R1646	340627.28	6259751.1	19 Balgowlah Rd, Manly	Residential	NCA1	56	43	17	16	14	28	15	13	13
R1647	340623.46	6258975.3	18 Fairlight St, Manly	Residential	NCA1	56	43	45	46	42	56	44	42	39
R1648	340637.59	6259369.6	2 Francis St, Fairlight	Residential	NCA1	56	43	31	33	30	43	31	29	26
R1649	340628.93	6258875.4	6-8 Laurence St, Manly	Residential	NCA1	56	43	46	47	45	58	45	43	39
R1650	340639.63	6259381.6	6 Francis St, Fairlight	Residential	NCA1	56	43	31	34	31	44	32	30	27
R1651	340630.14	6259194.1	2 Crescent St, Fairlight	Residential	NCA1	56	43	28	28	25	39	26	24	26
R1652	340630.2	6259061.8	14 Griffin St, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1653	340640.53	6259393.1	8 Francis St, Fairlight	Residential	NCA1	56	43	26	27	24	38	26	24	20
R1654	340637.93	6259402.8	12 Francis St, Fairlight	Residential	NCA1	56	43	28	28	26	39	27		

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1666	340650.64	6259452	20 Francis St, Fairlight	Residential	NCA1	56	43	27	29	26	40	28	26	24
R1667	340649.58	6259228.7	8 Crescent St, Fairlight	Residential	NCA1	56	43	37	38	35	49	37	35	33
R1668	340637.11	6259027.8	9 Griffin St, Manly	Residential	NCA1	56	43	41	43	39	53	41	39	39
R1669	340653.13	6259475.4	28 Francis St, Fairlight	Residential	NCA1	56	43	24	25	22	36	23	21	20
R1670	340651.67	6259239.2	10 Crescent St, Fairlight	Residential	NCA1	56	43	36	38	35	48	36	34	34
R1671	340653.77	6259489.1	30 Francis St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	20
R1672	340650.01	6259246.5	12 Crescent St, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1673	340644.29	6258972.6	16 Fairlight St, Manly	Residential	NCA1	56	43	44	44	41	55	43	41	29
R1674	340644.8	6259288.8	24 Crescent St, Fairlight	Residential	NCA1	56	43	28	30	27	40	28	26	26
R1675	340653.14	6259514	34 Francis St, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	20
R1676	340659.8	6259263.5	16 Crescent St, Fairlight	Residential	NCA1	56	43	35	37	34	47	35	33	33
R1677	340657.19	6259499.9	32 Francis St, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	19
R1678	340646.64	6259329	6 Griffiths St, Fairlight	Residential	NCA1	56	43	37	39	35	49	37	35	33
R1679	340656.91	6259526.8	36 Francis St, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	16
R1680	340648.29	6259001.5	16A Fairlight St, Manly	Residential	NCA1	56	43	42	42	40	53	41	39	37
R1681	340656.44	6259161	116 Sydney Rd, Fairlight	Residential	NCA1	56	43	40	41	38	51	39	37	36
R1682	340663.38	6259280.5	20 Crescent St, Fairlight	Residential	NCA1	56	43	35	36	33	47	34	32	31
R1683	340651.89	6259542.7	38 Francis St, Fairlight	Residential	NCA1	56	43	17	18	15	28	16	14	14
R1684	340651.96	6259377.2	5 Cecil St, Fairlight	Residential	NCA1	56	43	33	35	32	45	33	31	22
R1685	340654.07	6259097.9	125 Sydney Rd, Fairlight	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1686	340664.79	6259550.1	40 Francis St, Fairlight	Residential	NCA1	56	43	17	18	15	28	16	14	14
R1687	340664.11	6259561.5	42 Francis St, Fairlight	Residential	NCA1	56	43	18	19	16	29	17	15	17
R1688	340663.33	6258858.1	26 The Crescent, Manly	Residential	NCA1	56	43	44	45	42	55	43	41	33
R1689	340653.75	6259587.5	37 Arthur St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1690	340661.99	6259082	12 Griffin St, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1691	340661.97	6259572.5	44 Francis St, Fairlight	Residential	NCA1	56	43	19	21	17	31	19	17	18
R1692	340664.09	6259292.9	24 Crescent St, Fairlight	Residential	NCA1	56	43	34	36	33	46	34	32	32
R1693	340657.14	6258973.8	14 Fairlight St, Manly	Residential	NCA1	56	43	35	36	33	46	34	32	28
R1694	340659.39	6259411.4	18 Cecil St, Fairlight	Residential	NCA1	56	43	29	32	29	42	30	28	25
R1695	340658.78	6259327.4	4 Griffiths St, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	34
R1696	340697.34	6259849.2	17 Balgowlah Rd, Manly	Commercial	NCA1	70	Non Res	17	19	16	29	17	15	13
R1697	340664.86	6259042.7	7 Griffin St, Manly	Residential	NCA1	56	43	30	30	28	41	28	26	27
R1698	340671.48	6259629.8	46 Francis St, Manly	Residential	NCA1	56	43	22	22	19	32	20	18	18
R1699	340662.58	6259368	3 Cecil St, Fairlight	Residential	NCA1	56	43	35	35	32	47	33	31	26
R1700	340671.91	6259647.5	50 Francis St, Manly	Residential	NCA1	56	43	16	17	14	27	15	13	13
R1701	340664.25	6259459.3	31 Augusta Rd, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R1702	340675.03	6259656.7	52 Francis St, Manly	Residential	NCA1	56	43	17	18	15	29	16	14	15
R1703	340665.45	6259681.3	56 Francis St, Manly	Residential	NCA1	56	43	15	16	13	26	14	12	12
R1704	340663.32	6258902.5	17 Fairlight St, Manly	Residential	NCA1	56	43	46	47	42	56	45	43	39
R1705	340674.48	6259687.1	58 Francis St, Manly	Residential	NCA1	56	43	18	17	14	27	15	13	16
R1706	340679.35	6259637.5	48 Francis St, Manly	Residential	NCA1	56	43	23	23	20	35	21	19	15
R1707	340680.64	6259699.5	62 Francis St, Manly	Residential	NCA1	56	43	17	18	15	28	16	14	15
R1708	340664.05	6259593.3	35 Arthur St, Fairlight	Residential	NCA1	56	43	16	17	14	27	15	13	13
R1709	340668.8	6258958	12 Fairlight St, Manly	Residential	NCA1	56	43	47	49	45	59	46	44	40
R1710	340676.94	6259333.2	2 Griffiths St, Fairlight	Residential	NCA1	56	43	38	40	36	50	38	36	30
R1711	340671.07	6259413	16 Cecil St, Fairlight	Residential	NCA1	56	43	30	33	29	43	30	28	24
R1712	340671.82	6259070.9	10 Griffin St, Manly	Residential	NCA1	56	43	46	46	44	57	45	43	41
R1713	340671.85	6259509.1	50 Augusta Rd, Fairlight	Residential	NCA1	56	43	23	25	22	35	23	21	20
R1714	340675.19	6259096.7	123 Sydney Rd, Fairlight	Residential	NCA1	56	43	45	46	43	56	44	42	41
R1715	340673.96	6258844.4	24 The Crescent, Manly	Residential	NCA1	56	43	46	48	42	57	45	43	36
R1716	340686.02	6259663.4	54 Francis St, Manly	Residential	NCA1	56	43	18	18	15	28	16	14	15
R1717	340674.76	6259190.9	1 Parkview Rd, Fairlight	Residential	NCA1	56	43	42	41	39	53	40	38	36
R1718	340674.98	6259363.6	1 Cecil St, Fairlight	Residential	NCA1	56	43	32	32	29	44	30	28	24
R1719	340675.65	6258862.3	24 The Crescent, Manly	Residential	NCA1	56	43	34	35	32	46	33	31	28
R1720	340688.29	6259212.5	3 Parkview Rd, Fairlight	Residential	NCA1	56	43	40	41	38	52	39	37	36
R1721	340677.3	6259457	29 Augusta Rd, Fairlight	Residential	NCA1	56	43	28	29	26	39	27	25	24
R1722	340676.97	6259008.4	5 Griffin St, Manly	Residential	NCA1	56	43	43	44	41	54	42	40	40
R1723	340695.5	6259745.1	64 Francis St, Manly	Residential	NCA1	56	43	18	18	15	28	16	14	16
R1724	340691	6259242.8	7 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	36
R1725	340689.04	6259227.3	5 Parkview Rd, Fairlight	Residential	NCA1	56	43	40	42	40	53	41	39	36
R1726	340701.18	6259767.6	17 Balgowlah Rd, Manly	Residential	NCA1	56	43	17	18	17	30	18	16	15
R1727	340683.16	6259578.1	33 Arthur St, Fairlight	Residential	NCA1	56	43	19	19	16	30	17	15	18
R1728	340683.35	6259411	12 Cecil St, Fairlight	Residential	NCA1	56	43	29	31	28	41	29	27	27
R1729	340695.78	6259257.7	9 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	35
R1730	340698.67	6259273.1	11 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	41	37	51	39	37	35
R1731	340685.15	6259511	48 Augusta Rd, Fairlight	Residential	NCA1	56	43	23	26	22	36	24	22	20
R1732	340684.08	6258846.7	22 The Crescent, Manly	Residential	NCA1	56	43	48	49	46	60	47	45	38
R1733	340684.24	6258900.1	15 Fairlight St, Manly	Residential	NCA1	56	43	47	47	44	58	45	43	40
R1734	340699.92	6259289	15 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1735	340688.73	6258962.6	8 Fairlight St, Manly	Residential	NCA1	56	43	47	46	45	58	46	44	37
R1736	340689.35	6259622.5	36 Arthur St, Fairlight	Residential	NCA1	56	43	18	19	16	30	17	15	17
R1737	340688.56	6259454.3	27 Augusta Rd, Fairlight	Residential	NCA1	56	43	26	29	25	38	26	24	23
R1738	340696.64	6259075.8	8 Griffin St, Manly	Residential	NCA1	56	43	42	43	40	53	41	39	37
R1739	340692.61	6258821.6	37 The Crescent, Manly	Residential	NCA1	56	43	41	42	34	52	40	38	33
R1740	340693.8	6259100.9	121 Sydney Rd, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1741	340692.88	6259004.9	1-3 Griffin St, Manly	Residential	NCA1	56	43	46	44	41	54	42	40	41
R1742	340693.01	6259574.1	31 Arthur St, Fairlight	Residential	NCA1	56	43	21	20	17	31	19	17	18
R1743	340734.54	6259789.5	15-17 Balgowlah Rd, Manly	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1744	340694.55	6259411.4	6 Cecil St, Fairlight	Residential	NCA1	56	43	32	33	30	43	31	29	31
R1745	340694.99	6259507.3	44 Augusta Rd, Fairlight	Residential	NCA1	56	43	24	26	23	36	24	22	23
R1746	340697.03	6259665.9	35 Herbert St, Manly	Residential	NCA1	56	43	17	19	16	29	17	15	16
R1747	340698.89	6259314.7	17 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	42	37	51	39	37	35
R1748	340710.23	6259336	19 Parkview Rd, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	33
R1749	340702.29	6259690.6	35 Herbert St, Manly	Residential	NCA1	56	43	15	17	14	27	15	13	13
R1750	340712.86	6259349.8	23 Parkview Rd, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	33
R1751	340699.29	6259622.5	34 Arthur St, Fairlight	Residential	NCA1	56	43	22	20	17	31	18	16	18
R1752	340705.32	6259532.8	44A Augusta Rd, Fairlight	Residential	NCA1	56	43	19	20	17	31	18	16	17
R1753	340700.05	6259453.5	25 Augusta Rd, Fairlight	Residential	NCA1	56	43	26	29	26	39	27	25	23
R1754	340715.8	6259361.4	27 Parkview Rd, Fairlight	Residential	NCA1	56	43	37	39	36	49	37	35	33
R1755	340704.33	6258908.4	11 Fairlight St, Manly	Residential	NCA1	56	43	43	44	41	54	42	40	37
R1756	340706.34	6259571.2	29 Arthur St, Fairlight	Residential	NCA1	56	43	20	21	18	32	19	17	19
R1757	340717.12	6259377	29 Parkview Rd, Fairlight	Residential	NCA1	56	43	37	38	35	48	36	34	32
R1758	340703.6	6259680.4	33 Herbert St, Manly	Residential	NCA1	56	43	15	17	14	27	15	13	13
R1759	340705.75	6259407.6	4 Cecil St, Fairlight											

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1770	340718	6259620.9	30 Arthur St, Fairlight	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1771	340718.19	6258896.5	9 Fairlight St, Manly	Residential	NCA1	56	43	47	47	45	58	46	44	35
R1772	340714.53	6259581.5	27 Arthur St, Fairlight	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1773	340719.98	6259406.4	2 Cecil St, Fairlight	Residential	NCA1	56	43	33	34	31	45	33	31	29
R1774	340718.73	6259497.8	38 Augusta Rd, Fairlight	Residential	NCA1	56	43	28	28	25	41	26	24	25
R1775	340735.17	6258956.4	1-7 George St, Manly	Residential	NCA1	56	43	48	49	46	60	47	45	43
R1776	340737.8	6259812.4	17 Balgowlah Rd, Manly	Residential	NCA1	56	43	18	21	16	29	17	15	17
R1777	340722.02	6259726.2	20 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1778	340731.61	6259453.1	31 Parkview Rd, Fairlight	Residential	NCA1	56	43	30	33	28	43	31	29	28
R1779	340722.94	6259667.1	29 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1780	340730.95	6259462.8	21 Augusta Rd, Fairlight	Residential	NCA1	56	43	30	29	26	42	28	26	27
R1781	340726.82	6259618.3	28 Arthur St, Fairlight	Residential	NCA1	56	43	20	20	17	30	18	16	18
R1782	340739.39	6259205.7	4 Parkview Rd, Fairlight	Residential	NCA1	56	43	42	43	41	54	42	40	38
R1783	340737.02	6259217.5	6 Parkview Rd, Fairlight	Residential	NCA1	56	43	42	42	39	53	40	38	37
R1784	340725.48	6259150	108 Sydney Rd, Manly	Residential	NCA1	56	43	41	42	39	53	40	38	39
R1785	340741.51	6259002.6	11 George St, Manly	Residential	NCA1	56	43	48	48	46	59	46	44	43
R1786	340732.87	6258806.7	33 The Crescent, Manly	Residential	NCA1	56	43	44	42	38	52	40	38	33
R1787	340740.94	6258992.5	9 George St, Manly	Residential	NCA1	56	43	48	48	46	59	47	45	43
R1788	340741.77	6259233.7	8 Parkview Rd, Fairlight	Residential	NCA1	56	43	42	42	38	53	40	38	36
R1789	340739.65	6259257.2	85 Raglan St, Fairlight	Residential	NCA1	56	43	42	41	38	52	39	37	36
R1790	340729.51	6259563.7	25 Arthur St, Fairlight	Residential	NCA1	56	43	22	23	20	33	21	19	21
R1791	340745.21	6259190.4	2 Parkview Rd, Fairlight	Residential	NCA1	56	43	41	43	40	53	41	39	39
R1792	340729.28	6259730.1	18 Herbert St, Manly	Residential	NCA1	56	43	15	16	14	27	14	12	12
R1793	340729.72	6259675.8	27 Herbert St, Manly	Residential	NCA1	56	43	16	17	14	28	15	13	13
R1794	340732.22	6259493.5	34 Augusta Rd, Fairlight	Residential	NCA1	56	43	27	27	24	37	25	23	25
R1795	340739.69	6259103	113 Sydney Rd, Manly	Residential	NCA1	56	43	42	42	40	53	40	38	37
R1796	340736.18	6258914.1	7 Fairlight St, Manly	Residential	NCA1	56	43	43	41	39	52	40	38	32
R1797	340736.11	6259011.1	13 George St, Manly	Residential	NCA1	56	43	48	48	46	59	46	44	43
R1798	340735.32	6259288	88 Raglan St, Fairlight	Residential	NCA1	56	43	42	43	39	53	41	39	36
R1799	340739.01	6259618	26 Arthur St, Fairlight	Residential	NCA1	56	43	21	21	18	31	19	17	20
R1800	340739.63	6258776.1	31 The Crescent, Manly	Residential	NCA1	56	43	51	51	48	62	49	47	33
R1801	340740.36	6259720.3	16 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	18
R1802	340740.96	6259660.9	25 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1803	340740.58	6259562	23 Arthur St, Fairlight	Residential	NCA1	56	43	22	22	19	32	20	18	19
R1804	340749.82	6259509.7	32 Augusta Rd, Fairlight	Residential	NCA1	56	43	25	25	22	36	23	21	22
R1805	340743.97	6259324.2	12 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1806	340746.73	6259151.9	100 Sydney Rd, Manly	Residential	NCA1	56	43	43	43	39	55	43	41	40
R1807	340740.48	6258833.8	12 The Crescent, Manly	Residential	NCA1	56	43	50	48	45	61	49	47	41
R1808	340756.92	6259335.2	14 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1809	340750.09	6258906.6	5 Fairlight St, Manly	Residential	NCA1	56	43	45	39	36	49	38	36	32
R1810	340756.85	6259343.7	16 Parkview Rd, Fairlight	Residential	NCA1	56	43	39	40	37	50	38	36	35
R1811	340757.92	6259049.1	15 George St, Manly	Residential	NCA1	56	43	45	46	43	56	44	42	42
R1812	340749.96	6259657.1	23 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1813	340746.14	6259725.8	14 Herbert St, Manly	Residential	NCA1	56	43	15	17	14	27	15	13	13
R1814	340766.53	6259361.3	20 Parkview Rd, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	35
R1815	340765.57	6259377	24 Parkview Rd, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	35
R1816	340762.7	6259066.8	17 George St, Manly	Residential	NCA1	56	43	46	47	44	57	45	43	41
R1817	340752.36	6259615.8	24 Arthur St, Fairlight	Residential	NCA1	56	43	21	22	18	32	19	17	19
R1818	340764.82	6259253.6	81-83 Raglan St, Fairlight	Residential	NCA1	56	43	40	41	38	51	40	38	36
R1819	340749.9	6259576.1	21 Arthur St, Fairlight	Residential	NCA1	56	43	17	18	16	29	17	15	14
R1820	340766.3	6259080.4	19 George St, Manly	Residential	NCA1	56	43	47	47	44	58	45	43	42
R1821	340758.38	6258770.1	29 The Crescent, Manly	Residential	NCA1	56	43	51	52	49	62	50	48	34
R1822	340757.87	6259412.7	34 Parkview Rd, Fairlight	Residential	NCA1	56	43	24	25	22	35	23	21	20
R1823	340771.41	6259399.1	32 Parkview Rd, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	34
R1824	340765	6259156.4	100-104 Sydney Rd, Manly	Residential	NCA1	56	43	41	43	39	53	41	39	37
R1825	340773.33	6259388.5	28 Parkview Rd, Fairlight	Residential	NCA1	56	43	38	39	36	49	37	35	35
R1826	340766.41	6258850	10 The Crescent, Manly	Residential	NCA1	56	43	47	50	44	60	47	45	42
R1827	340769.25	6259093.5	23 George St, Manly	Residential	NCA1	56	43	45	44	42	55	43	41	40
R1828	340758.13	6259286.7	86 Raglan St, Fairlight	Residential	NCA1	56	43	41	41	37	51	39	37	37
R1829	340759.16	6259655.3	21 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	18
R1830	340770.79	6259875.7	2 Balgowlah Rd, Manly	Commercial	NCA1	70	Non Res	20	24	22	36	24	22	19
R1831	340760.2	6259107.9	25 George St, Manly	Residential	NCA1	56	43	41	44	41	54	42	40	38
R1832	340759.19	6258876.1	3 Fairlight St, Manly	Residential	NCA1	56	43	47	49	45	59	47	45	40
R1833	340783.05	6259804.9	7-13 Balgowlah Rd, Manly	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1834	340772.59	6259436.3	38 Parkview Rd, Fairlight	Residential	NCA1	56	43	34	33	30	45	31	29	30
R1835	340758.04	6259706.6	10 Herbert St, Manly	Residential	NCA1	56	43	15	17	14	27	15	13	13
R1836	340756.34	6259309.7	86 Raglan St, Fairlight	Residential	NCA1	56	43	28	28	26	39	27	25	22
R1837	340770.68	6259418.5	36 Parkview Rd, Fairlight	Residential	NCA1	56	43	37	35	32	46	33	31	32
R1838	340761.75	6259612.6	22 Arthur St, Fairlight	Residential	NCA1	56	43	21	22	19	33	21	19	19
R1839	340775.4	6259448.1	40 Parkview Rd, Fairlight	Residential	NCA1	56	43	32	31	28	43	29	27	29
R1840	340777.28	6259458.1	42 Parkview Rd, Fairlight	Residential	NCA1	56	43	27	27	24	39	25	23	24
R1841	340773.84	6259575.3	19 Arthur St, Fairlight	Residential	NCA1	56	43	25	27	24	37	25	23	24
R1842	340767.65	6259653.4	19 Herbert St, Manly	Residential	NCA1	56	43	19	21	18	31	19	17	18
R1843	340777.28	6259503.7	1A Mossiel St, Fairlight	Residential	NCA1	56	43	31	32	28	41	29	27	30
R1844	340771.75	6259612.1	20 Arthur St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	19
R1845	340774.85	6258766.3	27 The Crescent, Manly	Residential	NCA1	56	43	52	53	49	63	51	49	43
R1846	340787.02	6258937.5	4 George St, Manly	Residential	NCA1	56	43	50	50	47	61	48	46	44
R1847	340780.81	6258890.7	1 Fairlight St, Manly	Residential	NCA1	56	43	48	47	44	59	46	44	42
R1848	340774.32	6259708.7	10 Herbert St, Manly	Residential	NCA1	56	43	16	19	15	28	16	14	15
R1849	340782.9	6259537.5	8 Mossiel St, Fairlight	Residential	NCA1	56	43	26	26	22	36	24	22	24
R1850	340788.05	6258922.1	6B Fairlight St, Manly	Residential	NCA1	56	43	48	49	47	60	47	45	42
R1851	340785.34	6258981.8	8 George St, Manly	Residential	NCA1	56	43	49	49	47	60	47	45	44
R1852	340789.22	6258962	8 George St, Manly	Residential	NCA1	56	43	49	49	47	60	48	46	44
R1853	340786.54	6258857.7	8 The Crescent, Manly	Residential	NCA1	56	43	49	50	47	61	49	47	42
R1854	340778.23	6259646.7	17 Herbert St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	17
R1855	340780.86	6259611.1	18 Arthur St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	19
R1856	340787.59	6259757.2	53 Pine St, Manly	Residential	NCA1	56	43	23	25	22	35	23	21	21
R1857	340792.41	6258995.3	10 George St, Manly	Residential	NCA1	56	43	49	49	47	60	47	45	44
R1858	340793.66	6259004.7	12 George St, Manly	Residential	NCA1	56	43	49	49	46	60	47	45	44
R1859	340781.47	6259136.3	1 Birkeley Rd, Manly	Residential	NCA1	56	43	42	43	40	53	41	39	38
R1860	340778.64	6258975.7	17 Arthur St, Fairlight	Residential	NCA1	56	43	18	20	17	30	18	16	16
R1861	340788.07	6259700.8	8 Herbert St, Manly	Residential	NCA1	56	43	22	25	19	33	21	19	20
R1862	340781.91	6258866.5	4-6 The Crescent, Manly	Residential	NCA1	56	43	48	48	46	59	46	44	42
R1863	340794.94	62												

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1874	340799.81	6259182.9	9 Birkley Rd, Manly	Residential	NCA1	56	43	41	43	39	53	41	39	37
R1875	340792.22	6259563.7	15 Arthur St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	20
R1876	340801.32	6258822.6	19-21 The Crescent, Manly	Residential	NCA1	56	43	48	49	45	59	47	45	41
R1877	340793.06	6259716.3	6 Herbert St, Manly	Residential	NCA1	56	43	15	17	14	27	15	13	13
R1878	340803.66	6259078.1	34 George St, Manly	Residential	NCA1	56	43	43	43	41	54	NCA1	42	40
R1879	340792.58	6259060.1	28 George St, Manly	Residential	NCA1	56	43	42	43	41	54	41	39	39
R1880	340804.69	6259211.5	17 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1881	340809.93	6259252.4	25 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	38	52	40	38	37
R1882	340802.48	6258891.3	1A Fairlight St, Manly	Residential	NCA1	56	43	50	50	47	60	48	46	42
R1883	340806.89	6259226.2	19 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1884	340801.9	6259050.9	24 George St, Manly	Residential	NCA1	56	43	43	44	41	54	42	40	39
R1885	340790.51	6259766.4	51 Pine St, Manly	Residential	NCA1	56	43	14	16	13	26	NCA1	14	12
R1886	340809.4	6259238.2	23 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	38	52	40	38	37
R1887	340797.7	6259608.3	14 Arthur St, Fairlight	Residential	NCA1	56	43	20	21	18	31	19	17	19
R1888	340796.29	6259423.6	15 Augusta Rd, Manly	Residential	NCA1	56	43	26	27	24	37	25	23	25
R1889	340798.4	6259481.2	30 Augusta Rd, Manly	Residential	NCA1	56	43	26	27	24	37	25	23	25
R1890	340799	6258912.5	4 Fairlight St, Manly	Residential	NCA1	56	43	49	49	46	60	48	46	43
R1891	340805.72	6259097.6	97-107 Sydney Rd, Manly	Residential	NCA1	56	43	39	40	38	51	39	37	35
R1892	340800.74	6259561.8	13 Arthur St, Fairlight	Residential	NCA1	56	43	26	22	19	32	20	18	24
R1893	340807.6	6258783.5	23 Commonwealth Pde, Manly	Residential	NCA1	56	43	53	54	50	64	52	50	43
R1894	340799.83	6259278.9	27-47 Birkley Rd, Manly	Residential	NCA1	56	43	42	43	38	53	41	39	37
R1895	340808.08	6259699.3	4 Herbert St, Manly	Residential	NCA1	56	43	21	21	18	31	19	17	19
R1896	340803.15	6259822.3	49 Pacific Pde, Manly	Residential	NCA1	56	43	16	18	15	28	16	14	13
R1897	340803.37	6259642.8	11 Herbert St, Manly	Residential	NCA1	56	43	17	20	16	29	17	15	16
R1898	340800.12	6259525.7	1A Mossielg St, Manly	Residential	NCA1	56	43	20	21	18	31	19	17	17
R1899	340821.92	6260174.6	275B Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	28	30	28	41	29	27	17
R1900	340805.36	6259605.6	12 Arthur St, Fairlight	Residential	NCA1	56	43	20	22	19	32	20	18	19
R1901	340814.14	6258952.6	1 James St, Manly	Residential	NCA1	56	43	49	50	47	61	48	46	44
R1902	340815.74	6259724.3	2 Herbert St, Manly	Residential	NCA1	56	43	20	24	21	34	22	20	17
R1903	340809.42	6259752	49 Pine St, Manly	Residential	NCA1	56	43	19	21	18	31	19	17	15
R1904	340810.22	6259563.3	11 Arthur St, Fairlight	Residential	NCA1	56	43	25	26	23	36	24	22	24
R1905	340811.82	6259893.5	56 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1906	340818.76	6258971.2	3 James St, Manly	Residential	NCA1	56	43	49	50	47	60	48	46	44
R1907	340810.28	6259357.3	47 Birkley Rd, Manly	Residential	NCA1	56	43	39	42	37	51	39	37	36
R1908	340813.19	6259817.6	46 Pine St, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R1909	340812.65	6258909.3	2 Fairlight St, Manly	Residential	NCA1	56	43	50	47	46	59	47	45	43
R1910	340819.83	6259433.9	13 Augusta Rd, Manly	Residential	NCA1	56	43	30	31	28	41	29	27	29
R1911	340817.24	6259649.7	9 Herbert St, Manly	Residential	NCA1	56	43	17	18	15	28	16	14	14
R1912	340813.53	6259088.7	95 Sydney Rd, Manly	Residential	NCA1	56	43	43	43	41	54	41	39	39
R1913	340814.19	6259825	47 Pacific Pde, Manly	Residential	NCA1	56	43	16	18	16	29	17	15	14
R1914	340820.35	6259480.3	59B Birkley Rd, Manly	Residential	NCA1	56	43	29	29	26	39	27	25	27
R1915	340820.71	6259908.9	63 Alexander St, Manly	Residential	NCA1	56	43	22	25	22	35	23	21	13
R1916	340816.59	6259602.4	10 Arthur St, Fairlight	Residential	NCA1	56	43	21	22	19	32	20	18	19
R1917	340822.97	6259925.8	63 Alexander St, Manly	Residential	NCA1	56	43	20	16	13	26	14	12	11
R1918	340820.61	6258801	15 Commonwealth Pde, Manly	Residential	NCA1	56	43	53	54	50	64	52	50	43
R1919	340818.37	6259002.8	6 James St, Manly	Residential	NCA1	56	43	48	49	47	60	47	45	43
R1920	340818.67	6259561.3	9 Arthur St, Fairlight	Residential	NCA1	56	43	24	25	23	36	24	22	22
R1921	340826.33	6258812.4	15 The Crescent, Manly	Residential	NCA1	56	43	53	54	50	64	52	50	43
R1922	340813.42	6259023	7 James St, Manly	Residential	NCA1	56	43	33	33	31	44	32	30	27
R1923	340822.55	6259890.7	54 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1924	340820.05	6259027.2	8 James St, Manly	Residential	NCA1	56	43	48	49	46	59	47	45	44
R1925	340831.22	6258825	11 The Crescent, Manly	Residential	NCA1	56	43	53	54	50	64	52	50	43
R1926	340817.29	6259649.1	7 Herbert St, Manly	Residential	NCA1	56	43	16	18	15	28	16	14	14
R1927	340822.3	6259086	93 Sydney Rd, Manly	Residential	NCA1	56	43	40	42	39	52	40	38	38
R1928	340825.96	6259987.9	82 Alexander St, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R1929	340818.88	6259811.6	45 Pacific Pde, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R1930	340830.47	6259763.1	87 Birkley Rd, Manly	Residential	NCA1	56	43	16	20	17	30	18	16	13
R1931	340821.42	6259614.3	8 Arthur St, Fairlight	Residential	NCA1	56	43	17	20	16	29	17	15	15
R1932	340836.54	6258838.8	9 The Crescent, Manly	Residential	NCA1	56	43	52	54	50	64	52	50	43
R1933	340826.21	6259050.5	10 James St, Manly	Residential	NCA1	56	43	45	46	44	57	44	42	42
R1934	340825.19	6258857.7	7 Commonwealth Pde, Manly	Residential	NCA1	56	43	52	52	50	63	50	48	32
R1935	340828.56	6259558.2	7 Arthur St, Fairlight	Residential	NCA1	56	43	22	24	21	34	22	20	21
R1936	340830.48	6260004.5	5 Balgowlah Rd, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R1937	340830.48	6260004.5	5 Balgowlah Rd, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R1938	340825.08	6259919.9	59 Alexander St, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	10
R1939	340828.97	6259407.2	49 Birkley Rd, Manly	Residential	NCA1	56	43	38	39	36	49	37	35	35
R1940	340829.7	6259638.3	5 Herbert St, Manly	Residential	NCA1	56	43	17	19	16	29	17	15	15
R1941	340831.47	6260025.7	8 Rolfe St, Manly	Residential	NCA3	56	43	27	29	25	39	27	25	15
R1942	340837.13	6259877.5	52 Pacific Pde, Manly	Residential	NCA1	56	43	20	22	18	32	19	17	12
R1943	340830.64	6259960.7	80 Alexander St, Manly	Residential	NCA3	56	43	24	28	23	38	25	23	13
R1944	340841.72	6259425.7	53 Birkley Rd, Manly	Residential	NCA1	56	43	36	38	35	48	36	34	34
R1945	340833.07	6259600.2	6 Arthur St, Fairlight	Residential	NCA1	56	43	21	24	20	34	21	19	20
R1946	340833.85	6259810.8	43 Pacific Pde, Manly	Residential	NCA1	56	43	18	19	17	33	18	16	11
R1947	340834.73	6259083	12 James St, Manly	Residential	NCA1	56	43	43	44	41	54	42	40	39
R1948	340844.49	6259439.4	55 Birkley Rd, Manly	Residential	NCA1	56	43	35	36	33	46	34	32	34
R1949	340847.53	6259723.9	83 Birkley Rd, Manly	Residential	NCA1	56	43	23	27	24	37	25	23	20
R1950	340851.54	6259495.2	65 Birkley Rd, Manly	Residential	NCA1	56	43	31	32	28	41	29	27	29
R1951	340837.69	6259558.5	5 Arthur St, Fairlight	Residential	NCA1	56	43	23	25	21	34	22	20	21
R1952	340838.06	6259125.2	2-6 Birkley Rd, Manly	Residential	NCA1	56	43	42	44	40	54	42	40	38
R1953	340849	6259704.4	79 Birkley Rd, Manly	Residential	NCA1	56	43	24	27	25	38	26	24	21
R1954	340840.77	6259467.7	61 Birkley Rd, Manly	Residential	NCA1	56	43	32	33	30	44	32	30	30
R1955	340841.05	6259745.8	89 Birkley Rd, Manly	Residential	NCA1	56	43	22	26	23	37	25	23	20
R1956	340848.01	6259685.1	75 Birkley Rd, Manly	Residential	NCA1	56	43	23	27	24	38	26	24	22
R1957	340822.72	6259487.8	63 Birkley Rd, Manly	Residential	NCA1	56	43	27	23	20	33	21	19	19
R1958	340830.95	6259697.9	77 Birkley Rd, Manly	Residential	NCA1	56	43	17	19	16	29	17	15	15
R1959	340837.27	6259906.5	57 Alexander St, Manly	Residential	NCA1	56	43	22	25	21	35	23	21	13
R1960	340848.75	6258866.2	5 Commonwealth Pde, Manly	Residential	NCA1	56	43	53	53	50	64	51	49	43
R1961	340847.98	6259714	81 Birkley Rd, Manly	Residential	NCA1	56	43	24	27	25	38	26	24	21
R1962	340840.04	6259639.7	3 Herbert St, Manly	Residential	NCA1	56	43	18	21	18	31	19	17	17
R1963	340850.69	6259504.2	67 Birkley Rd, Manly	Residential	NCA1	56	43	30	30	27	40	28	26	28
R1964	340855.65	6258878.1	1-3 The Crescent, Manly	Residential	NCA1	56	43	53	52	50	64	51	49	43
R1965	340833.41	6259536.6	73 Birkley Rd, Manly	Residential	NCA1	56	43	19	21	18	31	19	17	17
R1966	340841.5	6260024.6	6C Rolfe St, Manly	Residential	NCA3	56	43	27	29	26	39	27	25	15
R														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R1978	340855.96	6259644.9	1 Herbert St, Manly	Residential	NCA1	56	43	25	29	26	39	27	25	23
R1979	340850.64	6259913	55 Alexander St, Manly	Residential	NCA1	56	43	22	25	22	35	23	21	13
R1980	340862.49	6259196.6	14 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	38
R1981	340853.85	6258976	16 Upper Gilbert St, Manly	Residential	NCA1	56	43	46	47	45	58	47	45	43
R1982	340858.56	6259558.4	1 Arthur St, Fairlight	Residential	NCA1	56	43	27	30	27	40	28	26	25
R1983	340853.16	6259227.2	20-22 Birkley Rd, Manly	Residential	NCA1	56	43	41	42	39	52	40	38	37
R1984	340862.71	6259604.5	2 Arthur St, Fairlight	Residential	NCA1	56	43	27	29	26	39	27	25	24
R1985	340853.44	6260022.3	4 Rolfe St, Manly	Residential	NCA3	56	43	26	27	25	39	27	25	14
R1986	340861.73	6259533.5	73 Birkley Rd, Manly	Residential	NCA1	56	43	26	30	25	40	26	24	24
R1987	340856.37	6259957.7	74 Alexander St, Manly	Residential	NCA3	56	43	24	27	23	37	25	23	13
R1988	340855.87	6258998.2	14 James St, Manly	Residential	NCA1	56	43	47	48	45	59	46	44	40
R1989	340851.94	6259333.1	30B Birkley Rd, Manly	Residential	NCA1	56	43	27	27	25	38	26	24	23
R1990	340860.13	6259039.9	14 Camera St, Manly	Residential	NCA1	56	43	48	47	45	58	45	43	40
R1991	340861.02	6259809.4	39 Pacific Pde, Manly	Residential	NCA1	56	43	14	16	13	26	14	12	11
R1992	340870.22	6259344.6	34 Birkley Rd, Manly	Residential	NCA1	56	43	39	40	37	50	38	36	36
R1993	340861.27	6259910.6	53 Alexander St, Manly	Residential	NCA1	56	43	21	23	20	33	21	19	12
R1994	340861.7	6259077.2	89 Sydney Rd, Manly	Residential	NCA1	56	43	38	40	37	50	38	36	36
R1995	340864.81	6260104.1	50 Golf Pde, Manly	Residential	NCA3	56	43	12	14	11	24	12	10	9
R1996	340861.55	6258939.7	17 Upper Gilbert St, Manly	Residential	NCA1	56	43	48	47	45	59	46	44	37
R1997	340862.53	6259748.6	22 Kangaroo St, Manly	Residential	NCA1	56	43	18	21	17	30	18	16	13
R1998	340863.56	6259265	82 Raglan St, Manly	Residential	NCA1	56	43	40	42	38	52	40	38	37
R1999	340871.65	6260255.9	2 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	19	40	28	26	19
R2000	340858.35	6259363.8	34 Birkley Rd, Manly	Residential	NCA1	56	43	25	26	23	37	24	22	23
R2001	340865.8	6260236.7	2 Eurobin Av, Manly	Residential	NCA3	56	43	29	18	11	28	16	14	11
R2002	340865.48	6260020	2 Rolfe St, Manly	Residential	NCA3	56	43	26	29	24	39	26	24	15
R2003	340874.23	6258751.4	23 Commonwealth Pde, Manly	Commercial	NCA1	70	Non Res	56	55	51	65	53	51	43
R2004	340869.05	6259886.6	44 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	10
R2005	340867.23	6259292.2	24 Birkley Rd, Manly	Residential	NCA1	56	43	40	41	38	51	39	37	37
R2006	340875.99	6259967	70 Alexander St, Manly	Residential	NCA3	56	43	24	26	22	36	24	22	13
R2007	340864.84	6259704.7	79 Kangaroo St, Manly	Residential	NCA1	56	43	17	19	16	30	17	15	14
R2008	340869.62	6258969.2	12 Upper Gilbert St, Manly	Residential	NCA1	56	43	48	49	46	59	47	45	43
R2009	340870.27	6259038	12 Camera St, Manly	Residential	NCA1	56	43	48	45	45	59	47	45	40
R2010	340878.51	6260298.9	1 Eurobin Av, Manly	Residential	NCA3	56	43	28	30	27	40	28	26	19
R2011	340871.69	6258900.1	93-94 West Esp, Manly	Residential	NCA1	56	43	53	52	50	63	50	48	46
R2012	340872.17	6259810.4	37 Pacific Pde, Manly	Residential	NCA1	56	43	15	16	13	26	14	12	11
R2013	340872.72	6259901.4	51 Alexander St, Manly	Residential	NCA1	56	43	20	23	20	34	21	19	12
R2014	340872.8	6259074.9	87A Sydney Rd, Manly	Residential	NCA1	56	43	38	40	37	50	38	36	37
R2015	340873.52	6259751.6	20 Kangaroo St, Manly	Residential	NCA1	56	43	22	22	19	32	20	18	13
R2016	340880.2	6260103.7	48A Golf Pde, Manly	Residential	NCA3	56	43	12	14	10	24	12	10	10
R2017	340893.7	6259373	40 Birkley Rd, Manly	Residential	NCA1	56	43	42	41	37	51	39	37	37
R2018	340877.23	6258993.9	11 Camera St, Manly	Residential	NCA1	56	43	50	47	46	60	48	46	41
R2019	340888.09	6259415.8	50 Birkley Rd, Manly	Residential	NCA1	56	43	41	40	36	50	38	36	36
R2020	340882.5	6258815.3	11 Commonwealth Pde, Manly	Commercial	NCA1	70	Non Res	45	47	44	57	45	43	36
R2021	340874.02	6259357.6	38 Birkley Rd, Manly	Residential	NCA1	56	43	27	28	25	38	26	24	24
R2022	340895.69	6259386.8	44 Birkley Rd, Manly	Residential	NCA1	56	43	42	41	37	51	38	36	36
R2023	340890.05	6259402.4	48 Birkley Rd, Manly	Residential	NCA1	56	43	40	36	31	44	32	30	36
R2024	340892.32	6259429.3	54A Birkley Rd, Manly	Residential	NCA1	56	43	38	39	36	49	37	35	35
R2025	340882.29	6259885.3	38 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	11
R2026	340878.23	6260026	71 Golf Pde, Manly	Residential	NCA3	56	43	27	29	26	39	27	25	17
R2027	340887	6260254.5	4 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	27	40	28	26	19
R2028	340880.27	6259266	80 Raglan St, Manly	Residential	NCA1	56	43	40	42	39	52	40	38	37
R2029	340892.55	6259434.6	58 Birkley Rd, Manly	Residential	NCA1	56	43	38	39	36	49	37	35	35
R2030	340879.62	6258930.7	15 Upper Gilbert St, Manly	Residential	NCA1	56	43	46	46	44	57	44	42	41
R2031	340879.45	6259036.1	10 Camera St, Manly	Residential	NCA1	56	43	48	46	43	56	43	41	40
R2032	340924.34	6260119.8	245-259 Pittwater Rd, Manly	Residential	NCA3	56	43	29	30	27	41	29	27	18
R2033	340890.3	6259696.1	77 Kangaroo St, Manly	Residential	NCA1	56	43	24	22	19	32	20	18	17
R2034	340889.47	6259820.9	35 Pacific Pde, Manly	Residential	NCA1	56	43	15	18	15	28	16	14	11
R2035	340894.27	6259325.8	28 Birkley Rd, Manly	Residential	NCA1	56	43	43	41	38	52	39	37	39
R2036	340896.68	6259339.7	2 Lawson Pl, Manly	Residential	NCA1	56	43	42	41	38	51	39	37	39
R2037	340896.23	6259677.2	98 Birkley Rd, Manly	Residential	NCA1	56	43	26	28	27	40	28	26	17
R2038	340886.16	6259749.6	18 Kangaroo St, Manly	Residential	NCA1	56	43	20	22	18	32	20	18	14
R2039	340885.39	6259461.6	60 Birkley Rd, Manly	Residential	NCA1	56	43	38	38	35	48	36	34	34
R2040	340885.8	6259074.7	85 Sydney Rd, Manly	Residential	NCA1	56	43	40	41	38	52	39	37	37
R2041	340884.02	6259899.9	47 Alexander St, Manly	Residential	NCA1	56	43	20	23	19	33	21	19	12
R2042	340893.14	6260296.2	3 Eurobin Av, Manly	Residential	NCA3	56	43	28	30	27	40	28	26	19
R2043	340887.21	6260094.9	46 Golf Pde, Manly	Residential	NCA3	56	43	12	14	11	24	12	10	10
R2044	340886.55	6258999.5	9 Camera St, Manly	Residential	NCA1	56	43	48	45	44	58	45	43	40
R2045	340901.19	6259475.9	62 Birkley Rd, Manly	Residential	NCA1	56	43	27	30	26	40	27	25	26
R2046	340897.38	6259663.9	96 Birkley Rd, Manly	Residential	NCA1	56	43	20	22	19	32	20	18	16
R2047	340892.16	6259886.3	36 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	11
R2048	340904.04	6260191.3	270-278 Pittwater Rd, Manly	Residential	NCA3	56	43	29	21	18	41	29	27	11
R2049	340878.04	6259495.6	66 Birkley Rd, Manly	Residential	NCA1	56	43	23	24	21	34	22	20	20
R2050	340899	6259352.1	3 Lawson Pl, Manly	Residential	NCA1	56	43	42	41	37	51	39	37	37
R2051	340892.68	6258968.2	10A Upper Gilbert St, Manly	Residential	NCA1	56	43	47	49	47	60	47	45	44
R2052	340892.55	6259032.9	8 Camera St, Manly	Residential	NCA1	56	43	45	46	42	56	44	42	40
R2053	340891.44	6260028.2	69 Golf Pde, Manly	Residential	NCA3	56	43	28	29	16	39	27	25	15
R2054	340903.14	6259638.7	92 Birkley Rd, Manly	Residential	NCA1	56	43	29	31	28	41	29	27	18
R2055	340902.24	6259628.8	90 Birkley Rd, Manly	Residential	NCA1	56	43	28	31	28	41	29	27	26
R2056	340907.22	6259498	64 Birkley Rd, Manly	Residential	NCA1	56	43	35	37	34	47	35	33	33
R2057	340903.14	6259651.3	94 Birkley Rd, Manly	Residential	NCA1	56	43	28	29	28	41	29	27	17
R2058	340895.19	6259859.6	34 Pacific Pde, Manly	Residential	NCA1	56	43	18	20	17	31	19	17	11
R2059	340893.09	6259957.6	64 Alexander St, Manly	Residential	NCA3	56	43	24	25	22	36	23	21	13
R2060	340905.27	6259615	88 Birkley Rd, Manly	Residential	NCA1	56	43	29	32	28	42	30	28	27
R2061	340903.68	6260254.2	6 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	28	40	29	27	10
R2062	340897.52	6259692.1	75 Kangaroo St, Manly	Residential	NCA1	56	43	26	27	24	38	26	24	16
R2063	340895.28	6259991.2	7-7 Camera St, Manly	Residential	NCA1	56	43	48	47	44	57	45	43	41
R2064	340905.99	6259542.1	76 Birkley Rd, Manly	Residential	NCA1	56	43	30	27	24	37	25	23	28
R2065	340912.46	6258865	93-94 West Esp, Manly	Commercial	NCA1	70	Non Res	54	54	52	65	52	50	45
R2066	340898.12	6259745.3	16 Kangaroo St, Manly	Residential	NCA1	56	43	22	22	19	33	20	18	14
R2067	340895.33	6259071.6	83 Sydney Rd, Manly	Residential	NCA1	56	43	39	41	38	51	39	37	29
R2068	340898.79	6259584.2	82 Birkley Rd, Manly	Residential	NCA1	56	43	19	21	18	31	19	17	17
R2069	340896.62	6259898.8	43 Alexander St, Manly	Residential	NCA1	56	43	20	23	19	33	20	18	12
R2070	340893.46	6259823.9	33 Pacific Pde, Manly	Residential	NCA1	56	43	14	15	12	25</			

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2082	340916.1	6259459.5	28 Augusta Rd, Manly	Residential	NCA1	56	43	35	38	35	48	36	34	34
R2083	340904.49	6259951.4	58 Alexander St, Manly	Residential	NCA3	56	43	27	25	14	35	23	21	15
R2084	340906.53	6259862.9	8A Upper Gilbert St, Manly	Residential	NCA1	56	43	50	48	48	61	49	47	44
R2085	340908.81	6259063.1	81 Sydney Rd, Manly	Residential	NCA1	56	43	38	38	35	49	37	35	32
R2086	340916.05	6259433.4	5 Lawson Pl, Manly	Residential	NCA1	56	43	36	38	35	48	36	34	34
R2087	340909.97	6259900.9	41 Alexander St, Manly	Residential	NCA1	56	43	21	23	20	33	21	19	12
R2088	340909.39	6259745.5	14 Kangaroo St, Manly	Residential	NCA1	56	43	20	22	19	32	20	18	14
R2089	340911.24	6259806.2	31 Pacific Pde, Manly	Residential	NCA1	56	43	14	16	13	26	14	12	11
R2090	340911.41	6260241.5	8 Eurobin Av, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	17
R2091	340901.12	6259289	1 Quinton Rd, Manly	Residential	NCA1	56	43	26	27	24	37	25	23	25
R2092	340907.81	6260086.8	42 Golf Pde, Manly	Residential	NCA3	56	43	14	15	12	25	13	11	10
R2093	340914.57	6259880.3	30 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	11
R2094	340913.72	6260289.6	7 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	27	40	28	26	19
R2095	340920.76	6260022.1	61 Rolfe St, Manly	Residential	NCA3	56	43	27	29	16	40	27	25	15
R2096	340915.7	6260054.6	61 Golf Pde, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R2097	340927.45	6259296.4	3 Quinton Rd, Manly	Residential	NCA1	56	43	42	42	38	52	40	38	39
R2098	340914.4	6259030.2	4A Camera St, Manly	Residential	NCA1	56	43	49	47	45	59	46	44	45
R2099	340917.3	6259949.8	56 Alexander St, Manly	Residential	NCA3	56	43	26	25	14	35	23	21	14
R2100	340917.15	6259253.1	76 Raglan St, Manly	Residential	NCA1	56	43	40	42	39	52	40	38	39
R2101	340916.36	6259896.2	3 Camera St, Manly	Residential	NCA1	56	43	50	48	48	61	48	46	46
R2102	340929.61	6259705	69 Quinton Rd, Manly	Residential	NCA1	56	43	30	34	31	45	32	30	20
R2103	340908.36	6259690.9	65 Quinton Rd, Manly	Residential	NCA1	56	43	24	21	18	31	19	17	15
R2104	340918.2	6259860	6 Upper Gilbert St, Manly	Residential	NCA1	56	43	51	48	48	62	49	47	46
R2105	340918.78	6260164.4	268 Pittwater Rd, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	18
R2106	340919.55	6259802.5	29 Pacific Pde, Manly	Residential	NCA1	56	43	14	16	13	26	14	12	11
R2107	340919.54	6259068.4	79 Sydney Rd, Manly	Residential	NCA1	56	43	39	44	41	54	42	40	38
R2108	340932.17	6259322.4	7 Quinton Rd, Manly	Residential	NCA1	56	43	42	41	38	51	39	37	38
R2109	340920.95	6259894.7	39 Alexander St, Manly	Residential	NCA1	56	43	22	23	13	33	20	18	14
R2110	340929.45	6260196.1	268 Pittwater Rd, Manly	Residential	NCA3	56	43	29	18	15	29	16	14	11
R2111	340929.96	6259308.7	5 Quinton Rd, Manly	Residential	NCA1	56	43	42	42	38	51	40	38	38
R2112	340927.26	6260291.9	7 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	27	40	28	26	19
R2113	340922.88	6259744.4	12A Kangaroo St, Manly	Residential	NCA1	56	43	30	32	29	43	30	28	18
R2114	340922.8	6260071.6	40A Golf Pde, Manly	Residential	NCA3	56	43	28	30	16	41	28	26	16
R2115	340935.21	6259680.4	63 Quinton Rd, Manly	Residential	NCA1	56	43	32	34	31	45	33	31	21
R2116	340933.24	6259654.1	57 Quinton Rd, Manly	Residential	NCA1	56	43	32	34	31	44	32	30	22
R2117	340935.42	6259667.4	61 Quinton Rd, Manly	Residential	NCA1	56	43	32	35	32	45	33	31	21
R2118	340933.64	6260216.3	268 Pittwater Rd, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	19
R2119	340932.32	6260247.7	10A Eurobin Av, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	11
R2120	340937.97	6259630.9	53 Quinton Rd, Manly	Residential	NCA1	56	43	32	35	31	45	32	30	23
R2121	340926.66	6259027.9	2A Camera St, Manly	Residential	NCA1	56	43	50	48	45	61	48	46	40
R2122	340940.44	6259619	51 Quinton Rd, Manly	Residential	NCA1	56	43	32	35	24	45	25	23	23
R2123	340933.5	6259360.8	13 Quinton Rd, Manly	Residential	NCA1	56	43	42	42	38	53	41	39	37
R2124	340926.74	6260024.2	59 Golf Pde, Manly	Residential	NCA3	56	43	27	29	16	39	27	25	15
R2125	340917	6259605.4	47 Quinton Rd, Manly	Residential	NCA1	56	43	29	24	21	42	23	21	17
R2126	340928.99	6259947.4	52 Alexander St, Manly	Residential	NCA3	56	43	24	26	23	40	28	26	22
R2127	340931.18	6259876.1	26 Pacific Pde, Manly	Residential	NCA1	56	43	13	15	12	25	13	11	11
R2128	340943.38	6259395.6	21 Quinton Rd, Manly	Residential	NCA1	56	43	41	42	37	53	38	36	36
R2129	340930.7	6258896.5	87-88 West Esp, Manly	Residential	NCA1	56	43	54	53	51	64	51	49	48
R2130	340931.47	6259062.2	77 Sydney Rd, Manly	Residential	NCA1	56	43	42	44	41	54	42	40	37
R2131	340938.48	6259475.6	29 Quinton Rd, Manly	Residential	NCA1	56	43	37	39	36	49	37	35	35
R2132	340925.21	6259530.7	33 Quinton Rd, Manly	Residential	NCA1	56	43	30	33	30	43	31	29	27
R2133	340946.76	6259595	43 Quinton Rd, Manly	Residential	NCA1	56	43	34	35	32	45	33	31	24
R2134	340944.73	6259426.2	25 Quinton Rd, Manly	Residential	NCA1	56	43	38	39	36	51	38	36	35
R2135	340939.28	6260293.6	9 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	27	40	28	26	11
R2136	340945.92	6259410.1	23 Quinton Rd, Manly	Residential	NCA1	56	43	39	40	37	52	39	37	36
R2137	340932.78	6259898.2	37 Alexander St, Manly	Residential	NCA1	56	43	24	25	14	35	23	21	13
R2138	340929	6259815	25 Pacific Pde, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R2139	340945.7	6259549.3	35 Quinton Rd, Manly	Residential	NCA1	56	43	36	37	34	47	35	33	24
R2140	340933.98	6259743.7	10 Kangaroo St, Manly	Residential	NCA1	56	43	31	30	27	42	28	26	16
R2141	340944.64	6259582.8	41 Quinton Rd, Manly	Residential	NCA1	56	43	33	35	32	45	33	31	25
R2142	340935.06	6260072	38 Golf Pde, Manly	Residential	NCA3	56	43	29	30	17	40	28	26	15
R2143	340937.5	6260160.4	268 Pittwater Rd, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	18
R2144	340943.37	6259506.8	29A Quinton Rd, Manly	Residential	NCA1	56	43	37	38	35	48	36	34	33
R2145	340946.39	6259570.3	39 Quinton Rd, Manly	Residential	NCA1	56	43	35	35	32	45	33	31	24
R2146	340947.55	6259561.4	37 Quinton Rd, Manly	Residential	NCA1	56	43	35	35	32	45	33	31	24
R2147	340938.89	6260257.1	12 Eurobin Av, Manly	Residential	NCA3	56	43	11	13	10	23	11	9	9
R2148	340939.34	6259852.3	24 Pacific Pde, Manly	Residential	NCA1	56	43	19	20	13	30	18	16	12
R2149	340942.24	6260049.5	57 Golf Pde, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R2150	340942.41	6259953.8	50 Alexander St, Manly	Residential	NCA3	56	43	25	27	24	37	25	23	15
R2151	340940.04	6259071.4	75 Sydney Rd, Manly	Residential	NCA1	56	43	31	31	28	42	29	27	26
R2152	340945.4	6260281.7	11 Eurobin Av, Manly	Residential	NCA3	56	43	29	19	16	29	17	15	12
R2153	340952.14	6259905.8	35 Alexander St, Manly	Residential	NCA1	56	43	23	17	14	35	23	21	11
R2154	340944.62	6259803.2	21 Pacific Pde, Manly	Residential	NCA1	56	43	15	17	13	27	15	13	11
R2155	340944.41	6259743.3	8 Kangaroo St, Manly	Residential	NCA1	56	43	31	25	22	35	23	21	14
R2156	340946.9	6258893.9	86 West Esp, Manly	Residential	NCA1	56	43	54	53	51	64	52	50	48
R2157	340956.17	6260211.4	268 Pittwater Rd, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	21
R2158	340947.6	6260068.9	34 Golf Pde, Manly	Residential	NCA3	56	43	28	19	16	40	17	15	12
R2159	340955.17	6259857.5	22 Pacific Pde, Manly	Residential	NCA1	56	43	20	21	13	31	19	17	12
R2160	340962.19	6259010.4	1-2 Tower St, Manly	Residential	NCA1	56	43	51	49	46	61	48	46	38
R2161	340951.53	6260233.9	14 Eurobin Av, Manly	Residential	NCA3	56	43	15	18	15	28	16	14	12
R2162	340955.03	6260046.9	53 Golf Pde, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R2163	340953.45	6259946.5	48 Alexander St, Manly	Residential	NCA3	56	43	25	26	23	36	24	22	14
R2164	340954.81	6259048	73 Sydney Rd, Manly	Residential	NCA1	56	43	42	41	39	53	40	38	36
R2165	340955.38	6260280.8	13 Eurobin Av, Manly	Residential	NCA3	56	43	29	20	20	40	28	26	12
R2166	340957.33	6259797.8	19 Pacific Pde, Manly	Residential	NCA1	56	43	17	18	13	30	18	16	12
R2167	340953.54	6259904.2	33 Alexander St, Manly	Residential	NCA1	56	43	14	16	12	26	14	12	11
R2168	340956.52	6259736.6	6 Kangaroo St, Manly	Residential	NCA1	56	43	21	23	16	33	21	19	15
R2169	340961.14	6259283.6	2 Quinton Rd, Manly	Residential	NCA1	56	43	42	42	39	52	40	38	39
R2170	340953.51	6259304.8	4 Quinton Rd, Manly	Residential	NCA1	56	43	28	28	25	40	26	24	26
R2171	340965.78	6259872.6	20 Pacific Pde, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R2172	340963.9	6259637.3	46 Quinton Rd, Manly	Residential	NCA1	56	43	30	25	22	41	23	21	17
R2173	340969.96	6260242.6	16 Eurobin Av, Manly	Residential	NCA3	56	43	18	19	16	29	17	15	12
R2174	340974.85	6259703.5	58 Quinton Rd, Manly	Residential	NCA1	56	43	21	23	17	33	21	19	16
R2														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2186	340981.6	6259666.3	48 Quinton Rd, Manly	Residential	NCA1	56	43	31	30	21	43	28	26	22
R2187	340969.44	6259795.6	15 Pacific Pde, Manly	Residential	NCA1	56	43	18	17	13	27	15	13	12
R2188	340970.67	6259892.9	31 Alexander St, Manly	Residential	NCA1	56	43	21	26	23	36	24	22	13
R2189	340971.94	6259330.4	10 Quinton Rd, Manly	Residential	NCA1	56	43	38	40	37	50	38	36	36
R2190	340980.95	6259264.6	70 Raglan St, Manly	Residential	NCA1	56	43	42	43	39	52	41	39	39
R2191	340973.75	6259658.4	46 Quinton Rd, Manly	Residential	NCA1	56	43	18	20	16	30	18	16	15
R2192	340972.7	6259342.8	12 Quinton Rd, Manly	Residential	NCA1	56	43	42	43	38	52	39	37	37
R2193	340974.29	6259281.6	2 Quinton Rd, Manly	Residential	NCA1	56	43	43	42	39	52	40	38	39
R2194	340984.51	6259641.4	44 Quinton Rd, Manly	Residential	NCA1	56	43	24	24	19	34	22	20	19
R2195	340976.24	6259739.7	4 Kangaroo St, Manly	Residential	NCA1	56	43	30	31	20	41	29	27	16
R2196	340974.56	6259847	16 Pacific Pde, Manly	Residential	NCA1	56	43	18	20	17	30	18	16	12
R2197	340965.28	6259627.3	42 Quinton Rd, Manly	Residential	NCA1	56	43	29	30	27	41	28	26	18
R2198	340983.06	6259299.4	4 Quinton Rd, Manly	Residential	NCA1	56	43	43	43	39	52	40	38	38
R2199	340987.84	6259373.4	18 Quinton Rd, Manly	Residential	NCA1	56	43	43	43	38	52	39	37	37
R2200	340974.28	6260236.4	18 Eurobin Av, Manly	Residential	NCA3	56	43	17	18	15	29	16	14	10
R2201	340985.17	6259309.4	8 Quinton Rd, Manly	Residential	NCA1	56	43	43	43	39	52	40	38	38
R2202	340989.9	6259383.7	20A Quinton Rd, Manly	Residential	NCA1	56	43	43	43	38	53	39	37	37
R2203	340978.9	6260044.4	45 Golf Pde, Manly	Residential	NCA3	56	43	13	14	12	24	13	11	10
R2204	340985.32	6260176.8	262 Pittwater Rd, Manly	Residential	NCA3	56	43	30	31	28	41	29	27	20
R2205	340994.42	6260208.7	262 Pittwater Rd, Manly	Residential	NCA3	56	43	29	31	20	41	29	27	20
R2206	340977.3	6259942.9	40 Alexander St, Manly	Residential	NCA3	56	43	25	26	23	37	24	22	16
R2207	340977.94	6259431.3	7 Augusta Rd, Manly	Residential	NCA1	56	43	35	37	34	47	35	33	33
R2208	340988.71	6259605.2	38 Quinton Rd, Manly	Residential	NCA1	56	43	22	24	19	34	22	20	18
R2209	340984.63	6260285.3	17 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	21	40	28	26	21
R2210	340978.64	6258995.5	8 Tower St, Manly	Residential	NCA1	56	43	52	51	47	62	49	47	47
R2211	340995.22	6259617.8	40 Quinton Rd, Manly	Residential	NCA1	56	43	30	32	22	42	30	28	22
R2212	340980.3	6259888.8	29 Alexander St, Manly	Residential	NCA1	56	43	22	24	21	36	24	22	14
R2213	340980.93	6259040.7	3 Tower St, Manly	Residential	NCA1	56	43	40	42	38	52	39	37	37
R2214	340996.09	6259410.8	22 Quinton Rd, Manly	Residential	NCA1	56	43	42	42	38	53	39	37	36
R2215	340989.21	6259806.8	11 Pacific Pde, Manly	Residential	NCA1	56	43	17	17	14	27	15	13	12
R2216	340990.6	6259491.2	22 Augusta Rd, Manly	Residential	NCA1	56	43	35	36	33	47	34	32	25
R2217	340996.43	6259568.3	30 Quinton Rd, Manly	Residential	NCA1	56	43	27	28	22	38	26	24	21
R2218	340982.54	6258891.4	83 West Esp, Manly	Residential	NCA1	56	43	55	51	51	65	52	50	49
R2219	340994.99	6259580.7	34 Quinton Rd, Manly	Residential	NCA1	56	43	29	29	22	40	28	26	22
R2220	340999.89	6259594.2	36 Quinton Rd, Manly	Residential	NCA1	56	43	29	31	22	41	29	27	21
R2221	340999.2	6259526.4	26 Quinton Rd, Manly	Residential	NCA1	56	43	31	32	24	42	30	28	24
R2222	340989.41	6260089.6	28-32 Golf Pde, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	10
R2223	340986.81	6259849.3	12 Pacific Pde, Manly	Residential	NCA1	56	43	21	22	19	34	22	20	12
R2224	340974.22	6259557.4	30 Quinton Rd, Manly	Residential	NCA1	56	43	32	31	28	44	29	27	23
R2225	340991.13	6260042.7	43 Golf Pde, Manly	Residential	NCA3	56	43	13	14	11	24	12	10	11
R2226	341000.95	6260230.6	20 Eurobin Av, Manly	Residential	NCA3	56	43	29	31	21	41	29	27	12
R2227	340988.66	6259939.3	36 Alexander St, Manly	Residential	NCA3	56	43	29	27	24	41	29	27	17
R2228	340990.19	6259428.3	5 Augusta Rd, Manly	Residential	NCA1	56	43	37	39	33	48	36	34	36
R2229	340998.71	6259743.8	2B Kangaroo St, Manly	Residential	NCA1	56	43	24	27	24	37	25	23	17
R2230	340995.53	6259801.1	9 Pacific Pde, Manly	Residential	NCA1	56	43	20	19	16	32	19	17	12
R2231	340996.27	6260282.5	19 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	21	40	28	26	21
R2232	340992.41	6259242.8	66 Raglan St, Manly	Residential	NCA1	56	43	43	43	39	53	41	39	39
R2233	340989.88	6259899	25 Alexander St, Manly	Residential	NCA1	56	43	14	16	13	26	14	12	11
R2234	340999.71	6259692.8	73 Kangaroo St, Manly	Residential	NCA1	56	43	30	32	29	42	30	28	16
R2235	340998.22	6259805	5 Pacific Pde, Manly	Residential	NCA1	56	43	19	19	16	29	17	15	12
R2236	340995.82	6258884.9	81-82 West Esp, Manly	Residential	NCA1	56	43	55	51	52	65	52	50	49
R2237	340993.59	6259498.9	20 Augusta Rd, Manly	Residential	NCA1	56	43	26	27	24	37	25	23	20
R2238	341009.23	6260110.6	245-259 Pittwater Rd, Manly	Residential	NCA3	56	43	30	32	20	42	30	28	20
R2239	341002.21	6259865.1	8 Pacific Pde, Manly	Residential	NCA1	56	43	14	15	13	25	14	12	11
R2240	341002.76	6260040.3	37 Golf Pde, Manly	Residential	NCA3	56	43	13	15	12	25	13	11	11
R2241	340999.14	6259043	69 Sydney Rd, Manly	Residential	NCA1	56	43	47	40	36	52	38	36	35
R2242	341009.57	6258992	8 Tower St, Manly	Residential	NCA1	56	43	53	52	48	62	50	48	48
R2243	341001.85	6259940.6	34 Alexander St, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	17
R2244	341001.98	6259423.9	1 Augusta Rd, Manly	Residential	NCA1	56	43	41	40	37	52	39	37	35
R2245	341003.65	6259239.2	62 Raglan St, Manly	Residential	NCA1	56	43	44	43	39	53	41	39	39
R2246	341008.81	6260288.3	21 Eurobin Av, Manly	Residential	NCA3	56	43	28	20	13	30	18	16	14
R2247	341006.53	6259538.6	28 Quinton Rd, Manly	Residential	NCA1	56	43	33	35	26	45	33	31	25
R2248	341006.96	6259888.2	23 Alexander St, Manly	Residential	NCA1	56	43	28	25	22	35	23	21	16
R2249	341000.59	6259683.6	71 Kangaroo St, Manly	Residential	NCA1	56	43	22	23	20	34	22	20	17
R2250	341007.9	6259289.4	5 Ocean Rd, Manly	Residential	NCA1	56	43	42	44	39	52	40	38	38
R2251	341007.2	6260060.2	24A Golf Pde, Manly	Residential	NCA3	56	43	30	19	18	41	29	27	13
R2252	341004.87	6260244.7	22 Eurobin Av, Manly	Residential	NCA3	56	43	29	31	21	41	29	27	12
R2253	341010.86	6259803.6	5 Pacific Pde, Manly	Residential	NCA1	56	43	19	18	15	29	17	15	13
R2254	341009.88	6259265.8	1 Ocean Rd, Manly	Residential	NCA1	56	43	43	43	39	52	41	39	38
R2255	341015.66	6259867.2	6 Pacific Pde, Manly	Residential	NCA1	56	43	14	16	13	25	14	12	11
R2256	341015.5	6260177.3	254 Pittwater Rd, Manly	Residential	NCA3	56	43	30	31	20	41	29	27	20
R2257	341015.17	6260039.1	33 Golf Pde, Manly	Residential	NCA3	56	43	13	15	11	25	13	11	10
R2258	341017.58	6259661.7	69 Kangaroo St, Manly	Residential	NCA1	56	43	31	33	30	44	31	29	21
R2259	341022.02	6259730.6	2A Kangaroo St, Manly	Residential	NCA1	56	43	32	33	30	43	31	29	21
R2260	341007.25	6259486.9	18 Augusta Rd, Manly	Residential	NCA1	56	43	26	27	22	37	25	23	20
R2261	341015.31	6259935.7	32 Alexander St, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	19
R2262	341027.94	6259307.1	7 Ocean Rd, Manly	Residential	NCA1	56	43	45	44	39	53	40	38	38
R2263	341016.5	6259236.7	60 Raglan St, Manly	Residential	NCA1	56	43	43	43	40	53	41	39	39
R2264	341015.05	6259556.5	6 Bundoon Lane, Manly	Residential	NCA1	56	43	18	19	16	30	18	16	15
R2265	341021.45	6259998.8	4 Tower St, Manly	Residential	NCA1	56	43	53	52	47	62	49	47	48
R2266	341021.89	6259909	19 Alexander St, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	12
R2267	341035.37	6259024.8	5 Tower St, Manly	Residential	NCA1	56	43	52	49	45	61	48	46	47
R2268	341032.01	6259330.1	13 Ocean Rd, Manly	Residential	NCA1	56	43	44	44	38	53	40	38	38
R2269	341029.83	6259315.3	11 Ocean Rd, Manly	Residential	NCA1	56	43	44	44	39	53	40	38	38
R2270	341019.7	6260059.6	22 Golf Pde, Manly	Residential	NCA3	56	43	30	20	13	41	30	28	13
R2271	341027.19	6260301.3	23 Eurobin Av, Manly	Residential	NCA3	56	43	29	30	21	40	28	26	15
R2272	341016.65	6259519.8	4 Sheridan Pl, Manly	Residential	NCA1	56	43	27	28	21	38	26	24	15
R2273	341026.94	6260241	24 Eurobin Av, Manly	Residential	NCA3	56	43	29	31	21	41	29	27	20
R2274	341033.8	6259341.1	15 Ocean Rd, Manly	Residential	NCA1	56	43	44	44	38	53	40	38	38
R2275	341014.34	6259652.5	67 Kangaroo St, Manly	Residential	NCA1	56	43	29	32	29	43	31	29	28
R2276	341039.27	6259038.5	6 Tower St, Manly	Residential	NCA1	56	43	52	48	44	61	47	45	47
R2277	341031.41	6258882.3	77 West Esp, Manly	Residential	NCA1	56	43	53	51	48	62	50	48	46
R2278	341017.68	6259808.8	3A Pacific Pde, Manly	Residential	NCA1	56	43	16	17	14	27	15	13	12
R2279														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2290	341040.09	6259376.1	21 Ocean Rd, Manly	Residential	NCA1	56	43	44	43	39	53	40	38	37
R2291	341036.92	6258902.7	80 West Esp, Manly	Residential	NCA1	56	43	56	52	47	64	50	48	49
R2292	341030.9	6259881.2	17 Alexander St, Manly	Residential	NCA1	56	43	29	30	27	40	28	26	18
R2293	341041.77	6259402.27	27 Ocean Rd, Manly	Residential	NCA1	56	43	43	43	39	53	40	38	37
R2294	341032.11	6260057.3	20 Golf Pde, Manly	Residential	NCA3	56	43	30	19	13	42	17	15	13
R2295	341034.09	6259507.13	13 Sheridan Pl, Manly	Residential	NCA1	56	43	20	22	19	32	20	18	18
R2296	341028.57	6260306.25	Eurobin Av, Manly	Residential	NCA3	56	43	29	30	21	40	28	26	15
R2297	341045.22	6259412.9	29 Ocean Rd, Manly	Residential	NCA1	56	43	43	43	39	53	40	38	36
R2298	341040.66	6260241.26	Eurobin Av, Manly	Residential	NCA3	56	43	29	24	21	41	29	27	15
R2299	341045.6	6259743.9	43 Pine St, Manly	Residential	NCA1	56	43	27	25	22	35	23	21	17
R2300	341047.89	6259424.31	Ocean Rd, Manly	Residential	NCA1	56	43	42	42	38	52	40	38	36
R2301	341050.34	6259437.6	33 Ocean Rd, Manly	Residential	NCA1	56	43	42	42	37	52	38	36	35
R2302	341039	6260035.8	27 Golf Pde, Manly	Residential	NCA3	56	43	13	15	11	25	13	11	10
R2303	341038.68	6259931.9	28B Alexander St, Manly	Residential	NCA3	56	43	30	32	18	42	30	28	18
R2304	341045.95	6260184	254 Pittwater Rd, Manly	Residential	NCA3	56	43	29	24	21	41	29	27	15
R2305	341039.92	6259812.5	1A Pacific Pde, Manly	Residential	NCA1	56	43	15	16	13	26	14	12	12
R2306	341045.02	6259576.8	53 Kangaroo St, Manly	Residential	NCA1	56	43	31	29	26	39	27	25	19
R2307	341038.72	6258871	77-78 West Esp, Manly	Residential	NCA1	56	43	58	51	47	66	50	48	51
R2308	341038.11	6260106.1	237-241 Pittwater Rd, Manly	Residential	NCA3	56	43	30	32	20	42	30	28	20
R2309	341052.2	6259605.2	55 Kangaroo St, Manly	Residential	NCA1	56	43	28	30	27	41	29	27	19
R2310	341051.81	6259842.1	15 Collingwood St, Manly	Residential	NCA1	56	43	29	30	17	40	28	26	17
R2311	341051.28	6259478.2	12 Augusta Rd, Manly	Residential	NCA1	56	43	37	32	29	43	31	29	26
R2312	341043.39	6260055.3	18 Golf Pde, Manly	Residential	NCA3	56	43	30	32	20	42	30	28	13
R2313	341045.84	6259905.3	13 Alexander St, Manly	Residential	NCA1	56	43	14	15	12	25	13	11	11
R2314	341049.46	6260248	28 Eurobin Av, Manly	Residential	NCA3	56	43	29	26	23	41	29	27	24
R2315	341053.76	6259851.9	17 Collingwood St, Manly	Residential	NCA1	56	43	29	30	17	41	28	26	17
R2316	341050.23	6259568.3	51A Kangaroo St, Manly	Residential	NCA1	56	43	18	20	17	30	18	16	15
R2317	341054.98	6259903.3	13 Gilbert St, Manly	Residential	NCA1	56	43	41	39	36	49	37	35	34
R2318	341055.65	6259862.4	21 Collingwood St, Manly	Residential	NCA1	56	43	29	31	17	41	29	27	17
R2319	341047.08	6259258.7	58 Raglan St, Manly	Residential	NCA1	56	43	45	43	39	53	41	39	39
R2320	341043.61	6260312.4	27 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	23	40	28	26	24
R2321	341057.5	6259246.8	58 Raglan St, Manly	Residential	NCA1	56	43	45	43	40	53	41	39	39
R2322	341052.02	6260034.4	23 Golf Pde, Manly	Residential	NCA3	56	43	13	15	11	25	13	11	11
R2323	341049.36	6259930.9	28 Alexander St, Manly	Residential	NCA3	56	43	30	32	18	42	30	28	18
R2324	341055.38	6259103.8	7 Tower St, Manly	Commercial	NCA3	70	Non Res	38	34	31	44	32	30	32
R2325	341051.7	6260146.8	250 Pittwater Rd, Manly	Residential	NCA3	56	43	29	26	23	41	29	27	24
R2326	341062.75	6259890.3	7 Alexander St, Manly	Residential	NCA1	56	43	29	31	18	42	29	27	18
R2327	341057.53	6260070.8	16 Golf Pde, Manly	Residential	NCA3	56	43	13	15	12	26	13	11	11
R2328	341052.71	6260264.6	30 Eurobin Av, Manly	Residential	NCA3	56	43	29	26	23	41	29	27	24
R2329	341070.19	6259286.4	4 Ocean Rd, Manly	Residential	NCA1	56	43	45	43	39	54	41	39	39
R2330	341070.58	6259736.9	41 Pine St, Manly	Residential	NCA3	56	43	29	28	17	39	27	25	17
R2331	341058.46	6259465.1	10 Augusta Rd, Manly	Residential	NCA1	56	43	38	39	36	49	37	35	29
R2332	341063.62	6260318.8	29 Eurobin Av, Manly	Residential	NCA3	56	43	29	20	14	40	20	18	16
R2333	341062.77	6259800.5	36 Pine St, Manly	Residential	NCA3	56	43	15	16	13	26	14	12	12
R2334	341071.24	6259270.9	2 Ocean Rd, Manly	Residential	NCA1	56	43	46	43	40	53	41	39	39
R2335	341066.15	6259564	51C Kangaroo St, Manly	Residential	NCA1	56	43	18	19	16	29	17	15	15
R2336	341060.5	6259514.3	2B Sheridan Pl, Manly	Residential	NCA1	56	43	23	24	21	34	22	20	17
R2337	341065.11	6260032.1	21 Golf Pde, Manly	Residential	NCA3	56	43	13	15	12	26	13	11	11
R2338	341060.85	6259928.5	24 Alexander St, Manly	Residential	NCA3	56	43	30	32	18	42	30	28	18
R2339	341053.17	6257800	5 Addison Rd, Manly	Residential	NCA4	57	48	44	45	40	55	43	41	36
R2340	341062.51	6260092.8	235 Pittwater Rd, Manly	Residential	NCA3	56	43	30	20	19	42	30	28	15
R2341	341057.66	6260144.2	248 Pittwater Rd, Manly	Residential	NCA3	56	43	30	20	20	41	29	27	15
R2342	341061.5	6259865	75 West Esp, Manly	Residential	NCA1	56	43	59	52	47	66	50	48	51
R2343	341075.91	6258897.7	11 Gilbert St, Manly	Residential	NCA1	56	43	48	43	39	53	41	39	38
R2344	341079.25	6259296.8	8 Ocean Rd, Manly	Residential	NCA1	56	43	45	42	39	54	40	38	38
R2345	341057.7	6260185.8	21 Iluka Av, Manly	Residential	NCA3	56	43	17	17	14	31	17	15	14
R2346	341070.66	6260268.2	32 Eurobin Av, Manly	Residential	NCA3	56	43	16	16	13	29	17	15	15
R2347	341074.3	6260059.8	14 Golf Pde, Manly	Residential	NCA3	56	43	30	25	22	42	30	28	15
R2348	341072.78	6259798.3	34 Pine St, Manly	Residential	NCA3	56	43	15	16	13	26	14	12	12
R2349	341072.05	6259231.3	56 Raglan St, Manly	Place of wo	NCA1	45	Non Res	46	44	40	53	42	40	39
R2350	341065.56	6260246.8	20 Iluka Av, Manly	Residential	NCA3	56	43	29	26	23	41	29	27	13
R2351	341084.48	6257759.2	1 Addison Rd, Manly	Residential	NCA4	57	48	39	40	37	50	38	36	35
R2352	341063.87	6257769.6	3 Addison Rd, Manly	Residential	NCA4	57	48	38	39	36	50	37	35	34
R2353	341082.85	6259827.2	4 Collingwood St, Manly	Residential	NCA3	56	43	28	32	19	42	31	29	17
R2354	341086.34	6259321.5	12 Ocean Rd, Manly	Residential	NCA1	56	43	45	42	39	53	40	38	38
R2355	341088.06	6259332.6	14 Ocean Rd, Manly	Residential	NCA1	56	43	45	44	39	54	40	38	38
R2356	341075.46	6259946.4	9 Eustace St, Manly	Residential	NCA1	56	43	52	50	46	60	48	46	45
R2357	341074.06	6260005.6	17 Golf Pde, Manly	Residential	NCA3	56	43	30	25	21	42	30	28	23
R2358	341084.47	6259344.1	16 Ocean Rd, Manly	Residential	NCA1	56	43	42	42	36	52	39	37	38
R2359	341079.15	6259726.5	39 Pine St, Manly	Residential	NCA3	56	43	25	28	16	38	26	24	16
R2360	341070.38	6260142.9	246 Pittwater Rd, Manly	Residential	NCA3	56	43	29	18	15	32	16	14	15
R2361	341086.8	6259308.4	10 Ocean Rd, Manly	Residential	NCA1	56	43	45	42	39	52	40	38	38
R2362	341071.94	6259596.5	51 Kangaroo St, Manly	Residential	NCA1	56	43	17	18	16	29	17	15	14
R2363	341073.95	6260087.3	233 Pittwater Rd, Manly	Residential	NCA3	56	43	30	25	22	42	30	28	15
R2364	341082.51	6257805.6	7 Addison Rd, Manly	Residential	NCA4	57	48	41	41	38	51	39	37	36
R2365	341083	6259837.3	6 Collingwood St, Manly	Residential	NCA3	56	43	29	23	20	42	30	28	17
R2366	341069.97	6259483.7	8 Augusta Rd, Manly	Residential	NCA1	56	43	29	28	25	39	27	25	21
R2367	341082.53	6259851.6	10 Collingwood St, Manly	Residential	NCA3	56	43	29	23	20	42	29	27	18
R2368	341084.33	6260333	31 Eurobin Av, Manly	Residential	NCA3	56	43	28	26	23	40	28	26	23
R2369	341082.41	6259936.9	22 Alexander St, Manly	Residential	NCA3	56	43	30	24	20	43	31	29	22
R2370	341089.74	6259367.2	22 Ocean Rd, Manly	Residential	NCA1	56	43	40	41	38	51	39	37	37
R2371	341084.67	6259863.5	12 Collingwood St, Manly	Residential	NCA3	56	43	29	23	20	43	30	28	20
R2372	341077.98	6259007.2	15A Eustace St, Manly	Residential	NCA1	56	43	51	49	45	58	47	45	46
R2373	341083.05	6259739	39 Pine St, Manly	Residential	NCA3	56	43	26	28	17	39	26	24	13
R2374	341084.84	6259874.9	14 Collingwood St, Manly	Residential	NCA3	56	43	29	23	20	42	30	28	20
R2375	341080.16	6258854.9	1-3 Eustace St, Manly	Residential	NCA1	56	43	60	52	47	62	50	48	52
R2376	341080.26	6259350.7	18 Ocean Rd, Manly	Residential	NCA1	56	43	42	44	39	54	41	39	38
R2377	341072.05	6258925.9	2A Gilbert St, Manly	Residential	NCA1	56	43	38	36	33	46	34	32	30
R2378	341123.53	6258901.1	2A Gilbert St, Manly	Residential	NCA2	65	53	48	45	43	56	44	42	44
R2379	341053.32	6258933.6	4 Gilbert St, Manly	Residential	NCA1	56	43	53	51	46	60	49	47	45
R2380	341077.55	6260187.6	19 Iluka Av, Manly	Residential	NCA3	56	43	17	17	14	32	19	17	15
R2381	341073.67	6259430.7	38 Ocean Rd, Manly	Residential	NCA1	56	43	37	38	35	49	36	34	24
R2382	341098.62	6259379.8	26A Ocean Rd, Manly	Residential	NCA1	56	43	44	43	40	53	41	39	37
R2														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2394	341087.61	6260065.2	10 Golf Pde, Manly	Residential	NCA3	56	43	13	14	12	26	13	11	11
R2395	341097.11	6259403.6	34 Ocean Rd, Manly	Residential	NCA1	56	43	43	43	39	53	41	39	37
R2396	341085.34	6259952.9	23 Collingwood St, Manly	Residential	NCA3	56	43	30	24	21	43	31	29	22
R2397	341098.86	6259518.9	2 Sheridan Pl, Manly	Residential	NCA1	56	43	24	26	19	36	24	22	18
R2398	341098.57	6259414.2	36 Ocean Rd, Manly	Residential	NCA1	56	43	43	43	39	53	41	39	37
R2399	341086.36	6259467.7	6 Augusta Rd, Manly	Residential	NCA1	56	43	38	38	34	48	35	33	36
R2400	341094.09	6259733.37	37 Pine St, Manly	Educational	NCA3	45	Non Res	25	21	18	41	26	24	13
R2401	341099.77	6259046.5	67 Sydney Rd, Manly	Residential	NCA1	56	43	48	47	44	57	46	44	43
R2402	341091.54	6259879.8	51 Smith St, Manly	Residential	NCA3	56	43	15	17	14	28	15	13	14
R2403	341097.64	6260193.3	17 Iluka Av, Manly	Residential	NCA3	56	43	30	17	14	33	20	18	21
R2404	341093.41	6260085.2	227 Pittwater Rd, Manly	Residential	NCA3	56	43	17	17	14	31	19	17	16
R2405	341090.87	6260142.8	242 Pittwater Rd, Manly	Residential	NCA3	56	43	30	20	22	41	30	28	17
R2406	341100.83	6260325.6	33 Eurobin Av, Manly	Residential	NCA3	56	43	29	26	23	40	28	26	19
R2407	341089.07	6259549.5	47 Kangaroo St, Manly	Residential	NCA1	56	43	19	20	17	30	18	16	15
R2408	341094.03	6259831.2	43 Smith St, Manly	Residential	NCA3	56	43	29	22	19	42	29	27	20
R2409	341101.41	6260244	16 Iluka Av, Manly	Residential	NCA3	56	43	29	25	22	41	29	27	23
R2410	341087.7	6257816.8	9 Addison Rd, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	36
R2411	341091.37	6260278.8	36 Eurobin Av, Manly	Residential	NCA3	56	43	29	16	13	32	19	17	17
R2412	341110.97	6259896.7	57 Smith St, Manly	Residential	NCA3	56	43	30	23	20	42	30	28	22
R2413	341108.69	6259003.2	17 Eustace St, Manly	Residential	NCA1	56	43	49	48	45	58	46	44	44
R2414	341097.52	6260001.7	7 Golf Pde, Manly	Residential	NCA3	56	43	30	24	21	42	31	29	23
R2415	341098.65	6259769.9	24 Pine St, Manly	Residential	NCA3	56	43	27	21	18	41	19	17	17
R2416	341113.38	6259236.7	54 Raglan St, Manly	Residential	NCA1	56	43	46	43	40	53	41	39	39
R2417	341089.34	6259863	47 Smith St, Manly	Residential	NCA3	56	43	15	17	14	28	16	14	13
R2418	341110.06	6259682.9	25 Smith St, Manly	Residential	NCA3	56	43	24	20	17	36	24	22	16
R2419	341099.87	6259920.3	20 Alexander St, Manly	Residential	NCA3	56	43	17	17	15	30	18	16	15
R2420	341100.24	6259714.8	35 Pine St, Manly	Hotel	NCA3	50	Non Res	25	20	17	37	18	16	14
R2421	341112.96	6259015.3	19 Eustace St, Manly	Residential	NCA1	56	43	48	48	45	58	46	44	44
R2422	341100.19	6259842.3	45A Smith St, Manly	Residential	NCA3	56	43	29	17	14	30	17	15	14
R2423	341088.15	6259872.4	49 Smith St, Manly	Residential	NCA3	56	43	29	19	20	43	21	19	15
R2424	341104.82	6258056.6	11-13 Oyama Av, Manly	Residential	NCA4	57	48	48	49	46	60	48	46	44
R2425	341099.83	6259460.2	4 Augusta Rd, Manly	Residential	NCA1	56	43	42	42	37	52	40	38	36
R2426	341101.61	6260085.6	223 Pittwater Rd, Manly	Residential	NCA3	56	43	17	17	14	31	18	16	16
R2427	341099.77	6260138.3	240 Pittwater Rd, Manly	Residential	NCA3	56	43	30	25	22	42	30	28	24
R2428	341114.4	6259026.8	23 Eustace St, Manly	Residential	NCA1	56	43	48	47	44	57	45	43	44
R2429	341110.83	6260056.6	8 Golf Pde, Manly	Residential	NCA3	56	43	30	24	21	42	30	28	17
R2430	341099.8	6258880	7-9 Gilbert St, Manly	Residential	NCA2	65	53	45	38	35	48	36	34	32
R2431	341112.14	6258022.6	15 Oyama Av, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	34
R2432	341101.48	6260198.2	15 Iluka Av, Manly	Residential	NCA3	56	43	15	14	11	26	13	11	14
R2433	341105.68	6259817.6	39 Smith St, Manly	Residential	NCA3	56	43	29	21	18	41	28	26	21
R2434	341107.6	6259838.7	43 Smith St, Manly	Residential	NCA3	56	43	14	16	13	27	14	12	13
R2435	341108.98	6260285.5	38 Eurobin Av, Manly	Residential	NCA3	56	43	13	14	10	24	12	10	12
R2436	341113.7	6260322.8	35 Eurobin Av, Manly	Residential	NCA3	56	43	29	26	23	40	28	26	23
R2437	341110.2	6259788.7	22B Pine St, Manly	Residential	NCA3	56	43	15	16	14	27	15	13	13
R2438	341114.23	6259995.2	9 Rolfe St, Manly	Residential	NCA3	56	43	31	24	21	43	31	29	25
R2439	341114.23	6259995.2	9 Rolfe St, Manly	Residential	NCA3	56	43	31	24	21	43	31	29	25
R2440	341114	6260241.8	14 Iluka Av, Manly	Residential	NCA3	56	43	29	25	23	41	29	27	24
R2441	341116.07	6259542.5	45 Kangaroo St, Manly	Residential	NCA1	56	43	25	25	22	39	23	21	19
R2442	341117.38	6259046.9	65 Sydney Rd, Manly	Residential	NCA1	56	43	49	47	44	57	45	43	43
R2443	341115.63	6260142.8	238 Pittwater Rd, Manly	Residential	NCA3	56	43	30	25	22	42	30	28	25
R2444	341109.52	6259917.7	16 Alexander St, Manly	Residential	NCA3	56	43	29	22	18	33	20	18	22
R2445	341116.7	6260016.8	5 Golf Pde, Manly	Residential	NCA3	56	43	31	24	21	42	30	28	26
R2446	341118.31	6260096.7	221 Pittwater Rd, Manly	Residential	NCA3	56	43	30	24	22	42	30	28	23
R2447	341115.14	6259743.6	33 Pine St, Manly	Residential	NCA3	56	43	15	17	14	27	15	13	14
R2448	341099.61	6257838.6	11A Addison Rd, Manly	Residential	NCA4	57	48	40	41	38	52	39	37	36
R2449	341121	6259463.6	2 Augusta Rd, Manly	Residential	NCA1	56	43	42	42	37	52	40	38	36
R2450	341111.51	6260056.9	4 Golf Pde, Manly	Residential	NCA3	56	43	30	24	21	42	30	28	16
R2451	341127.57	6259303.3	11 Kangaroo St, Manly	Residential	NCA1	56	43	45	42	39	52	40	38	38
R2452	341109.51	6259803.3	37 Smith St, Manly	Residential	NCA3	56	43	28	21	18	41	28	26	14
R2453	341127.03	6259335.5	15 Kangaroo St, Manly	Residential	NCA1	56	43	37	35	32	49	33	31	31
R2454	341114.05	6260181.8	13 Iluka Av, Manly	Residential	NCA3	56	43	30	19	14	32	20	18	27
R2455	341124.72	6258054.5	11 Oyama Av, Manly	Residential	NCA4	57	48	48	45	42	56	43	41	40
R2456	341130.18	6259346	17 Kangaroo St, Manly	Residential	NCA1	56	43	40	41	38	51	39	37	37
R2457	341123.12	6259514.3	43 Kangaroo St, Manly	Residential	NCA1	56	43	37	31	25	45	30	28	22
R2458	341126.53	6259798.5	19-21 Addison Rd, Manly	Residential	NCA4	57	48	34	35	32	45	33	31	31
R2459	341114.83	6260274.7	40 Eurobin Av, Manly	Residential	NCA3	56	43	29	18	15	32	19	17	18
R2460	341115.12	6260241.4	12 Iluka Av, Manly	Residential	NCA3	56	43	29	25	23	41	29	27	18
R2461	341133.87	6259272.8	7-7 Kangaroo St, Manly	Residential	NCA1	56	43	46	43	40	53	41	39	39
R2462	341116.28	6257860.7	15 Addison Rd, Manly	Residential	NCA4	57	48	40	39	35	49	37	35	34
R2463	341126.91	6260318.2	37 Eurobin Av, Manly	Residential	NCA3	56	43	29	19	16	32	18	16	23
R2464	341115.78	6258077.2	11 Oyama Av, Manly	Residential	NCA4	57	48	48	49	46	60	48	46	40
R2465	341111.53	6258941	4 Eustace St, Manly	Residential	NCA2	65	53	40	37	33	47	35	33	30
R2466	341123.1	6260065	2 Golf Pde, Manly	Residential	NCA3	56	43	15	15	12	25	13	11	14
R2467	341121.26	6259220.7	1 Kangaroo St, Manly	Residential	NCA1	56	43	45	43	41	54	42	40	40
R2468	341117.98	6258005.5	14 Oyama Av, Manly	Residential	NCA4	57	48	44	46	44	57	45	43	40
R2469	341117.98	6258005.5	14 Oyama Av, Manly	Residential	NCA4	57	48	44	46	44	57	45	43	40
R2470	341133.86	6259776.1	20 Pine St, Manly	Residential	NCA3	56	43	29	21	18	40	28	26	21
R2471	341136.75	6259319.8	13 Kangaroo St, Manly	Residential	NCA1	56	43	45	42	39	54	40	38	38
R2472	341125.17	6260023.1	3 Golf Pde, Manly	Residential	NCA3	56	43	15	16	12	25	13	11	14
R2473	341122.98	6259714.8	27 Pine St, Manly	Residential	NCA3	56	43	27	18	15	37	17	15	15
R2474	341117.84	6258957.2	4 Eustace St, Manly	Residential	NCA2	65	53	39	37	33	47	35	33	30
R2475	341122.17	6259913.3	12 Alexander St, Manly	Residential	NCA3	56	43	30	23	20	42	30	28	23
R2476	341135.98	6259282.9	9 Kangaroo St, Manly	Residential	NCA1	56	43	46	43	40	52	41	39	39
R2477	341139.33	6258974.9	6 Eustace St, Manly	Residential	NCA2	65	53	43	41	38	52	39	37	38
R2478	341125	6259255.4	3 Kangaroo St, Manly	Residential	NCA1	56	43	44	43	40	53	41	39	39
R2479	341123.72	6260145.6	236 Pittwater Rd, Manly	Residential	NCA3	56	43	30	27	23	41	30	28	21
R2480	341132.21	6260078.8	207-217 Pittwater Rd, Manly	Residential	NCA3	56	43	23	19	15	30	18	16	22
R2481	341122.26	6258096.5	7 Oyama Av, Manly	Residential	NCA4	57	48	49	49	47	61	48	46	36
R2482	341141.91	6259896.4	8 Eustace St, Manly	Residential	NCA2	65	53	45	42	39	53	40	38	37
R2483	341129.83	6260048.4	2A Golf Pde, Manly	Residential	NCA3	56	43	30	27	22	42	30	28	29
R2484	341123.81	6260180.3	11 Iluka Av, Manly	Residential	NCA3	56	43	20	16	13	31	15	13	15
R2485	341132.45	6260282.3	42 Eurobin Av, Manly	Residential	NCA3	56	43	14	14	11	24	12	10	12
R2486	341121.8	6259702.3	33 Smith St, Manly	Residential	NCA3	56	43	25	19	17	37	24	22	19

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2498	341130.06	6257870.5	17 Addison Rd, Manly	Residential	NCA4	57	48	34	33	30	44	31	29	28
R2499	341142.62	6260318.9	39 Eurobin Av, Manly	Residential	NCA3	56	43	28	19	16	33	18	16	23
R2500	341125.38	6259691	27 Smith St, Manly	Residential	NCA3	56	43	23	19	16	36	24	22	15
R2501	341147.15	6259040.5	63 Sydney Rd, Manly	Residential	NCA2	65	53	46	41	38	53	39	37	36
R2502	341152.28	6259374.2	21 Kangaroo St, Manly	Residential	NCA1	56	43	44	41	38	51	39	37	37
R2503	341129.44	6258130.6	5 Oyama Av, Manly	Residential	NCA4	57	48	49	50	47	61	49	47	46
R2504	341151.03	6259679	19 Smith St, Manly	Residential	NCA3	56	43	27	20	17	38	26	24	16
R2505	341126.83	6259668.1	19 Smith St, Manly	Residential	NCA3	56	43	23	19	16	35	23	21	18
R2506	341149.22	6259392	23 Kangaroo St, Manly	Residential	NCA1	56	43	41	41	38	53	39	37	37
R2507	341145.42	6260069.8	209-217 Pittwater Rd, Manly	Residential	NCA3	56	43	21	18	15	28	16	14	20
R2508	341128.93	6259511.1	41 Kangaroo St, Manly	Residential	NCA1	56	43	23	23	20	34	22	20	18
R2509	341145.28	6260155.8	232 Pittwater Rd, Manly	Residential	NCA3	56	43	15	15	12	25	13	11	13
R2510	341152.11	6258003.4	10 Oyama Av, Manly	Residential	NCA4	57	48	30	32	29	42	30	28	29
R2511	341145.08	6259962.7	8B Alexander St, Manly	Residential	NCA3	56	43	16	16	13	26	14	12	15
R2512	341154.69	6259405.9	25 Kangaroo St, Manly	Residential	NCA1	56	43	44	41	38	53	39	37	37
R2513	341150.82	6260174.2	9 Iluka Av, Manly	Residential	NCA3	56	43	25	19	16	31	17	15	22
R2514	341149.51	6260268.6	44 Eurobin Av, Manly	Residential	NCA3	56	43	25	19	16	32	17	15	23
R2515	341132.47	6259652.3	13 Smith St, Manly	Residential	NCA3	56	43	22	19	16	34	22	20	15
R2516	341140.31	6258959.2	4A West Prom, Manly	Place of wo	NCA2	45	Non Res	36	36	32	46	34	32	31
R2517	341149.39	6259878.6	5A Alexander St, Manly	Residential	NCA3	56	43	16	17	14	27	15	13	15
R2518	341141.33	6260227.6	8 Iluka Av, Manly	Residential	NCA3	56	43	29	21	22	41	19	17	24
R2519	341136.03	6259468.9	39 Kangaroo St, Manly	Residential	NCA1	56	43	38	30	29	47	30	28	23
R2520	341143.36	6258908.7	2 West Prom, Manly	Residential	NCA2	65	53	37	36	32	46	34	32	31
R2521	341138.29	6258144.5	3 Oyama Av, Manly	Residential	NCA4	57	48	49	51	48	61	49	47	46
R2522	341160.32	6258931.9	3 West Prom, Manly	Residential	NCA2	65	53	56	47	44	58	45	43	45
R2523	341141.34	6258036.4	8 Oyama Av, Manly	Residential	NCA4	57	48	43	44	41	55	43	41	40
R2524	341153.67	6260316.4	41 Eurobin Av, Manly	Residential	NCA3	56	43	29	21	17	40	19	17	23
R2525	341139.85	6259629.2	5 Smith St, Manly	Hotel	NCA3	50	Non Res	24	19	16	34	22	20	18
R2526	341158.66	6259645.5	7 Smith St, Manly	Residential	NCA3	56	43	18	19	16	29	17	15	16
R2527	341163.62	6258818.5	54-68 West Esp, Manly	Hotel	NCA2	50	Non Res	69	53	47	63	51	49	56
R2528	341158.2	6259416.8	27 Kangaroo St, Manly	Residential	NCA1	56	43	43	41	37	52	39	37	37
R2529	341160.38	6259428.8	31 Kangaroo St, Manly	Residential	NCA1	56	43	43	40	37	52	39	37	37
R2530	341161.45	6259441	33 Kangaroo St, Manly	Residential	NCA1	56	43	43	40	37	52	39	37	36
R2531	341144.34	6260124.9	230 Pittwater Rd, Manly	Residential	NCA3	56	43	30	28	25	42	27	25	26
R2532	341151.82	6260033.4	203-205 Pittwater Rd, Manly	Residential	NCA3	56	43	31	27	25	42	26	24	25
R2533	341161.19	6259855.4	64 Smith St, Manly	Residential	NCA3	56	43	26	19	16	29	17	15	25
R2534	341156	6259797.3	25 Addison Rd, Manly	Residential	NCA4	57	48	42	43	41	54	42	40	30
R2535	341162.36	6259846.6	60 Smith St, Manly	Residential	NCA3	56	43	25	19	17	30	18	16	23
R2536	341162.34	6259835.2	58 Smith St, Manly	Residential	NCA3	56	43	21	18	15	28	16	14	20
R2537	341166.3	6258965.1	5 West Prom, Manly	Residential	NCA2	65	53	55	47	44	57	45	43	44
R2538	341164.51	6259451.5	37 Kangaroo St, Manly	Residential	NCA1	56	43	43	40	37	52	39	37	36
R2539	341147.05	6259924.9	23 Addison Rd, Manly	Residential	NCA4	57	48	30	31	27	41	29	27	25
R2540	341161.37	6259909.7	6 Alexander St, Manly	Residential	NCA3	56	43	32	26	24	38	25	23	27
R2541	341150.12	6257783.8	6 Addison Rd, Manly	Residential	NCA4	57	48	38	40	36	50	38	36	36
R2542	341146.4	6258162.5	24 Cove Av, Manly	Residential	NCA4	57	48	50	51	48	62	50	48	47
R2543	341151.66	6260221.7	6 Iluka Av, Manly	Residential	NCA3	56	43	29	28	26	41	27	25	24
R2544	341154.92	6258046.1	6 Oyama Av, Manly	Residential	NCA4	57	48	45	47	44	58	46	44	40
R2545	341163.48	6260135.2	226 Pittwater Rd, Manly	Residential	NCA3	56	43	15	16	12	25	13	11	14
R2546	341156.58	6260261.6	46 Eurobin Av, Manly	Residential	NCA3	56	43	25	19	16	29	17	15	22
R2547	341178.18	6259037.6	10 West Prom, Manly	Residential	NCA2	65	53	53	47	44	57	45	43	41
R2548	341159.34	6259210.5	52 Raglan St, Manly	Residential	NCA3	56	43	47	44	41	54	42	40	40
R2549	341174.78	6259005.5	8 West Prom, Manly	Residential	NCA2	65	53	54	47	44	57	45	43	42
R2550	341161.57	6259942.4	177 Pittwater Rd, Manly	Residential	NCA3	56	43	16	16	13	26	14	12	15
R2551	341166.59	6259870.3	1 Alexander St, Manly	Residential	NCA3	56	43	32	25	23	37	25	23	26
R2552	341168.47	6258982.3	6 West Prom, Manly	Residential	NCA2	65	53	54	47	44	57	45	43	43
R2553	341158.03	6260163.7	7 Iluka Av, Manly	Residential	NCA3	56	43	23	19	15	29	16	14	21
R2554	341165.68	6259767.9	56B Smith St, Manly	Residential	NCA3	56	43	32	24	22	36	23	21	26
R2555	341160.42	6258063.6	4 Oyama Av, Manly	Residential	NCA4	57	48	46	48	45	58	46	44	40
R2556	341172.03	6258194	18 Cove Av, Manly	Residential	NCA4	57	48	51	53	50	63	51	49	48
R2557	341163.01	6260305	43 Eurobin Av, Manly	Residential	NCA3	56	43	25	20	16	30	18	16	23
R2558	341169.75	6260219.3	4 Iluka Av, Manly	Residential	NCA3	56	43	29	25	26	40	27	25	20
R2559	341177.61	6259999	197 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	31	28	25	39	27	25	26
R2560	341159.59	6257990.3	27 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	39
R2561	341160.47	6258172.5	22 Cove Av, Manly	Residential	NCA4	57	48	49	50	47	61	48	46	45
R2562	341174.11	6260131.7	224 Pittwater Rd, Manly	Residential	NCA3	56	43	15	16	12	26	13	11	14
R2563	341176.92	6259923	173 Pittwater Rd, Manly	Residential	NCA3	56	43	17	17	14	27	15	13	15
R2564	341166.79	6260085.8	220 Pittwater Rd, Manly	Residential	NCA3	56	43	30	28	25	39	27	25	26
R2565	341177.05	6260256.5	48 Eurobin Av, Manly	Residential	NCA3	56	43	29	22	17	31	19	17	22
R2566	341187.2	6259949.6	179 Pittwater Rd, Manly	Residential	NCA3	56	43	32	29	26	40	27	25	26
R2567	341166.62	6259764.2	12 Pine St, Manly	Residential	NCA3	56	43	32	24	22	36	23	21	26
R2568	341182.91	6259260.6	52 Raglan St, Manly	Residential	NCA3	56	43	47	43	40	53	41	39	39
R2569	341163.83	6259719.8	19 Pine St, Manly	Residential	NCA3	56	43	31	24	21	35	22	20	26
R2570	341169.95	6260153.6	5 Iluka Av, Manly	Residential	NCA3	56	43	25	20	16	30	18	16	23
R2571	341169.47	6257998.9	29 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	55	43	41	39
R2572	341169.47	6257998.9	29 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	55	43	41	39
R2573	341168.67	6257805.3	8 Addison Rd, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	29
R2574	341168.85	6258178.9	20 Cove Av, Manly	Residential	NCA4	57	48	50	52	49	62	50	48	47
R2575	341167.84	6259905.5	169-171 Pittwater Rd, Manly	Residential	NCA3	56	43	32	26	24	38	25	23	30
R2576	341170.93	6259930.2	177 Pittwater Rd, Manly	Residential	NCA3	56	43	23	19	16	29	17	15	21
R2577	341183.99	6260073.8	33 Collingwood St, Manly	Residential	NCA3	56	43	30	31	26	40	28	26	25
R2578	341174.04	6260306.8	45 Eurobin Av, Manly	Residential	NCA3	56	43	29	22	17	31	19	17	24
R2579	341174.01	6258074	2 Oyama Av, Manly	Residential	NCA4	57	48	48	48	45	59	46	44	43
R2580	341188.86	6259764.4	10 Pine St, Manly	Residential	NCA3	56	43	33	26	23	37	25	23	26
R2581	341180.23	6260154.6	3 Iluka Av, Manly	Residential	NCA3	56	43	17	17	13	27	14	12	15
R2582	341199.43	6259702.1	44 Smith St, Manly	Residential	NCA3	56	43	34	32	24	40	26	24	30
R2583	341177.42	6257831.7	10A Addison Rd, Manly	Residential	NCA4	57	48	38	39	37	50	38	36	36
R2584	341181.1	6260244.9	50 Eurobin Av, Manly	Residential	NCA3	56	43	24	22	17	30	18	16	22
R2585	341192.64	6260084.7	35 Collingwood St, Manly	Residential	NCA3	56	43	30	30	27	41	28	26	25
R2586	341179.56	6258192.6	16 Cove Av, Manly	Residential	NCA4	57	48	51	53	50	63	51	49	44
R2587	341176.54	6259677.5	40 Smith St, Manly	Residential	NCA3	56	43	31	23	20	34	21	19	29
R2588	341178.45	6258018.8	31 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	54	42	40	40
R2589	341176.11	6259847.6	167 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	32	26	23	37	25	23	28
R2590	341201.66	6260099.5	37 Collingwood St, Manly	Residential	NCA3	56	43	30	29	28	41	29	27	25
R														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2602	341190.27	6258230.1	12 Cove Av, Manly	Residential	NCA4	57	48	52	54	51	64	52	50	49
R2603	341206.41	6260107.5	39 Collingwood St, Manly	Residential	NCA3	56	43	30	29	27	41	28	26	25
R2604	341196.92	6260296	49 Eurobin Av, Manly	Residential	NCA3	56	43	17	17	14	27	15	13	13
R2605	341216.96	6259618.8	24 Smith St, Manly	Residential	NCA3	56	43	28	26	23	36	24	22	24
R2606	341192.83	6258047	33 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	55	43	41	40
R2607	341209.01	6260035.5	16 Collingwood St, Manly	Residential	NCA3	56	43	28	25	21	35	23	21	21
R2608	341196.33	6259216.1	48 Raglan St, Manly	Residential	NCA3	56	43	48	43	40	53	41	39	29
R2609	341214.01	6257874.2	22-26 Addison Rd, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	33
R2610	341197.32	6257909.7	28 Addison Rd, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	33
R2611	341210.76	6259547.9	12 Carlton St, Manly	Residential	NCA3	56	43	27	26	23	36	24	22	25
R2612	341214.54	6260117.8	45 Collingwood St, Manly	Residential	NCA3	56	43	30	28	27	40	28	26	25
R2613	341227.03	6260173.1	5 Iluka Av, Manly	Educational	NCA3	45	Non Res	29	27	26	39	27	25	24
R2614	341199.61	6257845.7	16 Addison Rd, Manly	Residential	NCA4	57	48	28	29	26	39	27	25	25
R2615	341215.43	6259344.5	34 Denison St, Manly	Residential	NCA3	56	43	40	41	38	51	39	37	38
R2616	341218.22	6259582.2	8 Smith St, Manly	Residential	NCA3	56	43	27	26	23	36	24	22	24
R2617	341219.19	6259496.6	17A Carlton St, Manly	Residential	NCA3	56	43	40	39	36	49	37	35	32
R2618	341212.83	6259783.1	145 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	34	31	31	45	32	30	28
R2619	341202.69	6257930.7	30A Addison Rd, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	32
R2620	341213.09	6259177.9	1 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	49	43	41	54	42	40	39
R2621	341206	6258143	17 Cove Av, Manly	Residential	NCA4	57	48	49	50	48	61	49	47	45
R2622	341207.22	6260281.7	51 Eurobin Av, Manly	Residential	NCA3	56	43	28	27	23	38	25	23	23
R2623	341197.48	6259982.8	210-212 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	31	33	28	43	29	27	29
R2624	341221.67	6260043.4	18 Collingwood St, Manly	Residential	NCA3	56	43	31	28	26	40	28	26	25
R2625	341223.6	6259717.3	129 Pittwater Rd, Manly	Residential	NCA3	56	43	28	26	23	37	25	23	24
R2626	341221.83	6260125.47	Collingwood St, Manly	Residential	NCA3	56	43	30	29	27	41	29	27	25
R2627	341208.33	6257856	20 Addison Rd, Manly	Residential	NCA4	57	48	26	28	25	38	26	24	24
R2628	341219.95	6259547.7	10 Carlton St, Manly	Residential	NCA3	56	43	33	28	26	40	28	26	25
R2629	341206.44	6257954.6	34A Addison Rd, Manly	Residential	NCA4	57	48	40	41	38	52	39	37	38
R2630	341205.62	6258077	1 Oyama Av, Manly	Residential	NCA4	57	48	43	45	42	55	43	41	41
R2631	341211.47	6259946	194A Pittwater Rd, Manly	Residential	NCA3	56	43	32	33	31	43	32	30	30
R2632	341235.01	6259237.1	7-9 Pittwater Rd, Manly	Residential	NCA3	56	43	44	42	34	48	36	34	39
R2633	341214.19	6260276.1	53 Eurobin Av, Manly	Residential	NCA3	56	43	28	27	25	39	26	24	23
R2634	341229.28	6260136.1	49 Collingwood St, Manly	Residential	NCA3	56	43	30	29	28	41	29	27	26
R2635	341216.34	6260057.2	35 Pacific St, Manly	Residential	NCA3	56	43	26	23	21	35	23	21	20
R2636	341214.59	6258162.5	15 Cove Av, Manly	Residential	NCA4	57	48	49	49	47	60	48	46	43
R2637	341234.87	6259212.1	3-5 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	48	43	40	53	41	39	39
R2638	341217.71	6257966.4	36 Addison Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	39
R2639	341208.33	6259686.5	123 Pittwater Rd, Manly	Residential	NCA3	56	43	35	33	31	44	32	30	30
R2640	341226.46	6259538.3	8 Carlton St, Manly	Residential	NCA3	56	43	35	30	28	42	30	28	27
R2641	341250.88	6259302.5	29-33 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	46	42	39	51	40	38	37
R2642	341214	6259922.7	184 Pittwater Rd, Manly	Residential	NCA3	56	43	32	33	31	44	32	30	30
R2643	341245.01	6259265.7	19-23 Pittwater Rd, Manly	Commercial	NCA3	70	Non Res	47	42	39	52	40	38	38
R2644	341215.72	6259908.9	180 Pittwater Rd, Manly	Residential	NCA3	56	43	32	34	31	44	32	30	30
R2645	341215.64	6259678.6	117 Pittwater Rd, Manly	Residential	NCA3	56	43	35	33	31	45	33	31	29
R2646	341217.29	6259670.4	115 Pittwater Rd, Manly	Residential	NCA3	56	43	35	33	31	45	33	31	26
R2647	341222.7	6259508.7	9 Carlton St, Manly	Residential	NCA3	56	43	38	34	32	46	34	32	29
R2648	341220.06	6258766.4	53A East Esp, Manly	Commercial	NCA2	70	Non Res	76	56	49	66	54	52	61
R2649	341223.83	6257989.5	38 Addison Rd, Manly	Residential	NCA4	57	48	41	43	40	54	41	39	39
R2650	341219.31	6259897.6	176 Pittwater Rd, Manly	Residential	NCA3	56	43	24	23	20	33	21	19	19
R2651	341221.98	6258171.1	13 Cove Av, Manly	Residential	NCA4	57	48	49	50	48	61	49	47	45
R2652	341235.91	6258072.8	37 Addison Rd, Manly	Residential	NCA4	57	48	45	47	44	58	45	43	41
R2653	341236.43	6260274.5	55 Eurobin Av, Manly	Residential	NCA3	56	43	28	28	26	40	27	25	24
R2654	341218.31	6259636.1	105 Pittwater Rd, Manly	Residential	NCA3	56	43	35	32	30	44	32	30	28
R2655	341221.79	6259650.7	111 Pittwater Rd, Manly	Residential	NCA3	56	43	29	26	24	37	25	23	23
R2656	341256.07	6258283	6 Cove Av, Manly	Residential	NCA4	57	48	50	51	48	62	49	47	49
R2657	341243.05	6259665.2	113 Pittwater Rd, Manly	Residential	NCA3	56	43	27	25	23	36	24	22	23
R2658	341233.2	6257865.1	28A Addison Rd, Manly	Residential	NCA4	57	48	34	35	32	45	33	31	30
R2659	341223.29	6259872.1	172 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	31	44	32	30	30
R2660	341225.9	6259623.7	103 Pittwater Rd, Manly	Residential	NCA3	56	43	34	28	25	39	27	25	24
R2661	341226.37	6259859.2	170 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	31	44	32	30	30
R2662	341244.02	6258164.9	11 Cove Av, Manly	Residential	NCA4	57	48	31	33	30	44	31	29	29
R2663	341235.3	6260042.6	33 Pacific St, Manly	Residential	NCA3	56	43	31	28	27	40	28	26	25
R2664	341248.99	6259618.8	101 Pittwater Rd, Manly	Residential	NCA3	56	43	28	26	24	37	25	23	22
R2665	341225.85	6258883.9	1 Belgrave St, Manly	Commercial	NCA2	70	Non Res	60	49	47	60	48	46	35
R2666	341227.54	6259846.6	166 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	31	44	32	30	31
R2667	341239.03	6259582.7	95 Pittwater Rd, Manly	Residential	NCA3	56	43	33	30	21	35	28	26	20
R2668	341248.27	6258103.2	39-41 Addison Rd, Manly	Residential	NCA4	57	48	43	46	43	56	44	42	42
R2669	341245.55	6259507	7A Carlton St, Manly	Residential	NCA3	56	43	36	32	30	44	32	30	28
R2670	341261.63	6259373.1	61-63 Pittwater Rd, Manly	Place of wo	NCA3	45	Non Res	44	41	38	50	39	37	37
R2671	341229.92	6259836.4	164 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	31	44	32	30	30
R2672	341237.86	6258203.4	9A Cove Av, Manly	Residential	NCA4	57	48	50	51	49	62	50	48	46
R2673	341229.03	6258905.8	1 Belgrave St, Manly	Commercial	NCA2	70	Non Res	59	48	46	60	47	45	34
R2674	341250.28	6257946	4 Bruce Av, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R2675	341253.41	6259338.5	47 Pittwater Rd, Manly	Residential	NCA3	56	43	40	32	30	43	31	29	37
R2676	341233.11	6259827.3	162 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	32	45	33	31	30
R2677	341257.36	6258336.8	1 East Esp, Manly	Commercial	NCA4	70	Non Res	55	57	54	68	55	53	52
R2678	341238.24	6260090.2	40-42 Pacific St, Manly	Residential	NCA3	56	43	30	28	26	40	28	26	24
R2679	341252.49	6260019.6	27A Pacific St, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	28
R2680	341255.21	6258086.4	39-41 Addison Rd, Manly	Residential	NCA4	57	48	45	48	45	58	46	44	41
R2681	341235.89	6259811.5	158 Pittwater Rd, Manly	Residential	NCA3	56	43	33	34	32	45	33	31	31
R2682	341241.02	6258012.7	40 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	40
R2683	341241.02	6258012.7	40 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	40
R2684	341238.15	6258926.6	1 Belgrave St, Manly	Commercial	NCA2	70	Non Res	47	38	36	49	37	35	34
R2685	341267.68	6258942.6	8 Belgrave St, Manly	Commercial	NCA2	70	Non Res	45	46	39	57	41	39	41
R2686	341255.3	6257894.5	8 Bruce Av, Manly	Residential	NCA4	57	48	34	36	30	43	34	32	33
R2687	341273.45	6259440.2	65-69 Pittwater Rd, Manly	Hotel	NCA3	50	Non Res	43	40	37	50	38	36	36
R2688	341246.46	6260177.2	52 Eurobin Av, Manly	Educational	NCA3	45	Non Res	30	26	26	40	28	26	22
R2689	341246.72	6260272.7	57 Eurobin Av, Manly	Residential	NCA3	56	43	28	25	23	37	25	23	21
R2690	341237.96	6259572.5	93 Pittwater Rd, Manly	Residential	NCA3	56	43	36	31	32	46	34	32	25
R2691	341246.24	6258211.6	7 Cove Av, Manly	Residential	NCA4	57	48	50	51	48	62	49	47	47
R2692	341248.39	6260251.8	59 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	25	39	27	25	24
R2693	341248.28	6260083.4	38 Pacific St, Manly	Residential	NCA3	56	43	30	28	26	40	28	26	24
R2694	341245.63	6259791.4	156 Pittwater Rd, Manly	Residential	NCA3	56	43	29	26	24	38			

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2706	341252.91	6259494.2	75 Pittwater Rd, Manly	Residential	NCA3	56	43	30	27	25	38	26	24	24
R2707	341259.82	6260244.4	61 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	25	39	27	25	24
R2708	341253.87	6259485.7	73 Pittwater Rd, Manly	Residential	NCA3	56	43	27	25	23	36	24	22	22
R2709	341259.19	6258032.9	44 Addison Rd, Manly	Residential	NCA4	57	48	42	45	41	55	43	41	40
R2710	341259.17	6259690.8	138-140 Pittwater Rd, Manly	Residential	NCA3	56	43	35	33	32	45	33	31	30
R2711	341261.11	6260108.1	22 Collingwood St, Manly	Residential	NCA3	56	43	19	19	16	29	17	15	15
R2712	341260.46	6260027.2	27 Pacific St, Manly	Residential	NCA3	56	43	31	32	30	43	30	28	28
R2713	341261.49	6260011	25 Pacific St, Manly	Residential	NCA3	56	43	31	31	29	42	30	28	27
R2714	341284.04	6260143.2	51-53 Collingwood St, Manly	Educational	NCA3	45	Non Res	30	28	27	40	28	26	25
R2715	341272.26	6260274.8	59A Eurobin Av, Manly	Residential	NCA3	56	43	28	26	24	38	26	24	22
R2716	341263.01	6257917.6	12 Bruce Av, Manly	Residential	NCA4	57	48	32	34	30	43	32	30	28
R2717	341265.24	6257965	5 Bruce Av, Manly	Residential	NCA4	57	48	33	33	30	43	31	29	32
R2718	341264.43	6258121.4	45 Addison Rd, Manly	Residential	NCA4	57	48	45	46	43	57	45	43	42
R2719	341264.34	6258235.2	3 Cove Av, Manly	Residential	NCA4	57	48	50	52	49	63	51	49	49
R2720	341255.26	6259893.7	25 Malvern Av, Manly	Residential	NCA3	56	43	32	31	29	43	30	28	28
R2721	341262.43	6260076.1	34-36 Pacific St, Manly	Residential	NCA3	56	43	31	32	29	42	30	28	26
R2722	341290.87	6259894.7	29 Malvern Av, Manly	Residential	NCA3	56	43	32	34	31	44	32	30	30
R2723	341268.41	6260239.8	63 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	26	39	27	25	24
R2724	341262.12	6259243.5	16 Pittwater Rd, Manly	Residential	NCA3	56	43	47	42	40	52	41	39	28
R2725	341269.64	6259923.9	33 Malvern Av, Manly	Residential	NCA3	56	43	32	28	27	40	28	26	25
R2726	341260.33	6259072.4	23-24 Belgrave St, Manly	Commercial	NCA2	70	Non Res	51	40	39	53	40	38	38
R2727	341287.26	6259839.6	17 Malvern Av, Manly	Residential	NCA3	56	43	32	34	30	44	31	29	31
R2728	341285.62	6259809.3	5 Malvern Av, Manly	Residential	NCA3	56	43	33	34	32	45	33	31	30
R2729	341280.46	6257923.1	11 Bruce Av, Manly	Residential	NCA4	57	48	30	32	27	41	30	28	29
R2730	341281.45	6259761.6	148 Pittwater Rd, Manly	Residential	NCA3	56	43	34	31	29	43	31	29	28
R2731	341265.02	6259855.3	19 Malvern Av, Manly	Residential	NCA3	56	43	25	23	21	34	22	20	20
R2732	341311.52	6258734.3	6-42 The Corso Esp, Manly	Commercial	NCA2	70	Non Res	73	64	59	73	61	59	70
R2733	341264.97	6259285.5	26-28 Pittwater Rd, Manly	Residential	NCA3	56	43	46	42	39	52	40	38	28
R2734	341272.48	6257976.5	3 Bruce Av, Manly	Residential	NCA4	57	48	34	34	31	45	32	30	33
R2735	341288.92	6259864.5	21 Malvern Av, Manly	Residential	NCA3	56	43	32	34	31	44	32	30	31
R2736	341287.08	6259823.9	9 Malvern Av, Manly	Residential	NCA3	56	43	33	34	32	45	33	31	30
R2737	341266.9	6259649.3	136 Pittwater Rd, Manly	Residential	NCA3	56	43	35	32	31	44	32	30	32
R2738	341274.88	6258053.8	44 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	55	43	41	40
R2739	341274.35	6260068.3	32 Pacific St, Manly	Residential	NCA3	56	43	30	31	29	42	30	28	26
R2740	341264.25	6259216.5	22-12 Raglan St, Manly	Residential	NCA3	56	43	48	43	40	53	41	39	29
R2741	341284.3	6259790.8	33 Malvern Av, Manly	Residential	NCA3	56	43	34	32	30	44	32	30	29
R2742	341269.52	6259911	31 Malvern Av, Manly	Residential	NCA3	56	43	29	26	24	38	26	24	23
R2743	341290.93	6259962.1	41 Malvern Av, Manly	Residential	NCA3	56	43	32	30	28	42	30	28	30
R2744	341289.77	6259711	11 Pine St, Manly	Residential	NCA3	56	43	31	26	23	36	24	22	28
R2745	341304.82	6259156.9	25-39 Belgrave St, Manly	Commercial	NCA2	70	Non Res	43	43	38	54	40	38	37
R2746	341293.42	6258198.9	2-4 Stuart St, Manly	Residential	NCA4	57	48	47	48	45	58	46	44	43
R2747	341277.21	6260233.4	65 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	26	39	27	25	24
R2748	341273.21	6258248.7	1 Cove Av, Manly	Residential	NCA4	57	48	51	53	50	64	51	49	49
R2749	341280.63	6258160	49-51 Addison Rd, Manly	Residential	NCA4	57	48	44	47	43	57	45	43	43
R2750	341295.75	6259974.6	43 Malvern Av, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	30
R2751	341280.46	6257986.9	1 Bruce Av, Manly	Residential	NCA4	57	48	41	37	33	47	35	33	33
R2752	341292.81	6260270.8	6 Cameron Av, Manly	Residential	NCA3	56	43	28	27	25	39	27	25	23
R2753	341291.28	6260081.4	30 Pacific St, Manly	Residential	NCA3	56	43	18	18	15	28	16	14	15
R2754	341274.86	6259613.3	108B Pittwater Rd, Manly	Residential	NCA3	56	43	35	33	30	44	31	29	33
R2755	341262.89	6258851.1	15-9 The Corso St, Manly	Commercial	NCA2	70	Non Res	61	46	43	58	45	43	44
R2756	341301.79	6258364.6	3 East Esp, Manly	Commercial	NCA4	70	Non Res	55	58	54	68	56	54	53
R2757	341296.51	6259986.9	21 Pacific St, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	29
R2758	341296.51	6259986.9	21 Pacific St, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	29
R2759	341283.34	6258303.6	1B East Esp, Manly	Residential	NCA4	57	48	53	55	51	66	53	51	50
R2760	341271.88	6259173.7	43 Belgrave St, Manly	Commercial	NCA2	70	Non Res	49	43	40	54	41	39	32
R2761	341295.89	6260229.5	67 Eurobin Av, Manly	Residential	NCA3	56	43	29	28	26	40	28	26	24
R2762	341287.14	6259332.4	62-58 Pittwater Rd, Manly	Residential	NCA3	56	43	40	35	34	47	35	33	32
R2763	341295.14	6260068.4	30 Pacific St, Manly	Residential	NCA3	56	43	30	29	27	41	29	27	26
R2764	341282.24	6259582	106 Pittwater Rd, Manly	Residential	NCA3	56	43	36	37	31	45	33	31	33
R2765	341287.47	6259328.7	22 Denison St, Manly	Residential	NCA3	56	43	40	35	33	47	35	33	31
R2766	341301.27	6258026.5	48-52 Addison Rd, Manly	Residential	NCA4	57	48	36	34	31	46	33	31	29
R2767	341288	6258000.6	46 Addison Rd, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	28
R2768	341288	6258000.6	46 Addison Rd, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	28
R2769	341293.09	6259276.6	17 Denison St, Manly	Residential	NCA3	56	43	42	38	36	50	38	36	33
R2770	341303.91	6260092	24 Collingwood St, Manly	Residential	NCA3	56	43	30	30	28	41	29	27	28
R2771	341285.69	6259568.6	104 Pittwater Rd, Manly	Residential	NCA3	56	43	40	38	35	48	36	34	33
R2772	341309.05	6259229.5	23-31 Whistler St, Manly	Residential	NCA3	56	43	39	35	33	47	34	32	32
R2773	341292.31	6258060.1	54 Addison Rd, Manly	Residential	NCA4	57	48	44	45	42	55	43	41	37
R2774	341288.59	6259415.8	80 Pittwater Rd, Manly	Residential	NCA3	56	43	33	29	26	39	27	25	25
R2775	341288.94	6258971	4-16 Whistler St, Manly	Commercial	NCA2	70	Non Res	48	44	43	58	45	43	36
R2776	341306.04	6258303.8	2 East Esp, Manly	Residential	NCA4	57	48	52	48	46	65	48	46	40
R2777	341293.07	6258085.1	58B Addison Rd, Manly	Residential	NCA4	57	48	46	45	42	55	43	41	42
R2778	341291.09	6259550.6	100 Pittwater Rd, Manly	Residential	NCA3	56	43	41	38	35	48	36	34	33
R2779	341313.21	6259423.5	15-15 Steinton St, Manly	Residential	NCA3	56	43	39	37	34	48	36	34	34
R2780	341295.53	6258166.7	53 Addison Rd, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	43
R2781	341308.11	6259331.4	20-20 Denison St, Manly	Residential	NCA3	56	43	37	35	34	48	35	33	27
R2782	341297.93	6260259.6	5 Cameron Av, Manly	Residential	NCA3	56	43	28	26	24	38	26	24	22
R2783	341293.76	6259261.9	23-31 Whistler St, Manly	Residential	NCA3	56	43	42	37	36	50	37	35	31
R2784	341300.67	6260216.6	69 Eurobin Av, Manly	Residential	NCA3	56	43	29	27	26	39	27	25	24
R2785	341310.64	6258791.1	8-28 The Corso, Manly	Commercial	NCA2	70	Non Res	49	50	43	60	45	43	48
R2786	341305.27	6259188.8	18 Raglan St, Manly	Residential	NCA3	56	43	39	35	33	47	34	32	32
R2787	341305.85	6259304.5	17 Denison St, Manly	Residential	NCA3	56	43	26	26	23	36	24	22	23
R2788	341298.88	6258002.6	48-52 Addison Rd, Manly	Residential	NCA4	57	48	29	30	27	41	28	26	25
R2789	341298.88	6258002.6	48-52 Addison Rd, Manly	Residential	NCA4	57	48	29	30	27	41	28	26	25
R2790	341304.18	6258197	6 Stuart St, Manly	Residential	NCA4	57	48	49	51	49	63	50	48	44
R2791	341303.29	6259747.8	8 Pine St, Manly	Residential	NCA3	56	43	34	34	32	45	33	31	29
R2792	341303.83	6258100	62 Addison Rd, Manly	Residential	NCA4	57	48	43	46	42	56	44	42	42
R2793	341305.4	6258308.4	3 East Esp, Manly	Residential	NCA4	57	48	52	43	41	57	43	41	36
R2794	341293.88	6259530.4	6C Carlton St, Manly	Residential	NCA3	56	43	41	38	35	48	36	34	32
R2795	341317.15	6258188.3	8 Stuart St, Manly	Residential	NCA4	57	48	45	47	43	57	44	42	43
R2796	341323.98	6259471.9	5A Carlton St, Manly	Commercial	NCA3	70	Non Res	38	37	35	49	36	34	31
R2797	341322.51	6258290	9 Stuart St, Manly	Residential	NCA4	57	48	47	50	47	60	48	46	46
R2798	341319.51	6258033.9	48-52 Addison Rd, Manly	Residential	NCA4	57	48	37	39	3				

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2810	341322.84	6260223.8	71 Eurobin Av, Manly	Residential	NCA3	56	43	17	17	14	28	16	14	13
R2811	341329.59	6260113.4	30 Collingwood St, Manly	Residential	NCA3	56	43	30	29	27	40	28	26	25
R2812	341319.42	6259281.4	11 Denison St, Manly	Residential	NCA3	56	43	40	38	37	50	37	35	37
R2813	341307.63	6259660.6	73 Whistler St, Manly	Residential	NCA3	56	43	35	34	32	46	34	32	30
R2814	341309.54	6259784.4	4 Malvern Av, Manly	Residential	NCA3	56	43	33	30	29	43	30	28	27
R2815	341309.4	6259646.2	69 Whistler St, Manly	Residential	NCA3	56	43	35	33	32	45	33	31	30
R2816	341334.39	6259326.7	12 Denison St, Manly	Residential	NCA3	56	43	39	41	34	51	35	33	36
R2817	341326.48	6258184.6	10 Stuart St, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	43
R2818	341317.89	6258329.4	4 East Esp, Manly	Residential	NCA4	57	48	53	56	53	66	54	52	52
R2819	341310.45	6259815	10 Malvern Av, Manly	Residential	NCA3	56	43	33	33	30	45	32	30	21
R2820	341336.47	6259349.1	35 Whistler St, Manly	Residential	NCA3	56	43	39	33	31	45	32	30	36
R2821	341330.68	6258017.5	48-52 Addison Rd, Manly	Residential	NCA4	57	48	35	34	31	45	32	30	30
R2822	341311.36	6259115.2	26-32 Whistler St, Manly	Commercial	NCA2	70	Non Res	45	37	35	49	36	34	34
R2823	341327.88	6260040.5	14-26 Pacific St, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	27
R2824	341333.8	6260123.7	34 Collingwood St, Manly	Residential	NCA3	56	43	30	29	27	41	29	27	26
R2825	341317.86	6259747	6 Pine St, Manly	Residential	NCA3	56	43	34	31	30	44	31	29	28
R2826	341310.96	6259612.3	57-59 Whistler St, Manly	Residential	NCA3	56	43	36	31	30	44	31	29	28
R2827	341329.56	6260252.4	3 Cameron Av, Manly	Residential	NCA3	56	43	29	28	25	39	27	25	24
R2828	341311.53	6259636.4	61 Whistler St, Manly	Residential	NCA3	56	43	35	33	31	45	33	31	27
R2829	341316.72	6259377.2	39 Whistler St, Manly	Residential	NCA3	56	43	40	34	32	46	34	32	28
R2830	341338.69	6259361.2	37 Whistler St, Manly	Residential	NCA3	56	43	38	37	33	47	34	32	36
R2831	341343.49	6259770.4	2 Malvern Av, Manly	Residential	NCA3	56	43	31	27	25	38	26	24	23
R2832	341320.06	6259937.3	36 Malvern Av, Manly	Residential	NCA3	56	43	32	33	31	43	32	30	22
R2833	341333.22	6258819.3	32 The Corso, Manly	Commercial	NCA2	70	Non Res	40	37	34	47	35	33	39
R2834	341317.29	6258264.6	11 Stuart St, Manly	Residential	NCA4	57	48	49	51	48	61	49	47	47
R2835	341321.93	6258312.1	4 East Esp, Manly	Residential	NCA4	57	48	52	45	43	58	45	43	39
R2836	341313.31	6259145.6	34 Whistler St, Manly	Commercial	NCA2	70	Non Res	44	43	40	54	42	40	32
R2837	341321.06	6258118.5	66 Addison Rd, Manly	Residential	NCA4	57	48	45	46	44	58	45	43	42
R2838	341325.31	6259454.6	6 Steinton St, Manly	Residential	NCA3	56	43	38	35	32	48	33	31	30
R2839	341336.12	6258042.8	5 Craig Av, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	36
R2840	341319.85	6259394.6	45 Whistler St, Manly	Residential	NCA3	56	43	39	34	34	48	34	32	29
R2841	341336.27	6259382.9	43 Whistler St, Manly	Residential	NCA3	56	43	32	33	30	44	32	30	30
R2842	341339.09	6260131.4	36 Collingwood St, Manly	Residential	NCA3	56	43	30	28	30	41	29	27	26
R2843	341324.56	6259564.6	51 Whistler St, Manly	Residential	NCA3	56	43	36	32	31	44	32	30	29
R2844	341316.89	6259893.6	26 Malvern Av, Manly	Residential	NCA3	56	43	32	33	31	44	32	30	28
R2845	341318.33	6259864.1	18-20 Malvern Av, Manly	Residential	NCA3	56	43	33	31	30	43	31	29	27
R2846	341316.45	6259163.17	7 Raglan St, Manly	Commercial	NCA2	70	Non Res	44	43	40	53	41	39	31
R2847	341318.14	6259915.5	40 Malvern Av, Manly	Residential	NCA3	56	43	32	33	31	44	32	30	29
R2848	341344.59	6260189.7	55 Collingwood St, Manly	Residential	NCA3	56	43	29	30	27	41	29	27	26
R2849	341318.61	6259419.1	5 Steinton St, Manly	Residential	NCA3	56	43	39	37	35	49	37	35	32
R2850	341350.11	6259836.5	14-16 Malvern Av, Manly	Residential	NCA3	56	43	33	32	30	44	32	30	29
R2851	341345.73	6259799.3	8A Malvern Av, Manly	Residential	NCA3	56	43	33	30	28	42	30	28	27
R2852	341317.71	6259879.7	22 Malvern Av, Manly	Residential	NCA3	56	43	33	33	30	44	31	29	28
R2853	341324.66	6259595.7	53 Whistler St, Manly	Residential	NCA3	56	43	33	29	27	41	29	27	26
R2854	341341.49	6259485.3	5 Carlton St, Manly	Residential	NCA3	56	43	38	33	31	45	33	31	29
R2855	341329.38	6259527	6B Carlton St, Manly	Residential	NCA3	56	43	37	33	31	45	33	31	29
R2856	341345.99	6258755.5	5 Wentworth St, Manly	Commercial	NCA2	70	Non Res	66	61	57	70	58	56	52
R2857	341345.81	6258906.2	27 The Corso, Manly	Commercial	NCA2	70	Non Res	55	44	41	56	43	41	42
R2858	341342.43	6258335.4	5 East Esp, Manly	Residential	NCA4	57	48	53	56	53	66	54	52	39
R2859	341333.9	6260235.7	2 Cameron Av, Manly	Residential	NCA3	56	43	29	28	25	39	27	25	23
R2860	341338.19	6259442.5	4 Steinton St, Manly	Residential	NCA3	56	43	36	32	30	44	31	29	28
R2861	341317.72	6258707.2	39 East Esp, Manly	Commercial	NCA2	70	Non Res	80	65	61	74	63	61	76
R2862	341333.67	6259747.4	2-4 Pine St, Manly	Residential	NCA3	56	43	34	33	31	45	33	31	30
R2863	341351.21	6258783	5 Wentworth St, Manly	Commercial	NCA2	70	Non Res	49	48	42	58	45	43	48
R2864	341351.01	6259570.6	49 Whistler St, Manly	Residential	NCA3	56	43	28	27	25	38	26	24	24
R2865	341344.88	6259695.3	5 Pine St, Manly	Residential	NCA3	56	43	35	33	31	45	33	31	31
R2866	341337.77	6258133.1	68 Addison Rd, Manly	Residential	NCA4	57	48	44	46	43	57	44	42	42
R2867	341353.09	6260201.9	57 Collingwood St, Manly	Residential	NCA3	56	43	29	29	27	41	29	27	25
R2868	341352.46	6259965.1	9-17 Pacific St, Manly	Residential	NCA3	56	43	31	31	29	43	31	29	28
R2869	341351.31	6259485	3 Carlton St, Manly	Residential	NCA3	56	43	36	33	32	47	33	31	23
R2870	341359.73	6258250	13 Stuart St, Manly	Residential	NCA4	57	48	50	51	49	63	51	49	45
R2871	341356.01	6258914.9	31 The Corso, Manly	Commercial	NCA2	70	Non Res	55	47	41	56	43	41	42
R2872	341344.48	6260241.4	1 Cameron Av, Manly	Residential	NCA3	56	43	18	16	16	29	17	15	14
R2873	341345.89	6259323	4 Denison St, Manly	Residential	NCA3	56	43	40	41	38	51	39	37	33
R2874	341342.12	6258354.2	6 East Esp, Manly	Residential	NCA4	57	48	54	56	53	67	54	52	52
R2875	341339.99	6258691.7	37-38 East Esp, Manly	Residential	NCA2	65	53	77	64	60	73	62	60	74
R2876	341346.59	6258020.7	6 Craig Av, Manly	Residential	NCA4	57	48	36	36	33	47	34	32	27
R2877	341379.59	6258778.3	4-8 Darley Rd, Manly	Commercial	NCA2	70	Non Res	62	59	55	68	56	54	46
R2878	341346.86	6259455.2	2A Steinton St, Manly	Residential	NCA3	56	43	29	28	25	38	26	24	24
R2879	341346.65	6258035.9	5 Craig Av, Manly	Residential	NCA4	57	48	30	29	27	40	28	26	25
R2880	341339.8	6259561.8	4 Carlton St, Manly	Residential	NCA3	56	43	35	31	29	43	30	28	28
R2881	341354.01	6259294.9	50 Whistler St, Manly	Educational	NCA3	45	Non Res	26	26	23	36	24	22	23
R2882	341356.85	6258199.3	15 Stuart St, Manly	Residential	NCA4	57	48	30	32	29	43	30	28	29
R2883	341347.42	6260084	1-11 Bonner Av, Manly	Residential	NCA3	56	43	30	31	29	42	30	28	27
R2884	341359.46	6258055.9	4 Craig Av, Manly	Residential	NCA4	57	48	38	38	35	49	36	34	34
R2885	341360.83	6259480.3	1 Carlton St, Manly	Residential	NCA3	56	43	37	34	31	45	32	30	34
R2886	341371.08	6260131.9	15 Bonner Av, Manly	Residential	NCA3	56	43	30	30	28	41	29	27	27
R2887	341346.41	6258156.3	70-14 Addison Rd, Manly	Residential	NCA4	57	48	48	47	44	59	46	44	42
R2888	341351.64	6259700.3	3A Pine St, Manly	Residential	NCA3	56	43	34	30	28	42	30	28	27
R2889	341369.33	6260120.3	13 Bonner Av, Manly	Residential	NCA3	56	43	30	30	28	41	29	27	26
R2890	341346.47	6259674.3	104-106 Whistler St, Manly	Residential	NCA3	56	43	35	34	32	45	33	31	30
R2891	341348.53	6259660.8	100 Whistler St, Manly	Residential	NCA3	56	43	35	33	32	45	33	31	30
R2892	341363.16	6258766.4	7A Wentworth St, Manly	Commercial	NCA2	70	Non Res	63	60	56	69	57	55	48
R2893	341358.65	6259311.9	54 Whistler St, Manly	Residential	NCA3	56	43	38	34	32	46	33	31	31
R2894	341351.41	6258305.1	2-4 Wood St, Manly	Residential	NCA4	57	48	48	50	47	60	48	46	45
R2895	341361.38	6260209.9	59 Collingwood St, Manly	Residential	NCA3	56	43	29	28	27	40	28	26	24
R2896	341362.64	6259641.7	94 Whistler St, Manly	Residential	NCA3	56	43	35	34	32	46	34	32	31
R2897	341348.81	6259000.9	21-29 Sydney Rd, Manly	Commercial	NCA2	70	Non Res	43	43	40	54	42	40	40
R2898	341374.16	6258928.5	31-39 The Corso, Manly	Commercial	NCA2	70	Non Res	54	48	41	58	43	41	41
R2899	341352.69	6259347.4	2A Denison St, Manly	Residential	NCA3	56	43	40	33	31	45	32	30	30
R2900	341376.45	6260145.9	17 Bonner Av, Manly	Residential	NCA3	56	43	30	30	28	41	29	27	27
R2901	341359.56	6259128.3	22 Central Av, Manly	Commercial	NCA2	70	Non Res	43	42	39	53	41	39	40
R2902	341376.14	6260014.3	6-12 Pacific St, Manly	Residential	NCA3	56	43	31	33	30				

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R2914	341380.99	6258118.5	16 Stuart St, Manly	Residential	NCA4	57	48	43	43	40	55	42	40	38
R2915	341373.14	6258969.2	41A The Corso, Manly	Commercial	NCA2	70	Non Res	41	34	30	44	32	30	31
R2916	341369.89	6259937.2	118A North Steyne, Manly	Residential	NCA3	56	43	32	33	30	43	31	29	29
R2917	341387.61	6258299.6	6 Wood St, Manly	Residential	NCA4	57	48	51	54	51	64	52	50	46
R2918	341382.97	6259140.9	5A Raglan St, Manly	Commercial	NCA2	70	Non Res	40	38	35	49	37	35	38
R2919	341363.15	6259807.1	102-104 North Steyne, Manly	Residential	NCA3	56	43	33	32	31	44	32	30	28
R2920	341387.6	6258104.2	22 Stuart St, Manly	Residential	NCA4	57	48	42	41	38	54	40	38	36
R2921	341389.64	6260226.7	65 Collingwood St, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	23
R2922	341366.11	6259767.5	98-100 North Steyne, Manly	Residential	NCA3	56	43	32	28	26	40	27	25	24
R2923	341365.85	6259857.8	110 North Steyne, Manly	Residential	NCA3	56	43	33	33	31	44	32	30	25
R2924	341364.37	6259411	74 North Steyne, Manly	Hotel	NCA3	50	Non Res	39	37	37	49	38	36	33
R2925	341368.06	6259843.7	108-109 North Steyne, Manly	Residential	NCA3	56	43	28	26	23	37	25	23	22
R2926	341366.16	6259873	111 North Steyne, Manly	Residential	NCA3	56	43	33	33	31	44	32	30	27
R2927	341375.63	6258722	2-4 Wentworth St, Manly	Residential	NCA2	65	53	66	61	57	70	58	56	64
R2928	341361.99	6258656.6	29-34 East Esp, Manly	Residential	NCA2	65	53	68	63	59	72	61	58	67
R2929	341376.82	6258065.5	2B Craig Av, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	26
R2930	341369.18	6259592.9	88-88 North Steyne, Manly	Residential	NCA3	56	43	36	34	32	46	33	31	33
R2931	341388.77	6258176	74 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	29
R2932	341388.43	6258994.2	15-19 Sydney Rd, Manly	Commercial	NCA2	70	Non Res	46	43	37	51	39	37	37
R2933	341394.01	6259436.9	75 North Steyne, Manly	Residential	NCA3	56	43	37	34	32	46	33	31	31
R2934	341376.77	6258247.2	55A Addison Rd, Manly	Residential	NCA4	57	48	49	51	48	61	49	47	45
R2935	341380.09	6258375.3	9 East Esp, Manly	Residential	NCA4	57	48	53	57	53	67	54	52	42
R2936	341399.65	6259886.9	112-113 North Steyne, Manly	Residential	NCA3	56	43	32	31	29	43	30	28	29
R2937	341397.99	6259781.5	101 North Steyne, Manly	Residential	NCA3	56	43	33	33	31	45	32	30	29
R2938	341370.26	6259637.6	91 North Steyne, Manly	Residential	NCA3	56	43	35	35	33	46	33	31	32
R2939	341375.35	6258275.4	8 Wood St, Manly	Residential	NCA4	57	48	49	49	46	61	48	46	37
R2940	341395.45	6258093	24 Stuart St, Manly	Residential	NCA4	57	48	42	40	37	50	38	36	30
R2941	341376.66	6259550.5	84-85 North Steyne St, Manly	Residential	NCA3	56	43	37	38	35	48	36	34	34
R2942	341395.57	6260231.9	67 Collingwood St, Manly	Residential	NCA3	56	43	29	28	26	40	27	25	24
R2943	341376.51	6259481	79-80 North Steyne St, Manly	Residential	NCA3	56	43	38	39	36	49	37	35	32
R2944	341378.84	6259681.4	93-95 North Steyne, Manly	Residential	NCA3	56	43	35	32	31	44	32	30	29
R2945	341400.77	6259959.8	119-120 North Steyne, Manly	Residential	NCA3	56	43	18	19	16	29	17	15	15
R2946	341378.85	6259514	82 North Steyne, Manly	Residential	NCA3	56	43	37	38	35	48	36	34	33
R2947	341400.15	6259650.3	92 North Steyne, Manly	Residential	NCA3	56	43	30	28	26	39	27	25	26
R2948	341377.84	6259909.7	114-117 North Steyne, Manly	Residential	NCA3	56	43	32	28	26	40	28	26	24
R2949	341400.56	6258273.1	10 Wood St, Manly	Residential	NCA4	57	48	49	49	46	59	47	45	48
R2950	341401.63	6258360	19 Wood St, Manly	Residential	NCA4	57	48	53	55	48	64	53	51	45
R2951	341509.07	6258214.3	21 Wood St, Manly	Residential	NCA4	57	48	41	43	39	53	41	39	34
R2952	341515.23	6258205.7	23-25 Wood St, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	36
R2953	341503.27	6258183.5	27-29 Wood St, Manly	Residential	NCA4	57	48	43	40	37	51	39	37	32
R2954	341502.44	6258222	3 Wood St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	34
R2955	341529.48	6258185.4	31 Wood St, Manly	Residential	NCA4	57	48	42	43	40	53	41	39	38
R2956	341536.76	6258177.5	33 Wood St, Manly	Residential	NCA4	57	48	42	43	40	53	41	39	39
R2957	341400.98	6258085.3	26 Stuart St, Manly	Residential	NCA4	57	48	41	40	37	50	38	36	30
R2958	341398.84	6258182.7	76B Addison Rd, Manly	Residential	NCA4	57	48	46	48	45	59	46	44	35
R2959	341382.32	6259358.5	66-68 North Steyne, Manly	Residential	NCA3	56	43	39	38	36	50	37	35	35
R2960	341410.05	6258956.4	49-55 The Corso, Manly	Commercial	NCA2	70	Non Res	52	47	41	57	42	40	42
R2961	341387.43	6259574.9	86 North Steyne, Manly	Residential	NCA3	56	43	34	30	28	42	29	27	26
R2962	341393.43	6258737	10 Darley Rd, Manly	Commercial	NCA2	70	Non Res	63	59	56	69	57	55	62
R2963	341403.87	6260236.3	69 Collingwood St, Manly	Residential	NCA3	56	43	29	28	26	40	27	25	24
R2964	341406.78	6258350.5	5 Wood St, Manly	Residential	NCA4	57	48	52	52	49	62	50	48	47
R2965	341403.99	6258815.1	11-15 Wentworth St, Manly	Commercial	NCA2	70	Non Res	47	49	46	59	47	45	42
R2966	341386.37	6259934.6	118 North Steyne, Manly	Residential	NCA3	56	43	31	27	25	39	27	25	23
R2967	341406.04	6258259.3	10-12 Wood St, Manly	Residential	NCA4	57	48	49	46	43	56	44	42	48
R2968	341393.4	6258235	10 Wood St, Manly	Residential	NCA4	57	48	47	47	45	59	47	45	33
R2969	341399.87	6259272.6	11 Denison St, Manly	Residential	NCA3	56	43	39	37	34	49	36	34	36
R2970	341385.49	6258599.2	2 Victoria Pde, Manly	Residential	NCA2	65	53	62	61	58	71	59	57	61
R2971	341405.57	6259194.3	2 Raglan St, Manly	Residential	NCA3	56	43	33	32	29	43	30	28	31
R2972	341389.08	6260181.6	48-38 Collingwood St, Manly	Residential	NCA3	56	43	29	31	28	41	29	27	27
R2973	341411.68	6258072.3	1 Craig Av, Manly	Residential	NCA4	57	48	39	39	36	49	37	35	28
R2974	341391.54	6258381.9	10 East Esp, Manly	Residential	NCA4	57	48	53	56	53	67	54	52	42
R2975	341399.24	6259337.6	62-65 North Steyne, Manly	Residential	NCA3	56	43	25	25	23	35	23	21	22
R2976	341409.62	6258194.3	78 Addison Rd, Manly	Residential	NCA4	57	48	46	48	44	58	46	44	41
R2977	341398.11	6258140.1	21 Stuart St, Manly	Residential	NCA4	57	48	33	33	30	43	31	29	26
R2978	341393.82	6258688.9	5-7 Victoria Pde, Manly	Residential	NCA2	65	53	49	49	46	59	47	45	47
R2979	341416.53	6260243.1	71 Collingwood St, Manly	Residential	NCA3	56	43	29	28	27	40	28	26	23
R2980	341397.14	6258587.7	27 East Esp, Manly	Residential	NCA2	65	53	61	61	57	70	58	56	60
R2981	341422.68	6259978.5	121 North Steyne, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	29
R2982	341397.93	6260165.2	32-34 Bonner Av, Manly	Residential	NCA3	56	43	29	31	29	41	30	28	27
R2983	341409.84	6258258.8	10 Wood St, Manly	Residential	NCA4	57	48	50	53	49	62	50	48	47
R2984	341419.92	6258343.7	9 Wood St, Manly	Residential	NCA4	57	48	51	55	51	65	53	51	47
R2985	341405.18	6258872	56-64 The Corso Lane, Manly	Commercial	NCA2	70	Non Res	47	49	42	59	47	45	45
R2986	341426.28	6259993.9	122 North Steyne, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	29
R2987	341426.28	6259993.9	122 North Steyne, Manly	Residential	NCA3	56	43	31	33	30	43	31	29	29
R2988	341399.66	6259134.4	3-3 Raglan St, Manly	Commercial	NCA2	70	Non Res	43	40	37	52	39	37	39
R2989	341399.78	6260127.6	24 Bonner Av, Manly	Residential	NCA3	56	43	30	31	29	42	30	28	28
R2990	341402.65	6260021.4	124 North Steyne, Manly	Residential	NCA3	56	43	22	21	19	32	20	18	17
R2991	341398.9	6258734.8	22A Darley Rd, Manly	Commercial	NCA2	70	Non Res	63	59	56	69	57	55	61
R2992	341410.33	6258195.2	80 Addison Rd, Manly	Residential	NCA4	57	48	46	48	44	59	46	44	35
R2993	341402.08	6260151.5	30 Bonner Av, Manly	Residential	NCA3	56	43	30	31	28	41	29	27	27
R2994	341407.08	6259282.7	61 North Steyne, Manly	Residential	NCA3	56	43	38	32	29	43	30	28	35
R2995	341404.1	6260074.4	20 Bonner Av, Manly	Residential	NCA3	56	43	30	31	29	42	30	28	21
R2996	341431.98	6258143.3	23 Stuart St, Manly	Residential	NCA4	57	48	40	42	39	52	38	36	28
R2997	341408.03	6260029.2	125 North Steyne, Manly	Residential	NCA3	56	43	26	23	22	35	23	21	18
R2998	341407.31	6258316.3	11 Wood St, Manly	Residential	NCA4	57	48	51	51	48	64	51	49	41
R2999	341416.11	6259020.6	9-15 Central Av, Manly	Commercial	NCA2	70	Non Res	42	43	37	54	39	37	39
R3000	341426.23	6260248.8	75 Collingwood St, Manly	Residential	NCA3	56	43	29	27	25	39	27	25	23
R3001	341408.54	6258573	26 East Esp, Manly	Residential	NCA2	65	53	60	60	56	70	57	55	59
R3002	341411.28	6258118.4	27 Stuart St, Manly	Residential	NCA4	57	48	30	27	24	38	25	23	23
R3003	341412.14	6259261	59-60 North Steyne, Manly	Residential	NCA3	56	43	40	38	35	50	37	35	34
R3004	341415.58	6258689.7	9 Victoria Pde, Manly	Residential	NCA2	65	53	47	47	42	57	45	43	45
R3005	341429.1	6258034.7	36 Stuart St, Manly	Residential	NCA4	57	48	25	26	23	36	24	22	22
R3006	341418.8	6258623.7	6 Victoria Pde, Manly	Residential	NCA									

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3018	341445.14	6258024.5	40 Stuart St, Manly	Residential	NCA4	57	48	39	35	32	49	33	31	31
R3019	341415.64	6258561.5	24 East Esp, Manly	Residential	NCA2	65	53	59	56	69	57	55	58	58
R3020	341450.16	6258903.5	72A The Corso , Manly	Commercial	NCA2	70	Non Res	39	41	35	51	39	37	36
R3021	341453.22	6258310.8	15 Wood St, Manly	Residential	NCA4	57	48	51	51	48	62	49	47	50
R3022	341429.53	6258702.7	13A Victoria Pde, Manly	Commercial	NCA2	70	Non Res	49	51	48	61	49	47	47
R3023	341453.41	6258838.7	11-15 Wentworth St, Manly	Commercial	NCA2	70	Non Res	56	55	52	65	53	51	43
R3024	341435.8	6258369.6	2 Osborne Rd, Manly	Residential	NCA4	57	48	53	55	52	65	53	51	49
R3025	341431.54	6258766	24 Wentworth St, Manly	Residential	NCA2	65	53	51	51	46	61	48	46	50
R3026	341436.17	6258221	84 Addison Rd, Manly	Residential	NCA4	57	48	48	50	47	60	48	46	43
R3027	341435.39	6258265.3	57E Addison Rd, Manly	Residential	NCA4	57	48	50	51	49	63	50	48	34
R3028	341431.38	6258637.1	8 Victoria Pde, Manly	Residential	NCA2	65	53	55	59	55	69	57	55	48
R3029	341448.96	6258074.8	39 Stuart St, Manly	Residential	NCA4	57	48	24	26	24	37	25	23	22
R3030	341457.49	6258107.4	35 Stuart St, Manly	Residential	NCA4	57	48	35	33	31	47	35	33	30
R3031	341440.4	6260155.3	140-142 North Steyne , Manly	Residential	NCA3	56	43	29	30	28	41	29	27	26
R3032	341462.09	6258196.2	24-26 Wood St, Manly	Residential	NCA4	57	48	38	33	29	43	31	29	37
R3033	341461.91	6260115.9	22-137 Bonner Av, Manly	Residential	NCA3	56	43	30	32	29	42	30	28	28
R3034	341446.41	6258554.7	1 Ashburner St, Manly	Residential	NCA2	65	53	49	50	47	62	49	47	44
R3035	341441.14	6258646.5	10 Victoria Pde, Manly	Residential	NCA2	65	53	54	58	55	68	56	54	47
R3036	341447.05	6259110	49-53 North Steyne , Manly	Hotel	NCA2	50	Non Res	40	42	35	50	37	35	38
R3037	341458	6258907.1	74-78 The Corso , Manly	Commercial	NCA2	70	Non Res	43	46	38	56	41	39	38
R3038	341445.16	6258358.7	4 Osborne Rd, Manly	Residential	NCA4	57	48	51	50	47	64	52	50	40
R3039	341449.62	6258513.2	19 East Esp, Manly	Residential	NCA4	57	48	53	57	54	67	55	53	45
R3040	341450.73	6258064.5	43 Stuart St, Manly	Residential	NCA4	57	48	34	31	28	44	29	27	24
R3041	341464.95	6258092.6	39 Stuart St, Manly	Residential	NCA4	57	48	35	34	32	48	35	33	31
R3042	341470.47	6260140.9	138 North Steyne , Manly	Residential	NCA3	56	43	30	32	29	42	30	28	28
R3043	341469.42	6258289.8	61 Addison Rd, Manly	Residential	NCA4	57	48	50	48	47	60	48	46	49
R3044	341451.74	6258346.1	6-8 Osborne Rd, Manly	Residential	NCA4	57	48	51	54	51	64	52	50	44
R3045	341468.32	6258076.8	43 Stuart St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	26
R3046	341460.22	6258562.8	7A Ashburner St, Manly	Residential	NCA2	65	53	46	48	45	59	47	45	43
R3047	341452.54	6258652.9	12 Victoria Pde, Manly	Residential	NCA2	65	53	53	58	54	68	55	53	44
R3048	341474.27	6258175.8	30 Wood St, Manly	Residential	NCA4	57	48	42	45	42	56	43	41	35
R3049	341454.76	6258485.2	16-17 East Esp, Manly	Residential	NCA4	57	48	55	57	53	67	55	53	54
R3050	341456.76	6258053.8	47 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	26
R3051	341454.01	6258328.7	6-8 Osborne Rd, Manly	Residential	NCA4	57	48	52	53	50	63	51	49	50
R3052	341465.17	6258821.2	10 Wentworth St, Manly	Residential	NCA2	65	53	55	49	46	59	47	45	45
R3053	341462.42	6258232.3	86A Addison Rd, Manly	Residential	NCA4	57	48	48	45	43	58	45	43	34
R3054	341464.4	6258450	1 Osborne Rd, Manly	Residential	NCA4	57	48	54	56	52	66	54	52	53
R3055	341481.55	6258164.2	32 Wood St, Manly	Residential	NCA4	57	48	42	45	42	55	43	41	36
R3056	341458.9	6258314.3	10 Osborne Rd, Manly	Residential	NCA4	57	48	51	51	48	62	50	48	50
R3057	341458.25	6258743.7	48 Victoria Pde, Manly	Residential	NCA2	65	53	48	50	47	60	48	46	46
R3058	341464.24	6258665.2	26A Darley Rd, Manly	Residential	NCA2	65	53	49	53	49	67	54	52	43
R3059	341479.76	6258893.4	29 Rialto Lane, Manly	Residential	NCA2	65	53	43	46	43	56	44	42	38
R3060	341473.85	6258289.1	63 Addison Rd, Manly	Residential	NCA4	57	48	50	48	45	61	48	46	42
R3061	341473.46	6258586	7-11 Ashburner St, Manly	Residential	NCA2	65	53	48	51	48	61	49	47	45
R3062	341488.47	6258157.3	34 Wood St, Manly	Residential	NCA4	57	48	42	45	42	55	43	41	36
R3063	341476.51	6259008.1	42-45 North Steyne , Manly	Hotel	NCA2	50	Non Res	46	45	39	55	41	39	41
R3064	341501.35	6258933.3	92-92 The Corso , Manly	Commercial	NCA2	70	Non Res	43	45	42	55	43	41	36
R3065	341474.16	6258250.6	88 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	43	41	40
R3066	341464.1	6258466.2	15 East Esp, Manly	Residential	NCA4	57	48	55	56	53	66	54	52	53
R3067	341471.31	6258414.5	5 Osborne Rd, Manly	Residential	NCA4	57	48	53	55	52	65	53	51	48
R3068	341493.48	6258150	36 Wood St, Manly	Residential	NCA4	57	48	42	45	42	55	43	41	36
R3069	341494.13	6258056.2	49 Stuart St, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	35
R3070	341476.13	6258027.8	51 Stuart St, Manly	Residential	NCA4	57	48	39	38	36	51	39	37	25
R3071	341488.21	6258590.7	13A Ashburner St, Manly	Residential	NCA2	65	53	36	37	33	46	35	33	35
R3072	341491.03	6258818.8	12 Wentworth St, Manly	Residential	NCA2	65	53	54	48	45	58	46	44	45
R3073	341499.31	6258135.7	38 Wood St, Manly	Residential	NCA4	57	48	38	39	36	49	37	35	35
R3074	341494.23	6258635.5	30-34 Darley Rd, Manly	Residential	NCA2	65	53	36	36	33	46	34	32	35
R3075	341479.78	6258309	14 Osborne Rd, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	37
R3076	341485.9	6258299	16 Osborne Rd, Manly	Residential	NCA4	57	48	42	43	40	54	41	39	37
R3077	341479.98	6258017.3	53 Stuart St, Manly	Residential	NCA4	57	48	39	40	37	52	40	38	25
R3078	341498.72	6258252.8	92 Addison Rd, Manly	Residential	NCA4	57	48	46	48	45	57	45	43	39
R3079	341507.32	6258619.7	38 Darley Rd, Manly	Residential	NCA2	65	53	35	36	33	46	34	32	34
R3080	341488.61	6258600.6	40 Darley Rd, Manly	Residential	NCA2	65	53	46	49	46	59	47	45	42
R3081	341491.41	6258513.9	2A Ashburner St, Manly	Residential	NCA4	57	48	49	51	48	61	49	47	46
R3082	341507.33	6258129.2	42 Wood St, Manly	Residential	NCA4	57	48	41	44	41	54	42	40	35
R3083	341510.59	6258960.7	96-100 The Corso , Manly	Commercial	NCA2	70	Non Res	30	32	28	42	29	27	28
R3084	341499.6	6258748.1	48 Victoria Pde, Manly	Residential	NCA2	65	53	45	47	44	57	45	43	42
R3085	341513.39	6258121.3	44 Wood St, Manly	Residential	NCA4	57	48	41	44	41	54	42	40	36
R3086	341493.88	6258381.7	9 Osborne Rd, Manly	Residential	NCA4	57	48	52	54	50	64	52	50	49
R3087	341525.47	6258896.5	25-27 Wentworth St, Manly	Commercial	NCA2	70	Non Res	52	50	49	62	50	48	44
R3088	341486.04	6258400.4	7 Osborne Rd, Manly	Residential	NCA4	57	48	51	54	51	65	52	50	47
R3089	341494.17	6258590.9	44 Darley Rd, Manly	Residential	NCA2	65	53	42	44	40	54	42	40	41
R3090	341500.26	6258252.7	98 Addison Rd, Manly	Residential	NCA4	57	48	46	48	46	59	46	44	34
R3091	341501.59	6258049.1	10 Marshall St, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	36
R3092	341507.44	6258437.3	3 Osborne Rd, Manly	Residential	NCA4	57	48	51	53	50	63	51	49	50
R3093	341501.05	6258681.2	14-16 Victoria Pde, Manly	Residential	NCA2	65	53	47	51	47	65	50	48	42
R3094	341520.59	6258111.3	48 Wood St, Manly	Residential	NCA4	57	48	41	44	41	54	42	40	36
R3095	341504.63	6258540.6	2A Ashburner St, Manly	Residential	NCA4	57	48	52	51	48	61	49	47	51
R3096	341498.95	6258577.5	48-50 Darley Rd, Manly	Residential	NCA2	65	53	44	46	43	56	44	42	42
R3097	341495.96	6258078.5	50 Wood St, Manly	Residential	NCA4	57	48	40	41	38	52	40	38	26
R3098	341502.85	6258813.4	14 Wentworth St, Manly	Residential	NCA2	65	53	47	49	45	59	46	44	45
R3099	341519.41	6258006.5	57 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	37
R3100	341519.41	6258006.5	57 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	37
R3101	341517.74	6258269.3	100 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	40
R3102	341510.25	6258488.4	2B Ashburner St, Manly	Residential	NCA4	57	48	53	55	51	65	53	51	50
R3103	341510.99	6258553.6	8 Ashburner St, Manly	Residential	NCA4	57	48	47	50	47	60	48	46	45
R3104	341507.26	6258360.8	13 Osborne Rd, Manly	Residential	NCA4	57	48	51	53	50	63	51	49	48
R3105	341513.08	6258648.8	9 Darley Rd, Manly	Residential	NCA2	65	53	45	48	45	58	46	44	40
R3106	341517.33	6258067.5	14-18 Marshall St, Manly	Residential	NCA4	57	48	40	43	39	53	40	38	39
R3107	341534.03	6257998	59 Stuart St, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	35
R3108	341534.03	6257998	59 Stuart St, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	35
R3109	341516.17	6258777.6	26-27 Victoria Pde, Manly	Residential	NCA2	65	53	48	50	47	60	48	46	46
R3110	341511.91	6258941.8	34-35 South Steyne , Manly	Commercial	NCA2	70	Non Res	43	45	42	55</			

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3122	341525.79	6257963.9	63 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	38
R3123	341532.18	6258239.8	18 Osborne Rd, Manly	Residential	NCA4	57	48	44	44	42	57	44	42	39
R3124	341537.5	6258872.8	22 Wentworth St, Manly	Residential	NCA2	65	53	51	48	45	58	46	44	38
R3125	341531.39	6258327.8	17 Osborne Rd, Manly	Residential	NCA4	57	48	50	52	49	62	50	48	46
R3126	341533.95	6258545.1	58 Darley Rd, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	48
R3127	341554.18	6258902.2	25-27 South Steyne, Manly	Commercial	NCA2	70	Non Res	50	49	46	60	48	46	42
R3128	341541.65	6258372.3	15 Osborne Rd, Manly	Residential	NCA4	57	48	46	48	44	58	45	43	44
R3129	341544.45	6258719.1	28-32 Victoria Pde, Manly	Hotel	NCA2	50	Non Res	46	49	45	59	47	45	41
R3130	341536.48	6258235.1	20 Osborne Rd, Manly	Residential	NCA4	57	48	44	46	43	57	45	43	33
R3131	341541.18	6258484.5	66 Darley Rd, Manly	Residential	NCA4	57	48	52	54	50	64	52	50	47
R3132	341539.6	6258518.1	62 Darley Rd, Manly	Residential	NCA4	57	48	49	50	47	61	48	46	45
R3133	341555.41	6258016.1	1 Marshall St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	27
R3134	341543.55	6258224.1	22 Osborne Rd, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	40
R3135	341537.93	6258613.4	15 Ashburner St, Manly	Residential	NCA2	65	53	46	48	45	58	46	44	41
R3136	341567.58	6257943.5	73 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	38
R3137	341555.73	6258015.8	5 Marshall St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	30
R3138	341542.12	6258158.7	36-42 Osborne Rd, Manly	Residential	NCA4	57	48	43	44	41	54	42	40	41
R3139	341563.67	6258837.4	22 Wentworth St, Manly	Commercial	NCA2	70	Non Res	45	47	44	57	45	43	44
R3140	341550.67	6258211.3	24-26 Osborne Rd, Manly	Residential	NCA4	57	48	44	46	42	57	44	42	42
R3141	341555.54	6258514	64 Darley Rd, Manly	Residential	NCA4	57	48	48	50	46	60	48	46	47
R3142	341561.65	6258506.1	66 Darley Rd, Manly	Residential	NCA4	57	48	50	53	50	63	51	49	49
R3143	341561.16	6258371.8	65 Addison Rd, Manly	Residential	NCA4	57	48	47	48	44	58	45	43	46
R3144	341560.14	6258034.8	9 Marshall St, Manly	Residential	NCA4	57	48	42	44	39	54	42	40	39
R3145	341538.86	6258440.3	69 Addison Rd, Manly	Residential	NCA4	57	48	51	53	49	63	50	48	50
R3146	341560.02	6258198.6	28-30 Osborne Rd, Manly	Residential	NCA4	57	48	44	45	43	56	44	42	36
R3147	341578.89	6257935	75 Stuart St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	27
R3148	341578.98	6258632.1	17A Ashburner St, Manly	Residential	NCA2	65	53	33	35	32	45	33	31	31
R3149	341564.77	6258300.5	108-110 Addison Rd, Manly	Residential	NCA4	57	48	46	48	44	57	45	43	43
R3150	341532.76	6258793.3	15 South Steyne Pde, Manly	Residential	NCA2	65	53	48	50	47	60	48	46	47
R3151	341567.67	6258728.1	34-38 Victoria Pde, Manly	Residential	NCA2	65	53	43	43	39	53	41	39	41
R3152	341569.91	6258599	8A Ashburner St, Manly	Residential	NCA4	57	48	48	49	46	59	47	45	41
R3153	341567.66	6258380.5	67 Addison Rd, Manly	Residential	NCA4	57	48	50	50	47	60	48	46	46
R3154	341569.87	6258572.2	29 Darley Rd, Manly	Residential	NCA4	57	48	48	49	46	59	47	45	46
R3155	341572.54	6258026.4	11A Marshall St, Manly	Residential	NCA4	57	48	42	43	41	55	42	40	30
R3156	341567.69	6258658.7	19 Ashburner St, Manly	Residential	NCA2	65	53	44	47	44	57	45	43	39
R3157	341572.59	6258268.2	19 Osborne Rd, Manly	Residential	NCA4	57	48	48	49	45	59	47	45	37
R3158	341573.13	6258478.7	70 Darley Rd, Manly	Residential	NCA4	57	48	47	49	46	59	47	45	46
R3159	341585.95	6257946.6	21 Carey St, Manly	Residential	NCA4	57	48	41	41	38	51	39	37	31
R3160	341600.01	6257998.4	72 Wood St, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	38
R3161	341600.01	6257998.4	72 Wood St, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	38
R3162	341592.22	6258316.7	112 Addison Rd, Manly	Residential	NCA4	57	48	40	35	32	45	33	31	38
R3163	341593.45	6258812	19 South Steyne, Manly	Commercial	NCA2	70	Non Res	42	44	41	54	42	40	38
R3164	341592.59	6257900.2	18 Carey St, Manly	Residential	NCA4	57	48	32	34	30	44	32	30	28
R3165	341595.9	6258278.4	21 Osborne Rd, Manly	Residential	NCA4	57	48	41	43	39	53	40	38	39
R3166	341582.73	6258737.3	40 Victoria Pde, Manly	Residential	NCA2	65	53	45	48	45	58	46	44	41
R3167	341577.35	6258560.1	33 Darley Rd, Manly	Residential	NCA4	57	48	48	49	45	59	47	45	47
R3168	341585.72	6258660.5	23 Ashburner St, Manly	Residential	NCA2	65	53	45	47	44	57	45	43	39
R3169	341597.43	6258106.1	51 Wood St, Manly	Residential	NCA4	57	48	40	43	39	52	40	38	38
R3170	341587.65	6258383.2	71 Addison Rd, Manly	Residential	NCA4	57	48	48	51	48	61	49	47	44
R3171	341582.62	6258679.1	25-27 Ashburner St, Manly	Residential	NCA2	65	53	45	48	44	58	46	44	39
R3172	341603.88	6258272	23A Osborne Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3173	341599.05	6257954.8	23 Carey St, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	35
R3174	341590.74	6258321	114 Addison Rd, Manly	Residential	NCA4	57	48	45	46	43	56	44	42	43
R3175	341588.1	6258474.9	72 Darley Rd, Manly	Residential	NCA4	57	48	46	48	44	58	46	44	45
R3176	341593.22	6257912.7	20 Carey St, Manly	Residential	NCA4	57	48	38	37	34	50	35	33	30
R3177	341596.8	6258389.6	73-77 Addison Rd, Manly	Residential	NCA4	57	48	45	47	43	57	45	43	44
R3178	341594.82	6258682.9	29 Ashburner St, Manly	Residential	NCA2	65	53	45	48	44	58	46	44	38
R3179	341588.71	6258149.6	46 Osborne Rd, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	41
R3180	341601.47	6258559.6	35 Darley Rd, Manly	Residential	NCA4	57	48	47	50	46	61	48	46	46
R3181	341599.53	6258114.7	20 Marshall St, Manly	Residential	NCA4	57	48	42	44	40	53	42	40	33
R3182	341596.76	6258450.8	78 Darley Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	38
R3183	341595.49	6258243	29 Osborne Rd, Manly	Residential	NCA4	57	48	44	45	41	56	43	41	39
R3184	341592.05	6257872.7	85 Stuart St, Manly	Residential	NCA4	57	48	35	34	31	44	32	30	30
R3185	341589.05	6258611.8	10 Ashburner St, Manly	Residential	NCA4	57	48	45	48	45	58	46	44	40
R3186	341597.96	6258615.4	12 Ashburner St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	39
R3187	341603.14	6258619.8	14 Ashburner St, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	38
R3188	341610.26	6258624	16 Ashburner St, Manly	Residential	NCA4	57	48	44	46	44	56	45	43	39
R3189	341616.74	6258628.4	18 Ashburner St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	37
R3190	341622.89	6258633	20 Ashburner St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	37
R3191	341600.9	6258329.7	116 Addison Rd, Manly	Residential	NCA4	57	48	46	47	44	57	45	43	45
R3192	341598.38	6257858.7	89 Stuart St, Manly	Residential	NCA4	57	48	34	25	22	43	24	22	21
R3193	341601.5	6258230.2	31 Osborne Rd, Manly	Residential	NCA4	57	48	47	49	43	57	47	45	42
R3194	341596.67	6258534.4	37 Darley Rd, Manly	Residential	NCA4	57	48	48	49	45	59	47	45	46
R3195	341617.71	6257978.1	74-74 Wood St, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	39
R3196	341591.73	6258752.2	42-44 Victoria Pde, Manly	Residential	NCA2	65	53	44	47	44	57	45	43	40
R3197	341599.87	6258687.5	33 Ashburner St, Manly	Residential	NCA2	65	53	44	47	44	58	46	44	38
R3198	341603.97	6258057	53-55 Wood St, Manly	Residential	NCA4	57	48	43	42	39	54	40	38	31
R3199	341616.78	6257913.5	22 Carey St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R3200	341608.81	6258540.4	39 Darley Rd, Manly	Residential	NCA4	57	48	49	51	48	62	49	47	48
R3201	341611.36	6258302.8	2 High St, Manly	Residential	NCA4	57	48	44	47	42	56	44	42	42
R3202	341609.22	6258143.2	48 Osborne Rd, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	33
R3203	341624.14	6258231.1	33A Osborne Rd, Manly	Residential	NCA4	57	48	42	44	41	55	42	40	41
R3204	341602.85	6258424.5	80 Darley Rd, Manly	Residential	NCA4	57	48	48	45	41	55	43	41	47
R3205	341629.04	6258040.8	59 Wood St, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	38
R3206	341617.13	6257927.4	26 Carey St, Manly	Residential	NCA4	57	48	37	40	37	50	38	36	30
R3207	341618.4	6258065.4	17 Marshall St, Manly	Residential	NCA4	57	48	42	42	39	52	40	38	33
R3208	341618.06	6258133.8	50 Osborne Rd, Manly	Residential	NCA4	57	48	39	37	38	51	39	37	34
R3209	341616.63	6258349.5	118 Addison Rd, Manly	Residential	NCA4	57	48	45	48	44	57	45	43	43
R3210	341616.8	6258283	4 High St, Manly	Residential	NCA4	57	48	39	40	38	51	38	36	36
R3211	341632.29	6257854.2	97 Stuart St, Manly	Residential	NCA4	57	48	25	27	24	37	25	23	23
R3212	341618.41	6258209.6	33 Osborne Rd, Manly	Residential	NCA4	57	48	46	48	44	58	46	44	40
R3213	341637.28	6258132.1	22 Marshall St, Manly	Residential	NCA4	57	48	44	43	40	53	41	39	43
R3214	341626.4	6258075.1	19 Marshall St, Manly	Residential	NCA4	57	48	42	44	41	54			

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3226	341630.73	6258007.2	65 Wood St, Manly	Residential	NCA4	57	48	42	41	39	54	41	39	38
R3227	341630.84	6258189.5	37 Osborne Rd, Manly	Residential	NCA4	57	48	46	43	44	55	46	44	42
R3228	341632.21	6258634.9	22-24 Ashburner St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	38
R3229	341630.65	6257892.4	84 Wood St, Manly	Residential	NCA4	57	48	37	40	36	50	38	36	26
R3230	341638.74	6257942.1	80 Wood St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	37
R3231	341633.85	6258247.6	12 High St, Manly	Residential	NCA4	57	48	44	46	41	56	42	40	43
R3232	341633.71	6257994.8	67 Wood St, Manly	Residential	NCA4	57	48	42	42	39	55	42	40	38
R3233	341633.71	6257994.8	67 Wood St, Manly	Residential	NCA4	57	48	42	42	39	55	42	40	38
R3234	341637.03	6258485.9	47 Darley Rd, Manly	Residential	NCA4	57	48	49	49	46	60	47	45	48
R3235	341660.51	6258488.4	49 Darley Rd, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	32
R3236	341640.39	6257873.9	88 Wood St, Manly	Residential	NCA4	57	48	35	38	35	48	36	34	22
R3237	341655.55	6258001	69 Wood St, Manly	Residential	NCA4	57	48	27	29	25	39	27	25	25
R3238	341655.55	6258001	69 Wood St, Manly	Residential	NCA4	57	48	27	29	25	39	27	25	25
R3239	341640.18	6258094.1	54 Osborne Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	39
R3240	341639.44	6258179.9	39 Osborne Rd, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	40
R3241	341631.99	6258705.2	43 Ashburner St, Manly	Residential	NCA2	65	53	44	47	44	57	45	43	38
R3242	341644.38	6258568.1	7 Cliff St, Manly	Residential	NCA4	57	48	49	50	46	60	48	46	45
R3243	341647.53	6258241.2	14 High St, Manly	Residential	NCA4	57	48	41	43	40	54	41	39	39
R3244	341644.77	6258645.2	26-28 Ashburner St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	37
R3245	341661.96	6257993.8	71 Wood St, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	30
R3246	341648.81	6258352.2	120 Addison Rd, Manly	Residential	NCA4	57	48	45	46	42	58	46	44	42
R3247	341662.58	6258179.3	41 Osborne Rd, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	38
R3248	341645.14	6258720.5	8-13 South Steyne, Manly	Residential	NCA2	65	53	43	46	43	57	44	42	36
R3249	341649.54	6258469.3	51 Darley Rd, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	48
R3250	341665.97	6257899.3	86 Wood St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	28
R3251	341653.45	6258329.1	17 High St, Manly	Residential	NCA4	57	48	43	45	42	55	43	41	42
R3252	341650.94	6258070.9	56 Osborne Rd, Manly	Residential	NCA4	57	48	43	45	42	55	43	41	39
R3253	341654.42	6258580.5	9 Cliff St, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	45
R3254	341657.71	6258244	16 High St, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	40
R3255	341655.49	6258657.3	30 Ashburner St, Manly	Residential	NCA4	57	48	43	46	43	56	44	42	36
R3256	341658.01	6258501.2	2A Cliff St, Manly	Residential	NCA4	57	48	45	46	43	56	44	42	44
R3257	341654.19	6258373.6	84A Darley Rd, Manly	Residential	NCA4	57	48	44	46	42	56	43	41	42
R3258	341654.52	6257964.8	75 Wood St, Manly	Residential	NCA4	57	48	42	41	39	53	41	39	34
R3259	341623.68	6258777.2	7-51 South Steyne St, Manly	Hotel	NCA2	50	Non Res	44	47	43	57	45	43	42
R3260	341659.52	6258456.3	53 Darley Rd, Manly	Residential	NCA4	57	48	46	49	45	58	46	44	44
R3261	341673.55	6258171.5	43B Osborne Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	39
R3262	341661.1	6258224.1	18 High St, Manly	Residential	NCA4	57	48	45	44	41	57	44	42	43
R3263	341678.67	6258567.7	11 Cliff St, Manly	Residential	NCA4	57	48	32	35	31	45	32	30	29
R3264	341664.12	6258446.6	55 Darley Rd, Manly	Residential	NCA4	57	48	48	47	43	58	46	44	47
R3265	341664.12	6258153.7	47 Osborne Rd, Manly	Residential	NCA4	57	48	44	45	42	55	43	41	37
R3266	341667.97	6258668	34 Ashburner St, Manly	Residential	NCA4	57	48	43	46	43	56	44	42	36
R3267	341665.62	6258211.4	20 High St, Manly	Residential	NCA4	57	48	45	46	43	57	44	42	42
R3268	341666.83	6258522.9	4 Cliff St, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	44
R3269	341668.82	6258051.9	58 Osborne Rd, Manly	Residential	NCA4	57	48	41	42	39	53	40	38	38
R3270	341685.91	6257959.3	81 Wood St, Manly	Residential	NCA4	57	48	37	40	36	49	38	36	36
R3271	341668.66	6258355.2	86 Darley Rd, Manly	Residential	NCA4	57	48	44	43	40	53	41	39	43
R3272	341677.53	6258351.8	86 Darley Rd, Manly	Residential	NCA4	57	48	43	45	41	55	42	40	41
R3273	341671.01	6258032.9	60 Osborne Rd, Manly	Residential	NCA4	57	48	42	45	41	54	43	41	38
R3274	341674.31	6258202.8	22-22 High St, Manly	Residential	NCA4	57	48	45	46	43	57	45	43	41
R3275	341671.13	6258434.2	57 Darley Rd, Manly	Residential	NCA4	57	48	47	49	45	58	46	44	46
R3276	341671.98	6258280.9	19 High St, Manly	Residential	NCA4	57	48	45	45	43	56	44	42	44
R3277	341672.7	6258326.3	88-90 Darley Rd, Manly	Residential	NCA4	57	48	44	45	42	55	43	41	41
R3278	341680.48	6258584.9	15 Cliff St, Manly	Residential	NCA4	57	48	46	48	43	57	46	44	44
R3279	341692.04	6257934.9	83 Wood St, Manly	Residential	NCA4	57	48	24	26	22	36	24	22	22
R3280	341682.78	6258672.6	38 Ashburner St, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	42
R3281	341679.12	6258191.7	24 High St, Manly	Residential	NCA4	57	48	45	46	43	57	45	43	42
R3282	341679.88	6258266.5	19 High St, Manly	Residential	NCA4	57	48	44	45	43	56	43	41	43
R3283	341681.18	6258533.5	6 Cliff St, Manly	Residential	NCA4	57	48	49	50	47	60	48	46	45
R3284	341685.63	6258602.8	17 Cliff St, Manly	Residential	NCA4	57	48	47	50	47	60	48	46	44
R3285	341678.72	6258307.4	92 Darley Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3286	341685.3	6258181	26 High St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	42
R3287	341685.35	6258029.6	62 Osborne Rd, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R3288	341695.89	6258625.5	19 Cliff St, Manly	Residential	NCA4	57	48	47	50	47	60	48	46	43
R3289	341681.88	6258125.7	49 Osborne Rd, Manly	Residential	NCA4	57	48	45	46	41	55	44	42	41
R3290	341687.49	6258255.3	25 High St, Manly	Residential	NCA4	57	48	45	47	43	57	45	43	43
R3291	341692.42	6258012.7	64 Osborne Rd, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	37
R3292	341695.69	6258472.9	83 Addison Rd, Manly	Residential	NCA4	57	48	47	49	45	59	47	45	46
R3293	341694.14	6258245.8	27 High St, Manly	Residential	NCA4	57	48	44	47	42	56	44	42	43
R3294	341692.78	6258173.7	28 High St, Manly	Residential	NCA4	57	48	44	47	43	57	45	43	40
R3295	341696.43	6258647.6	21B Cliff St, Manly	Residential	NCA4	57	48	47	50	47	60	48	46	43
R3296	341694.32	6257896.1	24 Spring Cove Av, Manly	Residential	NCA4	57	48	32	31	28	42	30	28	21
R3297	341700.65	6258686	40-42 Ashburner St, Manly	Residential	NCA4	57	48	44	46	42	55	43	41	42
R3298	341696.37	6258545	10 Cliff St, Manly	Residential	NCA4	57	48	48	50	47	60	48	46	44
R3299	341713.36	6257928.8	2 Spring Cove Av, Manly	Residential	NCA4	57	48	23	25	21	35	23	21	22
R3300	341706.49	6258612.8	19 Cliff St, Manly	Residential	NCA4	57	48	44	45	42	55	43	41	39
R3301	341698.66	6258300.6	92 Darley Rd, Manly	Residential	NCA4	57	48	39	42	39	52	40	38	37
R3302	341697.77	6257987.2	66 Osborne Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	37
R3303	341697.77	6257987.2	66 Osborne Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	37
R3304	341703.22	6258234.4	29 High St, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	43
R3305	341720.87	6258459.4	85B Addison Rd, Manly	Residential	NCA4	57	48	29	31	28	41	29	27	27
R3306	341709.77	6258655.6	23 Cliff St, Manly	Residential	NCA4	57	48	47	49	46	59	47	45	43
R3307	341705.37	6258408.6	73 Darley Rd, Manly	Residential	NCA4	57	48	48	48	45	58	46	44	46
R3308	341726.56	6258530.8	14 Cliff St, Manly	Residential	NCA4	57	48	30	32	28	42	29	27	27
R3309	341713.83	6258224.1	31 High St, Manly	Residential	NCA4	57	48	43	45	42	55	43	41	40
R3310	341717.56	6258304.6	94 Darley Rd, Manly	Residential	NCA4	57	48	42	43	40	54	41	39	40
R3311	341723.61	6257945.7	4 Spring Cove Av, Manly	Residential	NCA4	57	48	37	38	35	48	36	34	22
R3312	341791.85	6257886.4	17 Spring Cove Av, Manly	Residential	NCA4	57	48	21	23	20	33	21	19	20
R3313	341764.16	6257882.9	19 Spring Cove Av, Manly	Residential	NCA4	57	48	24	25	22	35	23	21	19
R3314	341756	6257879.8	21 Spring Cove Av, Manly	Residential	NCA4	57	48	18	20	17	30	18	16	17
R3315	341722.56	6257876	23 Spring Cove Av, Manly	Residential	NCA4	57	48	26	21	18	33	20	18	18
R3316	341718.07	6258620	21A Cliff St, Manly	Residential	NCA4	57	48	45	48	45	58	46	44	43
R3317	341720.51	6258475.6	87 Addison Rd, Manly	Residential	NCA4	57	48	45	46	42	55	44	42	44
R3318	341719.79	6258213	33 High St, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	43
R3														

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3330	341742.98	6258565	16 Cliff St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	27
R3331	341732.68	6258625	23A Cliff St, Manly	Residential	NCA4	57	48	46	49	46	59	47	45	43
R3332	341734.79	6258438	9 126 Addison Rd, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	41
R3333	341732.81	6258123	4 25 Marshall St, Manly	Residential	NCA4	57	48	43	46	43	56	44	42	41
R3334	341734.41	6258044	9 63 Osborne Rd, Manly	Residential	NCA4	57	48	42	42	40	53	41	39	37
R3335	341730.57	6258732	2 Reddall St, Manly	Commercial	NCA2	70	Non Res	41	42	40	54	42	40	35
R3336	341739.67	6258034	8 65 Osborne Rd, Manly	Residential	NCA4	57	48	41	41	38	53	39	37	37
R3337	341750.75	6258409	5 44 Fairy Bower Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3338	341738.2	6258338	87 Darley Rd, Manly	Residential	NCA4	57	48	44	45	41	54	44	42	41
R3339	341754.68	6257941	7 8 Spring Cove Av, Manly	Residential	NCA4	57	48	19	21	18	31	19	17	18
R3340	341744.33	6258707	5 2 Reddall St, Manly	Residential	NCA4	57	48	44	48	44	57	45	43	42
R3341	341743.62	6258508	95 Addison Rd, Manly	Residential	NCA4	57	48	46	49	45	58	46	44	44
R3342	341758.08	6257636	3 103 Stuart St, Manly	Educational	NCA4	45	Non Res	34	36	33	46	34	32	31
R3343	341747.26	6258629	25 Cliff St, Manly	Residential	NCA4	57	48	46	49	46	59	47	45	42
R3344	341747.42	6258564	7 18-20 Cliff St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	35
R3345	341734.15	6258063	1 61 Osborne Rd, Manly	Residential	NCA4	57	48	42	44	40	54	42	40	37
R3346	341747.53	6258449	1 128 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	54	42	40	41
R3347	341749.67	6258548	4 18-20 Cliff St, Manly	Residential	NCA4	57	48	43	45	41	54	43	41	42
R3348	341755.73	6257992	3 1-9 Spring Cove Av, Manly	Residential	NCA4	57	48	37	38	35	50	38	36	36
R3349	341744.61	6258330	93 Darley Rd, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	40
R3350	341751.08	6258246	2 104 Darley Rd, Manly	Residential	NCA4	57	48	44	46	43	57	45	43	40
R3351	341751.11	6258382	31 Fairy Bower Rd, Manly	Residential	NCA4	57	48	42	44	40	54	42	40	41
R3352	341742.95	6257594	4 103 Stuart St, Manly	Educational	NCA4	45	Non Res	34	36	33	46	34	32	32
R3353	341760.63	6257901	8 20 Spring Cove Av, Manly	Residential	NCA4	57	48	25	24	21	34	22	20	18
R3354	341757.74	6258518	5 99 Addison Rd, Manly	Residential	NCA4	57	48	45	47	44	57	45	43	44
R3355	341754.32	6258411	4 2 Fairly Bower Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3356	341760.3	6258552	18 Cliff St, Manly	Residential	NCA4	57	48	43	45	41	54	42	40	41
R3357	341758.73	6258456	7 130 Addison Rd, Manly	Residential	NCA4	57	48	43	44	41	54	42	40	41
R3358	341755.56	6258321	8 97 Darley Rd, Manly	Residential	NCA4	57	48	43	43	41	54	42	40	41
R3359	341762.84	6258640	5 27B Cliff St, Manly	Residential	NCA4	57	48	44	47	41	57	45	43	42
R3360	341763.57	6258153	7 27-29 Marshall St, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	40
R3361	341766.14	6258679	5 4-6 Reddall St, Manly	Residential	NCA4	57	48	44	46	43	57	45	43	42
R3362	341765.45	6258371	7 29 Fairy Bower Rd, Manly	Residential	NCA4	57	48	42	44	40	53	41	39	40
R3363	341763.36	6258308	5 99 Darley Rd, Manly	Residential	NCA4	57	48	40	40	35	52	39	37	36
R3364	341777.07	6257993	1 1 Spring Cove Av, Manly	Residential	NCA4	57	48	37	38	36	49	37	35	26
R3365	341776.18	6258187	2 27 Marshall St, Manly	Residential	NCA4	57	48	41	42	39	52	40	38	38
R3366	341771.88	6257944	10 Spring Cove Av, Manly	Residential	NCA4	57	48	36	31	28	41	29	27	29
R3367	341772.42	6258430	40 Fairy Bower Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3368	341772.31	6258524	9 101 Addison Rd, Manly	Residential	NCA4	57	48	43	46	41	56	44	42	43
R3369	341772.45	6258464	8 132 Addison Rd, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	41
R3370	341796.83	6258572	8 22 Cliff St, Manly	Residential	NCA4	57	48	29	30	27	40	28	26	26
R3371	341768.35	6258360	6 27 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3372	341766.86	6258297	7 101 Darley Rd, Manly	Residential	NCA4	57	48	43	43	40	53	41	39	42
R3373	341778.99	6258661	27-27 Cliff St, Manly	Residential	NCA4	57	48	44	47	44	57	45	43	41
R3374	341775.52	6258285	7 105 Darley Rd, Manly	Residential	NCA4	57	48	43	43	40	53	41	39	42
R3375	341781.68	6258471	8 134 Addison Rd, Manly	Residential	NCA4	57	48	42	44	40	54	42	40	41
R3376	341780.16	6258355	23 Fairy Bower Rd, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	38
R3377	341795.31	6257947	8 12 Spring Cove Av, Manly	Residential	NCA4	57	48	30	30	28	42	29	27	25
R3378	341778.83	6258644	1 27-27 Cliff St, Manly	Residential	NCA4	57	48	44	46	43	56	44	42	41
R3379	341785.15	6258528	8 103 Addison Rd, Manly	Residential	NCA4	57	48	44	46	41	56	44	42	41
R3380	341785.89	6258595	7 28A Cliff St, Manly	Residential	NCA4	57	48	44	45	42	55	43	41	41
R3381	341781.46	6258277	3 107 Darley Rd, Manly	Residential	NCA4	57	48	41	43	39	53	40	38	39
R3382	341783.07	6258339	5 21 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3383	341796.2	6258441	7 38 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3384	341791.73	6258330	19 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	39	53	41	39	40
R3385	341794.15	6258480	2 136 Addison Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3386	341788.57	6258196	6 27 Marshall St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	38
R3387	341795.31	6258615	8 30 Cliff St, Manly	Residential	NCA4	57	48	42	44	41	54	42	40	39
R3388	341798.44	6257637	9 103 Stuart St, Manly	Educational	NCA4	45	Non Res	34	36	33	46	34	32	32
R3389	341783.74	6258716	8 129 Bower St, Manly	Residential	NCA4	57	48	44	48	41	58	45	43	41
R3390	341794.69	6258545	1 105 Addison Rd, Manly	Residential	NCA4	57	48	44	46	40	56	44	42	41
R3391	341811.37	6257950	6 14 Spring Cove Av, Manly	Residential	NCA4	57	48	32	32	29	43	30	28	27
R3392	341797.29	6258417	8 36A Fairy Bower Rd, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	36
R3393	341799.04	6258690	7 7 Reddall St, Manly	Residential	NCA4	57	48	41	44	41	54	42	40	36
R3394	341797.5	6258320	7 15 Fairy Bower Rd, Manly	Residential	NCA4	57	48	40	40	37	50	38	36	39
R3395	341799.91	6258400	8 34 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3396	341802.5	6257685	103 Stuart St, Manly	Educational	NCA4	45	Non Res	34	36	33	46	34	32	28
R3397	341804.69	6258263	9 111 Darley Rd, Manly	Residential	NCA4	57	48	42	43	40	54	42	40	39
R3398	341802.37	6257987	1 11-15 Spring Cove Av, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	30
R3399	341802.37	6257987	1 11-15 Spring Cove Av, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	30
R3400	341805.03	6258303	7 13 Fairy Bower Rd, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	39
R3401	341807.71	6258547	2 107 Addison Rd, Manly	Residential	NCA4	57	48	43	45	41	55	43	41	41
R3402	341811.31	6258625	9 38 Cliff St, Manly	Residential	NCA4	57	48	42	44	40	54	42	40	39
R3403	341812.19	6258588	14 Reddall St, Manly	Residential	NCA4	57	48	41	44	40	54	41	39	34
R3404	341812.37	6258673	6 29 Cliff St, Manly	Residential	NCA4	57	48	42	43	40	53	41	39	41
R3405	341809.87	6258388	8 30 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3406	341814.26	6258238	2 113 Darley Rd, Manly	Residential	NCA4	57	48	41	43	39	53	41	39	39
R3407	341815.83	6258379	7 26-28 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	39	53	41	39	40
R3408	341824.76	6258718	3 127 Bower St, Manly	Residential	NCA4	57	48	37	40	37	50	38	36	32
R3409	341820.53	6258556	3 109 Addison Rd, Manly	Residential	NCA4	57	48	42	43	40	53	41	39	39
R3410	341822.02	6258226	5 115 Darley Rd, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	39
R3411	341817.67	6258578	7 16 Reddall St, Manly	Residential	NCA4	57	48	40	42	38	51	40	38	33
R3412	341826.52	6258605	3 14 Reddall St, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	32
R3413	341827.01	6257648	8 17 Spring Cove Av, Manly	Educational	NCA4	45	Non Res	34	36	33	46	34	32	29
R3414	341820	6257942	16 Spring Cove Av, Manly	Residential	NCA4	57	48	31	31	28	41	29	27	27
R3415	341825.28	6258367	6 24 Fairy Bower Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	40
R3416	341822.26	6258573	18 Reddall St, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	33
R3417	341829.36	6258423	4 1 College St, Manly	Residential	NCA4	57	48	41	41	38	51	40	38	39
R3418	341829.41	6258568	3 111 Addison Rd, Manly	Residential	NCA4	57	48	41	43	40	53	41	39	36
R3419	341830.26	6258213	4 117 Darley Rd, Manly	Residential	NCA4	57	48	39	41	38	51	39	37	38
R3420	341832.28	6258429	1 2 College St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	38
R3421	341836.55	6258692	8 123 Bower St, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	37
R3422	341834.29	6258355	22 Fairy Bower Rd, Manly	Residential	NCA4	57	48	40						

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3434	341857.33	6258666.9	121 Bower St, Manly	Residential	NCA4	57	48	41	43	39	53	40	38	33
R3435	341854.84	6258465.6	4 College St, Manly	Residential	NCA4	57	48	40	41	38	51	39	37	38
R3436	341852.61	6258754.8	132-134 Bower St, Manly	Residential	NCA4	57	48	42	45	42	55	43	41	40
R3437	341856.35	6258316.6	16 Fairy Bower Rd, Manly	Residential	NCA4	57	48	39	41	37	51	39	37	38
R3438	341860.34	6258394.4	6 College St, Manly	Residential	NCA4	57	48	39	40	37	50	38	36	38
R3439	341860.14	6258606.8	11 Reddall St, Manly	Residential	NCA4	57	48	40	42	39	52	40	38	33
R3440	341864.41	6258647.8	119 Bower St, Manly	Residential	NCA4	57	48	28	30	27	40	28	26	25
R3441	341859.5	6258723.2	128-130 Bower St, Manly	Residential	NCA4	57	48	39	42	37	52	40	38	33
R3442	341864.33	6258471.5	5 College St, Manly	Residential	NCA4	57	48	35	36	33	46	34	32	31
R3443	341868.22	6258309.6	14 Fairy Bower Rd, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3444	341868.12	6258712.4	126 Bower St, Manly	Residential	NCA4	57	48	38	41	38	51	39	37	31
R3445	341873.26	6258364.7	6 College St, Manly	Residential	NCA4	57	48	36	36	33	46	34	32	34
R3446	341876.46	6258296	12 Fairy Bower Rd, Manly	Residential	NCA4	57	48	38	40	37	50	38	36	37
R3447	341883.55	6258633.8	115 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	28
R3448	341894.49	6258119.8	106 Darley Rd, Manly	Educational	NCA4	45	Non Res	38	40	36	50	37	35	36
R3449	341883.5	6258606	111 Bower St, Manly	Residential	NCA4	57	48	28	30	27	40	28	26	24
R3450	341885.35	6258346.3	6 College St, Manly	Residential	NCA4	57	48	34	35	31	45	33	31	32
R3451	341890.04	6258503.4	28 Reddall St, Manly	Residential	NCA4	57	48	35	33	29	43	31	29	25
R3452	341903.88	6258132	106 Darley Rd, Manly	Educational	NCA4	45	Non Res	38	40	36	50	37	35	36
R3453	341893.94	6258330.5	6 College St, Manly	Residential	NCA4	57	48	35	34	31	44	32	30	31
R3454	341891.21	6258701.9	122-124 Bower St, Manly	Residential	NCA4	57	48	38	41	37	51	39	37	30
R3455	341902.23	6258482.2	30 Reddall St, Manly	Residential	NCA4	57	48	30	32	29	42	30	28	27
R3456	341900.18	6258324.2	6 College Grn, Manly	Residential	NCA4	57	48	34	33	30	44	31	29	32
R3457	341915.81	6258467.7	32 Reddall St, Manly	Residential	NCA4	57	48	24	26	23	36	24	22	22
R3458	341911.74	6258595.8	105 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	27
R3459	341901.13	6258682.6	120 Bower St, Manly	Residential	NCA4	57	48	35	36	33	47	35	33	26
R3460	341899.17	6258041.3	106A Darley Rd, Manly	Educational	NCA4	45	Non Res	37	39	36	49	37	35	35
R3461	341905.72	6258570.3	103 Bower St, Manly	Residential	NCA4	57	48	32	33	29	43	31	29	25
R3462	341917.06	6258662.3	114 Bower St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	24
R3463	341893.31	6258282.5	2 Fairy Bower Rd, Manly	Hotel	NCA4	50	Non Res	38	40	37	50	38	36	30
R3464	341919.18	6258557	101 Bower St, Manly	Residential	NCA4	57	48	30	32	29	42	30	28	24
R3465	341933.92	6258678.4	118 Bower St, Manly	Residential	NCA4	57	48	25	27	24	37	25	23	22
R3466	341920.15	6258639.2	108 Bower St, Manly	Residential	NCA4	57	48	32	33	30	43	31	29	24
R3467	341915.54	6258147.2	106A Darley Rd, Manly	Educational	NCA4	45	Non Res	39	40	37	50	38	36	36
R3468	341930.84	6258444.3	7 College St, Manly	Residential	NCA4	57	48	35	37	34	47	36	34	32
R3469	341928.17	6258626.9	108 Bower St, Manly	Residential	NCA4	57	48	27	29	25	39	27	25	22
R3470	341933.97	6258110.6	106A Darley Rd, Manly	Educational	NCA4	45	Non Res	37	39	36	49	37	35	35
R3471	341948.05	6258078.7	106A Darley Rd, Manly	Educational	NCA4	45	Non Res	37	38	35	48	36	34	33
R3472	341938.6	6258531	29 Reddall St, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	25
R3473	341938.64	6258671.6	116 Bower St, Manly	Residential	NCA4	57	48	33	35	28	45	33	31	24
R3474	341946.64	6258553.7	97 Bower St, Manly	Residential	NCA4	57	48	23	25	21	35	22	20	20
R3475	341952.57	6258615.9	104 Bower St, Manly	Residential	NCA4	57	48	22	24	21	34	22	20	20
R3476	341945.15	6258506.2	31 Reddall St, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	25
R3477	341967.16	6258656.6	17 Marine Pde, Manly	Residential	NCA4	57	48	27	29	26	39	27	25	21
R3478	341945.88	6258096.2	126 Darley Rd, Manly	Educational	NCA4	45	Non Res	36	38	35	48	36	34	33
R3479	341970.28	6258536.9	95 Bower St, Manly	Residential	NCA4	57	48	31	32	29	42	30	28	22
R3480	341996.62	6258571.8	1 Bower St, Manly	Residential	NCA4	57	48	20	22	19	32	20	18	18
R3481	341999.2	6258607.2	98-100 Bower St, Manly	Residential	NCA4	57	48	20	22	18	31	19	17	18
R3482	341999.2	6258607.2	98-100 Bower St, Manly	Residential	NCA4	57	48	20	22	18	31	19	17	18
R3483	342000.31	6258584.3	3 Bower Lane, Manly	Residential	NCA4	57	48	20	21	18	31	19	17	18
R3484	342000.31	6258584.3	3 Bower Lane, Manly	Residential	NCA4	57	48	20	21	18	31	19	17	18
R3485	342006.36	6258496.9	93 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	25
R3486	342011.47	6258599	7-9 Marine Pde, Manly	Commercial	NCA4	70	Non Res	20	22	18	32	20	18	18
R3487	342023.75	6258579.7	94 Bower St, Manly	Commercial	NCA4	70	Non Res	20	22	19	32	20	18	18
R3488	342038.57	6258581.6	92 Bower St, Manly	Residential	NCA4	57	48	21	23	20	33	21	19	18
R3489	342036.83	6258516.8	89-91 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	27
R3490	342042.81	6258606.3	94 Bower St, Manly	Commercial	NCA4	70	Non Res	20	22	18	32	20	18	18
R3491	342021.36	6258220.8	151 Darley Rd, Manly	Place of wo	NCA4	45	Non Res	37	39	36	49	37	35	36
R3492	342051.48	6258268.1	151 Darley Rd, Manly	Educational	NCA4	45	Non Res	39	41	38	51	39	37	35
R3493	342053.16	6257298.2	17 North Head Scenic Dr, Manly	Hotel	NCA4	50	Non Res	33	35	32	45	33	31	30
R3494	342063.88	6258568.9	86 Bower St, Manly	Residential	NCA4	57	48	34	36	31	46	34	32	23
R3495	342065.94	6258441.9	1 Montpelier Pl, Manly	Residential	NCA4	57	48	37	39	36	49	37	35	35
R3496	342077.86	6258590.5	84-84 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	24
R3497	342086.12	6258520.4	83 Bower St, Manly	Residential	NCA4	57	48	37	39	36	49	37	35	29
R3498	342087.87	6258459.9	2 Montpelier Pl, Manly	Residential	NCA4	57	48	37	39	36	49	37	35	33
R3499	342091.6	6257331	33 North Head Scenic Dr, Manly	Hotel	NCA4	50	Non Res	34	34	31	47	34	32	29
R3500	342090.08	6258578.1	80 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	25
R3501	342068.25	6258022.2	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	35	37	34	47	35	33	33
R3502	342068.25	6258022.2	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	35	37	34	47	35	33	33
R3503	342092.25	6258567.3	80 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	26
R3504	342101.2	6258527.5	81 Bower St, Manly	Residential	NCA4	57	48	37	39	35	49	37	35	30
R3505	342097.76	6258463.5	3 Montpelier Pl, Manly	Residential	NCA4	57	48	37	39	35	49	37	35	34
R3506	342084.41	6258263.5	151 Darley Rd, Manly	Educational	NCA4	45	Non Res	38	40	38	51	39	37	36
R3507	342107.95	6258561.8	78 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	27
R3508	342111.84	6258603.9	78 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	25
R3509	342117.57	6258461.7	4 Montpelier Pl, Manly	Residential	NCA4	57	48	37	38	35	48	36	34	33
R3510	342098.16	6258142.6	1 Cerretti Cr, Manly	Hotel	NCA4	50	Non Res	37	40	36	50	37	35	34
R3511	342061.89	6258070.6	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	36	37	34	48	35	33	34
R3512	342061.89	6258070.6	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	36	37	34	48	35	33	34
R3513	342127.58	6258601.1	76 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	27
R3514	342124.37	6258464.5	5 Montpelier Pl, Manly	Residential	NCA4	57	48	37	38	35	48	36	34	34
R3515	342130.36	6257989.2	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	25	26	23	37	24	22	19
R3516	342130.36	6257989.2	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	25	26	23	37	24	22	19
R3517	342135.17	6258539.1	75 Bower St, Manly	Residential	NCA4	57	48	37	38	35	48	36	34	34
R3518	342138.87	6258475.8	6 Montpelier Pl, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R3519	342143.09	6258601.7	74 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	28
R3520	342118.68	6258330.9	151 Darley Rd, Manly	Educational	NCA4	45	Non Res	38	40	38	50	38	36	35
R3521	342144.17	6258302.1	151 Darley Rd, Manly	Educational	NCA4	45	Non Res	37	38	35	48	36	34	35
R3522	342149.97	6258537.8	73 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R3523	342151.94	6258481	7 Montpelier Pl, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	35
R3524	342160.91	6258603.4	72 Bower St, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	29
R3525	342090.91	6258108.1	3 Cerretti Cr, Manly	Medical	NCA4	45	Non Res	37	38	35	48	36	34	34
R3526	342163.62	6257985.2	150 Darley Rd, Manly											

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3538	342190.53	6258191.5	2-3 Cerretti Cr, Manly	Hotel	NCA4	50	Non Res	38	39	35	50	37	35	35
R3539	342210.95	6257299.5	5 North Head Scenic Dr, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3540	342220.41	6258481.7	11 Montpelier Pl, Manly	Residential	NCA4	57	48	36	38	35	48	36	34	34
R3541	342215.68	6257877.4	150 Darley Rd, Manly	Medical	NCA4	45	Non Res	33	35	31	45	33	31	31
R3542	342220.99	6258607.7	62 Bower St, Manly	Residential	NCA4	57	48	36	37	34	47	35	33	30
R3543	342225.83	6258549.2	63-65 Bower St, Manly	Residential	NCA4	57	48	36	37	34	47	35	33	33
R3544	342235.55	6257312.4	11 North Head Scenic Dr, Manly	Residential	NCA4	57	48	32	33	31	44	32	30	28
R3545	342234.46	6258484.6	12 Montpelier Pl, Manly	Residential	NCA4	57	48	36	38	34	48	36	34	34
R3546	342231.37	6258583.3	60 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	31
R3547	342233.63	6257322.9	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	28
R3548	342217.26	6258213.8	2 Cerretti Cr, Manly	Hotel	NCA4	50	Non Res	35	37	34	47	35	33	33
R3549	342252.24	6258607.7	62 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	29
R3550	342248.94	6257338.8	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	34	30	44	32	30	28
R3551	342256.12	6258551.5	59 Bower St, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	33
R3552	342251.39	6258418.7	20 Montpelier Pl, Manly	Residential	NCA4	57	48	35	37	33	47	35	33	32
R3553	342267.06	6258578.3	56 Bower St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	23
R3554	342272.25	6257355.3	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	33	31	43	31	29	28
R3555	342269.56	6258398.7	21 Montpelier Pl, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	29
R3556	342273.47	6258548.3	57 Bower St, Manly	Residential	NCA4	57	48	34	29	26	39	27	25	32
R3557	342277.21	6258578.1	54 Bower St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	21
R3558	342274.03	6257360.7	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	28
R3559	342283.83	6258393.4	22 Montpelier Pl, Manly	Residential	NCA4	57	48	34	36	32	45	34	32	27
R3560	342267.73	6258483.5	19 Montpelier Pl, Manly	Residential	NCA4	57	48	35	37	34	47	35	33	33
R3561	342287.62	6258529.4	55 Bower St, Manly	Residential	NCA4	57	48	25	27	23	37	25	23	20
R3562	342291.86	6258574.9	50 Bower St, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	25
R3563	342295.5	6258384.9	23 Montpelier Pl, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	27
R3564	342292.77	6257383.8	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	28
R3565	342304.23	6258541.2	53 Bower St, Manly	Residential	NCA4	57	48	28	28	25	38	26	24	21
R3566	342301.11	6258003.7	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	31
R3567	342301.11	6258003.7	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	31
R3568	342308.25	6258571.9	50 Bower St, Manly	Residential	NCA4	57	48	34	36	33	46	34	32	25
R3569	342308.98	6258376.5	24 Montpelier Pl, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	26
R3570	342309.2	6257980.4	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	34	31	45	33	31	31
R3571	342317.59	6258524.6	51 Bower St, Manly	Residential	NCA4	57	48	25	27	23	37	25	23	20
R3572	342315.2	6257965.9	4 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	45	33	31	31
R3573	342311.32	6257405.8	7 St Barbaras Av, Manly	Residential	NCA4	57	48	32	33	31	44	32	30	28
R3574	342318.68	6258364.3	25 Montpelier Pl, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3575	342328	6258593.2	46 Bower St, Manly	Residential	NCA4	57	48	34	36	32	46	34	32	26
R3576	342319.83	6258015.7	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	31
R3577	342323.48	6257957.9	4 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	45	32	30	30
R3578	342331.63	6258521.8	49 Bower St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	21
R3579	342337.18	6258379.6	26 Montpelier Pl, Manly	Residential	NCA4	57	48	23	25	22	35	23	21	18
R3580	342331.56	6258001.3	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	31
R3581	342331.56	6258001.3	4 Artillery Dr, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	31
R3582	342333.6	6257933.4	4 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3583	342338.41	6258571.1	44 Bower St, Manly	Residential	NCA4	57	48	29	30	27	40	28	26	21
R3584	342334.21	6258470.4	41 Bower St, Manly	Residential	NCA4	57	48	30	32	29	42	30	28	23
R3585	342339.56	6258447.3	39 Bower St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	22
R3586	342340.41	6258428.1	37 Bower St, Manly	Residential	NCA4	57	48	34	36	32	45	34	32	23
R3587	342343.26	6258515.3	47 Bower St, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	24
R3588	342354.46	6258567.8	42 Bower St, Manly	Residential	NCA4	57	48	33	36	32	46	34	32	23
R3589	342353.3	6257898.9	8 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3590	342350.31	6257885.4	8 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	30	44	32	30	30
R3591	342355.84	6257983.5	4 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	30
R3592	342351.69	6257503.1	7 St Barbaras Av, Manly	Commercial	NCA4	70	Non Res	31	32	28	42	29	27	28
R3593	342359.05	6257837.8	8 Artillery Dr, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	29
R3594	342351.98	6257848.8	8 Artillery Dr, Manly	Residential	NCA4	57	48	32	33	30	43	31	29	30
R3595	342354.7	6257921	10 Artillery Dr, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	29
R3596	342357.31	6258397.9	35 Bower St, Manly	Residential	NCA4	57	48	31	28	24	38	26	24	17
R3597	342355.62	6257859.6	8 Artillery Dr, Manly	Residential	NCA4	57	48	32	33	30	43	31	29	30
R3598	342356.92	6257810.8	8 Artillery Dr, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	29
R3599	342361.98	6258510.5	45 Bower St, Manly	Residential	NCA4	57	48	33	35	31	45	33	31	24
R3600	342358.15	6257773.8	8 Artillery Dr, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	29
R3601	342358.17	6257792.3	8 Artillery Dr, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	29
R3602	342363.55	6257474.1	17 St Barbaras Av, Manly	Commercial	NCA4	70	Non Res	32	31	28	42	29	27	28
R3603	342382.05	6257331.2	1370 North Head Scenic Dr, Manly	Educational	NCA4	45	Non Res	31	33	30	43	31	29	27
R3604	342369.51	6258501.6	43 Bower St, Manly	Residential	NCA4	57	48	34	35	32	45	33	31	25
R3605	342363.16	6257282.2	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	29	31	28	41	29	27	23
R3606	342382.14	6258365.6	31 Bower St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	27
R3607	342385.86	6258565.3	38 Bower St, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	21
R3608	342401.52	6258569.36	36 Bower St, Manly	Residential	NCA4	57	48	21	23	20	33	21	19	16
R3609	342403.89	6258367.4	29 Bower St, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	25
R3610	342420.85	6257608.1	7 St Barbaras Av, Manly	Educational	NCA4	45	Non Res	31	32	29	42	30	28	28
R3611	342405.92	6258554.3	32 Bower St, Manly	Residential	NCA4	57	48	33	35	32	45	33	31	29
R3612	342422.86	6258374.8	27 Bower St, Manly	Residential	NCA4	57	48	33	34	31	44	32	30	25
R3613	342417.31	6257355.8	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	31	31	28	43	29	27	27
R3614	342413.25	6257699.8	1 Bluefish Dr, Manly	Hotel	NCA4	50	Non Res	31	33	30	43	31	29	28
R3615	342413.66	6257377.6	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	31	31	28	43	30	28	27
R3616	342419.6	6257332.3	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	31	31	29	43	31	29	26
R3617	342431.17	6258565.1	34 Bower St, Manly	Residential	NCA4	57	48	25	26	23	37	24	22	17
R3618	342435.55	6257448.1	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	29	31	28	41	29	27	27
R3619	342437.85	6258402.5	25 Bower St, Manly	Residential	NCA4	57	48	33	35	31	44	32	30	28
R3620	342438.81	6258381.7	25 Bower St, Manly	Residential	NCA4	57	48	33	34	31	44	32	30	29
R3621	342417.01	6257400.8	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	31	31	28	43	29	27	27
R3622	342446.68	6258412.3	23 Bower St, Manly	Residential	NCA4	57	48	33	34	31	44	32	30	26
R3623	342445.54	6258479.6	18 Bower St, Manly	Residential	NCA4	57	48	33	34	31	44	32	30	27
R3624	342445.01	6257363.7	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	28	30	27	40	28	26	26
R3625	342453.09	6257344.8	1370 North Head Scenic Dr, Manly	Commercial	NCA4	70	Non Res	28	30	27	40	28	26	26
R3626	342455.95	6257692.8	1 Bluefish Dr, Manly	Hotel	NCA4	50	Non Res	30	32	29	42	30	28	28
R3627	342457.74	6258422.2	21 Bower St, Manly	Residential	NCA4	57	48	33	34	31	44	32	30	26
R3628	342453.65	6258500.1	16 Bower St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	22
R3629	342457.08	6257633.3	1370 North Head Scenic Dr, Manly	Hotel	NCA4	50	Non Res	30	32	29	42	30	28	28
R3630	342456.44	6258604.6	1 Marine Pde, Manly	Residential	NCA4</									

RID	X	Y	Address	Type	NCA	NML-SH	NML-Night	S01	S02	S03	S04	S05	S06	S07
R3642	342521.6	6258487.2	9 Bower St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	27
R3643	342522.37	6258571	2 Bower St, Manly	Residential	NCA4	57	48	31	33	30	43	31	29	22
R3644	342544.93	6258497.5	5 Bower St, Manly	Residential	NCA4	57	48	32	34	31	44	32	30	26
R3645	342556.67	6258516.5	3 Bower St, Manly	Residential	NCA4	57	48	32	34	30	43	31	29	29
R3646	342582	6258534.4	1 Bower St, Manly	Residential	NCA4	57	48	32	33	30	43	31	29	29
OA01	340279.42	6257740.6	Manly to Spit	Passive Rec	NCA4	60	Non Res	38	39	36	50	37	35	35
OA02	339877.53	6258282.3	Forty Baskets Beach	Passive Rec	NCA4	60	Non Res	38	40	37	50	38	36	35
OA03	339624.05	6258575.5	Wellings reserve	Passive Rec	NCA4	60	Non Res	35	36	33	46	34	32	32
OA04	339615.13	6257636.9	Tania Park	Active Recr	NCA4	65	Non Res	27	29	26	39	27	25	25
OA05	340317.48	6258695.1	Fairlight beach	Passive Rec	NCA1	60	Non Res	27	28	25	39	26	24	24
OA06	340605.44	6258743.3	Delwood beach	Passive Rec	NCA1	60	Non Res	43	44	41	54	42	40	34
OA07	340810.1	6258730.8	Federation point	Passive Rec	NCA1	60	Non Res	54	55	51	65	53	51	43
OA08	341112.9	6258780.9	Manly Cove beach	Passive Rec	NCA2	60	Non Res	68	52	44	61	50	48	55
OA09	341339.86	6258619.9	East Manly Cove beach	Passive Rec	NCA2	60	Non Res	68	65	61	74	62	60	67
OA10	341418.13	6258486.3	East esplanade park	Passive Rec	NCA4	60	Non Res	56	58	54	68	56	54	55
OA11	341450.32	6257969.8	Little Manly beach	Passive Rec	NCA4	60	Non Res	27	27	25	38	26	24	23
OA12	341114.96	6257736.5	Manly Peace Park	Passive Rec	NCA4	60	Non Res	27	27	24	38	25	23	22
OA13	341481.68	6257731.9	Little Manly Point Park	Passive Rec	NCA4	60	Non Res	35	37	34	47	35	33	34
OA14	341866.99	6257791.5	Collins Beach	Passive Rec	NCA4	60	Non Res	21	23	19	33	21	19	18
OA15	342113.62	6258622.1	Fairy Bower Sea Pool	Passive Rec	NCA4	60	Non Res	27	29	26	39	27	25	19
OA16	342447.39	6258649.9	Shelly Beach	Passive Rec	NCA4	60	Non Res	32	34	31	44	32	30	23
OA17	341666.57	6258919.6	Manly Beach	Passive Rec	NCA2	60	Non Res	42	44	39	54	41	39	40
OA18	341140.53	6259124.3	Manly Oval	Active Recr	NCA3	65	Non Res	44	41	38	52	39	37	37
OA19	340945.9	6259167.7	Ivanhoe Park	Active Recr	NCA3	65	Non Res	25	27	24	37	25	23	24
OA20	340087.2	6259547.6	Weeroona Reserve Playground	Passive Rec	NCA1	60	Non Res	16	17	14	28	16	14	15
OA21	340321.83	6259782.1	Manly Golf Club	Active Recr	NCA1	65	Non Res	24	25	22	36	23	21	17
OA22	340559.25	6259825.3	LM Graham Reserve	Active Recr	NCA1	65	Non Res	20	17	14	30	15	13	16
OA23	341067.09	6258029	Little Penguin	Passive Rec	NCA4	60	Non Res	42	44	41	54	42	40	39

Appendix D

Construction noise contours



Paper Size ANSI A

0 250 500 m

Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere



TfNSW
 Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

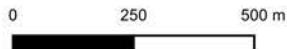
Scenario 1 - Noise contours,
 L_{Aeq}(15 min) dBA

Project
 Revision 12547220
 No. -
 Date. 15/08/2022

FIGURE D.1



Paper Size ANSI A



Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere

TfNSW
 Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

Scenario 2 - Noise contours,
 LAeq(15 min) dBA

Project
 Revision 12547220
 No. -
 Date. 15/08/2022

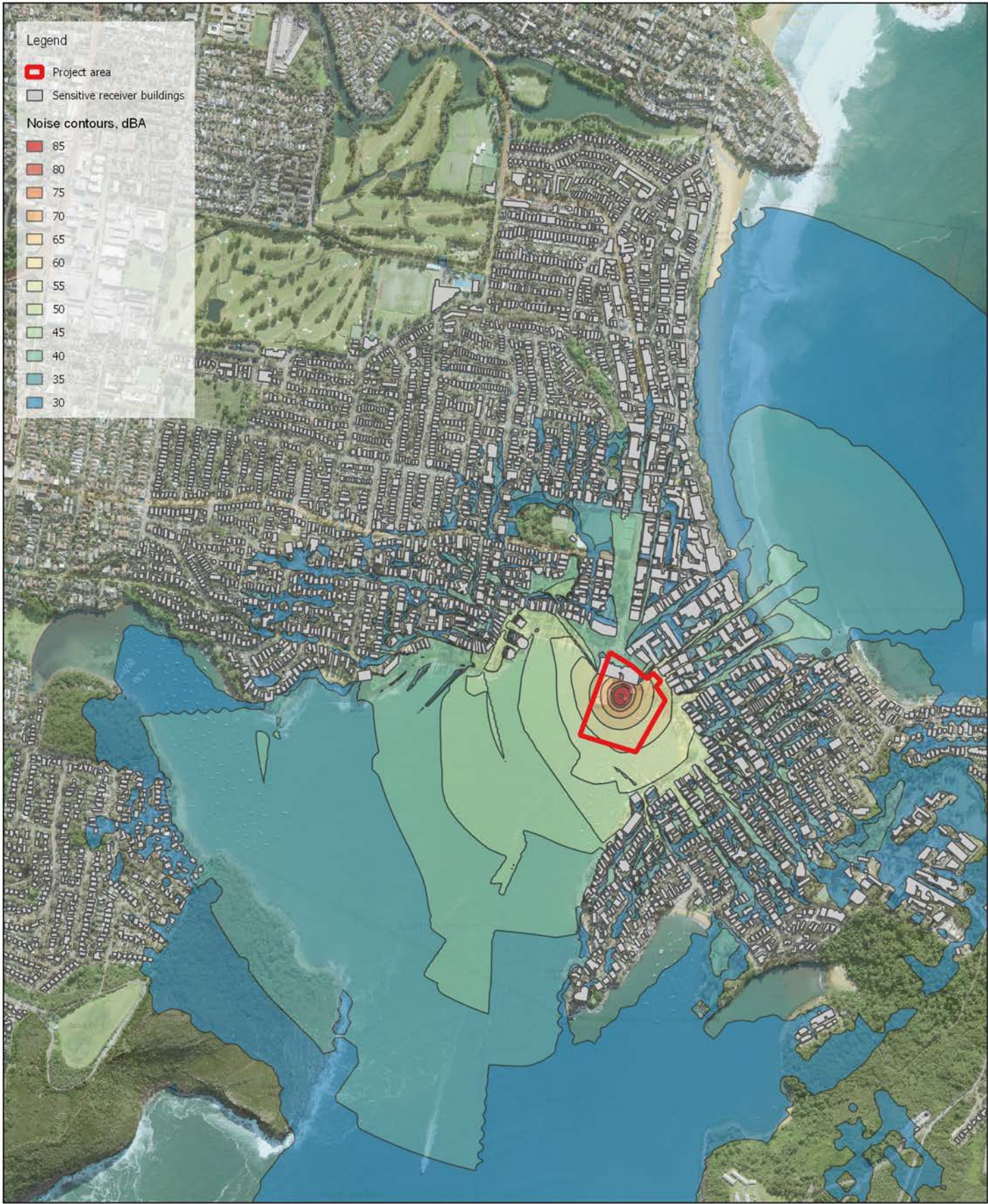
FIGURE D.2

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Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21112547220\Tech\Noise\03 Modelling\Manly.gxz

Print Date:

Created By: Rosy Browell

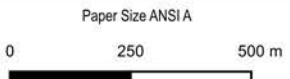


Legend

- Project area
- Sensitive receiver buildings

Noise contours, dBA

- 85
- 80
- 75
- 70
- 65
- 60
- 55
- 50
- 45
- 40
- 35
- 30



TfNSW
Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

Project
 Revision **12547220**
 No. -
 Date. **15/08/2022**

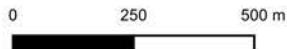
**Scenario 3 - Noise contours,
 L_{Aeq}(15 min) dBA**

FIGURE D.3

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Paper Size ANSI A



Map Projection: Mercator Auxillary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxillary Sphere

TfNSW
 Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

Scenario 4 - Noise contours,
 LAeq(15 min) dBA

Project
 Revision 12547220
 No. -
 Date. 15/08/2022

FIGURE D.4

Data Source:

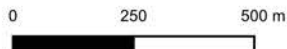
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Print Date:

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Paper Size ANSI A



Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere



TfNSW
 Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

Scenario 5 - Noise contours,
 L_{Aeq}(15 min) dBA

Project
 Revision 12547220
 No. -
 Date. 15/08/2022

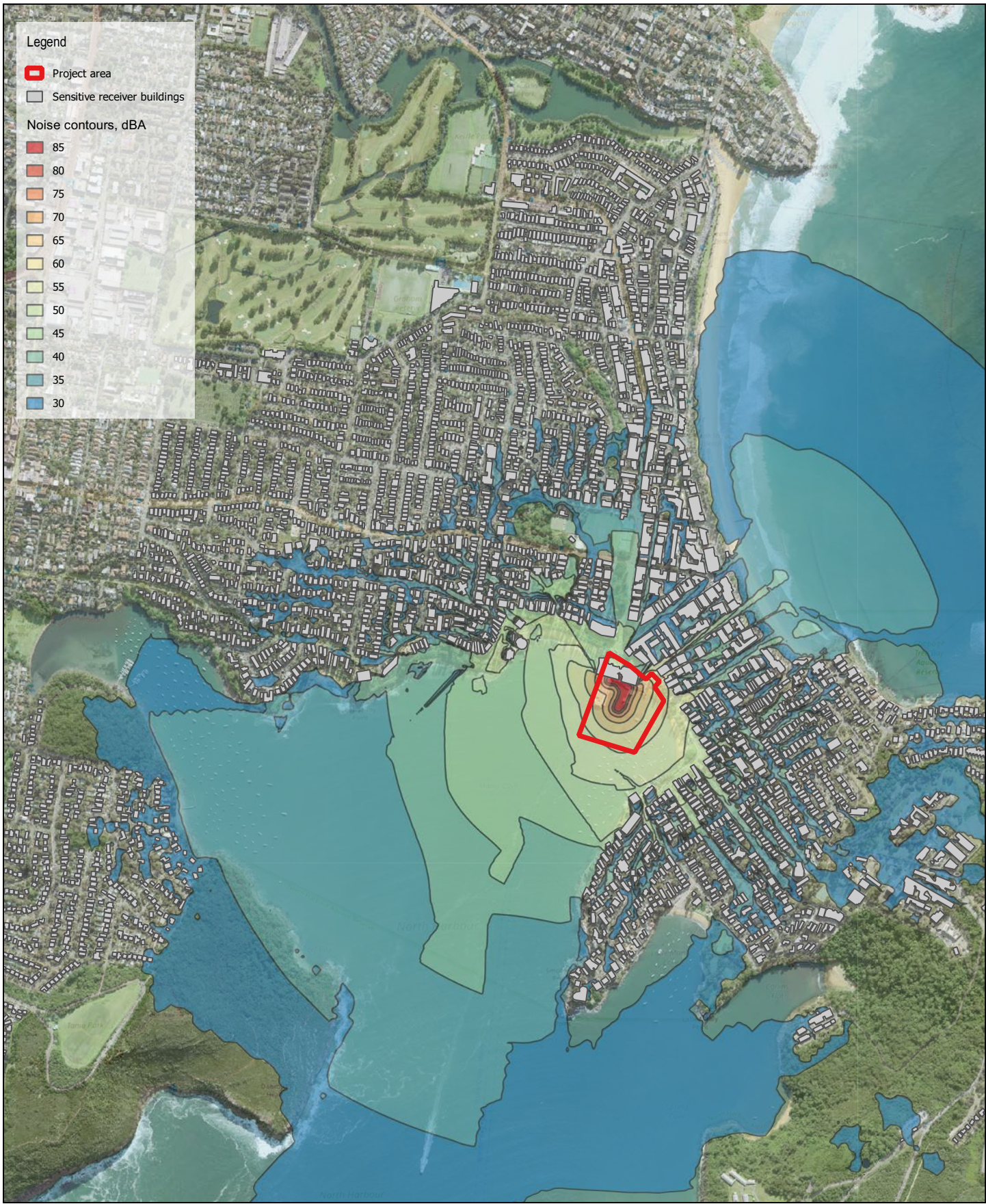
FIGURE D.5

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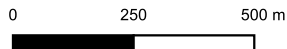
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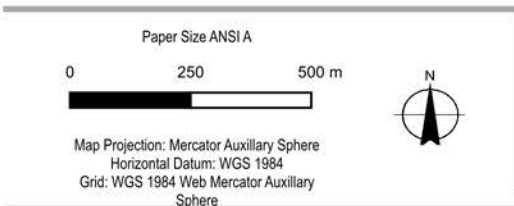
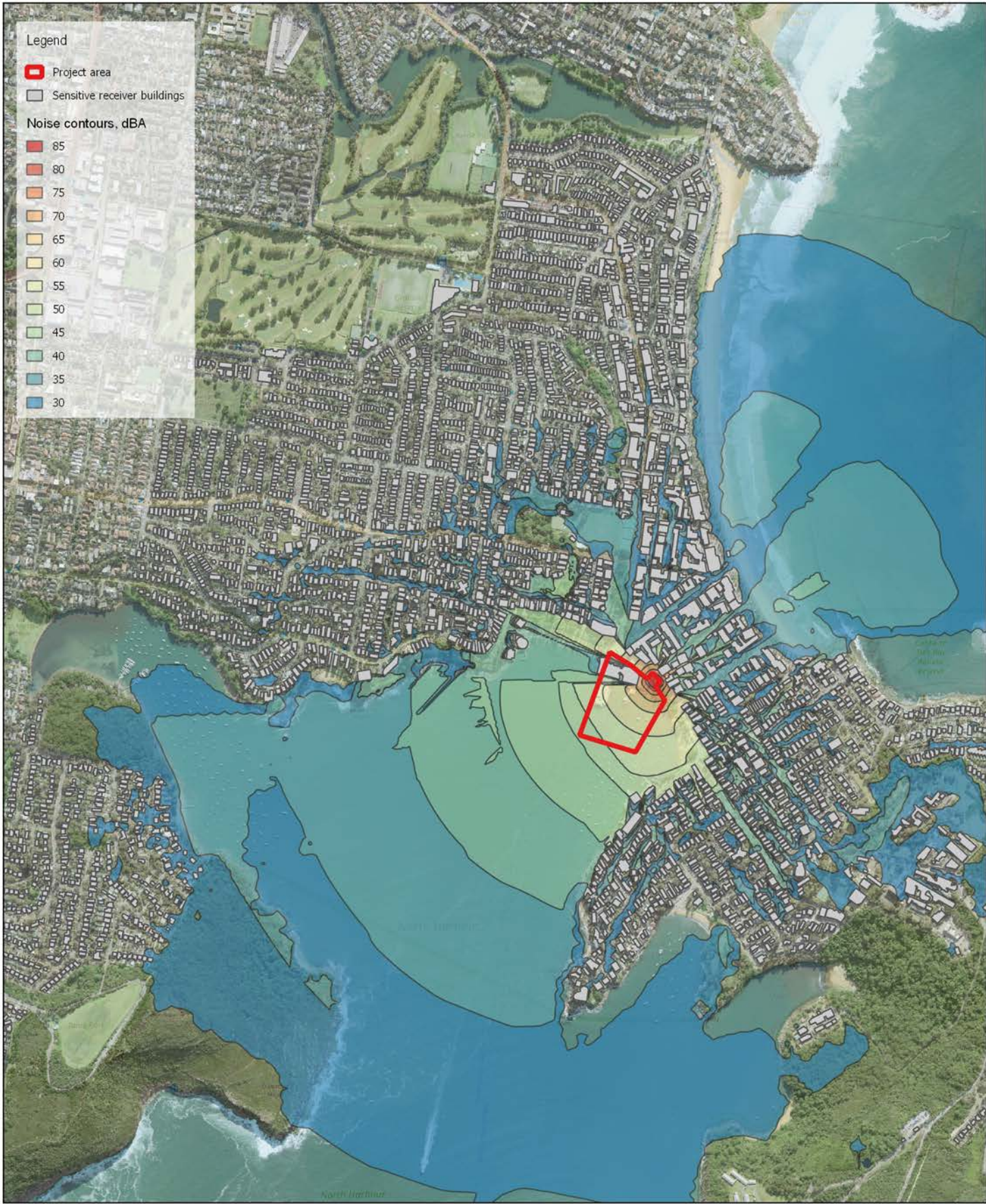
Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere

TfNSW
 Manly Wharf 3 Upgrade
 Noise and vibration impact assessment

Scenario 6 - Noise contours,
 LAeq(15 min) dBA

Project
 Revision 12547220
 No. -
 Date. 15/08/2022

FIGURE D.6



TfNSW
Manly Wharf 3 Upgrade
Noise and vibration impact assessment

Scenario 7 - Noise contours,
LAEq(15 min) dBA

Project
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No. -
Date. 15/08/2022

FIGURE D.7



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→ **The Power of Commitment**

Appendix D

Underwater noise impact assessment



Manly Wharf 3 Upgrade

Underwater noise impact assessment

Transport for NSW

05 September 2022

→ **The Power of Commitment**



Project name		Manly Wharf 3 Upgrade					
Document title		Manly Wharf 3 Upgrade Underwater noise impact assessment					
Project number		12547220					
File name		12547220-REP-Manly Wharf 3 Underwater Noise Assessment.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	M. Velasco R. Browell	P. Pandey	*on file	S.Fallon	*on file	5/08/22
S4	1	M. Velasco	P. Pandey	*on file	J.McKinney	*on file	23/08/22
S4	2	M. Velasco	P. Pandey	*on file	J.McKinney	*on file	5/09/22

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Glossary of terms

Term	Description
Ambient sound	Environmental background noise not of direct interest during a measurement or observation.
Decibel (dB)	Unit used in the logarithmic measure of sound strength.
Frequency	Rate at which water particles move backwards and forwards measured in cycles per seconds or Hertz (Hz).
Hearing threshold	The hearing threshold represents the lowest signal level an animal can detect at a particular frequency, usually referred (and measured) as the threshold at which an animal will indicate detection 50% of the time.
Impulse sound	Transient sound produced by a rapid release of energy, e.g. from a piling impact or explosive. Impulse sound has extremely short duration and high peak sound pressure level.
Sound Pressure Level (SPL)	Sound pressure expressed in the decibel (dB) scale and with the standard reference pressure of 1 μ Pa for water.
Root-Mean-Square Sound pressure level (RMS SPL)	The mean sound pressure is the average of the squared pressure over the pulse duration. The root-mean-square sound pressure level is the logarithmic ratio of the root of the mean-square pressure to the reference pressure. Pulse duration is taken as the duration between the 5% and the 95% points on the cumulative energy curve.
Peak Sound Pressure Level	Peak level is the highest sound pressure level of an impulsive sound signal.
Sound Exposure Level (SEL)	Sound exposure level (SEL) is most often used to compare the total energy in impulsive signals with different time durations, average pressure levels and temporal characteristics. Impulsive underwater noise sources for which the SEL noise descriptor is useful include piling, blasting and geophysical surveys
Source Level	Source level (SL) is the noise level that would be measured at a standard reference distance of one metre away from an ideal point source radiating the same amount of sound energy as the actual source.
Spectrum	Distribution of sound energy versus frequency.
Spherical spreading	Received level diminishes by 6 dB per doubling of distance from the source.
Third-octave band level	The energy of a sound split into a series of adjacent frequency bands, each being 1/3 of an octave wide
Temporary Threshold Shift (TTS)	Temporary threshold shift (TTS) is a temporary reduction in hearing sensitivity as a result of exposure to sound. Exposure to high levels of sound over relatively short time periods can cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The duration of TTS varies depending on the nature of the stimulus.
Permanent Threshold Shift (PTS)	Permanent threshold shift (PTS) is a permanent reduction in hearing sensitivity caused by irreversible damage to the sensory hair cells of the ear.
Transmission loss	Reduction of the sound pressure level with distance from the noise source, which occurs through geometric spreading, absorption and scattering of sound energy.

Executive Summary

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout the Report.

Project overview

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Purpose of the report

This underwater noise impact assessment has been prepared by GHD on behalf of Transport for NSW for inclusion in the review of environmental factors (REF).

The purpose of this underwater noise impact assessment is to describe the proposal, document the likely underwater noise impacts of the proposal on the underwater environment (i.e. marine fauna) and to detail potential mitigation and management measures to reduce the potential for impacts.

Existing environment

The existing underwater noise environment in the Manly Harbour would be influenced by a composite of natural events (waves, wind, precipitation), bioacoustics noise from marine fauna and anthropogenic noise such as vessel movements in and out of the harbour.

The following marine fauna have been identified as having a high likelihood of occurring in the study area:

- syngnathids (including White's seahorse)
- fish (including the black rock cod, estuary cod and the Eastern blue devil)
- seabirds, including the little penguin.

Other marine fauna that are less likely to enter the study area have been identified as including cetaceans, sirenians, carnivores and turtles.

Additionally, humans frequent Manly Harbour and its surrounds for recreational purposes such as swimming or diving.

Impact assessment

Construction works that have the potential to cause underwater noise impacts include dredging (using a barge mounted excavator) and pile driving (either vibratory piling or impact piling). A worst-case scenario has been assessed to determine buffer distances from works where marine fauna may be affected (either a permanent temporary shift (PTS), temporary temporal shift (TTS) response or a behavioural response).

For marine fauna identified in the study area, the following buffer distances have been determined based on either vibratory or impact piling activities:

- 12 metres (PTS), 175 metres (TTS) and >1.2 kilometres (behavioural) for fish and seahorses
- 120 metres (PTS) and >1 kilometre (behavioural) for seabirds, including little penguins
- 100 metres (PTS), 650 metres (TTS) and 2 kilometres (behavioural) for humans.

Noise mitigation

General noise mitigation and management measures have been discussed to reduce potential impacts, including shut down and observation zones for marine fauna and humans, as well as community notification of the potential dangers of swimming or diving during either vibratory or impact piling works.

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Appendices

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1. Introduction

1.1 Project overview

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre. It is also located at the western end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes a ferry terminal, restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

1.2 Purpose of the report

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

The purpose of this underwater noise impact assessment is to describe the proposal, document the likely underwater noise impacts of the proposal on the underwater environment (i.e. marine fauna) and to detail potential mitigation and management measures to reduce the potential for impacts.

1.3 Scope of this report

The scope of the report to assess the potential underwater noise impacts from piling and dredging works associated with the Manly Wharf 3 upgrade includes:

- a qualitative description of the existing marine environment with respect to noise
- the identification of the marine fauna in the study area
- assessment of the potential underwater noise impacts associated with piling and dredging construction works to the identified marine fauna
- recommendation of measures to mitigate and manage any identified impacts.

This report has been prepared to specifically address underwater noise associated with the construction of the marine components of the proposal and should be read in conjunction with the *Manly Wharf Upgrade Biodiversity Assessment Report* (Cardno, 2022) included in Appendix K of the REF.

Underwater noise impacts associated with the operation of the proposal are anticipated to be similar to the existing conditions and therefore have not been considered further in this report.

1.4 Key features and objectives of the proposal

A concept design drawing of the proposal is shown in Figure 1.1, the regional setting of the proposal is shown in Figure 1.2 and the key features of the proposal are shown in Figure 1.3.

Key features of the proposal would include:

- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk

- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- a new public seating space / rest ‘slow space’ within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.
- construction of a new vessel arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- wharf booking information screens system
- providing conduits for opal readers to be installed in the future if required.

It is anticipated construction of the proposal would take eight months, commencing about 2023 and be completed by 2025.

Revised Scheme 23/03/22
Aerial View

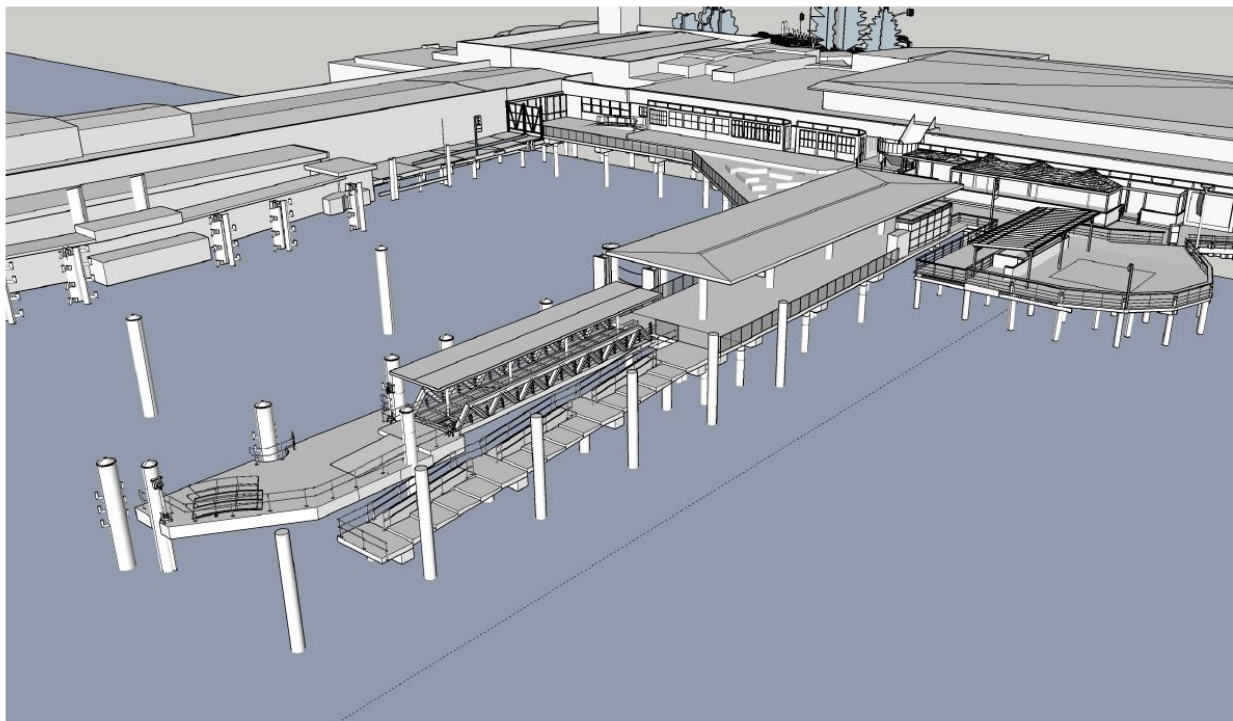
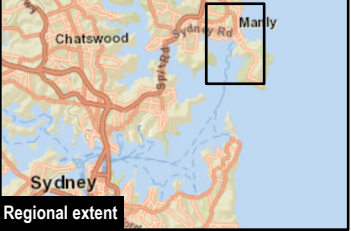


Figure 1.1 Concept design drawing – proposed Manly Wharf 3 upgrade



0 250 500 750 1,000
Metres

Legend
 Proposal area

Figure 1.2 - Regional Setting

Whilst every care has been taken to generate the structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
 World Street Map, Woollahra Municipal Council, Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Data source: Mapbox, The Service, Created by mfrade



- Legend**
- Piles**
- New Arrestor
 - New Mooring and Berthing Piles
 - New Separator Piles
 - New Steel Support Piles
 - Proposal Area
 - New Wharf Structures
 - Compound Area
 - Dredging Area
 - Existing Wharf Infrastructure
 - Provision For New Tidal Step When Funding Is Available

0 25 50 75 100
Metres

Figure 1.3 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHQ makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unstable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by inroads

Data source: publicNSW, Imagery: © Department of Customer Service 2020

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1.5 Policy context

Currently, there are no quantitative national guidelines on acceptable exposure levels for fauna to underwater noise generated by construction works. However, the South Australian Department of Planning Transport and Infrastructure and government departments from other countries have published guidelines on acceptable exposure levels for marine fauna on the basis of the work undertaken by Southall et al. (2007). These include:

- The South Australian Department of Planning Transport and Infrastructure Underwater Piling Noise Guidelines (2012);
- The Irish Guideline Guidance to manage the Risk to marine Mammals from man-made Sound Sources in Irish Waters (2014); and
- The U.S. Department of Commerce NOAA Technical Memorandum NMFS-OPR-59 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (2018).

This report incorporates findings and guidance from the above references and as well as the latest research and recommendations found in the following two documents:

- Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI (Popper et al., 2014).
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall et al., 2019)

1.6 Limitations

This report: has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Existing environment

Manly Harbour is located approximately 10 kilometres northeast of the Sydney CBD and 500 metres west of Manly Beach. The Harbour is sheltered and relatively shallow compared to the coastline. Various marine fauna inhabit or visit the Harbour and the Harbour is also used for recreational and commercial activities.

2.1 Existing underwater noise environment

Underwater sound is transmitted as cyclical pressure variations that travel through the marine environment at approximately 1.5 km/s. The acoustic frequency describes the number of pressure cycles per second, with the unit of Hertz (Hz) defined as one cycle per second.

The existing underwater ambient noise environment at a given location is a complex composite of the following types of noise sources:

- Natural events:
 - Natural non-biological sources of underwater noise in the area are anticipated to be from wave turbulence, waves breaking along shorelines, wind-wave interactions, and precipitation. The contribution from each source depends on the frequencies of interest. Breaking ocean waves, for example, generate acoustic pressure frequencies ranging from less than 1 Hz to greater than 100 kHz (Jensen et al., 2000).
 - Wenz (1962) showed that in the frequency region above 100 Hz, underwater ambient noise levels depend on weather conditions, with wind and waves creating sound. At frequencies above 100 Hz and below 10 kHz, precipitation is generally the dominant natural noise source that would increase ambient noise levels.
 - In the mid-frequency range (10 kHz), sediment transport noise may be a significant noise source where strong currents and turbulence exist due to wave action or tidal flow. At frequencies greater than 50 kHz, the molecular motion of water (thermal noise) contributes to the ambient noise level at an increasing rate (Mellen, 1952).
- Bioacoustic noise from marine animals:
 - Baleen whales regularly produce intense low-frequency sound (whale songs) that can be detected at long range in the open water.
 - dolphins produce rapid bursts of high-frequency clicks primarily used for echo-location
 - some fish species produce sounds either individually or in chorus
- Anthropogenic noise sources:
 - The dominant anthropogenic noise sources are anticipated to be from vessels travelling to and from Manly Wharf. It is expected that a relatively high ambient noise environment already exists in the project area due to the presence of these vessel movements.

Ambient underwater noise in Manly Harbour would be influenced by a range of maritime, commercial and recreational activities, where the dominant underwater noise source would originate from the frequent movement of marine vessels. Ambient noise levels around Australia coastal waters are generally around 100 to 120 dB (re: 1 μ Pa) (Government of South Australia, 2012) and noise generated from vessel movements would be intermittent. Noise levels would vary depending on the type and the size of the vessel, where ferries could generate ambient noise levels of 141 to 145 dB (re: 1 μ Pa) at distances of 100 metres and 50 metres, respectively (Transport for NSW, 2021).

Underwater noise sources and sound pressure levels from natural, bioacoustics and anthropogenic noise sources are shown in Figure 2.1 along with typical range of the noise source spectrum.

A SEA OF SOUND

Underwater sound from anthropogenic sources can be so loud that it disrupts marine animals' communications — and can even cause injuries and deaths.

UNDERSEA SOUND SOURCES

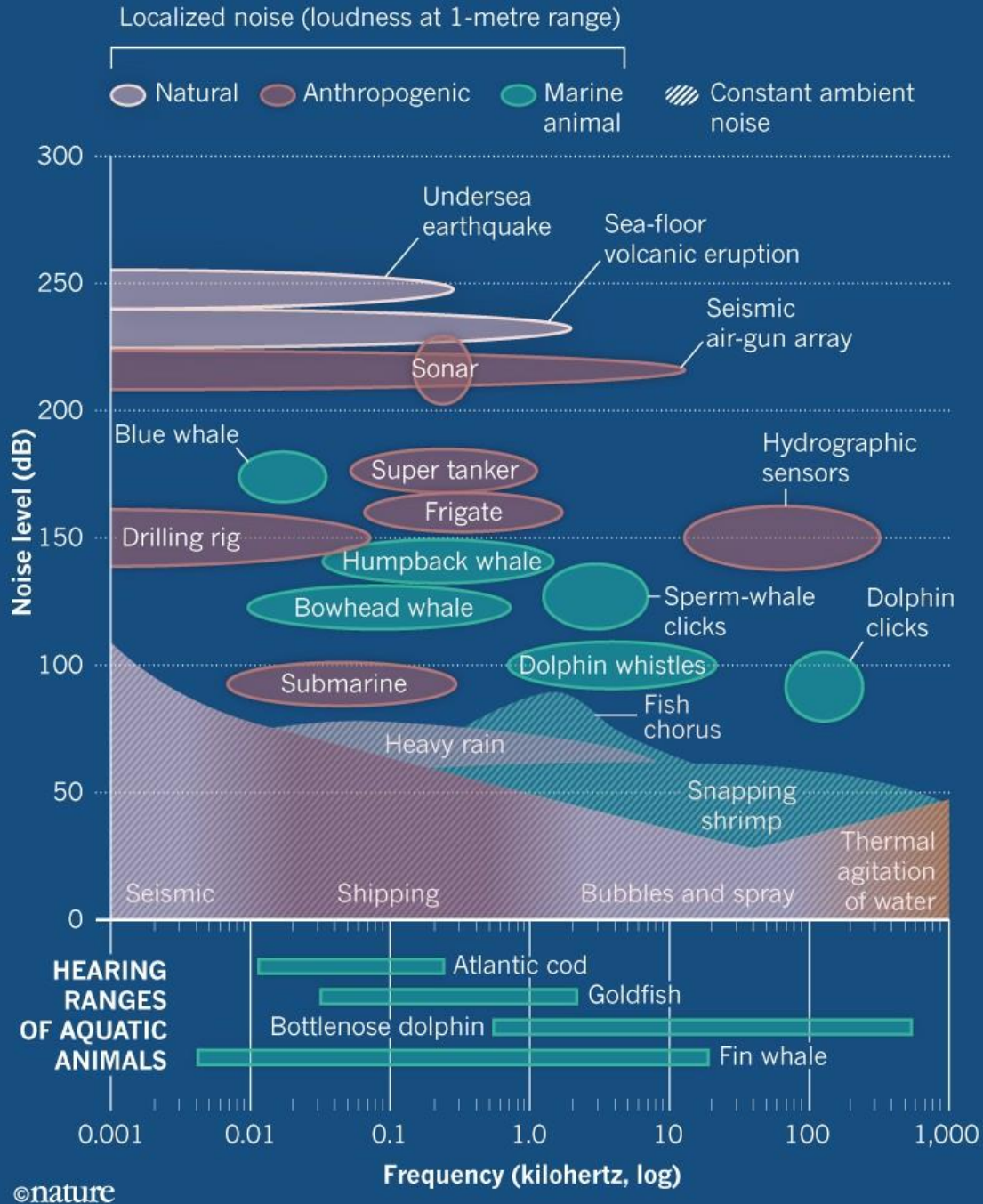


Figure 2.1 Typical underwater noise levels

Source: (*Ocean uproar: saving marine life from a barrage of noise (nature.com)*)

2.2 Potential marine fauna

Certain fauna that are potentially present in Manly Harbour and North Harbour (referred to as the ‘study area’) could be impacted by underwater noise.

These effects could range from mild (e.g. avoiding the area) to serious (e.g. death or permanent hearing loss) and would depend on the species’ physiological sensitivity to noise and the proximity, intensity and duration of the noise source. Table 2.1 lists the noise-sensitive species and humans that may potentially occur in the area or have been recorded to occur in the area. The likelihood of occurrence assessment (Cardno, 2022) is based on the list of marine fauna presented in Appendix B of this report. Cephalopods (e.g. squid and octopus) and crustaceans, ascidians and invertebrates (e.g. spiny sea urchin and cunjevoi) have not been considered in this assessment as appropriate noise criteria for these species is still a subject of research.

For marine fauna that have a low likelihood of occurring, this local study area is not considered their core range. Nevertheless, buffer distances where impacts may occur have been provided for reference in this assessment.

Table 2.1 Likelihood assessment summary of various marine fauna and humans in the study area

Noise-sensitive species	Likelihood rating	Likelihood assessment summary
Marine fauna		
Low frequency (LF) cetaceans	Low likelihood	LF cetaceans, including Sei whales, Blue whales, southern right whale, Bryde’s whale, pygmy right whale, humpback whale, killer whale and fin whales are generally associated with open water. As such, they have a low likelihood of occurring within the study area.
High frequency (HF) cetaceans	Low likelihood	Several species of HF cetaceans, such as the dusky dolphin and the Australian humpback dolphin are deemed as likely to occur off the ocean coast. However, there is a low likelihood that these cetaceans would occur within the study area. There is potential these dolphins may swim through the study area, albeit boat traffic renders the study area suboptimal.
Very high frequency (VHF) cetaceans	Low likelihood	There is a low likelihood of VHF cetacean species (e.g. river dolphin species) occurring within the study area.
Sirenians (SI)	Low likelihood	There is a low likelihood of the dugong occurring in the study area
Phocid carnivores (PCW)	Low likelihood	There is a low likelihood of Phocid carnivore species (true seals, including harbour, gray and freshwater seals, elephant and monk seals, and Antarctic and Arctic ice seals) occurring in the study area.
Other Carnivores in Water (OCW)	Low likelihood	There is a low likelihood of the following otariid species occurring in the study area: <ul style="list-style-type: none"> – New Zealand fur seal prefer rocky parts of islands with jumbled terrain and boulders – Australian fur seal prefers to utilise oceanic waters of the continental shelf
Sharks	Low likelihood	Sharks, such as the grey nurse shark, white shark, whale shark, ocean whitetip shark and the porbeagle have the potential to occur in the project area but it is unlikely.
Syngnathids	Highly likely	Pipefishes, pipehorses and seadragons, seahorses (including White’s Seahorse) have a high likelihood of occurring in the study area.
Fish	Moderately likely	The black rock cod, estuary cod, Queensland groper and the Eastern blue-devil have a moderate likelihood of occurring in the study area. The Queensland groper has a moderate likelihood of occurring in the study area.
Skates	Low likelihood	The reef manta ray and giant manta ray have a low likelihood of occurring in the study area.
Marine turtles and other reptiles	Low likelihood	The loggerhead turtle, green turtle, leatherback turtle, hawksbill turtle and flatback turtle have low likelihood of occurring in the study area as it is not considered core range. The Yellow-bellied Seasnake prefers specific habitats not in the study area.
Seabirds (little penguin)	Highly likely	The little penguin population at Manly is listed as an endangered population under the <i>Biodiversity Conservation Act 2016</i> (BC Act). Critical habitat for the little penguin in the Manly Point Area includes the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 m offshore from that shoreline).
Humans		
Swimmers and divers (human)	Highly likely	People swim, dive, snorkel, boat, and carry out water sports in the Manly Harbour area.

3. Methodology

3.1 Underwater noise generating activities

Noise sources associated with the construction of the project would include:

- dredging (barge mounted excavator)
- pile driving (impact piling).

Noise levels associated with impulsive noise sources (such as pile driving) are expressed in terms of peak-to-peak source levels while noise levels associated with continuous noise sources such as dredging are expressed in terms of the root mean square (rms) sound pressure level.

3.1.1 Piling works

Piling would be required as part of the following construction activities:

- construction of the western side of the promenade
- construction of temporary separation piles
- construction of remaining promenade area and the main waiting area
- construction of Wharf 3 platform and installation of the gangway
- construction of Wharf 3 fixed structure.

For safety reasons the piling may need to take place late at night or early in the morning when the water is calm and the harbour is least busy, with up to 40 nights shifts (from 11pm to 7am) staggered across the eight month construction period time. During piling, a work schedule similar to the following may be adopted:

- vibration of piles (preferred method):
 - Setup: 11 pm to 12 am (approximately)
 - Vibration: between 12 am to 6 am (approximately)
 - Pack up: 6 am to 7 am (approximately)
- hammering of piles (alternative method):
 - Setup: 4 am to 5 am (approximately)
 - Hammering: 5 am to 7 am (approximately).

Piling noise emission varies depending on the size of the pile being installed and the driving methodology used. The most common pile driving methods include impact pile driving, where a pile is hammered into the ground by a hydraulic ram, and vibro-driving, where rotating eccentric weights create an alternating force on the pile, vibrating it into the ground. A description of the typical impacting piling and vibro-driving noise levels is provided below:

- **Impact piling** – Impulsive noise source with multiple pulses occurring at blow rates in the order of 30 to 60 impacts per minute. Typical source levels range from SEL 170–225 dB re 1 μ Pa for a single pulse, and peak levels range from 190–245 dB re 1 μ Pa. Most of the sound energy usually occurs at lower frequencies between 100 Hz and 1 kHz. Factors that influence the source level include the size, shape, length and material of the pile, the weight and drop height of the hammer, and the seabed material and depth.
- **Vibro-driving** – Continuous noise source and usually of a much lower level than impact piling. Typical source levels range from SPL 160–200 dB re 1 μ Pa, with most of the sound energy occurring between 100 Hz and 2 kHz. Strong tones at the driving frequency and associated harmonics may occur with the driving frequency typically ranging between 10 and 60 Hz. Sound propagation at such low frequencies is often poor in shallow water environments, such that the tones may not be noticeable at greater distances from the source.

For the purposes of this assessment, the impact piling method has been assessed as a worst-case scenario to determine the buffer distances where marine fauna may be impacted by underwater noise.

3.1.2 Dredging works

Construction of Wharf 3 would involve limited dredging of material at the northern face of Wharf 3 berth pocket area. About 290 cubic metres of material would be removed as a part of the *in-situ* dredging. This is based on the size of the berthing pocket, including a one metre offset, a 1:5 batter and a 0.5 metre deep over-dredging allowance. Dredging would be undertaken from a barge mounted excavator.

The volume of dredge spoil that would be produced will be about 350 cubic metres. All dredge spoil would be contained on hopper barges for offsite re-use or disposal to a licensed facility, depending on waste classification. Beyond the dredging, there would be limited earthworks associated with the construction of the proposal. A small amount of seabed sediment would be disturbed during the piling work and demolition of the existing structures.

While dredging activities are likely to cause a temporary behavioural shift as marine fauna avoid the area immediately in the vicinity of the noise source, the overall risk from these activities is considered to be lower than impulsive noise generating activities, such as pile driving.

3.1.3 Worst-case construction activities

In view of the above, the worst-case construction activity, being impact pile driving, has been assessed to determine the buffer distances where marine fauna may be impacted. A conservative assumption of 1000 pile strikes per day has been adopted to calculate the accumulated sound exposure over a 24 hour period.

1000 pile strikes a day assumes:

- 500 pile strikes per pile case;
- up to two piles cases to occur during the 2-hour impact piling period; and
- no additional piling occurring outside of the 2-hour impact piling period (5 am to 7 am).

3.2 Noise sources

Piling noise data has been sourced from ICF Jones & Stokes et al. (2009), prepared for the California Department of Transportation. The impacts at 10 metres from a single strike on a 610 mm diameter pile (considered representative of the pile to be used for construction activities) are summarised in Table 3.1.

Dredging source level data has been sourced from Erbe (2016). The dredging scenario considers only an rms and SEL assessment as noise production is relatively consistent from the dredge.

No attenuation measures (such as bubble curtains) have been considered for either activity.

The noise source has been modelled in one-third octave spectral levels between 10 Hz to 4,000 Hz, which is considered sufficient to encompass the dominant energy frequency ranges of the modelled equipment. Noise level information is provided below in Table 3.1. Frequency spectra have been sourced from Erbe (2016).

Table 3.1 Noise source details

Noise source	Source level, dB re: 1 µPa	Data source
Impact piling (610 mm steel pipe) at relative water depth of 5 metres	203 dB Peak re: 1 µPa at 10 m 177 dB SEL re: 1 µPa ² s (per strike) at 10 m 190 dB rms re: 1 µPa at 10 m	ICF Jones & Stokes et al. (2009)
Dredging	179 dB rms re: 1 µPa at 1 m SEL: rms+10*log(duration of dredging, seconds)	Erbe (2016)

As the number of pile strikes increases, the accumulated SEL noise levels increase according to the following relationship:

$$SEL_{Accumulated} = SEL_{Single\ strike} + 10 \times \log(\text{number of pile strikes})$$

3.3 Noise modelling methodology

3.3.1 Underwater noise model

An underwater noise model calculates the received noise level (RNL) by taking into account the attenuation (transmission loss, TL) of the source noise level (SNL) through the medium (seawater and seabed). The received noise level is a function of depth, range, physical properties of the media and other factors.

The transmission loss (TL) is a complex interaction of multiple attenuation processes which generally differ across the acoustic frequency range (a comprehensive treatment of the subject is presented by Jensen et al. 2000) and includes:

- geometrical wave-front spreading
- frequency dependent molecular sound absorption in the water column
- frequency dependent scattering of surface reflected acoustic waves, which is increased by higher (rougher) wave conditions
- frequency dependent scattering of bottom reflected acoustic waves
- frequency and depth dependent absorption of acoustic waves in thin bottom sediments (water borne waves) and deeper strata (e.g., sound radiated from pile via sea bed)
- depth dependent cut off of lower-frequency wave-modes that are unsupported in shallow water.

Numerous acoustic models have been proposed to calculate the transmission loss parameter. Three of the more popular solver classes currently utilise ray theory (e.g., Bellhop), parabolic equations (e.g., RAM) or normal mode (e.g., Kraken) algorithms.

For this project, the software dBSea has been utilised. The RAMS parabolic solver equivalent in dBSea (“dBSeaPE”) was utilised for frequencies up to 1,000 Hz, while the Bellhop equivalent ray tracing solver in dBSea (“dBSeaRay”) was utilised for higher frequencies.

The model permits the calculation of frequency, range, and depth-dependent transmission loss from a point source in the water column, across an elastic seabed with depth variation in the radial direction. The software requires inputs of the bathymetry and seabed characteristics.

3.3.2 Bathymetry

A combination of publicly available surveys Australian and international bathymetric databases were used to produce the required bathymetric datasets for the project. The study area for the purposes of this assessment is 1.2 kilometres from the proposal site.

The following datasets were utilised:

- NSW Government Department of Planning, Industry and Environment (DPIE) Marine LiDAR Topo-Bathy 2018
- Navionics Chart Viewer.

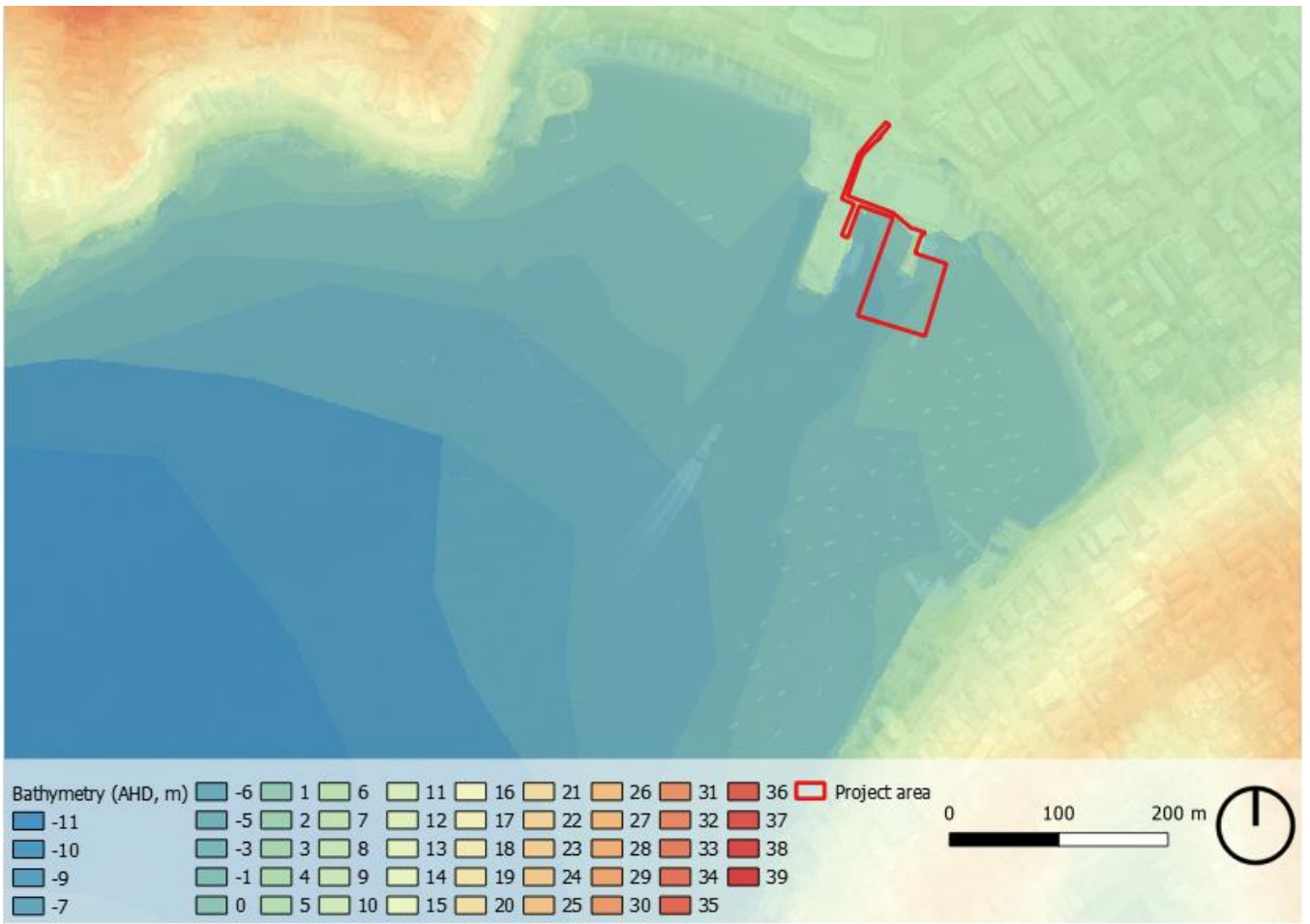


Figure 3.1 Site bathymetry

3.3.3 Seabed

Field observations indicated that surface sediments in Manly Harbour are comprised of fine to coarse grainy sand with silty sands with darker grains, likely to be coal and organic fragments, and shells.

A typical seabed profile in the study area was modelled based on the investigations undertaken in the area. The modelled seabed comprises of layers of sand, silty sand, and sandstone (bedrock) and is considered to be representative of the area. The modelled acoustic properties and layer thickness details of the seabed profile are summarised below in Table 3.2.

Table 3.2 Modelled acoustic properties of seabed

Material	Layer thickness	Compressed wave sound speed (m/s)	Density (kg/m ³)	Compression wave attenuation rate (dB/λ)
Sand	0 to 8 metres	1650	1900	0.8
Silty sand	8 to 12 metres	1575	1700	1.0
Sandstone	Bedrock	5250	2700	0.1

3.4 Summary of assessment criteria

The behavioural and physiological noise criteria for species relevant to the area of interest are summarised in Table 3.4. Further information regarding the derivation of this criteria is presented in Appendix A.

The general consensus is that the frequency weighting functions are applicable to the SEL, while the peak sound pressure levels should remain unweighted. The frequency weightings reflect the hearing sensitivity of mammals and are indicated by the subscript LF, HF, VHF, SI, PCW, OCW, etc. (refer to Section A-1). While frequency weightings are still a subject of research and debate (i.e. for non-marine mammals), the cumulative (24 h) unweighted SEL is considered applicable.

In an applied construction noise management context, TTS criteria are used in preference to PTS criteria to minimise the risk of irreversible auditory damage. Similarly, criteria for single or multiple pulses (high crest factor wave forms), particularly pertaining to the assessment of impact piling noise, are used without reference to the higher criteria relating to non-pulsed underwater sound (approximately sinusoidal waveforms).

For the purposes of developing underwater noise criteria for sharks and syngnathids, they have been assigned the same criteria as fish with swim bladders involved in hearing. This approach has been adopted as it is the most stringent criteria of the three types of fish as an appropriate noise criteria for syngnathids is still an active area of research.

For other fauna (including humans), where there is limited research available regarding their responses to underwater noise levels, indicative thresholds have been determined for injury to mortality and behavioural responses. Further information relating to this research is provided in Appendix A.

Table 3.3 *Indicative threshold levels for other marine fauna and humans*

Species	Potential to occur within study area?	Injury to mortality ¹	Behavioural response ¹
Birds (diving birds and little penguins)	Highly likely	190 dB SEL	120 dB
Humans	Highly likely	170 – 184(100 Hz to 1500 Hz) dB peak and 167 – 185 (501 Hz to 2500 Hz) dB peak	145 dB (100 Hz to 1500 Hz) SPL and 155 dB (501 to 2500 Hz) SPL

Note: 1. The indicative threshold levels are based on unweighted noise levels

Table 3.4 Behavioural and physiological noise criteria for marine fauna identified within study area

Thresholds	Marine species and noise criteria ¹									
	Low-frequency cetaceans (LF)	High-frequency cetaceans (HF)	Very high frequency cetaceans (VHF)	Sirenians (SI)	Phocid carnivores (in water) (PCW)	Other carnivores (in water) (OTW)	Marine turtle	Fish (no swim bladder)	Fish (swim bladder not involved in hearing)	Fish (swim bladder involved in hearing)
Likelihood of occurring?	Low likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood	Moderately likely	Moderately likely	Highly likely
Noise criteria (Non impulsive noise), PTS ² onset threshold	199 SEL Weighted (LF)	198 SEL Weighted (HF)	173 SEL Weighted (VHF)	206 SEL Weighted (SI)	201 SEL Weighted (PCW)	219 SEL Weighted (OCW)	Low risk	Low risk	Low risk	170 rms (48h)
Noise criteria (Non-impulsive noise), TTS ³ onset threshold	179 SEL Weighted (LF)	178 SEL Weighted (HF)	153 SEL Weighted (VHF)	186 SEL Weighted (SI)	181 SEL Weighted (PCW)	199 SEL Weighted (OCW)	Low risk	Low risk	Low risk	158 rms (12h)
Noise criteria (Impulsive noise), PTS ² onset threshold	183 SEL Weighted (LF)	185 SEL Weighted (HF)	155 SEL Weighted (VHF)	190 SEL Weighted (SI)	185 SEL Weighted (PCW)	203 SEL Weighted (OCW)	210 SEL (Unweighted)	219 SEL (Unweighted)	210 SEL (Unweighted)	207 SEL (Unweighted)
	219 Peak (Unweighted)	230 Peak (Unweighted)	202 Peak (Unweighted)	226 Peak (Unweighted)	218 Peak (Unweighted)	232 Peak (Unweighted)	207 Peak (Unweighted)	213 Peak (Unweighted)	207 Peak (Unweighted)	207 Peak (Unweighted)
Noise criteria (Impulsive noise), TTS ³ onset threshold	168 SEL Weighted (LF)	170 SEL Weighted (HF)	140 SEL Weighted (VHF)	175 SEL Weighted (SI)	170 SEL Weighted (PCW)	188 SEL Weighted (OCW)	Low risk except when near source	186 SEL (Unweighted)	186 SEL (Unweighted)	186 SEL (Unweighted)
	213 Peak (Unweighted)	224 Peak (Unweighted)	196 Peak (Unweighted)	220 Peak (Unweighted)	212 Peak (Unweighted)	226 Peak (Unweighted)	-	-	-	-
Behavioural ⁴	120 dB rms (Unweighted) (Non-impulsive noise) 160 dB rms (Unweighted) (Impulsive noise)						166 dB rms (Unweighted)	150 dB rms (Unweighted)		

Note 1: The peak and rms noise criteria are in units dB re: 1 µPa. The Sound exposure level (SEL) noise criteria are in units dB re: 1 µPa²s and correspond to cumulative noise impacts, conservatively calculated over a 24 hour time period.

Note 2: Mortality or permanent injury.

Note 3: Temporary loss of hearing sensitivity.

Note 4: Behavioural criteria have been based on guidance provided by the NMFS Greater Atlantic Regional Fisheries Office (GARFO), available online at:

<http://www.greateratlantic.fisheries.noaa.gov/protected/section7/guidance/consultation/index.html>

The behavioural thresholds can be adjusted if background noise levels are above the prescribed values.

4. Impact assessment

The effects of underwater noise on marine fauna depend both on the magnitude and type of the noise source and the hearing sensitivities of the marine fauna.

In general, the potential impacts of excessive levels of underwater noise on marine fauna can include:

- significant behavioural disturbance that may affect important populations or species survival
- noise masking interference with acoustic communication and echo location
- temporary loss of auditory sensitivity
- permanent loss of auditory sensitivity
- other tissue damage (lethal and sub-lethal).

It should be noted that the above impacts are potentially overlapping- i.e., where the marine fauna is close to a sound (highest intensity), the impact on an animal can include death, physiological effects, temporary hearing shift, masking and behavioural responses (Hawkins and Popper, 2012). This is illustrated in Figure 4.1 as impact zones from the source location.

Physiological impacts and behavioural responses are further discussed below for the proposed noise generating activities.

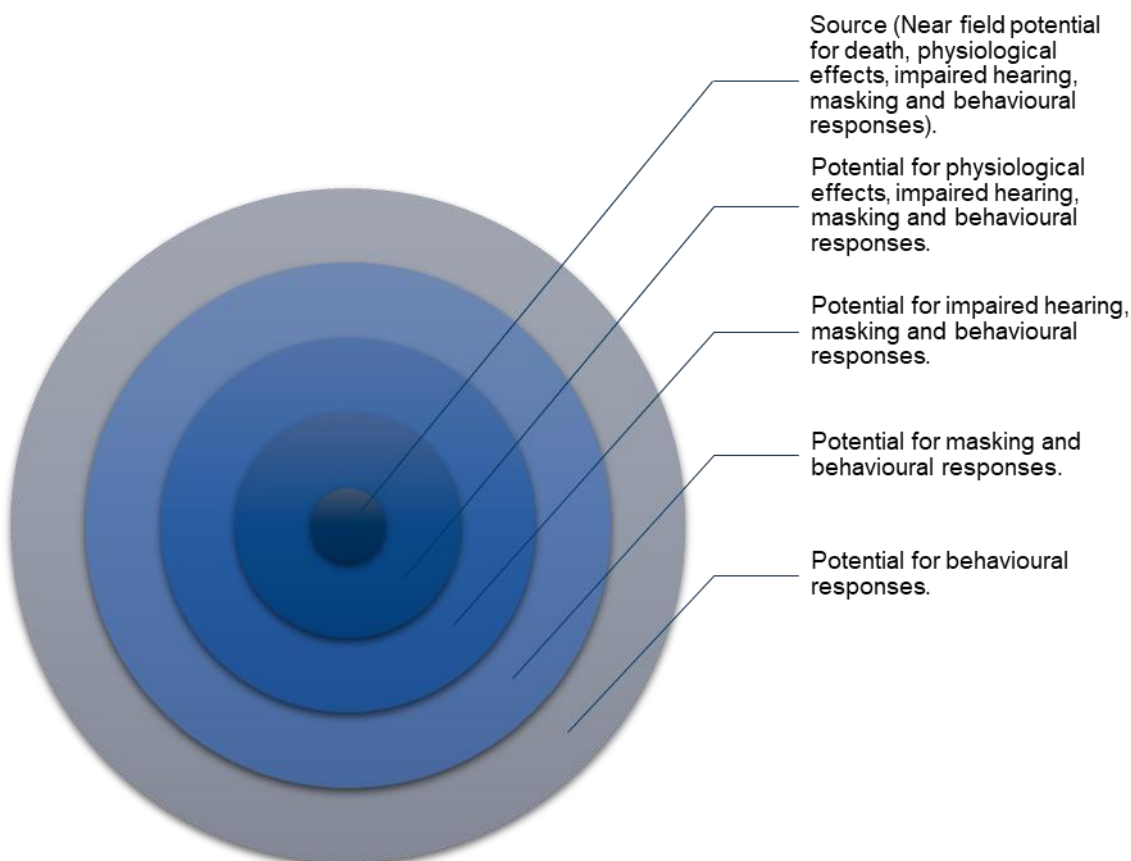


Figure 4.1 Impact zones as a function of relative distance from noise source

4.1.1 Typical noise level decay

Underwater noise levels vary due to changes in bathymetry along individual transects. A typical reduction in the noise level as a function of distance in eight cardinal directions from the source point is shown in Figure 4.2. The figure shows that noise levels decay by approximately 45 dB at a distance of 1 km for the unweighted results in the south-westerly direction, in the most open water area.

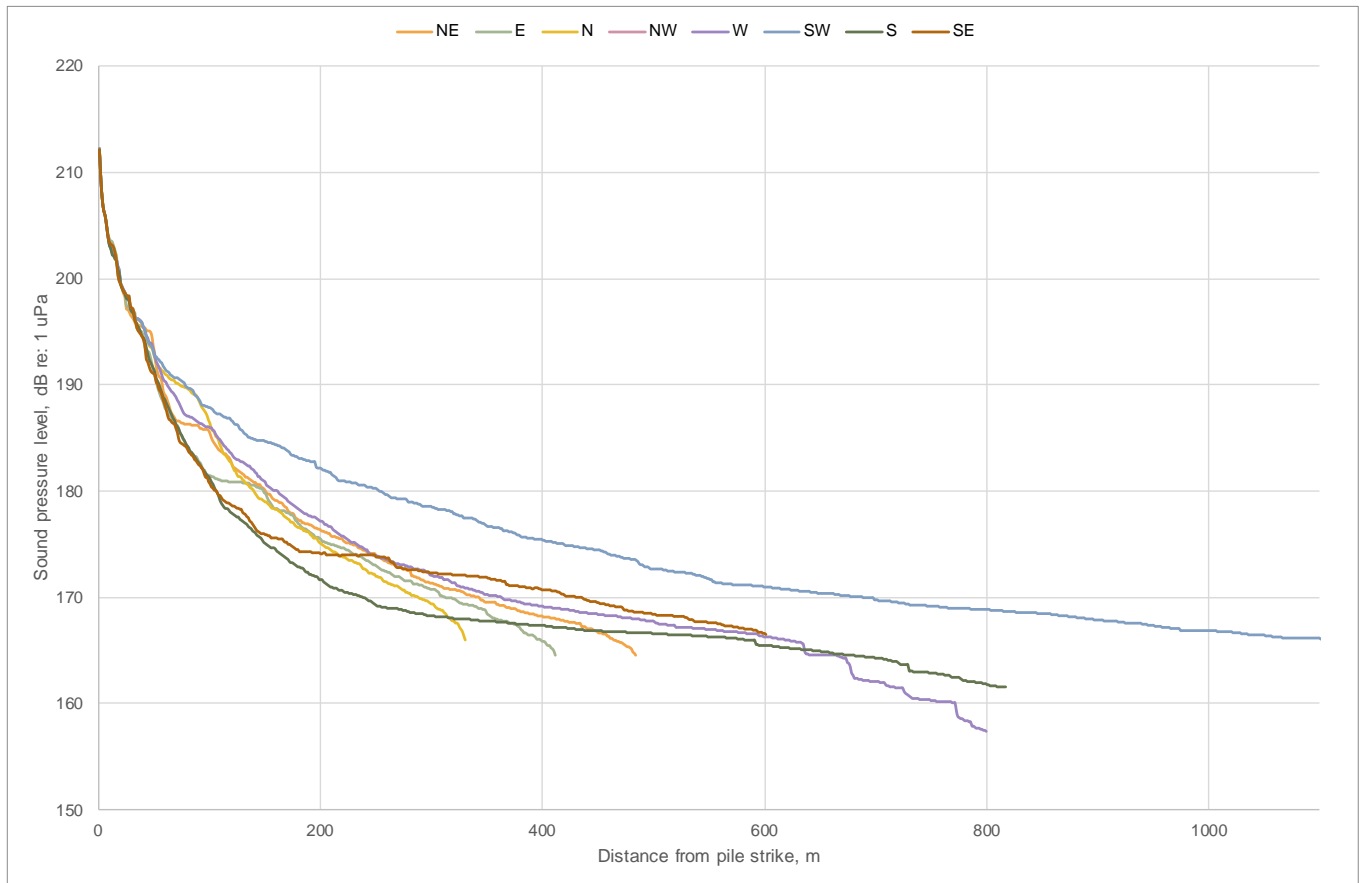


Figure 4.2 Typical noise level decay in the study area (SPL vs. distance)

The impulsive noise criteria provided in Table 3.4 are considered applicable to impact piling operations while the non-impulsive noise criteria are applicable to dredging. Of the peak and SEL criteria listed in Table 3.4, the SEL criteria are more conservative.

4.1.2 Impact piling buffer distances

The typical buffer distances required to meet the PTS and TTS onset thresholds for various species groups likely to be present in the study area during piling activities are summarised below in Table 4.1. The SEL distances are provided for 1000 pile strikes per day and assume the marine fauna have full exposure to the piling works (i.e. are underwater and are within the buffer distance for the entirety of the daily piling period).

For marine fauna that have a high likelihood of occurring in the study area, the distances to meet the criteria are presented in Table 4.1. Marine fauna that have a low likelihood of occurring in the study area are also presented in Table 4.1 for reference.

Table 4.1 Typical impact piling buffer distances required to meet noise criteria

Noise-sensitive species	Likelihood of occurrence?	Distances to meet criteria, m ¹				
		PTS Peak	TTS Peak	PTS SEL	TTS SEL	Behavioural
Marine fauna						
Low-frequency cetaceans	Low likelihood	<10	<10	200	1055	400
High-frequency cetaceans	Low likelihood	<10	<10	5	50	400
Very High-frequency cetaceans	Low likelihood	20	40	180	1170	400
Sirenians	Low likelihood	<10	<10	20	80	400
Phocid carnivores (in water)	Low likelihood	<10	<10	80	500	400
Other carnivores (in water)	Low likelihood	<10	<10	10	55	400
Marine turtle	Low likelihood	<10	-	10	-	225
Fish (no swim bladder)	Moderately likely	<10	-	5	175	1250 ¹
Fish (swim bladder not involved in hearing)	Moderately likely	<10	-	10	175	1250 ¹
Fish (swim bladder involved in hearing), including White's seahorses	Highly likely	<10	-	12	175	1250 ¹
Seabirds, including little penguins ²	Highly likely	-	-	120	-	>2 km ¹
Humans						
Humans ²	Highly likely	100	650	-	-	2 km ¹

Note 1: For distances over 25 metres, the impacted distances have been rounded up to the nearest 25 metres for conservatism

Note 2: The affected distance is outside the study area of the underwater noise model. The distance to meet the criteria has been extrapolated based on a line of best fit (logarithmic) derived from the transmission loss curve.

Note 3: Criteria for peak levels are not provided for seabirds and such distances are only presented for PTS SEL and behavioural response. Similarly, for human distances are provided for PTS and TTS peak responses and behavioural responses.

4.1.3 Dredging buffer distances

The buffer distances associated with dredging would be significantly less than impact piling works. Nevertheless, it is proposed that the buffer distances calculated for impact piling be adopted during dredging works. This is considered to be a conservative approach to reduce the potential impacts to marine fauna in Manly Harbour.

4.2 Marine fauna impacts

4.2.1 Syngnathids and fishes

There is a high likelihood for syngnathids, including the White's seahorse, and other fishes to be present in the study area for piling and dredging works in the construction of the Manly Wharf Upgrade. There is potential for temporary threshold shift (TTS) impacts within 175 metres of piling works and for behavioural impacts at distances over 1.2 kilometres for all types of fish and syngnathids. Permanent threshold shift (PTS) impacts for fish involved in hearing, including the White's seahorse, have the potential to occur up to 12 metres from the source.

Mitigation measures have been recommended in Section 5.1 to reduce the potential for impacts to White's seahorse and other Syngnathids that have a high likelihood of occurring within the study area.

4.2.2 Little penguin and diving birds

An Area of Outstanding Biodiversity (AOBV) has been declared for the Little Penguin breeding ground approximately 500 metres south of the proposed construction area. While the ships and construction activities are likely to deter penguins from swimming through the project area, there is potential for PTS impacts within 120 metres of piling works and for behavioural impacts over 1 kilometre.

Mitigation measures have been recommended in Section 5.1 to reduce the potential for impacts to Little Penguins and other diving birds that have a high likelihood of occurring within the study area.

4.2.3 Humans

As Manly Harbour is a popular area for swimming and diving, impacts may be experienced by humans from underwater noise from the construction activities. There is potential for PTS and TTS impacts at swimmers and divers at distances of 100 metres and 650 metres respectively, from piling works.

The predicted noise level within the entire project study area is predicted to exceed the threshold for behavioural impacts to human swimmers and divers. Noise from a single pile strike is predicted to exceed the 145 dB re 1 μ Pa recommended threshold at a distance of approximately 2 kilometres (with line of sight to the works). This indicates that piling noise is likely to be extremely unpleasant for any swimmers or divers exposed to the noise level and severe avoidance reactions (including startle reactions) may be expected, with divers and swimmers unlikely to want to remain in the water while exposed to the noise.

Within 2 kilometres of piling works, the following potential swimming and diving spots have been identified:

- Manly Cove
- East Manly Cove Beach
- Manly Point
- Delwood Beach
- Fairlight Beach
- Dirty Haul Beach
- North Harbour Reserve
- Silver Beach
- Forty Baskets Beach
- Reef Beach.

Management measures have been recommended in Section 5 to reduce the potential for impacts to human swimmers and divers within the study area.

5. Mitigation and management measures

5.1 Standard mitigation and management measures

Mitigation and management measures are provided in Table 5.1 to reduce the potential physiological impacts to marine fauna and swimming humans in the study area. The measures in Table 5.1 are recommended on the basis that impact piling would be required, representative of worst case construction activities, during the construction phase of the project. As source noise levels for vibro-driving and dredging works are significantly lower than impact piling, the recommended shut down and observation zones would be considered conservative and could be refined through further assessment.

Table 5.1 Management and mitigation measures

Mitigation I.D	Mitigation / management measure	Description of measure												
NV1	Standard management and mitigation measures	<p><i>The Underwater Piling Noise Guidelines (2012)</i> advises the following standard management and mitigation procedures with respect to piling operations:</p> <ul style="list-style-type: none"> – Consideration be given to avoiding conducting impact piling activities during times when marine fauna are likely to be breeding, calving, feeding, migrating or resting in biologically important habitats located within the potential noise impact footprint, where possible. – Use low noise piling methods, instead of impact piling, where possible. – Presence of marine fauna and human swimmers/divers should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the impact piling procedure. – If no marine fauna and human swimmers/divers are nearby, a soft start piling procedure should be used. This involves gradually increasing the piling impact energy over a 10-minute time period. Visual observations of marine fauna and humans within the exclusion zone should be maintained by trained crew throughout the start period. – If a marine fauna and humans is sighted within the observation zone during the soft start of normal operation procedures, the operator of the impact piling rig should be placed on stand-by to shut down the piling rig. – A record of procedures employed during the operations should be maintained by the piling contractor. 												
NV2	Observation and shut-down safety zones	<p>Two safety zones would be applied around each impact piling location:</p> <ul style="list-style-type: none"> – An observation zone, within which the movement of marine fauna or human divers/swimmers would be monitored to identify any approach to the shut-down zone. – A shut-down zone, within which the sighting of a marine fauna or human divers/swimmers would trigger piling activities to be ceased as soon as reasonably practical. <p>The recommended shutdown and observation zones for either vibratory or impact piling are shown in the table below and presented in Figure 5.1.</p> <table border="1"> <thead> <tr> <th>Marine fauna type / Humans</th> <th>Shutdown zone (PTS)</th> <th>Observation zone (TTS)</th> </tr> </thead> <tbody> <tr> <td>Black cod fish and Syngnathids</td> <td>12 m</td> <td>175 m</td> </tr> <tr> <td>Diving birds and little penguins</td> <td>120 m</td> <td>1 km (estimated observation zone)</td> </tr> <tr> <td>Humans</td> <td>100 m</td> <td>650 m</td> </tr> </tbody> </table>	Marine fauna type / Humans	Shutdown zone (PTS)	Observation zone (TTS)	Black cod fish and Syngnathids	12 m	175 m	Diving birds and little penguins	120 m	1 km (estimated observation zone)	Humans	100 m	650 m
Marine fauna type / Humans	Shutdown zone (PTS)	Observation zone (TTS)												
Black cod fish and Syngnathids	12 m	175 m												
Diving birds and little penguins	120 m	1 km (estimated observation zone)												
Humans	100 m	650 m												

Mitigation I.D	Mitigation / management measure	Description of measure
NV3	Underwater noise monitoring should impact piling be necessary	Consideration would also be given to undertaking underwater noise monitoring, should impact piling be required, at selected areas (chosen by a marine ecologist) to measure actual underwater noise levels and to refine the shutdown and observation zones, if required.
NV4	Record procedure of piling activities	<p>The selected contractor undertaking the piling activities would maintain a record of procedures employed during operations and would include:</p> <ul style="list-style-type: none"> – Information on any marine fauna sighted during the piling activity, and their reaction to the piling activity would be documented – A report on the piling activity should at a minimum contain the location, date, start and completion time of the piling activity, information on the piling rig (hammer weight and drop height, pile size, number of piles, number of impacts per pile, etc.) – details on the trained crew members conducting the visual observations – times when observations were hampered by poor visibility or high winds – times when start-up delays or shut-down procedures occurred – the time and distance of any marine fauna sightings.
NV5	Removal / disturbance to threatened, migratory and protected species	<p>A targeted survey for Black Rockcod, White's Seahorse and Little Penguin would be completed 24 hours prior to the commencement of water-based construction activities. Black Rockcod would be encouraged to move away from the study area prior to silt curtain installation.</p> <p>White's Seahorses would be collected and relocated to nearby similar habitat (i.e. Manly Cove Tidal Pool netting) using methods approved by NSW DPI (Fisheries). A White's Seahorse Management Plan would be developed in consultation with NSW DPI (Fisheries) to guide this activity. These activities are to be completed by a qualified marine ecologist. The Manly Cove Tidal Pool netting area is located outside the observation zone for syngnathids as seen in Figure 5.1.</p> <p>Refer to Section 5 of the <i>The Manly Wharf Upgrade Biodiversity Assessment Report</i> (Cardno, 2022).</p>
NV6	Management of swimmers and divers	<p>Public swimming and diving areas would be cleared prior to (and during) any vibratory or impact piling periods where the TTS threshold may be exceeded. This includes the following areas:</p> <ul style="list-style-type: none"> – Manly Cove – East Manly Cove Beach – Delwood Beach/Federation Point <p>For other swimming and diving areas within 2 kilometres of either vibratory or impact piling works, visible signs should be erected containing the following information:</p> <ul style="list-style-type: none"> – The scheduled times for piling works – A warning that swimming is not recommended during piling works as it has the potential to cause adverse hearing effects and could be extremely unpleasant <p>The community should be notified a minimum of 7 days prior to piling works regarding the dangers of swimming/diving in proximity to piling works (especially impact piling).</p> <p>To avoid significant disruptions to the community's ability to engage in recreational swimming and diving within Manly Harbour and North Harbour for the duration of piling works, it is recommended that vibratory or impact piling works be scheduled to provide periods in which recreational swimming or diving can be conducted.</p> <p>For example, no vibratory or impact piling works on weekends, public holidays works or during school holidays</p>

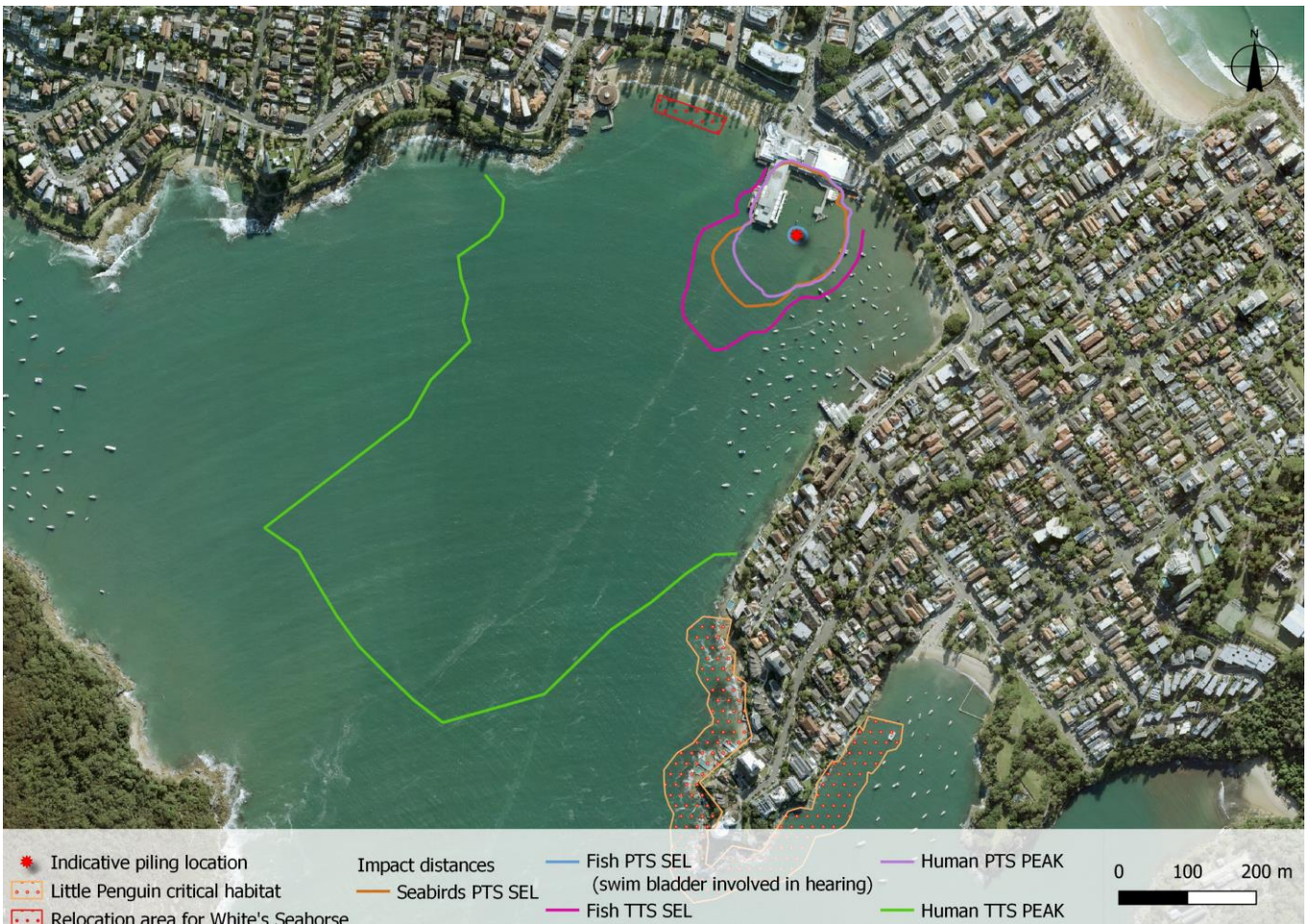


Figure 5.1 Impact distances for marine fauna likely to occur within the study area

5.2 Additional noise reduction options

Vibro-piling would result in lower underwater noise levels than impact piling. As such, it would be the preferred method to reduce potential underwater noise impacts to marine fauna and humans.

If impact piling is required, additional noise reduction options can be used to reduce noise from piling operations and the calculated buffer distances. These include pile head cushion blocks, bubble curtains and aerated, damped or dewatered outer pile casings. Detailed information on field tested results and ongoing research can be found at the California Department of Transport website.

A **cushion block** is made of an energy absorbing material such as wood or nylon to reduce the generation of high frequency vibrations in the pile during pile impact. Marine noise reductions of 11-26 dB are reported for wood blocks and 4-5 dB for nylon blocks applied to 300 mm hollow steel piles (ICF Jones & Stokes et al. 2009). At the time of reporting it was not known whether this approach has been, or can be successfully applied to larger than 500 mm diameter steel hollow piles.

A **bubble curtain** consists of a series of vertical-spaced air diffuser rings on a frame that is lowered around the pile. The change in effective water density created by the curtain of air bubbles around the pile reduces the sound transmission to the surrounding water. This method is not recommended for open waters subject to cross currents. In these conditions reported results show unreliable attenuation results.

A **dewatered or aerated isolation casing** system uses a concentric outer shell around the driven pile to contain either a complete air gap or an aerated bubble layer. In situations subject to tidal flows isolation casing attenuation is more reliable than an unconstrained bubble layer, which may have the continuity of the bubble layer degraded by cross currents. This method does however require significant alteration to the pile installation methodology. Attenuations up to 15 dB have been demonstrated for the aerated option and over 20 dB for the dewatered option.

Some reported results for dewatered isolation casings note failure of the dewatering system, leading to sub optimal performance.

Damped outer casings have been demonstrated for steel casings 760 mm and 910 mm diameter. The use of outer damping layers as an attenuation method offers greater reliability than aerated or dewatered casing systems.

A summary of the effectiveness of alternative attenuation methods is reproduced in Table 5.2 based on data collected by both California and Washington State Departments of Transportation.

Table 5.2 Attenuation options for impact driven steel hollow piles

Attenuation method	SEL Attenuation	Pile diameter	Reference
Plywood pile cushion	>11 dB	No known data demonstrating effectiveness on steel piles greater than 300 mm diameter	Cape Disappointment, California 2006.
Aerated shell casing/bubble curtain	>10 dB	0.76 m diameter steel pile	Richmond-San Rafael Bridge.
Dewatered shell casing	>12 dB	0.91 m diameter steel shell	Mukilteo Test Pile Project 2007.
Damped shell casing	>15 dB >8 dB	0.91 m diameter steel shell around pile with 50 mm closed cell internal lining. 0.76 m diameter hollow steel 'thermos' shell around pile, with 50 mm dry mineral wool fibre in cavity.	Mukilteo Test Pile Project 2007 (TNAP2 case) Vashon Ferry Terminal Test Piling Project 2010.

6. Conclusion

An assessment of potential underwater noise impacts on marine fauna (including humans) has been undertaken with consideration to underwater noise generating construction activities planned as part of the Manly Wharf 3 Upgrade project.

A review of the local marine fauna was undertaken to establish the likelihood of specific marine fauna being present in the area. Hearing sensitivities and relevant physiological and behavioural noise criteria for those species that could potentially be present in the area were developed based on a review of current scientific research.

Noise modelling of significant noise generating activities (impact piling) was undertaken using the dBSea underwater noise modelling software, with site specific bathymetric data and seabed characteristics input into the model. The noise modelling outputs were used to generate typical buffer distances for the criteria established for the various marine fauna that have the potential to be present in the area. General noise management and monitoring measures have been discussed to reduce potential impacts, including shut down and observation zones for marine fauna and humans and community notification of the potential dangers of swimming or diving during vibratory or impact piling works.

7. References

- Burton C. Suedel, Andrew D. McQueen, Justin L. Wilkens, and Morris P. Fields (2019), *Evaluating Effects of Dredging-Induced Underwater Sound of Aquatic Species: A Literature Review*, US Army Corps of Engineers
- CEDA Environment Commission Working Group (2011), *CEDA Position Paper: Underwater sound in relation to dredging*, Terra et al. Aqua Number 125
- David, J.A. (2006), *Likely sensitivity of bottlenose dolphins to pile-driving noise*, Water and Environment Journal, Vol.20 pp.48-54
- Erbe, C., Reichmuth, C., Cunningham, K., Lucke, K. and Dooling, R. (2016), *Communication masking in marine mammals: A review and research strategy*, Marine Pollution Bulletin vol. 103 pp. 15-38
- Hawkins, A.D. and Popper, A.N. (2012), *Effects of noise on fish, fisheries and invertebrates in the U.S. Atlantic and Arctic from energy industry sound-generating activities: A literature synthesis for the U.S.* Department of the Interior Bureau of Ocean Energy Management Contract # M11PC00031
- ICF Jones & Stokes, and Illingworth & Rodkin Inc. (2009), Final report to the California Department of Transportation *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*, February 2009
- Jensen F.B., Kuperman W.A., Porter M.B., and Schmidt H. (2000), *Computational Ocean Acoustics*, Springer-Verlag, New York
- Ketten D R and Bartol S M. (2005), *Functional Measures of Sea Turtle Hearing –Final Report*, Woods Hole Oceanographic Institution
- Ketten D. R. (2008), *Underwater ears and the physiology of impacts: Comparative Liability for Hearing Loss in Sea Turtles, Birds and Mammals*, Bioacoustics, Vol. 17(103) pp. 315-318
- Martin, K.J., Alessi, S.C., Gaspard, J.C., Tucker, A.D., Bauer, G.B. and Mann, D.A. (2012), *Underwater hearing in the loggerhead turtle (Caretta caretta): a comparison of behavioural and auditory evoked potential audiograms*, Journal of Experimental Biology 215: 3001-3005
- Mellen, R. (1952), *Thermal noise limit in the detection of underwater acoustic signals*, Journal of Acoustical Society of America, Vol 24 pp. 478-480
- Mutilkeo Test Pile Project (2007), *Underwater sound levels associated with driving steel and concrete piles near the Mukilteo Ferry Terminal*, Washington State Department of Transportation
- National Marine Fisheries Service (2018), *2018 Revisions to: Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (version 2.0): Underwater thresholds for onset of permanent and temporary threshold shifts*, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-OPR-59
- Popper, A.N., Hawkins, A.D., Fay, R.R., Mann, D.A., Bartol, S., Carlson, T.J., Coombs, S., Ellison, W.T., Gentry, R.L., Halvorsen, M.B., Lokkeborg, S., Rogers, P.H., Southall, B.L., Zeddis, D.G. and Tavolga, W.N. (2014), *Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI*, ASA Press Springer
- Southall B. L., Bowles A. E., Ellison W. T., Finneran J. J., Gentry R. L., Green C. R., Kastak D., Ketten D. R., Miller J. H., Nactigall P. E., Richardson W. J., Thomas J. A., and Tyack P. L. (2007), *Marine Mammal Noise Exposure Criteria*, Aquatic Mammals, Vol. 33(4)
- Southall B. L., Finneran, J.J., Reichmuth, C., Nachtigall, P.E., Ketten, D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P. and Tyack, P.L. (2019), *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*, Aquatic Mammals, Vol. 45(2) pp. 125-232
- Vashon Test Pile Project (2010), *Underwater sound levels associated with driving steel piles at the Vashon Ferry Terminal*, Washington State Department of Transportation
- Transport for NSW (2021), *Kamay Kerry Wharves Project Underwater Noise Assessment*, March 2021
- Cardno (2022), *Manly Wharf Upgrade Biodiversity Assessment Report*, July 202

Appendix A

**Derivation of underwater noise criteria for
marine fauna**

A-1 Marine mammals

Southall et al. (2007) were the first to develop a comprehensive set of frequency-weighting functions for marine mammals. Citing previous scientific literature they used the following mammal hearing-groups: low frequency cetaceans (baleen whales), mid frequency cetaceans (toothed whales), high frequency cetaceans (porpoises, river dolphins, etc.), pinnipeds (seals, sea lions, walruses, in water) and pinnipeds (in air).

They proposed separate 'M' frequency-weighting functions for these groups, which were similar to the C-weighting function developed for human hearing at high sound levels. These functions were flat for a major part of the spectrum, symmetrical and assumed a logarithmic reduction in auditory sensitivity outside the range of best hearing. The 'M' frequency-weighting functions were a conservative representation of hearing sensitivities based on the scientific literature available at the time.

In the decade following that research, significant additional work has been undertaken in the field. Additional marine mammal groups have been added and modifications to the original groups and new weighting functions (based on audiograms) have been developed. This research has been incorporated into the guidance provided by the US NMFS (2018).

Southall et al. (2019) have also revisited their original recommendations and published amended scientific recommendations on the marine mammal noise exposure criteria, which further builds upon the guidance provided by the US NMFS (2018).

The currently recommended marine mammal hearing groups include the following:

- Low-frequency (LF) cetaceans: Mysticetes (Baleen whales). The generalised hearing frequency range for this group is estimated to be between 7 Hz and 35 kHz.
- High-frequency (HF) cetaceans: Delphinid species (bottlenose dolphin, common dolphin, beaked whales, sperm whales and killer whales). The generalised hearing frequency range for this group is estimated to be between 150 Hz and 160 kHz.
- Very high-frequency (VHF) cetaceans: True porpoises, most river dolphin species, pygmy/dwarf sperm whales and some oceanic dolphins. The generalised hearing frequency range for this group is estimated to be between 275 Hz and 160 kHz.
- Sirenians (SI): Manatees and dugongs. The generalised hearing frequency range for this group is between 250 Hz and 72 kHz.
- Phocid carnivores (in water) (PCW) and in air (PCA): True seals, including harbour, gray and freshwater seals, elephant and monk seals, and Antarctic and Arctic ice seals. The generalised hearing frequency range for this group is estimated to be between 50 Hz and 86 kHz.
- Other carnivores in water (OCW) and in air (OCA): Otariid seals (sea lions and fur seals), walruses, sea otters and polar bears. The generalised hearing frequency range for this group is estimated to be between 60 Hz and 39 kHz.

Revised frequency-weighting functions, analogous to the A-weighting function for human hearing, have been created based on a general band-pass filter equation for each marine mammal group. The band pass filter parameters were derived from audiogram data corresponding to each group.

These frequency-weighting functions are presented in Figure A.1 and Figure A.2. For phocid carnivores and other carnivores, the presented weighting functions have been limited to the 'in water' categories.

The functions are denoted by subscripts corresponding to the group names (LF, HF, VHF, SI, PCW, and OCW) as noted above.

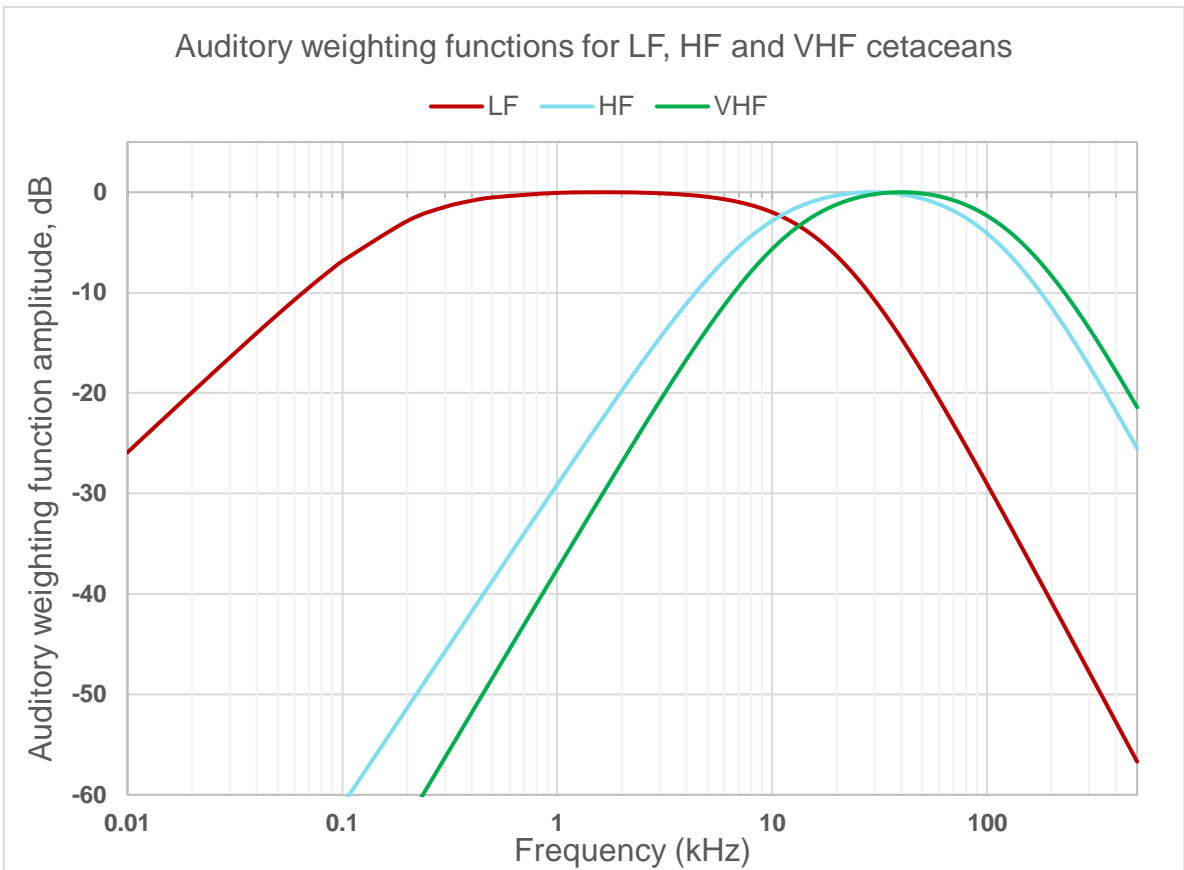


Figure A.1 Auditory weighting functions for low frequency, high frequency and very high frequency hearing group cetaceans

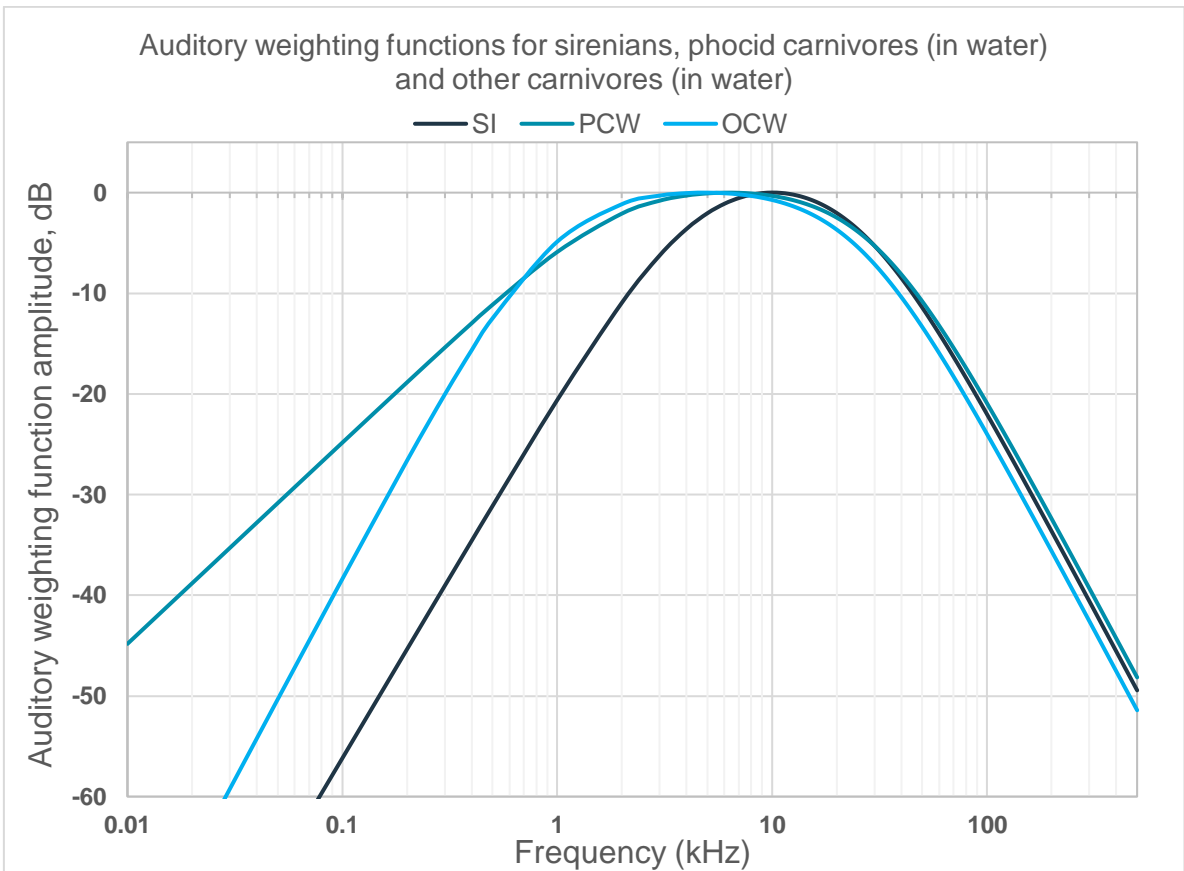


Figure A.2 Auditory weighting functions for sirenians, phocid carnivores (in water) and other carnivores (in water)

A-2 Marine turtle

Turtles may be present in the construction area. The auditory frequency range of marine turtles is significantly lower than that of marine mammals, with estimates for a range of species (including the green turtle and loggerhead turtle) in the range of 100 Hz to 1 kHz (Ketten and Bartol, 2005) and best sensitivities near 400 – 1,000 Hz (Ketten, 2008).

Martin et al. (2012) presented data on the behavioural and auditory evoked potential (AEP) thresholds for the loggerhead sea turtle. This was included in Popper et al. (2014)'s recommended sound exposure guidelines for fishes and sea turtles and is reproduced in Figure A.3.

Hearing sensitivity data for most other species of turtles is currently limited. However, based on the scientific research undertaken so far, it can be reasonably concluded that the auditory frequency range of marine turtles is between 50 Hz to 1.2 kHz.

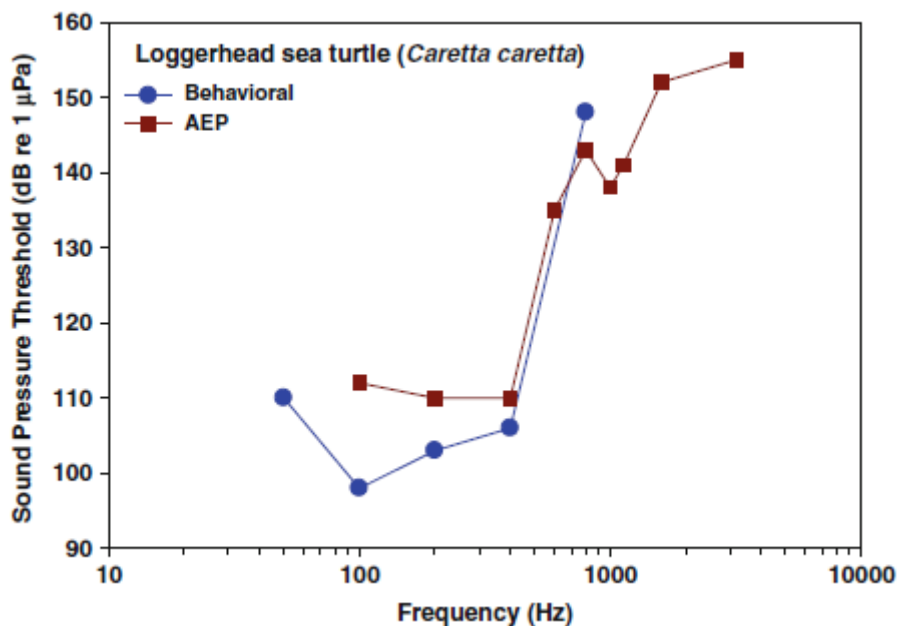


Figure A.3 Hearing sensitivity (behavioural and auditory evoked potential) for the Loggerhead sea turtle (Source: Popper et al. 2014)

A-3 Fish

Over 32,000 species of fish exist, compared to 130 marine mammals. Additionally, between species, fishes are much more diverse anatomically, physiologically, ecologically and behaviourally than marine mammals (Popper et al., 2014). Therefore, the hearing ranges of most fish are currently unknown.

Research indicates that many fish species respond to the particle motion component of sound waves while marine mammals do not. Particle motion is the oscillatory displacement of fluid particles in a sound field (Hawkins and Popper, 2012) and generally measured with reference to acceleration (m/s^2).

Popper et al. (2014) proposed the following categories of fish:

- Fishes with no swim bladder or other gas chamber (e.g. dab and other flatfish): These fish only detect particle motion and are less susceptible to pressure-related injuries.
- Fishes with swim bladders in which hearing does not involve the swim bladder or other gas volume (e.g. Atlantic salmon): These fish base their hearing only on particle motion but are susceptible to pressure-related injuries.
- Fishes in which hearing involves a swim bladder or other gas volume (Atlantic cod, herring and relatives, etc.): These fish detect sound pressure and particle motion and are susceptible to pressure-related injuries.

Behavioural audiograms for select fish species sensitive to particle motion are provided in Figure A.4 while audiograms for select fish species sensitive to sound pressure are provided in Figure A.5.

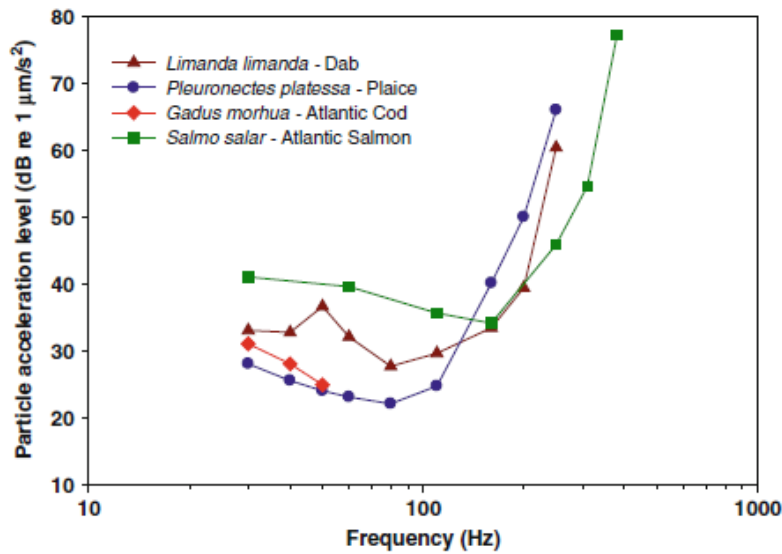


Figure A.4 Particle motion hearing sensitivity for select fish species (Source: Popper et al., 2014)

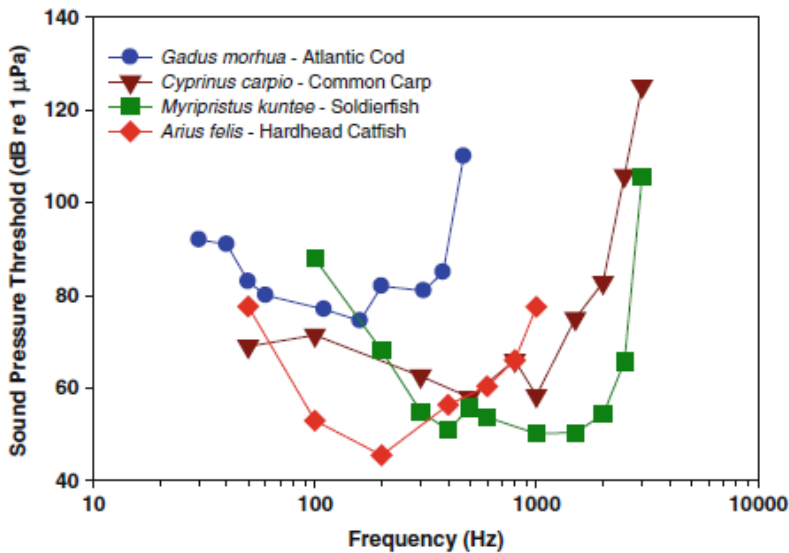


Figure A.5 Sound pressure hearing sensitivity for select fish species (Source: Popper et al., 2014)

A-4 Birds

There is little information available on birds (while diving) as far as the impact on hearing and behaviour due to pile driving underwater. The capabilities and thresholds for avian hearing underwater is not well understood and defined (Johansen et al., 2016, Sørensen et al., 2019).

Both Crowell (2016) and Johansen et al (2016) suggested birds could hear the pile being driven however their range of most hearing sensitivity of hearing (> 1 kHz) is above the frequency range containing the greatest energy from pile driving (< 1 kHz). In the study completed by Sørensen et al. (2019) established behaviour responses to sound play back trials of stimulus sound levels ranging from 100 to 120 dB re 1 μPa. This study identified clear behavioural response and startle responses at 120 dB re 1 μPa. As such 120 dB re 1 μPa (RMS) is therefore applied as the behaviour response threshold.

There is data in the literature regarding hearing injury and mortality impacts to diving birds from a proximity explosion (Yelverton et al., 1973) which has a different acoustic energy composition to pile driving. However as there is still a lack of understanding of the hearing and behavioural impacts of impulse noise on marine birds

(diving) estimated thresholds (Table A.1) have been based on data from explosions. This is expected to be conservative due to the shorter rise time of explosive sources compared to impact piling.

Table A.1 *Estimated thresholds for bird injury and behaviour*

Sound pressure level	Injury mortality	Behavioural response
Birds (diving)	190 dB SEL (Yelverton et al. 1973)	120 dB (dB re: 1 µPa) (Sorenson et al 2019)

A-5 Humans

Recreational human divers and swimmers are also potentially at risk from anthropogenic underwater noise. Currently, no national or state criteria exist for human exposure to underwater noise in Australia. A review of international research suggests that the field is still in its nascent stages with various measurement methods currently under development.

Research by the US Navy during the 1980s on the effects of exposure to intense underwater sound on military divers concluded that the threshold for biological effects was an SPL of 160 dBA re: 1µPa (McCarthy, 2004).

More recently, Parvin et al. (2002) reviewed diver exposure to underwater sound in the frequency of 500 to 2500 Hz. Their stipulated guidance of recreational divers/swimmers and military divers are summarised in Table A.2.

A conservative accumulated sound energy threshold of 183 dB SEL re: 1µPA has been adopted to assess noise impacts on recreational divers and swimmers.

Table A.2 *Effects of underwater noise on humans*

Type	Frequency range		
	100 to 500 Hz (SPL dB re: 1µPa)	501 to 1500 Hz (SPL dB re: 1µPa)	1501 to 2500 Hz (SPL dB re: 1µPa)
Recreational divers and swimmers	145	155	155
Military divers	160	180	190

Table A.3 summarises how divers are impacted by underwater noise based on published information. This identifies that trained divers will be increasingly affected by noise up to 170 dB SPL above which noise is likely to be intolerably loud. Above 184 dB SPL there is the risk of physical injury. As such 190 dB re 1 µPa (peak) has been applied as the physical injury threshold.

Table A.3 *Effects of underwater noise on humans*

Sound pressure level	Effect (source: Parvin, 2005)
>184	Liver haemorrhage and soft tissue damage likely ¹
>170	Tolerance level for divers and swimmers. Sound causes lung and body vibration
148 -157	The loudness and vibration levels become increasingly aversive. Some divers will contemplate aborting an open water dive.
140 – 148	A small number of divers rate the sound as “very severe
136 - 140	The sound is clearly audible. Most divers tolerate the sound well with only “slight” aversion
130	Divers and swimmers able to detect body vibration
80 -100	Auditory threshold

Note: 1. Based on extrapolation from animal models of pressure-induced damage

Appendix B

Likelihood of occurrence assessment

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (5 kilometre) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (5 kilometre). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.

Threatened species habitat assessment table

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Seabirds (swimming birds)						
<i>Eudyptula minor</i>	Little penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)	EP	-	<p>Little penguins are only found in southern Australia and New Zealand. In Australia little penguin colonies are scattered around the coastline from near Perth on the west coast, to Sydney on the east coast, and around Tasmania.</p> <p>On land little penguins live in holes in the ground known as burrows. These burrows provide a place for little penguins to rest, nest and moult. Burrows also provide protection from predators and extreme heat. While on land little penguins remain inside their burrows during the day to avoid predators. Little penguins spend approximately 80% of their lives at sea, returning to land to breed, moult and rest. Satellite tracking from Phillip Island Nature Parks shows that Phillip Island's little penguins swim an average 15 to 50 km a day. This includes diving up and down as they look for fish. The deepest little penguin dive recorded is 72 m. An average dive in search of fish is between 5 and 20 m.</p>	(DPI) / 30 (BioNet)	<p>High.</p> <p>AOBV located about 360 metres south-east of the study area. Multiple records within the AOBV.</p> <p>May swim through the study area albeit boat traffic renders the study area suboptimal.</p>
Fish and Syngnathids						
<i>Epinephelus daemeli</i>	Black rockcod	E (FM Act)	V	<p>In Australia, the distribution of black cod ranges from southern QLD through NSW to northern VIC. However, records from QLD and VIC are rare, and the NSW coastline forms the species' main range, both in Australia and internationally. Adults are usually found in saves, gutters and beneath bommies on rocky reefs from nearshore areas to at least 50 metres depth. Small juveniles are often recorded in coastal rock pools while larger juveniles are found around rocky shores in estuaries. The use of estuaries may be an important part of the ecology of juvenile black cod in NSW waters. The black cod is territorial and often have a high site fidelity.</p>	(PMST)	<p>Moderate.</p> <p>Known to occur in Sydney Harbour. However, study area does not contain rocky reef.</p>

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Hippocampus whitei</i>	White's seahorse	E (FM Act)	E, Ma	Endemic temperate Australian species found only between Forster and Wollongong, NSW. White's seahorse inhabits shallow inshore areas in estuaries, harbours and bays, where it lives on rocky reefs, sponges, seagrass beds, and under piers and jetties to 25 m.	(PMST)	High
<i>Prototroctes maraena</i>	Australian Grayling	E (FM Act)	V	The Australian grayling occurs in rivers and streams on the eastern and southern flanks of the Great Dividing Range but is diadromous. During the freshwater phase of the life cycle, this species inhabits lower altitude reaches of both large rivers and smaller streams spawning in the tidal freshwater reaches of rivers, presumably among a gravel streambed. Very little is known of the Australian grayling's specific habitat requirements during the estuarine or marine phase of the life cycle.	(PMST)	Low. May occur in the Study area during the marine phase of lifecycle albeit at the end of its range, no records in the Survey Locality and habitat is widespread.
Mammals						
<i>Arctocephalus forsteri</i>	New Zealand fur seal	V	Ma	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders.	(PMST)	Low. Some foraging habitat present in the Study area however, is suboptimal and widely distributed in the Survey Locality.
<i>Arctocephalus pusillus</i>	Australian fur seal	V	Ma	Reported to breed at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand fur-seals where they occur together. The Australian fur-seal prefers to utilise oceanic waters of the continental shelf for foraging and generally does not dive deeper than 150 m.	(PMST) / 1 (BioNet)	Low. Some foraging habitat present in the Study area however, is suboptimal and widely distributed in the Survey Locality.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Balaenoptera borealis</i>	Sei whale	-	V, M (B)	Sei whales have been infrequently recorded in Australian waters. The similarity in appearance of sei whales and Bryde's whales (<i>Balaenoptera edeni</i>) has resulted in confusion about distributional limits and frequency of occurrence, particularly in warmer waters (>20 °C) where Bryde's whales are more common. Sei whales were thought to be the most common whales reported by whalers off Albany, WA while hunting sperm whales (<i>Physeter macrocephalus</i>), however, these may have been misidentified Bryde's whales. There are several reports of presumed sei whale sightings by fishermen around the shelf edge (50 km offshore) off the coast of NSW. The Australian Antarctic waters are important feeding grounds for sei whales, as are temperate, cool waters. Sightings of sei whales feeding in the Bonney Upwelling area indicate that this area is potentially also an important feeding ground. Breeding occurs in tropical and subtropical waters.	(PMST)	Low. Usually associated with open water.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Balaenoptera musculus</i>	Blue whale	E	E, M (B)	Oceanic within Southern Hemisphere between 20° to 70° S including NSW waters. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are only used for migration and opportunistic feeding. The only known areas of significance to the blue whale are feeding areas around the southern continental shelf, notably Perth Canyon, in WA and the Bonney Upwelling and adjacent upwelling areas of SA and VIC. Preferring open seas rather than coastal waters. While breeding areas have not yet been identified, it is likely that they occur in tropical areas of high localised biological production, as, unlike the humpback whale (<i>Megaptera novaeangliae</i>) and southern right whale (<i>Eubalaena australis</i>), the blue whale has a thin blubber layer, which implies that they cannot fast during the winter season. This is supported by the occurrence of the blue whale in tropical upwelling areas in the eastern tropical Pacific Ocean, such as the Costa Rica Dome and the waters west of the Galapagos Islands. Wintering areas, where some blue whale sightings have been reported, include the Indonesian archipelago and the waters adjacent to the Solomon Islands and other island groups of the south-west Pacific (Paton & Gibbs 2003). Satellite tagging has confirmed that the pygmy blue whale feeds off the Perth Canyon and head north in March/April to potential breeding grounds in Indonesian waters by June.	(PMST)	Low. Usually associated with open water.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Balaenoptera physalus</i>	Fin whale	-	V, M	Fin whales are widely distributed in both hemispheres between latitudes 20–75° S. This species is common in temperate waters, the Arctic Ocean and Southern Ocean. In the Southern Ocean/Subantarctic this species is often found in areas of complex and steep bathymetry, such as deep ravines, where fish and other prey are known to concentrate. Fin whales have been observed during aerial surveys in SAn waters between November and May. The Australian Antarctic waters are important feeding grounds for fin whales. Sightings of fin whales feeding in the Bonney Upwelling area indicate that this area is also a potentially important feeding ground. There are no known mating or calving areas in Australian waters.	(PMST)	Low. Usually associated with open water.
Dugong dugon	Dugong	E	M, Ma	Major concentrations of dugongs along the Queensland coast occur in wide, shallow, protected bays and mangrove channels, and in the inside edge of large inshore islands. These areas coincide with significant seagrass beds. They also use deep-water habitats. Large numbers have been sighted in water more than 10 metres deep in several areas including the Torres Strait, the northern Great Barrier Reef region, and Hervey Bay in southeast Queensland. A large proportion of the world's dugong population is found in northern Australian waters from Moreton Bay in the east to Shark Bay in the west. Dugongs are also occasionally reported much further south in NSW.	(PMST)	Low. Some foraging habitat present in the Study area however, is highly disturbed and not considered in core range.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Eubalaena australis</i>	Southern right whale	E	E, M	This species occurs in temperate and subpolar waters of the Southern Hemisphere, with a circumpolar distribution between about 20° S and 55° S with some records further south to 63° S. The southern right whale migrates between summer feeding grounds in Antarctica and winter breeding grounds around the coasts of southern Australia, NZ, South Africa and South America. This species feed in the open oceans in summer and move inshore in winter for calving and mating with calving females usually remaining very close to the coast. The southern right whale is not believed to feed in Australian waters at all. The southern right whale is constrained in their ability to colonise unused areas of potentially suitable habitat due to a high degree of site fidelity (individuals returning to the same breeding site each year).	(PMST)	Low. Usually associated with open water, but may swim through the Study area.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Megaptera novaeangliae</i>	Humpback whale	V	V, M (B)	Occurs in oceanic and coastal waters worldwide. The population of Australia's east coast migrates from summer, cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on the northward migration and October and November, on the southward migration. As with the western Australian population, the eastern Australian population also tend to migrate further offshore during their northward migration. Three major aggregation areas have been previously identified for the eastern Australian population in Queensland around the southern end of the Great Barrier Reef, Hervey Bay and in the Gold Coast region. The southern end of the Great Barrier Reef is a suspected calving area. The breeding area for the eastern population of the humpback whale is presumed to be off the coast between central and northern Queensland. Some feeding has been observed in Australia's coastal waters but this is thought to primarily be opportunistic and forms only a small portion of their nutritional requirements. Feeding has been observed close to shore off Eden, NSW, from late September until late November. Feeding behaviour has also been reported off Fraser Island, Queensland. Feeding may also occur in northern waters of the Great Barrier Reef, as well as Victoria, as sightings of humpback whales have been reported in these areas in summer months.	(PMST) / 25 (BioNet)	Low. Usually associated with open water, but may swim through the Study area.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Reptiles						
<i>Caretta caretta</i>	Loggerhead turtle	E	E, M, Ma	The Loggerhead Turtle has a worldwide distribution in coastal tropical and subtropical waters. In Australia, Loggerheads occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of QLD, NT, WA and NSW.	(PMST) / 1 (BioNet)	Low. Study area not considered core range.
<i>Chelonia mydas</i>	Green turtle	V	V, M, Ma	Green Turtles occur in seaweed-rich coral reefs and coastal seagrass pastures in tropical and subtropical areas of Australia. Usually ocean-dwelling but also occurs in coastal waters on the north or central coast with some straying south of the central coast. Green Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum (a floating marine plant that is also carried by currents). Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae mats on which Green Turtles mainly feed. In Australia there are seven separate genetic management units for the green turtle, and three of these occur in QLD. The entire Great Barrier Reef area is an important feeding area for turtles which nest locally, as well as for those which nest in other regions and countries.	(PMST) / 5 (BioNet)	Low. Study area not considered core range.
<i>Dermochelys coriacea</i>	Leatherback turtle	E	E, M, Ma	Throughout the world's tropical and temperate seas and in all coastal waters of Australia. Most sightings are in temperate waters. Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW.	(PMST)	Low. Study area not considered core range.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Eretmochelys imbricata</i>	Hawksbill turtle	-	V, M, Ma	Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in WA, and in the northern Great Barrier Reef and Torres Strait, QLD. hawksbill turtles spend their first five to ten years drifting on ocean currents. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. During this pelagic phase, they are often found in association with rafts of Sargassum sp. (floating marine algae that is also carried by currents). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae. They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries. Hawksbill Turtles have been seen in temperate regions as far south as northern NSW.	(PMST) 1 (BioNet)	Low. Study area not considered core range.
<i>Natator depressus</i>	Flatback turtle	-	V, M, Ma	The flatback turtle is only found in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Post-hatchling and juvenile flatback turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles. Adults inhabit soft bottom habitat over the continental shelf of northern Australia, extending into Papua New Guinea and Irian Jaya although the extent of their range is not fully known. Hatchling to subadult flatback turtles lack a pelagic life stage and reside in the Australian continental shelf. Flatback turtles require sandy beaches to nest. Sand temperatures between 25 °C and 33 °C are needed for successful incubation. Beaches free from light pollution are required to prevent disorientation, disturbance, and to allow nesting females to come ashore.		Low. Study area not considered core range.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Elasmobranchs						
<i>Carcharias taurus</i>	Grey nurse shark (east coast population)	CE (FM Act)	CE	Grey Nurse Sharks are usually found in inshore coastal waters usually less than 40 metres in depth. This species congregates at a number of rocky reef sites with gravel or sand filled gutters, overhangs or caves known as 'aggregate sites' and key aggregate sites refer to those areas occupied by a larger number of grey nurse sharks. Individuals spend most of their time within or in close proximity to aggregate sites but may undertake excursions of varying lengths of time away from site. In NSW, aggregations of grey nurse sharks (east coast population as listed under the EPBC Act) can be found at reefs off the following locations: Byron Bay, Brooms Head, Solitary Islands, South West Rocks, Laurieton, Forster, Seal Rocks, Port Stephens, Sydney, Bateman's Bay, Narooma and Montague Island. Relatively little is known about the migratory habits of Grey Nurse Sharks in Australian waters but tagged sharks have been recorded moving over 800 kilometres between sites in relatively short periods of time.	(PMST)	Low. May swim through the Study area albeit widespread. No aggregate sites known in the harbour.
<i>Carcharodon carcharias</i>	White shark	V (FM Act)	V, M	In Australia, White Sharks have been recorded from central QLD around the south coast to north-west WA, but may occur further north on both coasts. White Sharks are widely, but not evenly, distributed in Australian waters. This species can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. The majority of recorded White Shark movements occur between the coast and 100 metres in depth but have been recorded to dive to depth of over 1,200 m. Individuals may travel long distances in a relatively short time, but can remain in the same areas for weeks to months. In NSW, the Stockton Beach/Hawks Nest area are identified	(PMST)	Low. May swim through the Study area.

Scientific Name	Common Name	BC Act/ FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				as primary residency areas for juvenile White Sharks.		
<i>Rhincodon typus</i>	Whale shark	-	V, M	In Australia, the Whale Shark is known from NSW, QLD, NT, WA and occasionally VIC and SA, but it is most commonly seen in waters off northern WA, NT and QLD. The Whale Shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls. The Whale Shark is generally encountered close to or at the surface, as single individuals or occasionally in schools or aggregations of up to hundreds of sharks. This species is generally found in areas where the surface temperature is 21–25 °C, preferably with cold water of 17 °C or less upwelling into it, and salinity of 34 to 34.5 parts per thousand.	(PMST)	Low. Study area is not considered core range for the species.

* Distribution and habitat requirement information adapted from:

Australian Government DAWE <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

The NSW DPI (Fisheries) Threatened species lists <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/>. and

Australian Government DAWE PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

EP = endangered population

CE = critically endangered

E = endangered

V = vulnerable

M = migratory (EPBC Act only)

Ma = marine (EPBC Act only)

Migratory species habitat assessment table

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Marine mammals and Elasmobranchs					
<i>Balaenoptera edeni</i>	Bryde's whale	M (B)	Bryde's whales occur in temperate to tropical waters, both oceanic and inshore, bounded by latitudes 40° N and 40° S, or the 20 °C isotherm. Bryde's whales have been recorded from all Australian states except the Northern Territory, including one sighting each in Victoria and NSW and 11 reported strandings in South Australia (7), NSW (2), Victoria (1) and Queensland (1). Bryde's whales are found year-round primarily in temperatures exceeding 16.3 °C. The coastal form of Bryde's whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m). Dive times are relatively short, averaging 1.27 minutes but potentially lasting 9 minutes. This suggests that Bryde's whales use the upper layers of the ocean, and can therefore be considered pelagic.	(PMST)	Low. Usually associated with open water, but may swim through the Study area albeit boat traffic renders the Study area suboptimal.
<i>Caperea marginata</i>	Pygmy right whale	M (B)	In Australia, dusky dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s. They occur across southern Australia from Western Australia to Tasmania, with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, South Australia, and off Tasmania, and a recent stranding in the latter State. Given the lack of understanding of the species' distribution in Australian waters, no key localities have yet been identified. Dusky dolphins occur mostly in temperate and subantarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times.	(PMST)	Low. Usually associated with open water, but may swim through the Study area albeit boat traffic renders the Study area suboptimal.
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	M	The Oceanic Whitetip Shark is widespread throughout tropical and subtropical pelagic waters of the world (30°N to 35°S). Within Australian waters, it is found in from Cape Leeuwin (Western Australia) through parts of the Northern Territory, down the east coast of Queensland and New South Wales to Sydney. It has not been recorded within the Gulf of Carpentaria or the Arafura Sea, preferring pelagic waters. A single specimen has been recorded in South Australia.	(PMST)	Low. Some foraging habitat present in the Study area however, is suboptimal and widely distributed.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Lagenorhynchus obscurus</i>	Dusky dolphin	M (B)	In Australia, dusky dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s. They occur across southern Australia from Western Australia to Tasmania, with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, South Australia, and off Tasmania, and a recent stranding in the latter State. Given the lack of understanding of the species' distribution in Australian waters, no key localities have yet been identified. Dusky dolphins occur mostly in temperate and subantarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times.	(PMST)	Low. Some foraging habitat present in the study area however, is suboptimal and widely distributed.
<i>Lamna nasus</i>	Porbeagle	M	The Porbeagle is wide-ranging and inhabits temperate, subarctic and subantarctic waters of the North Atlantic and Southern Hemisphere. The Porbeagle primarily inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle utilises a broad vertical range of the water column and is known to dive to depths exceeding 1300 m. The Porbeagle is thought to be reasonably flexible in the types of habitat used for foraging.	(PMST)	Low. Some foraging habitat present in the study area however, is suboptimal and widely distributed.
<i>Orcinus orca</i>	Killer whale	M (B)	In Australia, orcas are recorded from all states, with concentrations reported around Tasmania. Sightings are also frequent in South Australia and Victoria. A sighting at Yirrkala in April 1999 provides evidence that they also occur in Northern Territory waters. Orcas are frequently seen in the Antarctic south of 60° S and have been recorded from Heard and Macquarie Islands. Macquarie Island appears to be a key locality, with orcas regularly reported there. The preferred habitat of orcas includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters. They may be more common in cold, deep waters, but off Australia, orcas are most often seen along the continental slope and on the shelf, particularly near seal colonies. Orcas have regularly been observed within the Australian territorial waters along the ice edge in summer.	(PMST)	Low. Usually associated with open water, but may swim through the Study area albeit boat traffic renders the Study area suboptimal.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Sousa sahalensis</i>	Australian Humpback Dolphin	M (B)	Australian humpback dolphins are found in tropical/subtropical waters of the Sahul Shelf from northern Australia to the southern waters of the island of New Guinea. In Australia, humpback dolphins are thought to be widely distributed along the northern Australian coastline from approximately the Queensland–New South Wales border to western Shark Bay, Western Australia.	(PMST)	Low Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.

* Distribution and habitat requirement information adapted from:

Australian Government DAWE <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/>. and

Australian Government DAWE PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

M = migratory (EPBC Act only)

Ma = marine (EPBC Act only)

Protected species habitat assessment table

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Fish and Syngnathids						
<i>Acentronura tentaculata</i>	Shortpouch Pygmy Pipehorse	P	Ma	This species is found on tropical inshore reefs. It also occurs in temperate waters associated with shallow sandflats in protected and somewhat silty coastal areas among sparse low plant growth and in algae on rocks. This species inhabits waters of 7-40 metres in depth. Pipefishes feed on small living crustaceans.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Anampses elegans</i>	Elegant Wrasse	P	-	Elegant Wrasse are a widespread but uncommon species found on coral reef and rocky reef habitats at depths from 2 to 35 m. The distribution of elegant wrasse extends from southern Queensland to Montague Island on the NSW south coast, particularly around inshore islands. The species is also found at Lord Howe Island, especially in the shallow lagoon habitat, and at nearby Elizabeth and Middleton Reefs, and they have also been recorded from Norfolk Island, the Kermadec Islands, New Zealand and Easter Island. Elegant wrasse are a subtropical, warm-temperate species that are active during the day.	(DPI)	Moderate. Potential habitat occurs within the study area, albeit widespread within the study locality.
<i>Epinephelus coioides</i>	Estuary Cod	P	-	Occurs in tropical and warm temperate marine waters of the Indo-Pacific including the Persian Gulf, India, the Philippines, Singapore, Hong Kong, Taiwan, Fiji and around numerous other islands. In Australia they are most common in Queensland, the Northern Territory and Western Australia; however, they are known to occur as far southwards as the Sydney area.	(DPI)	Moderate. Potential habitat occurs within the study area, albeit widespread within the study locality.
<i>Epinephelus lanceolatus</i>	Queensland Groper	P	Ma	This species has a wide distribution throughout the tropical waters of the Indo-West Pacific. In Australia they occur along all tropical and warm temperate coasts but are rarely found in cooler waters to the south. Queensland Gropers occupy a variety of habitats throughout their growth stages including estuaries and coral reefs. This species is usually solitary and inhabit caves and around wrecks and structures. They are ambush predators that swallow prey whole.	(DPI)	Moderate. Potential habitat is present in the Study area albeit towards the end of the species range.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Festucalex cinctus</i>	Girdled Pipefish	P	Ma	Endemic to tropical and temperate waters of the Northern Territory, Queensland and New South Wales. Usually inhabits sheltered coastal bays and estuaries, on patches of rubble, sand or in areas of sparse seagrass, algal and sponge growth. Most specimens were dredged or trawled in depths of 8-31 metres but divers collected some specimens over rubble bottoms in depths of 12 m. In Sydney Harbour it is most common in depths of 10-20 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Filicampus tigris</i>	Tiger Pipefish	P	Ma	The tiger pipefish is relatively common in subtropical waters of Australia's east and west coasts. A relic population also occurs in the warmer waters of Spencer Gulf, South Australia. Inhabits areas near channels in inshore sheltered bays and estuaries with sandy or muddy bottoms, or along seagrass bed edges at 2-30 m. Feeds on aggregations of mysid shrimps in sheltered bays adjacent to tidal channels.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Heraldia nocturna</i>	Upside-down Pipefish	P	Ma	Endemic to temperate waters of southern and south-eastern Australia, from about Hastings, New South Wales, southwards to Victoria, to Port Davey on the west coast of Tasmania, westwards through South Australia to Geographe Bay, Western Australia.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Hippichthys penicillus</i>	Beady Pipefish	P	Ma	Widespread in the tropical Indo-west-central Pacific, from the Red Sea and East Africa across the Indian Ocean to north-eastern Australia, north to Taiwan, Japan, Micronesia and east to Samoa and Tonga. This species usually inhabits brackish waters in mangrove estuaries, tidal creeks and sometimes in freshwater reaches in the lower parts of rivers and streams.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Hippocampus abdominalis</i>	Big-belly Seahorse	P	Ma	Known from temperate waters of New Zealand and southern Australia, where it occurs from about South West Rocks, New South Wales, southwards to the northern Great Australian Bight, South Australia, and south to the Derwent Estuary, Tasmania.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Histiogamphelus briggsii</i>	Crested Pipefish	P	Ma	Big-belly Seahorses live in a range of habitats from low rocky reefs in shallow estuaries, to deep tidal channels and deeper coastal reefs to 100 m. They cling to seagrasses, sponges, macroalgae such as kelp holdfasts and other structures on reefs.	(PMST/DPI)	High. Potential habitat present within the Study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Lissocampus runa</i>	Javelin Pipefish	P	Ma	Endemic to temperate waters of southern and eastern Australia; known from southern Qld, southwards to Tasmania, and across to about Rottnest Island, south-western Australia. Usually inhabits tidepools and sheltered bays, usually in seagrass and algal beds, and rocky and shelly rubble substratum to about 20 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Maroubra perserrata</i>	Sawtooth Pipefish	P	Ma	Endemic to temperate southern Australian waters from southern Queensland to Rottnest Island, Western Australia. The sawtooth pipefish inhabits coastal rocky reefs at 3-25 m, sheltering beneath ledges and in caves during day.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Notiocampus ruber</i>	Red Pipefish	P	Ma	Endemic to temperate waters of southern and south-eastern Australia from Sydney Harbour, New South Wales, south and west to Flinders Island in Bass Strait, Tasmania, Victoria, South Australia and the Recherche Archipelago, Western Australia; usually inhabits rocky reefs, often in crevices, in association with sponges and encrusting and filamentous red algae at 5–20 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Paraplesiops bleekeri</i>	Eastern Blue Devil	P	-	Eastern Blue Devil are a shy, secretive fish found in caves, crevices and under ledges on inshore reefs and estuaries. Eastern blue devil fish are distributed from southern Queensland to Montague Island on the NSW south coast. They can be found in waters between 3-30 metres and are generally solitary occupying caves, crevices or under ledges.	(DPI)	High. Potential habitat present within the Study area.
<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon	P	Ma	Endemic to temperate coastal waters of southern Australia, from about Newcastle (New South Wales) south to Actaeon Island (Tasmania) and across southern Australia to about Geraldton (Western Australia).	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Solegnathus spinosissimus</i>	Spiny Pipehorse	P	Ma	Common seadragons inhabit shallow estuaries to deeper offshore reefs, living seagrass beds and on rocky reefs covered in macroalgae, especially kelp beds, in depths of 1-50 m. Individuals usually remain within a broad home range.	(PMST/DPI)	High. Potential habitat present within the Study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Solenostomus cyanopterus</i>	Robust Ghostpipefish	P	Ma	Known from temperate waters of Australia and New Zealand. In Australian waters, spiny pipehorses have been recorded from off Caloundra, southern Queensland, to southern Tasmania, throughout Bass Strait to south of Cape Otway, Victoria. In the southern part of their range, Spiny Pipehorses inhabit relatively shallow waters. Specimens have been collected from muddy, silty, shelly and rubble substrates, and rocky reefs, and may be washed ashore after storms. Spiny Pipehorses use their prehensile tails to cling to macroalgae and sessile invertebrates on the substrate.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Solenostomus paradoxus</i>	Ornate Ghostpipefish	P	Ma	Widespread in the tropical Indo-west Pacific, from East Africa and the Red Sea, eastwards to Fiji and southern Japan, and south to Australia. Known in Australian waters from the Shark Bay region, Western Australia, around the tropical north and southwards to at least Sydney Harbour, New South Wales. Robust Ghost Pipefish live in protected coastal and lagoon reefs, deeper coastal reefs and deep, clear estuaries with seagrass or macro-algae in 15-25 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Stigmatopora argus</i>	Spotted Pipefish	P	Ma	Widespread in tropical and warm-temperate regions of the Indo-west Pacific, from East Africa, eastwards to Fiji and Tonga, north to southern Japan, south to Australia and New Caledonia. Ornate ghost pipefish inhabit protected coastal, lagoon and outer reef areas with drop-offs or rock faces, in depths of 3-35 m. They often associate with Crinoids (featherstars), Gorgonians and black corals. Although usually solitary, they may be seen in pairs, or even in small groups.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Stigmatopora nigra</i>	Widebody Pipefish	P	Ma	Found from the Hawkesbury River, NSW to Shark Bay, WA in temperate waters. Usually among vegetation in bays and estuaries, but sometimes offshore among floating Sargassum.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Syngnathoides biaculeatus</i>	Double-end Pipehorse	P	Ma	Known from temperate waters of southern Australia and New Zealand. The Widebody Pipefish occurs from about Fraser Island in southern Queensland to north of Perth (Western Australia), and around Tasmania. It is common in sheltered seagrass and algal beds from intertidal depths to 35 m.	(PMST/DPI)	High. Potential habitat present within the Study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish	P	Ma	Widespread in the tropical Indo-west Pacific. Bentstick Pipefish are known in Australian waters from the central coast of Western Australia, northwards throughout the waters of the Northern Territory and Queensland to central New South Wales. They live in sheltered coastal lagoon and reef areas on sandy and rubble habitats amongst seagrasses and macroalgae at 1-30 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Urocampus carinirostris</i>	Hairy Pipefish	P	Ma	In Australia, known from the Shoalwater Bay region (Queensland) to northern Tasmania, Victoria, and to the Ceduna region of South Australia, and in south-western Australia where it reaches the Perth region. Rare in South Australia. Inhabits the lower reaches of rivers, sheltered estuaries and shallow reefs in seagrass and algal beds a 0-6 m. One of the most common estuarine pipefishes in eastern Australia, occurring year-round in seagrass beds in Western Port (Victoria), and abundant in seagrass beds in Moreton Bay (Queensland).	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	P	Ma	Endemic to sub-tropical and temperate Australia, from North Stradbroke island, Queensland, southwards to Jurien Bay, Western Australia, absent from Tasmania. Inhabits shallow estuarine and coastal waters in seagrass beds), macroalgae (Ecklonia spp. and other brown algae), rocky reef, boulder, rubble, sandy and muddy habitats between 2-15 m.	(PMST/DPI)	High. Potential habitat present within the Study area.
Reptile						
<i>Pelamis platurus</i>	Yellow-bellied Seasnake	-	Ma	The Yellow-bellied seasnake is the most widely distributed of all sea snake species. In the beginning of the 21st century, the species was found to range from the east coast of Africa through the Indian and Pacific Oceans to the west coast of the Americas. It was found in most Australian waters with the exception of the colder southern coastline. The greatest density of populations was thought to exist south of the tropics where it was most commonly found on beaches after storms. Populations were also found in tropical seas and the Gulf of Carpentaria. The population living near the central coast of NSW was thought to be permanent and breeding, though no new studies have confirmed this. Most Australian specimens have been washed ashore by a combination of ebbing tides and onshore winds. The Yellow-bellied Seasnake is usually found within a few kilometres of the coast and prefers shallow inshore waters found to be between 11.7–36 °C. Nevertheless, the species is the most	(PMST)	Low. Prefers specific habitat not in the Study area however, it may get washed into the harbour.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				pelagic of all known sea snakes, occurring in the open waters well away from coasts and reefs.		

* Distribution and habitat requirement information adapted from:

Australian Government DAWE <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/> and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/> and

Australian Government DAWE PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

P = protected (FM Act only)

Ma = marine (EPBC Act only)



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→ **The Power of Commitment**

Appendix E

Landscape character and visual impact assessment



Manly Wharf 3 Upgrade

Landscape Character and Visual Impact Assessment

Transport for NSW

October 2022

→ The Power of Commitment



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File name	https://projectsportal.ghd.com/sites/sp01_02/manlywharf3upgrade/_layouts/15/DocIdRedir.aspx?ID=12547220-81992-868
Author	Izzy David
Project manager	Jillian Smith
Client name	Transport for NSW
Project name	Manly Wharf 3 Upgrade
Document title	Manly Wharf 3 Upgrade Landscape Character and Visual Impact Assessment
Revision version	Rev 0
Project number	12547220

Document status

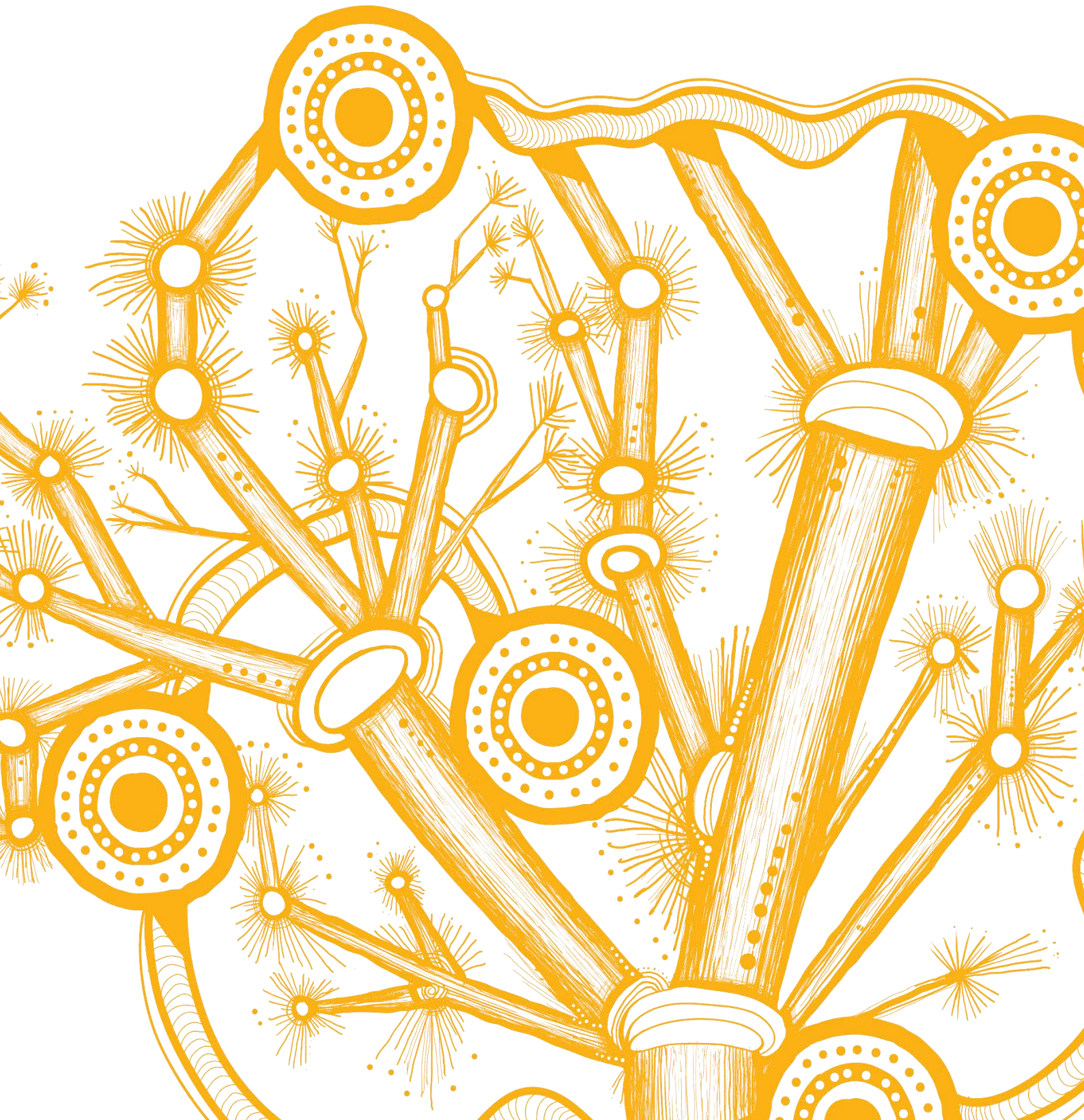
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	Izzy David	Sophie Rae Victoria Wheatley Jenny McKinney	*on file	Jenny McKinney	On file	
S4	0	Izzy David	Sophie Rae	*on file	Jenny McKinney		13/10/2022

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GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



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Terminology

Terminology	Definition
Aesthetics	Relating to the sense of the beautiful or science of aesthetics, ie the deduction, from nature and taste, the rules and principles of beauty.
Impact	The effect of a proposal, which can be adverse or beneficial, when measured against an existing condition.
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.
Landscape character	The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place.
Landscape character zone	An area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby.
Magnitude	The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer. Combines with sensitivity, magnitude provides a measurement of impact.
Proposal	The construction and operation of the Manly Wharf 3 Upgrade proposal
Proposal area	The area within which all the proposal construction and operational elements will be contained within.
Sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.
Significant	In the context of Environmental Impact Assessment, after analysing the extent (type, size, scope, intensity and duration) and nature (predictability, resilience of the environment, reversibility, ability to manage/mitigate, level of public interest) of a proposal, an expected level of impact of a proposal which requires an EIS to be undertaken. The term should be avoided in landscape character and visual impact assessments if the expected level of impacts is below the threshold.
Study area	Consists of land in the vicinity of, and including, the proposal site. The study area is a wider area surrounding the proposal site as defined in this assessment, including land that has the potential to be indirectly impacted by the proposal.
View	The sight or prospect of a landscape or scene.
Viewpoint	The point from which a view is observed that represents a visual receiver.
Viewshed	The area within which a proposal can be seen at eye level above ground. Its extent will usually be defined by a combination of landform, vegetation and built elements.
Visibility	The state or fact of being visible or seen.
Visual impact	The impact on the views from residences, workplaces and public places.
Visual receiver	Individuals and/or defined groups of people who have the potential to be affected by a proposal.
Zone of Theoretical Visibility	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

¹ Partially adapted from: *Environmental impact assessment practice note EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.2* (Transport for New South Wales, 2020).

Abbreviations

Abbreviations	Definition
3D	Three dimensional
DSAPT	Disability Standards for Accessible Public Transport
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
CCTV	Closed-circuit television
DCP	Development Control Plan
FRP	Fiberglass-reinforced polymer
GHD	GHD Pty Ltd
GIS	Geographic Information System
LCZ	Landscape character zone
LEP	Local Environmental Plan
LGA	Local Government Area
LVIA	Landscape and visual impact assessment
SEPP	State Environmental Planning Policy
SREP	Sydney Regional Environmental Plan
TfNSW	Transport for New South Wales
VP	Viewpoint
ZTV	Zone of theoretical visibility

1. Introduction

1.1 Purpose of this report

The Landscape and Visual Impact Assessment (LVIA) has been prepared by GHD on behalf of Transport for NSW to assess the potential impacts of the Manly Wharf 3 upgrade (the proposal) as part of the Review of Environmental Factors (REF). For the purposes of these works, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The proposal forms part of the Transport Access Program (TAP) which aims to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The report comprises of the following:

- an understanding of the landscape and visual attributes of the study area
- identification of sensitivities in relation to landscape and visual change associated with the proposal
- assessment of potential landscape and visual impact associated with the proposal
- provision of recommendations for managing and minimising identified impacts arising from the proposal.

1.2 Overview

The proposal is located within the local government authority area (LGA) of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay.

The existing wharf is located at the western end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes a ferry terminal and restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

The objectives of the proposal are to provide:

- facilities that are accessible to the disabled, ageing and parents with prams
- a reliable and durable ferry wharf that is suitable for ferry operations in this location
- comfortable and protected environments for customers from wet and windy weather while accessing and waiting for transport services
- service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- safety features including extra lighting, help points, fences, CCTV coverage and security measures for wharves
- efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

In order to achieve the above objectives, the proposal would involve the following key features:

- removal of the existing Manly Wharf 3 timber wharf structure and triangular concrete platform
- retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the commercial wharf platform at Wharf 3
- a new public seating space 'slow space' within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform

- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels
- construction of a new vessel arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- providing conduits for opal readers to be installed in the future if required.

1.3 Report structure

This report comprises of the following sections:

Section 1 – Introduction: provides background information and an overview of the proposal and assessment.

Section 2 – Methodology: describes the methodology used for the purpose of this report.

Section 3 – Proposal description: describes the proposed development, with emphasis on identifying the key sources of potential impacts relevant to this assessment.

Section 4 – Legislation and policy: provides an overview of relevant legislation and policy.

Section 5 – Existing landscape and visual existing environment: provides an overview and describes the landscape and visual environment within the study area.

Section 6 – Landscape character impact assessment: landscape character zones are identified and assessed against the proposed development.

Section 7 – Visual impact assessment: representative viewpoint locations are identified and assessed against the proposed development.

Section 8 – Mitigation measures: recommendations and mitigation measures are provided in response to identified impacts as a result of the construction and operation of the proposal.

Section 9 – Conclusion: presents a summary of the Landscape and Visual Impact Assessment.

2. Methodology

2.1 Standards and guidance

This landscape and visual impact assessment has been prepared in accordance with the following:

- *Environmental impact assessment practice note EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.2* (Transport for New South Wales, 2020)
- *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition* (Landscape Institute and Institute of Environmental Management & Assessment, 2013)

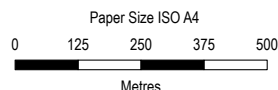
2.2 Study area

The study area is determined based on the height of the proposal, the topography, and the viewshed of the proposal as observed on site and using ZTV mapping. Based on these factors, the study area used for this assessment extended approximately 1.5 kilometres to the south-west and 0.8 kilometres to the north-east of the proposal. Refer to Figure 2.1 for the study area for this assessment.

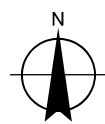


Legend

- Study Area
- Site boundary
- Proposal layout
- Roads
- Waterway



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



Transport for NSW
 Manly Wharf LVIA report

Project No. 12547220
 Revision No. 0
 Date 13/10/2022

Study area

FIGURE 2.1

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
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Data source: NSW Department of Finance and Services, 2017; NSW_Imagery; © Department of Customer Service 2020. Created by: mfredie

2.3 Existing landscape and visual environment

2.3.1 Review of legislation and policy

A review of key planning designations, policies and guidance was undertaken in relation to landscape and visual amenity within the study area. The emphasis of the review was to identify elements outlined within legislation, policy and planning documents relevant to the landscape and visual character and identity of the study area.

2.3.2 Desktop analysis landscape and visual resources

Existing data was gathered and reviewed, including:

- the proposal design information and site photographs
- topography, land use, and vegetation maps
- Google Earth and Google Street View.

Using this data, a preliminary assessment of the landscape and visual environment was undertaken to inform the site inspection.

2.3.3 Zone of theoretical visibility

Zone of theoretical visibility (ZTV) mapping is a computer-generated analysis which identifies land from which it is theoretically possible to view the components of the proposal. These have been used primarily to guide the area of site analysis and representative viewpoint selection.

ESRI ArcGIS software was used to model the ZTV of the proposal, using a viewing height of 1.7 metres, which is the average within the typical viewing level range of an adult, and a nominal eight metre height of proposed roof canopy. The GIS software then digitally determines the likely extent over which the feature would be visible or not visible. In interpreting the ZTV, the following issues must be considered:

- It only takes into account the landform and does not include land cover factors such as the presence of buildings and trees, therefore it represents the worst-case scenario of potential visual impact.
- It does not take into account the effect of distance. The greater the distance from the proposal, the lower the impact, as the development will take up a smaller portion of the view, and atmospheric conditions may reduce the visual prominence of the proposal.
- The ZTV is only accurate to the resolution of the elevation model.

The purpose of the ZTV mapping was to inform the site inspection. Subsequent viewshed mapping was undertaken after the site inspection as a refinement of the ZTV analysis, refer to section 5.1.7 and Figure 7.1.

2.3.4 Site inspection

A site inspection was undertaken by two Landscape Architects on the 16th and 17th of May 2022. The purpose of the inspection was to:

- inspect the site and appreciate views to / from sensitive visual receivers
- inspect publicly accessible locations identified in the desktop study as likely to provide views of the proposal
- identify sensitive visual receiver locations
- assess the landscape character of the study area and identify landscape sensitivities
- undertake site photography suitable for viewpoint assessment and photomontage preparation.

The coordinates of each viewpoint were recorded during the site inspection.

2.3.5 Definition of existing landscape and visual environment

An assessment of the existing landscape and visual environment was undertaken to determine the existing natural, cultural and visual features within the study area. This includes determination of key landscape and spatial elements, features and values. Aspects considered include:

- land use and built form
- landform, topography and hydrology
- vegetation
- historical features
- Aboriginal cultural values
- key visual features
- the proposal's viewshed.

2.4 Impact assessment

2.4.1 Landscape character zones

Landscape character considers common landscape zones defined by typical features and characteristics identified during the desktop assessment and site inspection. Defining landscape character zones (LCZs) identifies areas sharing the same homogenous environmental or cultural qualities or pattern such as topography, vegetation, hydrology, land use and settlement, built form scale and character, cultural and recreational characteristics.

This approach has been used to establish the existing landscape character within the study area and to provide a framework for measuring the impact of the proposal. This assists in:

- defining landscape elements that contribute to defining character
- defining landscape character attributes
- identifying landscape value.

The assessment of the existing environment also considers factors which have influenced landscape change in the past and those that are likely to do so in the future. The landscape character zones are defined in Section 6.

Landscape value

As part of the assessment of existing conditions, the value of the landscape is defined for each LCZ. Criteria for assessing the value of the landscape is defined in Table 2.1.

When defining LCZs, the value attached to the landscape also forms the baseline for which the significance of the impact is measured. Landscape value looks at designated and undesignated landscapes, and holistically at all the elements such as the environmental, cultural, historical and visual/sensory elements that form the landscape. The value of the landscape from an international, national, local and community level is considered when applying a landscape value. The following factors are taken into consideration when defining landscape value (Natural England, Scottish Natural Heritage and Countryside Council, 2011):

- landscape quality (physical state of the landscape)
- scenic quality (appeal of the landscape to the senses)
- rarity (presence of rare elements)
- representativeness (distinct character or features of landscape)
- conservation value
- Aboriginal and non-Aboriginal cultural values
- recreation value
- perceptual aspects/qualities
- associations (with particular people, artists, events in history).

The landscape values for each LCZ are described in Section 6.

Table 2.1 Landscape value

Landscape value	Definition
High	Landscape character elements in good or above average condition and/or that make a strong positive contribution to landscape character. May include nationally important features.
Medium	Landscape character elements in reasonably good condition and/or that make an average contribution to the local character, which may include locally important landscape features.
Low	Landscape character elements in below average condition and/or that are not particularly distinctive local features.

2.4.2 Landscape character impacts

Assessment of landscape impacts deals with the effect of change and development on landscape as a resource. The concern is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. The consideration of potential impacts on landscape character is determined based on the sensitivity of the existing landscape and the magnitude of change that is likely to occur.

The sensitivity of a landscape is judged on a combination of the landscape value (refer Table 2.1) and the landscapes susceptibility to change (refer Table 2.2) from the type of development proposed. A judgement on the level of sensitivity is made and a rating of High, Moderate or Low applied.

The magnitude of change to landscape character depends on the nature, scale and duration of the change expected to occur. The magnitude of change also depends on the loss, change or addition of any feature to the existing landscape. It is based on the part of the landscape character zone which is likely to be impacted to the greatest extent by the proposal.

The sensitivity and magnitude of landscape effects address the following specific criteria:

- sensitivity of landscape to proposed change, based on the susceptibility to change, and the value of landscape (refer Table 2.1 and Table 2.2 respectively)
- magnitude of landscape effect, based on the size or scale of change, the geographical extent of effects, and the duration and reversibility of effects (refer Table 2.3).

A judgement is made on the overall level of significance of the landscape impact in relation to the existing conditions.

Table 2.2 Landscape susceptibility to change

Landscape susceptibility	Definition
High susceptibility to change	The type of development proposed could have a detrimental effect on the landscape character, condition or value. Mitigation measures are unlikely to reduce the impacts of the change.
Moderate susceptibility to change	Any change caused by the type of development would be unlikely to have a significant adverse effect on the landscape character, condition or value that could not be mitigated.
Low susceptibility to change	Development of this type is unlikely to have an adverse effect on the landscape character, condition or value. Mitigation measures would be effective in neutralising adverse effects.

Table 2.3 Magnitude of change criteria (landscape)

Rating	Criteria
High	A substantial/obvious change to the landscape character due to total loss of, or change to, elements, features or characteristics of the landscape. Would cause a landscape to be permanently changed and its quality diminished.
Moderate	Discernible changes in the landscape character due to partial loss of, or change to elements, features or characteristics of the landscape, however has potential to be partly mitigated. The change would be out of scale with the landscape character, and at odds with the local pattern and landform and would leave an adverse impact on the landscape character.
Low	Minor loss or alteration to one or more key landscape character elements, features or characteristics, or the introduction of components that may be new but may not be uncharacteristic within the existing landscape character.
Negligible	Almost imperceptible or no change in the landscape character as there is little or no loss of/or change to the elements, features or characteristics of the landscape.

2.4.3 Viewpoint selection

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views as a result of the change or loss of existing elements of the landscape and/or the introduction of new elements.

Visual receivers have been considered in terms of the views they are likely to obtain from within the study area including consideration of any key vantage points, such as lookouts, where there is particular interest in the view. Visual receivers are identified based on:

- proximity of the receivers to the proposal, as the most affected visual receivers are anticipated to be located closest to the proposal, unless located at an elevated vantage point
- type of receiver, as different viewer types would have different perceptions of the change.

Based on the analysis of the existing landscape and visual environment, viewpoint locations were selected for assessment as representative of sensitive visual receiver locations. The viewpoint selection process considers a range of criteria including representation of a range of receiver types and distances from the proposal. It may include the most sensitive visual receivers and/or viewing locations where views may experience the greatest level of change. The assessment requires that viewpoints are in publicly accessible locations only, which means some private properties and residences may not be represented.

2.4.4 Visual impacts

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receiver it represents) to change, and the magnitude of change that is likely to occur.

The sensitivity of each viewpoint is considered to be dependent on the:

- importance of the view, its existing scenic qualities and the presence of other existing man-made elements in the view
- type of visual receiver and their likely interest in the view.

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of a change also depends on the loss, change or addition of any feature in the field of view of the receiver including an assessment of the level to which the change contrasts with the existing view or expected view of the landscape. This includes the degree of any change to the backdrop to, or outlook from a viewpoint.

The assessment considers the likely impacts of the proposal. The level of effects on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the proposal.

Steps undertaken to assess visual effects include:

- identify and map viewpoint locations
- Undertake assessment of visual effects, comprising:
 - sensitivity of visual receivers to proposed change, based on susceptibility of visual receivers to change, and value attached to views (refer Table 2.4)
 - magnitude of visual effect, based on size or scale of change; geographical extent of effects, and duration and reversibility of effects (refer Table 2.5)

An assessment is undertaken of the overall level of significance of the visual impacts in relation to the existing view (refer Section 2.4.5).

Table 2.4 Sensitivity criteria (visual)

Rating	Criteria
High	Occupiers of residential properties, at home or going to or from, with long viewing periods, within close proximity to the proposed development; Communities that place value upon the landscape and enjoyment of views of their setting.
Moderate	Outdoor workers who have a key focus on their work who may also have intermittent views of the study area; Viewers at schools, or similar, when outdoor play and recreation areas are located within close proximity but viewing periods are limited; Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
Low	Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and therefore have short term views; Viewers indoor at their place of work, schools or similar.
Negligible	Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

Table 2.5 Magnitude of change criteria (visual)

Rating	Criteria
High	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished.
Moderate	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however has potential to be partly mitigated. The change would be out of scale with the existing view, and would leave an adverse impact on the view.
Low	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view.

2.4.5 Significance of impacts

The combination of sensitivity and magnitude determines the significance of the impact on the landscape character or representative viewpoint. Refer to Table 2.6 for the matrix used to determine the significance of impact.

Table 2.6 Significance of impact matrix

		Magnitude of impact			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible
		Negligible	Negligible	Negligible	Negligible

2.4.6 Panorama and photomontage

Photographic images were captured using a 35 millimetre full frame format camera. All photographic images were taken using a 50 millimetre focal length, aside from VP05 and VP12, which use photos taken using a focal length of 47 millimetres, and the VP11 which uses photos taken with a focal length of 24 millimetres, due to technical difficulties on site. However, the field of view was calculated accordingly and all photomontages have been created according to industry standards. All photographs were taken at a camera height of 1.7 metres and photograph locations were recorded and mapped.

A series of 13 viewpoint locations were chosen and existing views represented using a panorama technique. This technique involves the stitching together of a number of adjoining images using the Adobe Photoshop software program.

Of the 13 viewpoint locations, six viewpoints were selected for the production of photomontage images to represent proposed views following the completion of the proposal. The software used to model and render the photomontages was Autodesk 3D Studio Max. In order to achieve an accurate photomontage of the proposal and surrounding landscape, one metre contours with a digital terrain model to a resolution of one metre were used to model the surrounding landform.

Once the 3D model incorporating both the landscape and new proposal elements were created, a virtual camera was placed in the software at the same location the photographs were taken. The film, focal lens and height of the virtual camera matches the real camera utilised to take the photographs. The photographs of the site were used in 3D Studio Max as a background to accurately match the 3D model with the proposal elements to the perspective of the photographs. From the camera view, rendered images of the proposal were produced to match the daylight exposure of the photographs. The rendered images were imported into Adobe Photoshop for post-production editing and collation of the photomontages.

The final result is the 3D model of the proposal shown in the correct 3D location in the photographs (refer Appendix A). The final images were produced to a high resolution, suitable for printing.

2.5 Mitigation measures

Mitigation measures were developed in response to the impacts identified within Section 6 and Section 7. Potential mitigation measures typically include:

- adopting alternative designs or revisions to the basic engineering and architectural design to prevent and/or minimise negative impacts
- remedial measures such as colour and textural treatment of structural features
- adopting sensitive siting and design of construction activities and structures to minimise visual impacts during the construction phase
- compensatory measures such as landscape design to compensate for unavoidable negative impacts and to attempt to generate long-term positive impacts.

3. Proposal description

The following section provides a summary of the proposal and includes the detail relating to the main visual components that have potential to affect the landscape character and visual amenity of the study area.

3.1 The Proposal site

The proposal is located within the LGA of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre. Figure 3.1 shows the local setting and features of the existing Wharf 3. The existing wharf is located on Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes two ferry terminals (wharves 1 and 2) a third tidal step wharf (Manly 3) and a restaurant and retail section. It also supports a transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

The Manly Wharf Complex is a large ferry terminal that provides a key transport link to Manly and the Northern Beaches and connection with Circular Quay, as well as an important site for hospitality businesses, recreation and in the broader area, residential areas. The Manly Wharf Complex is located within Sydney Harbour, in Manly Cove.

Manly Wharf 3 is located to the east of Manly Wharves 1 and 2. It is accessed via a timber board walk. There are numerous shops, restaurants, pubs, a supermarket, and parking in the interchange.

3.2 Design objectives

As outlined in the Concept Design Report (GHD Pty Ltd, 2022), the key relevant design objectives of the proposal are as follows:

Key urban design objectives

- Integrate the wharf within its local area, taking into consideration the nature of the site, local context and the surrounding biodiversity
- Integrate the wharf with its future urban context
- Create a high quality, secure and positive addition to the public domain
- Placemaking for community and wharf customers.

Key architectural objectives

- Use Kit-of-Parts elements in designing the wharf, where feasible
- Ensure compliance with functional and operational requirements
- Balance core operations and customer needs
- Design all elements for easy maintenance with an appropriate human scale
- Maintain elegant simplicity in architectural planning and detailing
- Sympathetic to surrounding structures, responding sensitively to current and likely future built environment around the wharf.

3.3 The Proposal

The proposal would involve the following key features:

- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk

- construction of a DSAPT compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- a new public seating space / rest ‘slow space’ within the new public promenade area
- construction of a new covered main waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.
- construction of a new vessel arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- providing conduits for opal readers to be installed in the future if required.

Figure 3.1 and Figure 3.2 show the key features of the proposal.

3.3.1 Key proposal components

Key proposal components relevant to this assessment are outlined below.

Boardwalk and ‘slow space’

The design proposes to widen the existing boardwalk, and create a new ‘slow space’ with clusters of seating. This space is intended as a space for people to informally meet and gather, whether waiting for a public transport service or enjoying the ambience of the wharf. It is intended for the design of this space to be developed further in future project stages. The widened boardwalk, ‘slow space’ and passenger waiting area would also feature new stainless steel and glass balustrades to the entire edge.

Covered passenger waiting area

The main roof canopy of the proposed covered passenger waiting area would be rectangular in shape (approximately 33 metres long x 10 metres wide) and supported by four columns along its centre-line. The shape of the roof in plan echoes the rectangular plan form of the main Wharf 1 and 2 buildings, yet on a smaller scale. The roof would be divided into four bays, with a single column at the centre of each bay. Each column supports tapered trusses which decrease in size at the outer edges of the roof bays creating a roof form comprised of three interconnected ‘inverted pyramids’. This allows for a minimal roof form with a small number of supporting columns, with the intention of reducing visual impact of the structure. The fascias of the main canopy roof are proposed to be painted ‘heritage green’ to match the existing heritage building.

A new service pod would be located at the north-east corner of the passenger waiting area.

Covered gangway and hydraulic platform (Wharf 3)

A new hydraulic platform is proposed to the south of the passenger waiting area, and would be accessed by a covered gangway. The platform is proposed to be constructed using fabricated steel box section primary beams, secondary and intermediate beams and steel stiffeners supporting a steel top plate covered in a protective non-slip surface treatment. The platform would not have a roof, and would have metal balustrades and an emergency ladder.

The covered gangway design is proposed to be similar to other gangways used at other commuter wharves. It would be 18 metres long by 4.2 metres wide.

The new wharf would be used by Manly Fast Ferry and Captain Cook Cruises vessels, along with other private commercial vessels.

Public jetty (Wharf 4)

A new multi-level public jetty would be located to the east of the gangway and hydraulic platform. This would comprise of a fixed tidal steps structure with ramps down to each level for the berthing of recreational vessels. The structure would feature four level landings for the full width of the structure to provide adequate points for embarkation / disembarkation from vessels across the full tidal range.

Wharf 4 is intended for use by small commercial vessels only (eg. water taxis) and recreational vessels.

Materials

The Wharf 3 design is to use the established 'kit of parts' components as used by other TfNSW ferry wharves. The materials chosen for the wharf are cognisant of the need to provide quality durable materials and construction systems. Materials include steel structure, stainless steel, precast concrete, aluminium cladding, and concrete. Wharf 4 would be constructed using 50 millimetre thick FRP (fiberglass-reinforced polymer) surface grating over a fabricated steel frame.

3.3.2 Construction activities

Construction of the proposal would likely occur in the stages set out in Table 3.1.

Table 3.1 Staging plan for the proposal

Stage	Operation	Works
1	Wharf 2 closed Wharf 3 open	<ul style="list-style-type: none"> - Site establishment including: <ul style="list-style-type: none"> • Establish site compound • Hoarding • Safe pedestrian access • Establish on-site laydown area • Delineate water-side construction area with floating booms, allowing for barge anchoring locations and extent of barge reach. • Install environmental perimeter controls - Construct western side of new promenade (in front of Wharf 2 berthing area) - Construct concrete topping slab - Regrade a section of existing promenade - Construct temporary separation piles between Manly Wharf 2 and proposed crane barge location at Manly Wharf 3
2	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> - Construct hoarding on promenade to close Wharf 3 - Demolish existing Wharf 3 pier (except for area to be retained) - Demolish area of existing boardwalk to be removed - Remove piles below demolished pier
3	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> - Install environment controls (including silt curtains) - Dredge Wharf 3 berth pocket
4	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> - Construct remaining promenade structure - Construct new waiting area structure - Promenade and waiting area fitout including wharf furniture and utilities.
5	Wharf 2 open Wharf 3 closed New Wharf opened	<ul style="list-style-type: none"> - Construct Wharf 3 platform, berthing piles and install gangway - Construct Wharf 4 fixed structure - Install separation, arrestor and safety marker piles - Commissioning of equipment and wharf - Site clean-up and opening of the new Wharf

Construction hours and duration

It is anticipated construction of the proposal would take up to eight months to complete depending on weather and maritime conditions, commencing in the first half of 2023.

Working hours

The work would take place within and outside of standard working hours. Standard working hours are as follows:

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

For safety reasons the piling may need to take place late at night or early in the morning when the water is calm and the harbour is least busy, with potentially up to 40 staggered night shifts (from 11pm to 7am) proposed across the eight month construction period time. During piling, a work schedule similar to the following may be adopted:

- Vibration of piles (preferred method):
 - Setup: 11pm to 12am (approximately)
 - Vibration: between 12am to 6am (approximately)
 - Pack up: generally, 6am to 7am (approximately)
- Hammering of piles (alternative method):
 - Setup: 4am to 5am (approximately)
 - Hammering: 5am to 7am (approximately).

Due to the requirement for calm water conditions, the new gangway, hydraulic platform and main waiting area canopy would be lifted into position by a barge-mounted crane over a two to three-day period between approximately 11pm and 7am when the water is calmer.

To reduce the impact from *in-situ* concrete pouring on businesses within close proximity to the concreting work, concrete pouring is proposed to take place outside of hospitality venue business hours:

- 4am to 12pm (approximately).

Workforce

Workforce numbers on site during construction would vary between 10-15 people onsite at any one time. It would be expected that peak workforce numbers would reach about 20 people during the busiest period of construction.

Site compound and laydown areas

A temporary site compound would be located in East Esplanade Park (refer Figure 3.1). This compound would be used to establish offices, lunch rooms, amenities and limited storage. The compound would only utilise the grassed area of the park and no tree clearance would be required. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

Laydown areas on the marine side of Manly Wharf would be used to enable closer access to equipment and materials. During Stage 1, it is proposed that a storage area at the end of Wharves 1 and 2 be used while the expansion of the western side of the promenade was being constructed. This could potentially be directly accessed from the work area using a berthing ramp. Once completed, the laydown area would be moved to the newly constructed expanded promenade area.

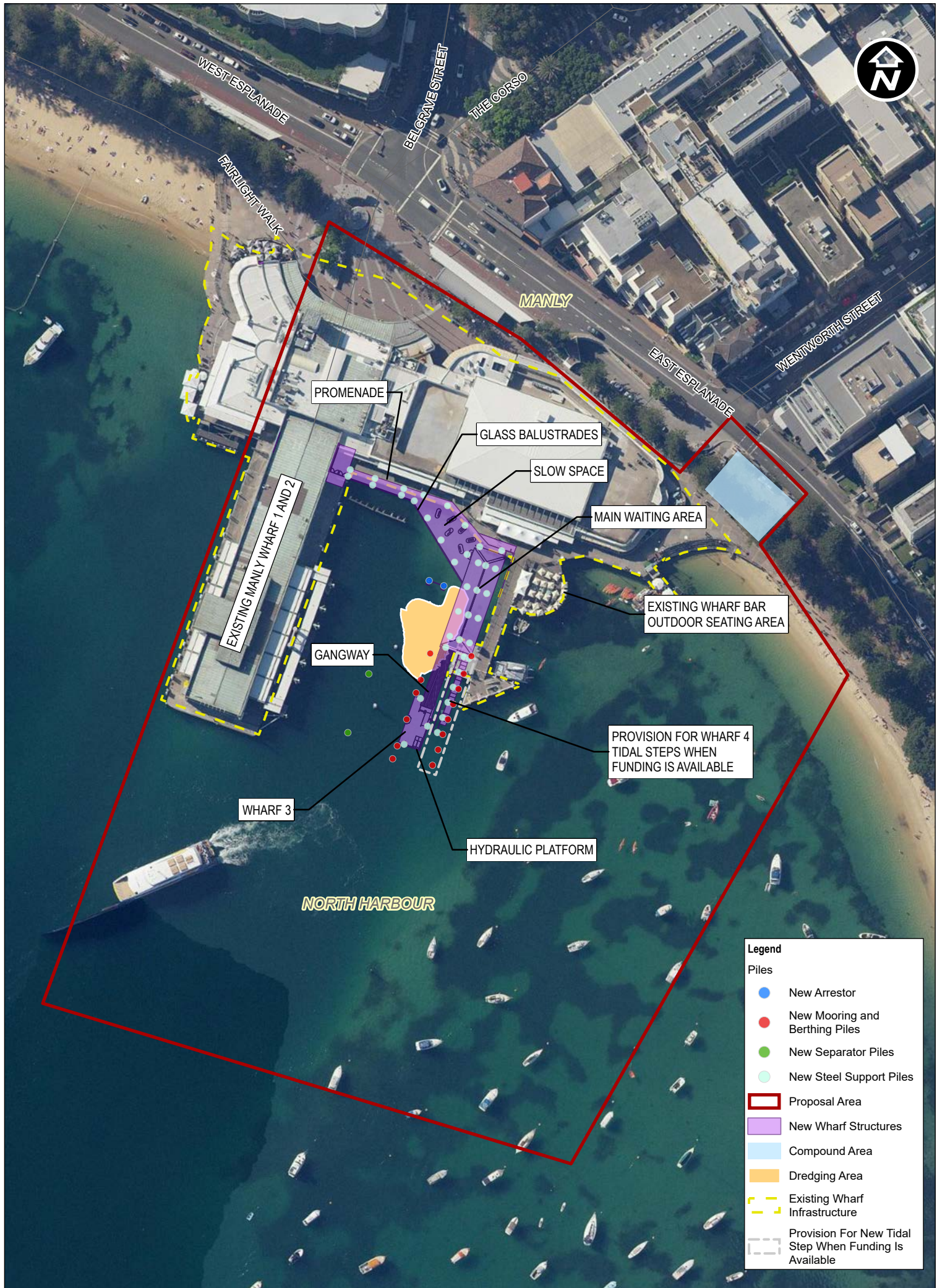


Figure 3.1 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHQ makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by metradia

Data source: publicNSW, Imagery: © Department of Customer Service 2020

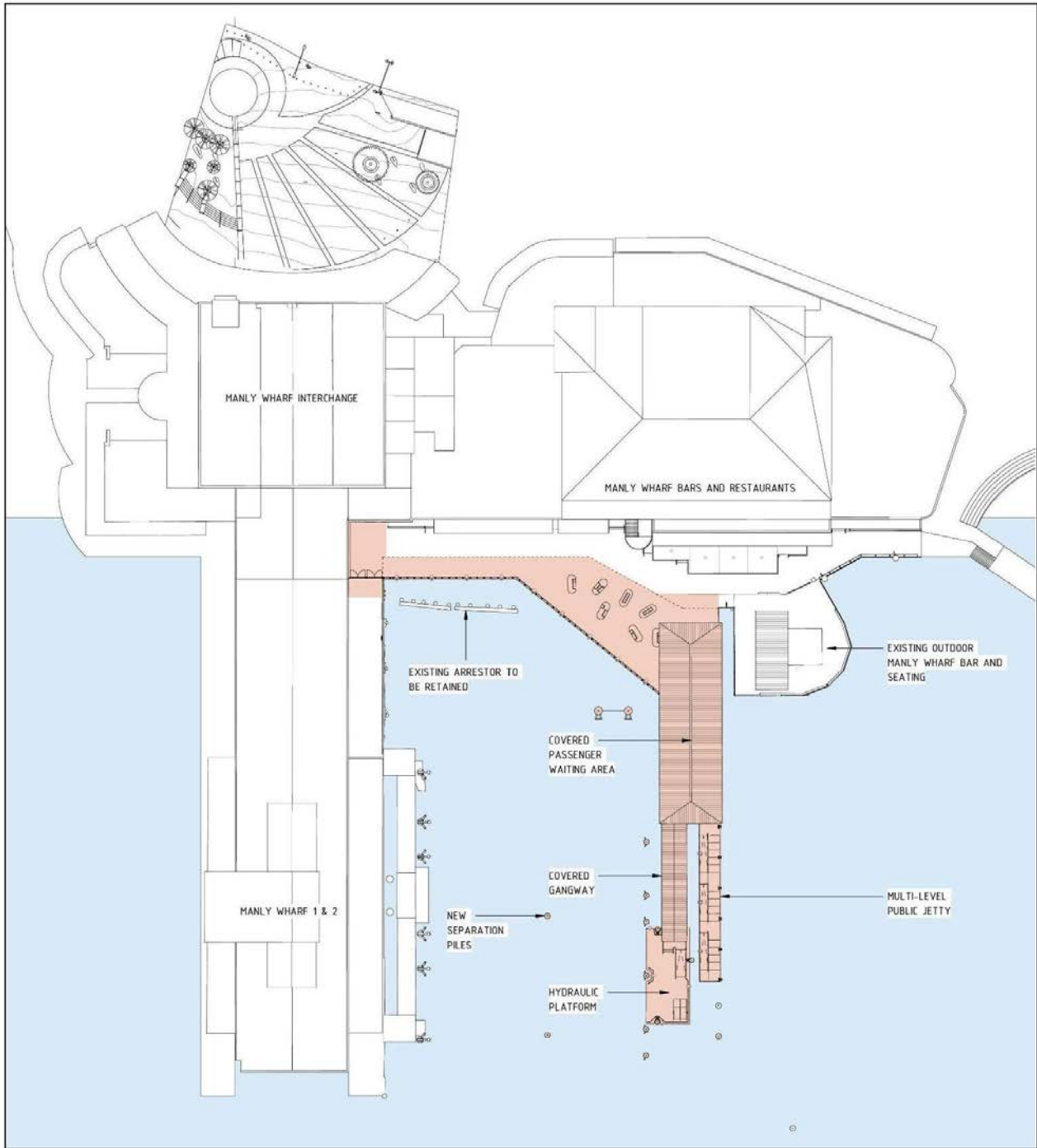


Figure 3.2 Site plan of the proposal (extent of proposal highlighted)

4. Legislation and policy

Land use planning, including zoning and development control, is governed primarily by local environmental plans (LEPs) made under the EP&A Act. LEPs include lists of local heritage items and local heritage precincts and provide controls on development which may affect those items or be located in those precincts. The study area for the proposal is within the LGA of Northern Beaches Council. Manly was previously in the Manly Council which, along with other councils in the area, was subsumed into Northern Beaches Council in 2016. For this reason, appropriate legislation from both Manly Council and Northern Beaches Council has been reviewed. Figure 4.1 shows the land use zoning within the study area in accordance with the relevant LEP.

The following section provides an overview of relevant legislation and policy objectives relating to landscape and visual values within the study area.

4.1 National legislation and framework

4.1.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NSW Government, 1974) relates to the preservation of national parks and other areas, as well as the protection of certain Aboriginal objects. Relevant objectives include:

- *the purpose of reserving land as a national park is to identify, protect and conserve areas containing outstanding or representative ecosystems, natural or cultural features or landscapes or phenomena that provide opportunities for public appreciation and inspiration and sustainable visitor or tourist use and enjoyment so as to enable those areas to be managed in accordance with...*
- *the conservation of places, objects, features and landscapes of cultural value.*

Dobroyd Head is located within the Sydney Harbour National Park, and within the assessment study area.

4.2 State legislation and framework

4.2.1 Heritage Act 1977

The *Heritage Act 1977* (NSW Government, 1977) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, moveable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be valuable to the State can be listed on the State Heritage Register and cannot be demolished, altered, moved or damaged, or their significance altered, without approval from the Heritage Council of NSW. Other items may be listed on the National and Commonwealth Heritage Lists, State Heritage Inventory, or by local councils in their LEPs.

A number of items within the study area are listed on the State Heritage Register. These include:

- Manly Wharf
- Manly Cove Pavilion
- Ivanhoe Park
- Substation (Whistler Street, Manly)
- St Patrick's Estate.

Of particular relevance to the study area are Manly Wharf and Manly Pavilion.

Manly Wharf

The Statement of Significance for Manly Wharf is as follows:

'Of environmental significance as a visually prominent man-made feature. Of historical significance for its associations with the maritime activities at Manly as a tourist destination and suburb of Sydney, dependent on the ferry link to the CBD. (Anglin 1990:2033).

Together with Circular Quay, the wharf is the only substantial older style ferry wharf surviving in Port Jackson: Association with Manly's history as a recreational centre. (Blackmore, Ashton, Higginbotham, Rich, Maitland, Pike 1985).'

Manly Cove Pavilion

The Statement of Significance for Manly Cove Pavilion is as follows:

'One of the few remaining harbour pavilion structures of this period and style in Sydney. ((Blackmore, Ashton, Higginbotham, Rich, Maitland, Pike 1986).'

Refer to section 4.4.1 for information regarding local heritage items within the *Manly Local Environmental Plan 2013*.

4.2.2 The Manly Ferry Wharf Conservation Management Plan

The *Manly Ferry Wharf Conservation Management Plan* (2011) was prepared by Architectural Projects Pty Ltd: Architects for TMG Development. It outlines the key physical and cultural values of the Manly Wharf, as follows:

Summary of significance

The Manly Ferry Wharf is significant as the gateway to Manly, and for its association with thousands of tourists who hold memories of the ferry trip and first impressions of Manly.

The Manly Ferry Wharf is significant for its age and association with the development and continuation of Manly as a seaside resort of Sydney from the earliest days of European settlement. The low sweeping form has significance for its contribution to the context of the sweeping beach and line of the trees which is now an integral part of this mainland view of Manly. The Manly Ferry Wharf is significant for the positive contribution of the low building scale to the topographical setting of Manly Cove. The Wharf is enhanced by its visual relationship with the curved lines of the beaches, seawalls, and pavement promenades of East and West Esplanades.

The Manly Ferry Wharf in association with the fun pier is significant, for its ability to reflect the long continuous history of Manly Ferry Wharf as the location of retail, transport and recreation.

The Manly Ferry Wharf has historical significance as a major project by an important Sydney Modernist Architect Arthur Baldwinson. The main (north) facade composition, with its clocktower, flat parapets and curved awning is mostly intact. The grooved weatherboard cladding and timber frame windows are features which give the exterior much of its distinctive period character.

The Manly Ferry Wharf is significant as the site of the redevelopment of the area and wharf facilities in particular during Manly's second boom period as a resort (c 1910-1940), when both Circular Quay and Manly Ferry Wharf were constructed for the Maritime Services Board. The Manly Ferry Wharf is significant as a reflection of developments in urban transport and infrastructure in that period.

Manly Ferry Wharf is significant as a rare surviving working example of a maritime building designed in the Modernist style of the mid Twentieth Century. It is a rare example of maritime architecture.

4.2.3 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The proposal is located within the Sydney Harbour Catchment and is subject to Chapter 10 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (NSW Government, 2021).

One Biodiversity and Conservation SEPP listed heritage item, Manly Wharf (item no. 18) is located within the proposal footprint.

Relevant aims of Chapter 10 - Sydney Harbour Catchment include:

- (a) To ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained
 - (i) as an outstanding natural asset, and
 - (ii) as a public asset of national and heritage significance, for existing and future generations.

Relevant planning principles

Sydney Harbour Catchment:

- (b) the natural assets of the catchment are to be maintained and, where feasible, restored for their scenic and cultural values and their biodiversity and geodiversity.

Foreshores and Waterways Area:

- (c) development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores.

Heritage conservation:

- (d) the natural, scenic, environmental and cultural qualities of the Foreshores and Waterways Area should be protected
- (e) significant fabric, settings, relics and views associated with the heritage significance of heritage items should be conserved.

Relevant Division matters

Section 10.23 Foreshores and waterways scenic quality

The matters to be taken into consideration in relation to the maintenance, protection and enhancement of the scenic quality of foreshores and waterways are as follows:

- (a) the scale, form, design and siting of any building should be based on an analysis of—
 - (i) the land on which it is to be erected, and
 - (ii) the adjoining land, and
 - (iii) the likely future character of the locality,
- (b) development should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands, foreshores and tributaries,
- (c) the cumulative impact of water-based development should not detract from the character of the waterways and adjoining foreshores.

Section 10.24 Maintenance, protection and enhancement of views

The matters to be taken into consideration in relation to the maintenance, protection and enhancement of views are as follows:

- (a) development should maintain, protect and enhance views (including night views) to and from Sydney Harbour,

(b) development should minimise any adverse impacts on views and vistas to and from public places, landmarks and heritage items

(c) the cumulative impact of development on views should be minimised.

Relevant heritage objectives

1 (b) To conserve the heritage significance of existing significant fabric, relics, settings and views associated with the heritage significance of heritage items

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 has been designed to preserve the heritage and conservation values of surrounding heritage items, and would ensure the values of Sydney Harbour are recognised, protected, enhanced, and maintained.

4.2.4 Draft Design and Place State Environmental Planning Policy

The proposed *Design and Place State Environmental Planning Policy* (SEPP) (NSW Government, 2021) aims to positively influence new development through quality design and place-led design approaches. In doing so, this SEPP supports the design of healthy and prosperous places that support the wellbeing of people, community and country.

The core principles relevant to this assessment include:

- designing places with character that are visually attractive, physically comfortable and make a positive contribution to their context
- projects should also respond to the community's needs and encourage pride and ownership
- design sustainable and green places which contribute to the wellbeing of communities and environment.

4.2.5 Local Character and Place Guideline 2019

The *Local Character and Place Guideline* (NSW Government, 2019) seeks to ensure local character is considered in decision making, and the identity and place attributes that make an area distinctive are maintained, enhanced and cultivated. The guideline recognises that places are multi-layered and diverse, and that there are a number of influences that contribute to, and impact local character.

The guideline stipulates that a local character statement should be prepared for different areas, to provide a reference for development proposals and decision making. This assessment outlines the landscape and visual elements that contribute to local character, potential impact of the proposal and mitigation measures to manage these impacts. The approach in this assessment is consistent with the *Local Character and Place Guidelines assessment toolkit*.

4.2.6 Better Placed

Better Placed is a design guide developed by the Government Architect NSW, recognising the importance of good design to make better places and enhance urban environments across the state. The design guide addresses design process, roles and responsibilities and desired outcomes (Government Architect NSW, 2017).

The relevant design principles within this guide include:

- **Better fit:** place-based response informed by and derived by its location, context and resonant with local character and heritage.
- **Better look and feel:** encouraging places which are welcoming and aesthetically pleasing, and design which contributes to the visual environment.

This guide prioritises visual amenity and local character. While of greater relevance to the proposal design, it has also informed the mitigation measures identified in this LVIA assessment.

4.2.7 Beyond the Pavement

Beyond the Pavement (Transport for New South Wales, 2020) is a document which outlines the urban design approach for road and maritime projects. The document identifies nine over-arching urban design principles for TfNSW's projects, as follows:

1. Contributing to urban structure, urban quality and economy
2. Fitting with the built fabric
3. Connecting modes and communities and promoting active transport
4. Fitting with the land form
5. Contributing to green infrastructure and responding to natural systems
6. Connecting with Country and incorporating heritage and cultural contexts into projects
7. Designing an experience in movement
8. Designing self-explaining roads that safely respond to their role and context
9. Achieving integrated and minimal maintenance design.

Of particular relevance is guideline 3.2.3 under principle two; *avoid adverse visual impacts when planning and designing transport projects*.

Where visual impacts cannot be avoided, the following measures are recommended:

- using mounding and false cuttings to help screen intrusive elements behind landform.
- allowing space for screen planting where necessary and where appropriate for the landscape and built character of the area.
- considering off-site planting, beyond the road corridor's width, subject to agreement with stakeholders, funding availability and maintenance arrangements.

4.3 Regional policy and strategies

4.3.1 Greater Sydney Region Plan: A Metropolis of Three Cities

The Greater Sydney Region Plan: A Metropolis of Three Cities (Government, 2018) seeks to revitalise land use and transport patterns within Greater Sydney in order to maximise liveability, productivity and sustainability. Relevant objectives relating to scenic amenity are as follows:

Sustainability Objective 28: 'Scenic and cultural landscapes are protected'

- aims to establish scenic and cultural landscapes as symbols of Greater Sydney, connecting contemporary urban environments with natural and historic urban landscapes.
- preserve links to Aboriginal, colonial and migrant era heritage and culture, further creating opportunities for tourism and recreation.
- maintain views and vistas of ridgelines, waterways and the urban skyline promoting distinctive local character.
- identify and protect scenic and cultural landscapes area
- enhance and protect views of scenic and cultural landscapes from the public realm.

Sustainability Objective 29: 'Environmental, social and economic values in rural areas are protected and enhanced'

- maintain or enhance the values of the Metropolitan Rural Area using place-based planning to deliver targeted environmental, social and economic outcomes.

4.3.2 North District Plan

The North District Plan (NSW Government, 2018) stems from the Greater Sydney Region Plan aiming to focus on the future of the Harbour CBD through planning and balancing high levels of development with high levels of amenity. Key priorities of the plan in relation to scenic amenity are as follows:

Priority 17: Protecting and enhancing scenic and cultural landscapes

Actions:

- identify and protect scenic and cultural landscapes
- enhance and protect views of scenic and cultural landscapes from the public realm.

4.3.3 Plan of Management: Sydney Harbour National Park 2012

The Plan of Management (NSW Government, 2012) is relevant to the portion of National Park within the study area at Dobroyd Head. The plan identifies values associated with Dobroyd Head, and outlines strategies for the precinct. The plan describes the unique combination of ecological, historical, social and recreational features of the precinct.

The Sydney Harbour Scenic Walk passes through the park at Dobroyd Head. This section of the walk is well known as part of the Manly Scenic Walk, a very popular walk from The Spit to Manly. A number of formal and informal lookouts are identified in the precinct, including Arabanoo Lookout, which offers views of the harbour, Manly, and the Quarantine Station. Arabanoo Lookout is also identified as being a prominent stop for tourist coaches. The plan also states that at the lookouts and along the main walking route, a substantial proportion of visits are made by people living over one hour travel time from the precinct.

4.4 Local legislation and policy

4.4.1 Manly Local Environmental Plan 2013

Key aims of the Manly LEP (NSW Government, 2013) in relation to scenic amenity are as follows:

- to promote a high standard of urban design that responds to the existing or desired future character of areas
- to ensure all development appropriately responds to environmental constraints and does not adversely affect the character, amenity or heritage of Manly or its existing permanent residential population
- to protect, enhance and manage environmentally sensitive land with special aesthetic, ecological, scientific, cultural or conservation values for the benefit of present and future generations, and
- to preserve and enhance the amenity of public places and areas visible from navigable water around Manly.

Land zoning

Refer to Figure 4.1 for land zoning within the study area.

The following zones have specific aims relevant to landscape and visual amenity:

Zone C1 National Parks and Nature Reserves

- to identify land that is to be reserved under the National Parks and Wildlife Act 1974 and to protect the environmental significance of that land.

Zone C2 Environmental Conservation

- to protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values
- to prevent development that could destroy, damage or otherwise have an adverse effect on those values.

Zone C3 Environmental Management

- to protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values
- to provide for a limited range of development that does not have an adverse effect on those values

- to ensure that development does not negatively impact on nearby foreshores, significant geological features and bushland, including loss of natural vegetation
- to ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses.

Zone C4 Environmental Living

- to protect tree canopies and ensure that new development does not dominate the natural scenic qualities of the foreshore
- to ensure that development does not negatively impact on nearby foreshores, significant geological features and bushland, including loss of natural vegetation
- to ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses.

Zone SP1 Special Activities

- to provide for sites with special natural characteristics that are not provided for in other zones
- to facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land
- to conserve, enhance and restore elements of built and natural heritage items of State and local significance and permit development that is compatible with the preservation, restoration and maintenance of items of environmental heritage within the zone
- to protect vistas to and from heritage items of local and State significance and preserve and protect the setting, consistent with the pre-eminence of principal heritage buildings when viewed from within the setting, and surrounding areas and vantage points.

Zone SP2 Infrastructure

- to minimise loss of views to, from and within heritage items and minimising intrusion on the heritage landscape and visual curtilage of heritage items.

Zone RE1 Public Recreation

- to protect and enhance the natural environment for recreational purposes
- to protect, manage and restore areas visually exposed to the waters of Middle Harbour, North Harbour, Burnt Bridge Creek and the Pacific Ocean
- to ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses.

Zone RE2 Private Recreation

- to protect and enhance the natural environment for recreational purposes
- to ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses.

Zone W1 Natural Waterways

- to protect the ecological and scenic values of natural waterways.

Planning overlays

Refer to Figure 4.2 for planning overlays within the study area. The direct proposal site where permanent works are is subject to a heritage overlay.

The following overlays have specific aims relevant to landscape and visual amenity:

Manly Foreshore Scenic Protection Area

The aim of this clause is to protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the foreshore in Manly. Development consent cannot be granted to development on land to which this clause applies unless the consent authority has considered the following matters:

- impacts that are of detriment to the visual amenity of harbour or coastal foreshore, including overshadowing of the foreshore and any loss of views from a public place to the foreshore
- measures to protect and improve scenic qualities of the coastline
- suitability of development given its type, location and design and its relationship with and impact on the foreshore.

Limited development on foreshore area

The objective of this clause is to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.

Development consent must not be granted under this clause unless the consent authority is satisfied that:

- the appearance of any proposed structure, from both the waterway and adjacent foreshore areas, will be compatible with the surrounding area
- any historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out and of surrounding land will be maintained, and
- in the case of development for the alteration or rebuilding of an existing building wholly or partly in the foreshore area, the alteration or rebuilding will not have an adverse impact on the amenity or aesthetic appearance of the foreshore.

Heritage Conservation

Relevant objectives of this clause are:

- to conserve the environmental heritage of Manly
- to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views

Together with the state heritage listed items identified in section 4.2.1, a number of items with local heritage significance include the following:

- the Town Centre Conservation Area (shown by black hatching on Figure 4.2)
- a number of residential houses and apartment buildings
- the Manly Cove amenities block
- The West Esplanade Park
- North Head and many of its features such as the quarantine station, The School of Artillery buildings, the North Head Scenic Drive, Australian Institute of Police Management and various stone walls The ocean foreshores
- numerous street trees, including Norfolk Island Pines and Fig trees
- commercial buildings fronting The Corso, as well as cast-iron letter boxes, street trees and monuments located on the strip.

4.4.2 Manly Development Control Plan (DCP) 2013

Relevant DCP (Northern Beaches Council, 2013) objectives in relation to heritage include the following:

Objective 1) To retain and conserve environmental heritage and cultural significance of Manly including:

- significant fabric, setting, relics and view associated with heritage items and conservation areas
- the foreshore, including its setting and associated views
- potential archaeological sites, places of Aboriginal significance and places of natural significance.

Objective 2) To ensure any modification to heritage items, potential heritage items or buildings within conservation areas is of an appropriate design that does not adversely impact on the significance of the item or the locality

Objective 3) To ensure that development in the vicinity of heritage items, potential heritage item and/ or conservation areas, is of an appropriate form and design so as not to detract from the significance of those items

Objective 4) To provide infrastructure that is visually compatible with surrounding character and locality/visual context with particular regard to heritage buildings/areas and cultural icons

Objective 5) To integrate heritage management and conservation into the planning development process including incentives for good heritage management, adaptive reuse, sustainability and innovative approaches to heritage conservation.

The DCP states the following regarding complementary form and scale that distinguishes heritage significance:

a) Alterations or additions to heritage items or buildings within a conservation area will not necessarily seek to replicate, overwhelm, dominate or challenge heritage details or character of the building or structure of heritage significant buildings. However, a contemporary response which complements and respects the form and scale of the original buildings may be considered if the heritage significance is retained.

In regards to the foreshore scenic protection area overlay in the LEP, the DCP offers additional matters for consideration, as follows:

a) Further to matters prescribed in the LEP, the development in the Foreshore Scenic Protection Area must also:

- i) minimise the contrast between the built environment and the natural environment
- ii) maintain the visual dominance of the natural environment
- iii) maximise the retention of existing vegetation including tree canopies, street trees, wildlife corridors and habitat
- iv) not cause any change, visually, structurally or otherwise, to the existing natural rocky harbour foreshore areas
- v) locate rooflines below the tree canopy
- vi) consider any effect of the proposal when viewed from the harbour / ocean to ridgelines, tree lines and other natural features
- vii) use building materials of a non-reflective quality and be of colours and textures that blend with the prevailing natural environment in the locality.

b) Setbacks in the Foreshore Scenic Protection Area should be maximised to enable open space to dominate buildings, especially when viewed to and from Sydney Harbour, the Ocean and the foreshores in Manly.

In 'Manly Town Centre Map A', the DCP also identifies 'important vistas' of the town centre. The proposal site is not visible from any 'important vistas' identified.

4.4.3 Towards 2040 – Local Strategic Planning Statement

Towards 2040 (Northern Beaches Council, 2020) outlines the future vision for the Northern Beaches and the council's commitment to a sustainable future. Key priorities and principles in relation to scenic amenity are as follows:

Priority 3: 'Protected scenic and cultural landscapes'

Principles:

- enhance and protect views of scenic and cultural landscapes from public areas
- protect areas of exceptional natural beauty and aesthetic importance
- make new development visually subservient to scenic and cultural landscapes
- avoid new development on ridgelines or in places that will disrupt the skyline.

Priority 17: ‘Centres and neighbourhoods designed to reflect local character, lifestyle and demographic changes’

Principles:

- renew great places through design excellence and innovative design while respecting and enhancing local character.
- recognise heritage and culture as a fundamental aspect of the identity of place, including identification of places and items which contribute to the significant character of a place
- enhance the visual and environmental amenity of buildings and places in centres
- enhance local identity through place-based planning and design.

Priority 26 ‘Manly as Sydney’s premier seaside destination’

Principles:

- protect and enhance Manly’s character, identity and social significance.

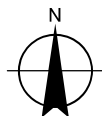
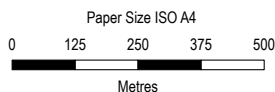
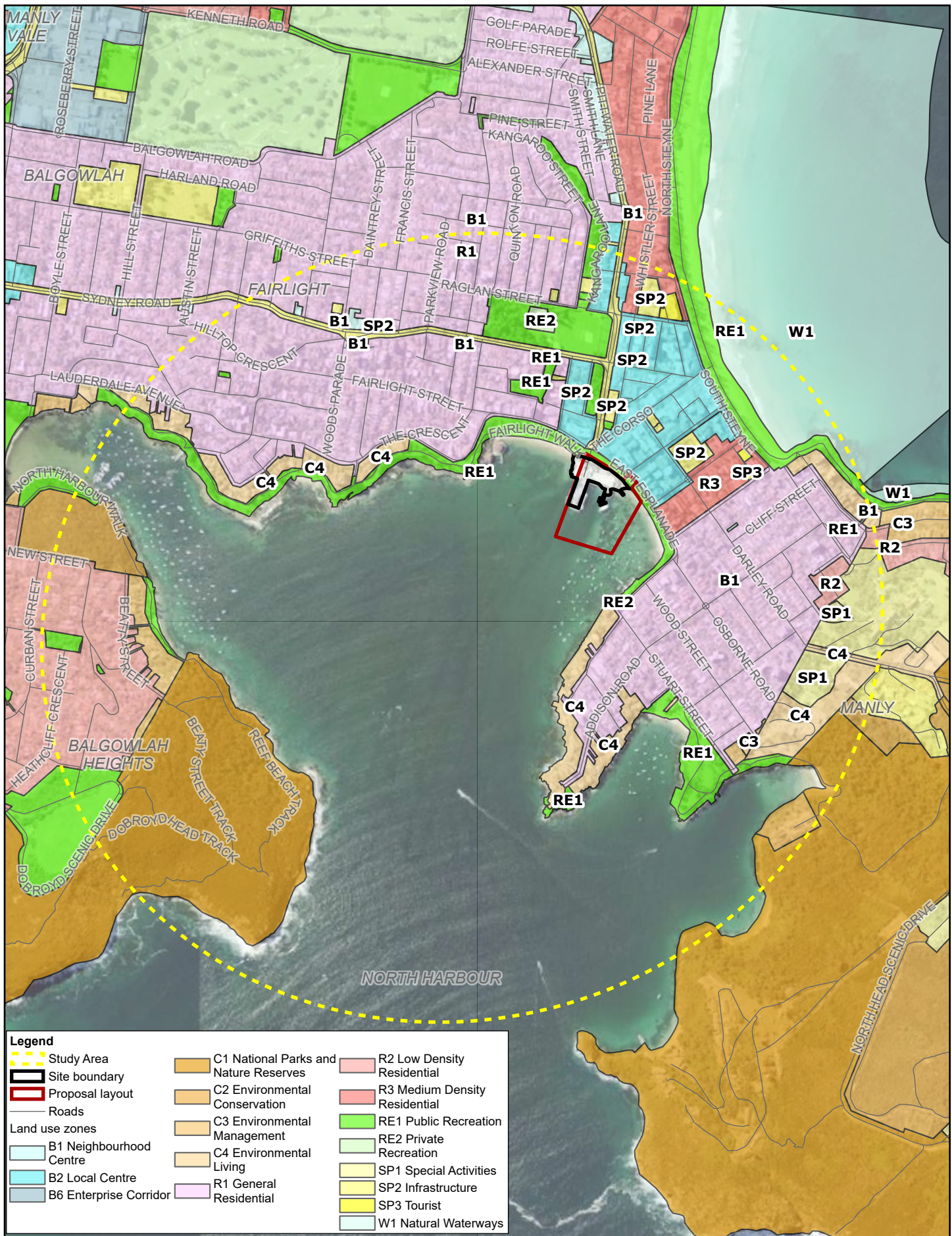
4.4.4 Northern Beaches Council Public Space Vision & Design Guidelines

The *Northern Beaches Council Public Space Vision & Design Guidelines* (Northern Beaches Council, 2021) recommends the use of material palettes that complement the four outlined character areas of beach, urban, bush, and waterfront. The proposal is within the ‘waterfront’ character area. Relevant design objectives of this character area include:

- appropriate material selection for harsh exposed coastal environments
- high quality materials in prominent areas with high visitation.

Regarding scenic amenity in heritage areas and places of cultural significance, this document outlines the following consideration:

- opportunity for retention of heritage features within the new design to reinforce a sense of place and local identity
- selection of high quality materials and fixtures that respond to site.



Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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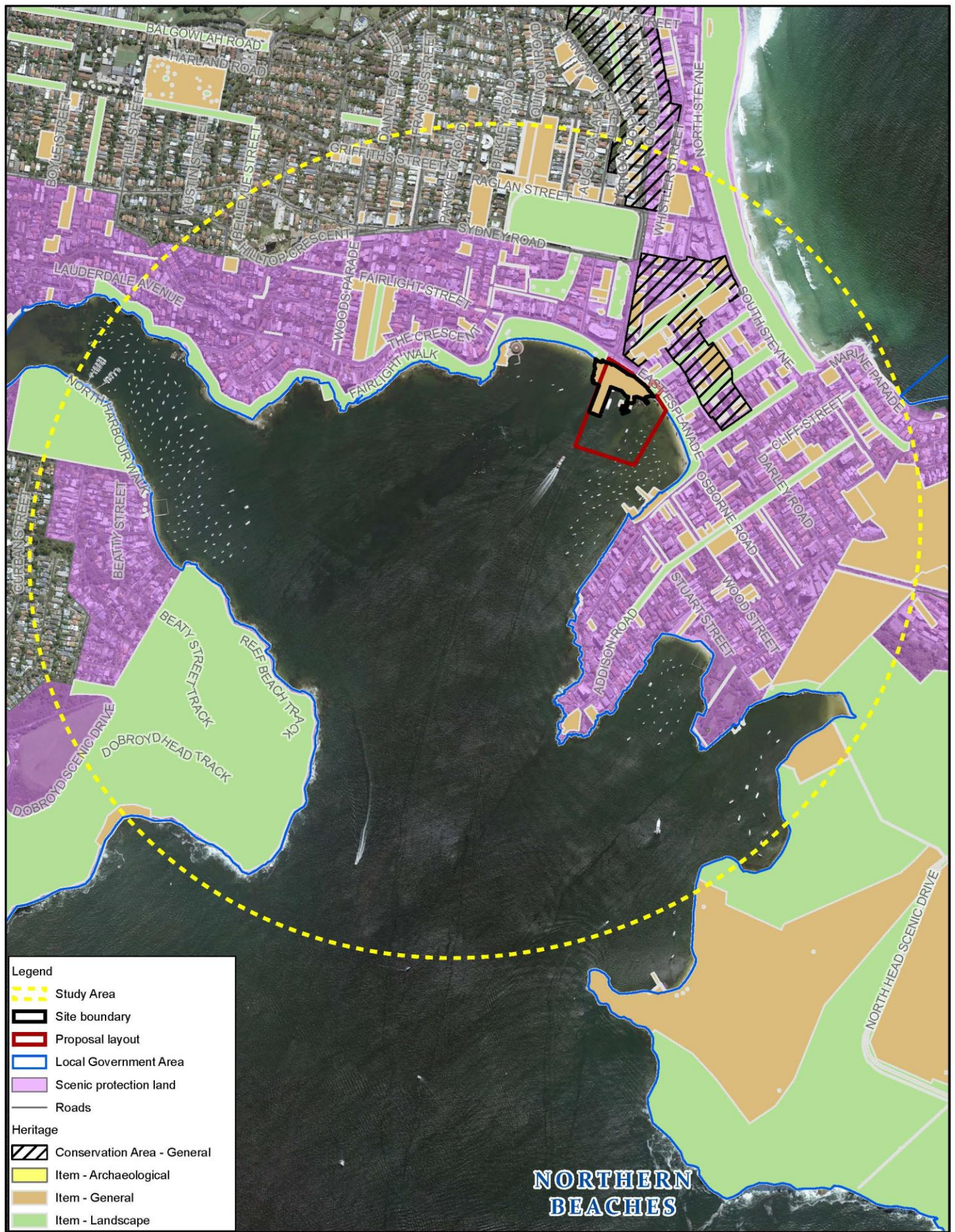
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Land use and built form

FIGURE 4.1

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
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Data source: NSW Department of Finance and Services, 2017; Office of Environment and Heritage NSW; NSW Imagery; © Department of Customer Service 2020
World Street Map: Esri, HERE, Garmin, NGA, USGS. Created by: mfredre



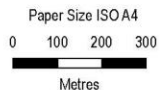
Legend

- Study Area
- Site boundary
- Proposal layout
- Local Government Area
- Scenic protection land
- Roads

Heritage

- Conservation Area - General
- Item - Archaeological
- Item - General
- Item - Landscape

NORTHERN BEACHES



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Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary Sphere

Planning overlays

FIGURE 4.2

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason. \\ghd\ghd\4\1\Sydney\Projects\21172547220\GIS\Maps\Deliverables\12547220_LVIA.aprx
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5. Existing landscape and visual environment

The following section provides a summary of the existing landscape and visual environment of the study area.

5.1.1 Land use and built form

The Manly Wharf Complex is a large ferry terminal located within Sydney Harbour, in Manly Cove. It provides a key transport link between Manly and Circular Quay. Construction of the wharf was completed in September of 1855 and in 1990, Wharf 3 and the retail arcade were constructed to the east of the original structure. In April of 2000, the wharf was added to the NSW State Heritage Register.

The wharf is supported on timber piers and has a concrete platform. The architectural design of the façade is similar to that of the Circular Quay ferry terminals. Manly Wharf has established itself as a major destination and meeting-place for commuters, tourists and visitors. The wharf complex contains shops, bars, and restaurants, some of which have views over the harbour.

Also in Manly Cove are the Manly Art Gallery and Museum, the Manly Pavilion and the former Manly Sea Life Sanctuary. Parallel to the beach are the Fairlight Walk and the East and West Esplanades. The waterfront is lined by a long strip of tall and iconic Norfolk Island pine trees. The town centre is adjacent to the wharf and features buildings that are typically two to six stories high. Running through the town centre is The Corso, a lively pedestrian mall which connects Manly Cove and Manly beach.

The area surrounding the town centre is mostly residential, with areas zoned general, low-density and medium density. The Sydney Harbour National Park is located approximately one kilometre to the south-east at Dobroyd Head, offering walking trails and views of the harbour and city. The Pacific Ocean and Manly Beach are located to the east.

5.1.2 Topography and hydrology

The study area consists of a variety of landforms such as bays, beaches, headlands, rugged cliffs, steep slopes and hills. The core geological land formation within the area is middle triassic Hawkesbury sandstone, overlying the Newport Formation of the Narrabeen group.

The Manly town centre is low-lying as it sits on the isthmus between the North Harbour and the Pacific Ocean. The surrounding hills slope upwards from the town centre, reaching elevations of over 80 metres on Dobroyd Head to the south-west of the proposal site, and approximately 60 metres in the suburb of Fairlight to the north-west.

Manly is bound by Burnt Bridge Creek and Manly Creek to the north, the North Harbour to the south-west, and the South Pacific Ocean in the north-east.

5.1.3 Vegetation

The Manly urban area has been largely cleared of its remnant vegetation, and street trees consist of a mix of exotic and native species. Of note are the iconic tall row of Norfolk Island Pine trees along the East and West Esplanades and along Manly Beach.

Areas of the 'Coastal Freshwater Lagoon' vegetation complex exist close to the town centre, in the linear park parallel Kangaroo Street and at the edge of town to the east of the proposal site.

Dobroyd Head and North Head, both of which are part of the Sydney Harbour National Park, contain well-preserved, extensive areas of Sydney Coastal Heaths and Sydney Coastal Dry Sclerophyll Forests. A small area of Littoral Rainforest exists to the east of North Head.

Seagrass meadows are present along the coastline in Manly Cove, along Smedleys Point and near Little Manly Cove Beach. See Figure 5.2 for vegetation complexes in and around the study area.

5.1.4 Mitchell landscapes

The study area falls within two identified Mitchell landscapes, as described below and shown in Figure 5.3. The following descriptions are from the Department of Environment and Climate Change NSW (2002).

Ecosystem Meso Grouping: SB Pittwater

Landscape Name: Belrose Coastal Slopes

Estimate Fraction Cleared: 0.59

- Benched hill slopes and deep valleys of the coastal fall on horizontal Triassic quartz sandstone, lithic sandstone and shales. High proportion of rock outcrop with discontinuous cliffs to 5 m high. General elevation 0 to 180 m, local relief 80 m. Shallow uniform or gradational sands and earthy sands on ridges, deeper sands, loamy sands and organic sands on wet benches and in hanging swamps, grey or yellow texture-contrast soils on shale benches. Accumulations of deeper sand and occasional podsols in depositional sites and along streams. Low woodland of scribbly gum (*Eucalyptus haemostoma*), red bloodwood (*Corymbia gummifera*), yellow-top ash (*Eucalyptus leuhmanniana*), and narrow-leaved apple (*Angophora bakeri*) in deeper soils on ridges. Scrub and heath of she-oak (*Allocasuarina distyla*) and heath banksia (*Banksia ericifolia*), with other Hakea, Grevillea, and Baeckea sp., on ridges and upper benches. Wet heath and swamps with Gahnia sp. and swamp banksia (*Banksia robur*) in hanging valleys. Coastal forest in sheltered areas on better quality shale soil with; Sydney blue gum (*Eucalyptus saligna*), blackbutt (*Eucalyptus pilularis*), turpentine (*Syncarpia glomulifera*), grey ironbark (*Eucalyptus paniculata*), spotted gum (*Corymbia maculata*), southern mahogany (*Eucalyptus botryoides*), cabbage-tree palm (*Livistona australis*) and burrawang (*Macrozamia* sp.). Coastal headlands with scrub of *Allocasuarina distyla*, coast rosemary (*Westringea fruticosa*), and dwarf kangaroo grass (*Themeda triandra*).

Ecosystem Meso Grouping: SB Coastal Barriers

Landscape Name: Sydney - Newcastle Barriers and Beaches

Estimate Fraction Cleared: 0.5

- Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. Includes areas of more extensive high dunes often located on top of the headlands. General elevation 0 to 30 m, local relief 10 m. Cliff top dunes may be found as high as 90 m above sea level. Distinct zonation of vegetation and increasing soil development from the beach to the inland dunes. At the beach; spinifex (*Spinifex hirsutus*), spiky mat-rush (*Lomandra longifolia*), coast wattle (*Acacia longifolia* ssp. *sophorae*) and coast tea-tree (*Leptospermum laevigatum*) colonise the frontal dune in which there is little soil development. Coast banksia (*Banksia integrifolia*) and old man banksia (*Banksia serrata*) are found on the second dunes and these merge with more complex forest containing blackbutt (*Eucalyptus pilularis*), red bloodwood (*Corymbia gummifera*), grass trees (*Xanthorrhoea* sp.) and numerous understorey shrubs on deep sands that have an organic rich A horizon, a bleached A2 horizon and the initial development of weak iron or organic pans in the sandy subsoil. Well-developed, deep podsol profiles are present in cliff top dunes with swampy swales indicating that these forms are probably older than the coastal dunes. Vegetation of *Banksia aemula* heathland and open scrub of coast banksia (*Banksia integrifolia*), coast rosemary (*Westringea fruticosa*), coast tea-tree and grass tree, with dwarfed smooth-barked apple (*Angophora costata*) and red bloodwood. Freshwater sedge swamps in larger areas of sand. In the lagoons salinity varies depending on tidal flushing and they are often surrounded by broad-leaved tea-tree (*Melaleuca quinquenervia*) and swamp oak (*Casuarina glauca*). Water margins are occupied by *Juncus* sp. and common reed (*Phragmites australis*) in fresh water areas. Grey mangrove (*Avicennia marina*) may occur in some tidal inlets.

5.1.5 Indigenous cultural values

At the time of European settlement, the Manly area was home to the Cannalgal and Kay-ye-my clans (of the Dharug-speaking Gayemaygal people). The Sydney region has been inhabited by Aboriginal people for tens of thousands of years. The Gayemaygal people are the traditional custodians of this land and are part of the oldest surviving continuous culture in the world.

Pre-European colonisation, the Aboriginal people of the area were well adapted to a life on the sea and on the land, living on a diet that included fish, shellfish and seabirds. People would fish from bark nowise (canoes), and the catch would have been cooked on a small fire on a clay pad.

Many Aboriginal carvings and art works can still be found on the rock platforms and walls around Manly within the study area, as well as shelters, midden sites, and burial sites.

Governor Phillip was the first European to arrive at Manly, in January 1788 and a smallpox epidemic broke out in 1789 which decimated much of the Aboriginal population (NSW Government, 2019).

45 Aboriginal sites and one Aboriginal place registered on the AHIMS database have been identified within one kilometre of the proposal site (NGH Environmental and Roads and Maritime Services, 2018). Aboriginal sites include art (pigment or engraved), artefacts, burials, habitation structures and shells. The Aboriginal place is the Guringai Resting Place - Reef Beach.

5.1.6 Key views and visual features

Based on the desktop review and site inspection, the key visual features in the study area were identified as:

- the avenue of Norfolk Island Pine trees along the East and West Esplanade
- the modernist architectural style of the Manly Wharf building
- the strong Mediterranean architectural style of the Manly Cove Pavilion
- the multi-storey buildings along coastal edge
- long views across the North Harbour towards docked boats in the harbour, beaches, bush-covered headlands and rugged cliffs
- the scenic qualities of the foreshore and harbour.

Key views are typically achieved from elevated and waterfront locations within the study area. Of particular note are the following:

- distant, open views achieved from elevated locations such as Arabanoo Lookout and sections of Fairlight Walk
- distant, open views across the North Harbour from low-lying, coastal locations such as Reef beach, Manly Wharf, the Manly Yacht Club, Manly Cove Beach, various ocean pools and sections of Fairlight Walk
- scenic views from the ferry when in the North Harbour, traveling between Manly Wharf and Circular Quay
- views from multi-level buildings oriented towards the water
- important views from the town centre identified in the DCP, which provide framed vistas towards the North Harbour from The Corso and Whistler Street.

5.1.7 Proposal viewshed

As outlined in section 2.3.3, a computer-generated ZTV analysis was undertaken in order to inform the site inspection. This analysis identified land from which it would be theoretically possible to view the components of the proposal. During the site inspection, the viewshed of the proposal was refined, taking into account built form and vegetation within the study area. The resulting indicative viewshed mapping is shown in Figure 7.1.

The site inspection confirmed that views towards the proposal are mostly achieved from coastal foreshore locations, looking across the harbour. Further inland in residential areas, the presence of mature street trees and multi-storey houses shield the majority of views towards the proposal. From the town centre, though some framed views of the harbour can be achieved from streets such as The Corso, the proposal site is largely obscured by a combination of Norfolk Island Pines, parked cars and the Manly Wharf complex itself. Views of the proposal site can be achieved from the East and West Esplanades, but are significantly filtered by the same elements. On Dobroyd Head, dense vegetation generally obscures views of the proposal, except on highpoints such as Arabanoo lookout, which rise above the canopy.



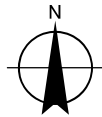
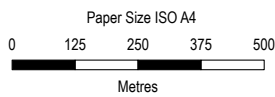
Legend

- Study Area
- Site boundary
- Proposal layout
- Water Bodies
- Contour
- Roads
- Creeks

Elevation (m)

High : 126.068

Low : -1.68769



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56

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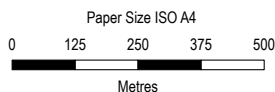
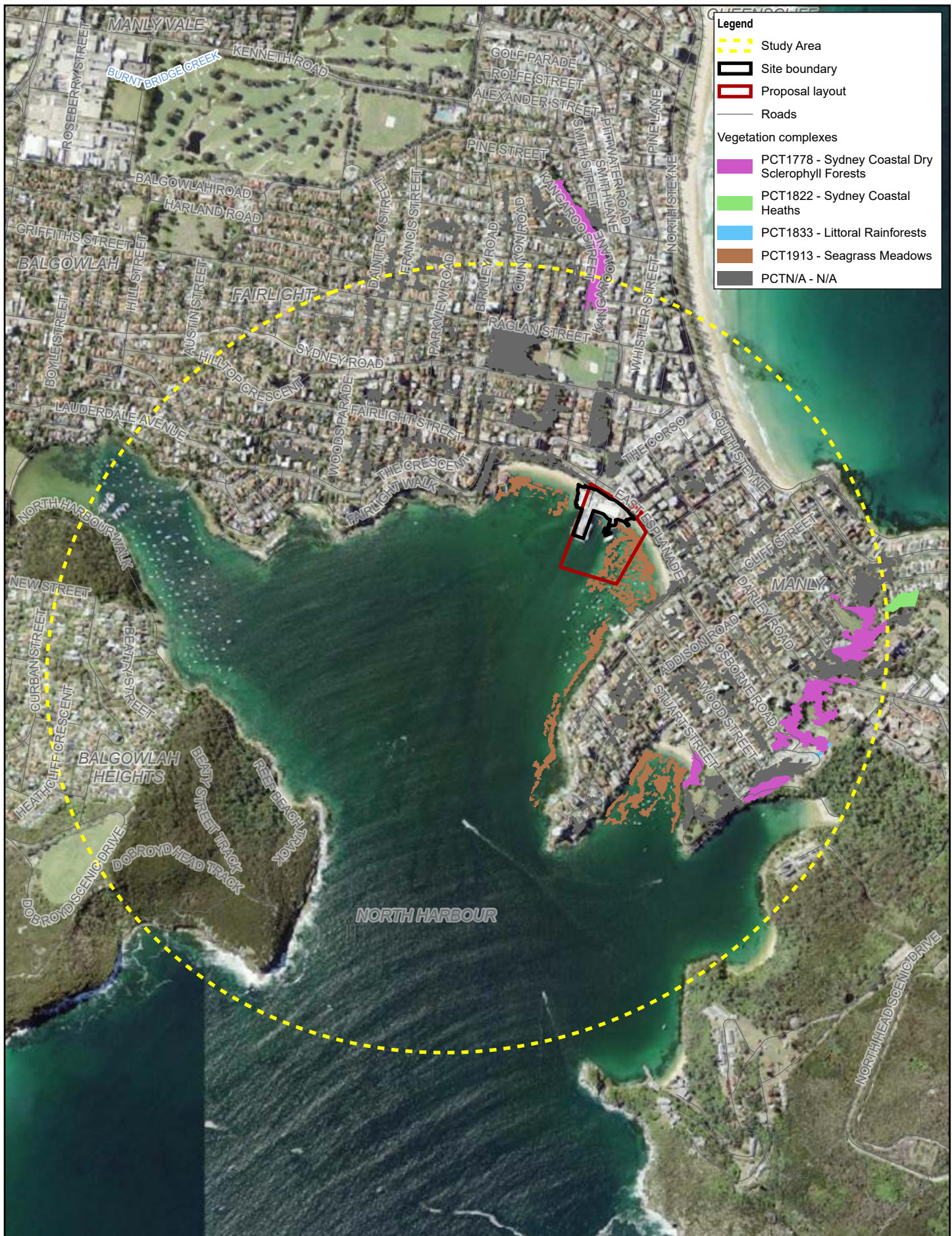
Topography and hydrology

FIGURE 5.1

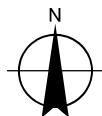
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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Vegetation

FIGURE 5.2

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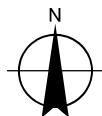
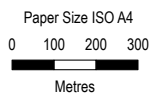


Legend

- Study Area
- Site boundary
- Proposal layout
- Roads

Mitchell Landscapes

- SB Coastal Barriers
- SB Pittwater



Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere

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Mitchell landscapes

FIGURE 5.3

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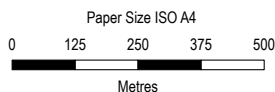
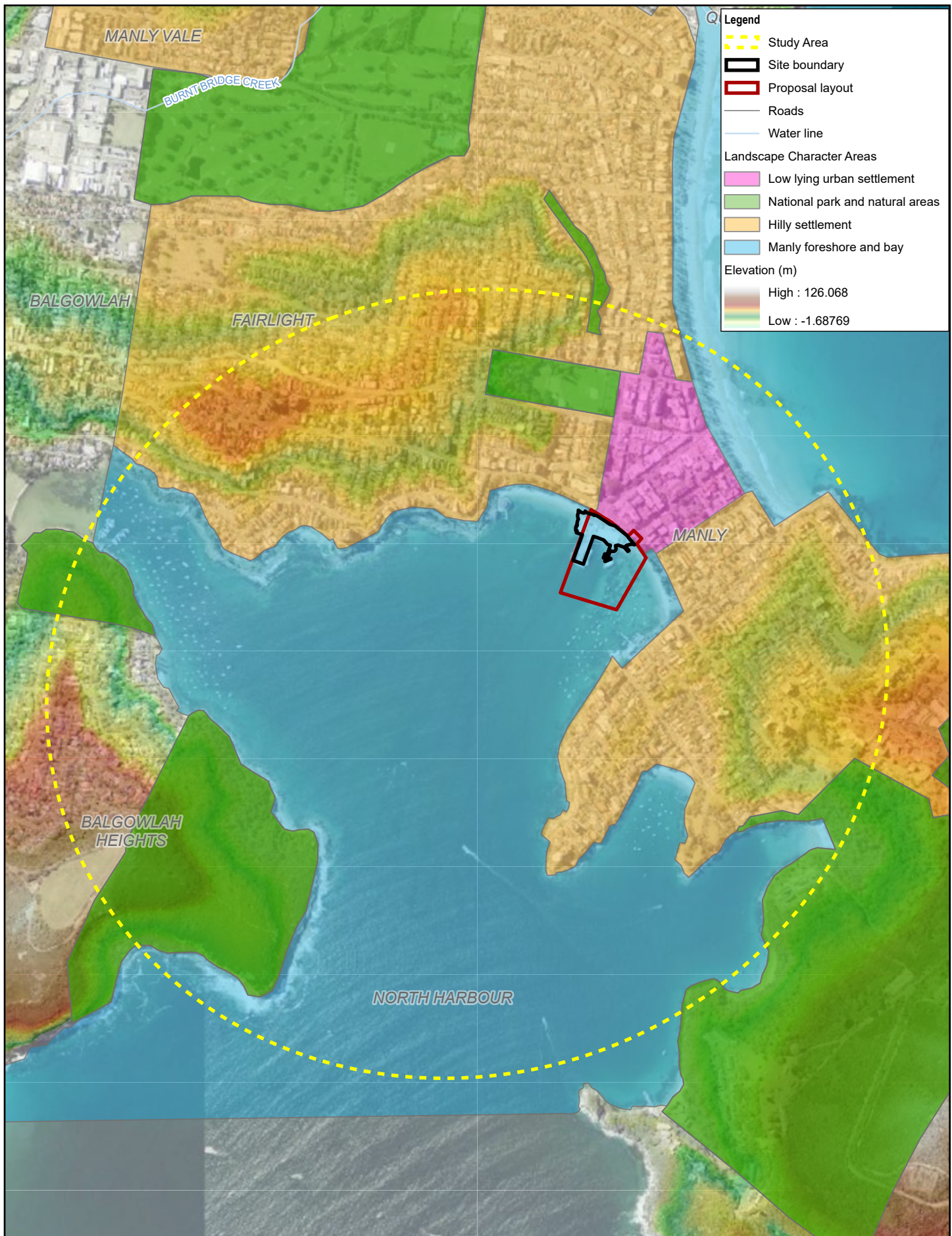
Data source: NSW Department of Finance and Services, 2017; State Government of NSW and Department of Planning, Industry and Environment 2016; Metromap Tile Service. Created by: mfredre

6. Landscape character impact assessment

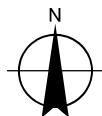
The study area has been classified into four LCZs. These LCZs have different associated sensitivities to potential changes as a result of the proposal. The sensitivities are discussed below and have informed the landscape impact assessment.

The four LCZs identified are illustrated in Figure 6.1, and are as follows:

- LCZ1: Manly Foreshore and Cove
- LCZ2: National Park and Open Space
- LCZ3: Low Lying Urban Centre
- LCZ4: Hilly Settlement.



Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Manly Wharf LVIA report

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Landscape Character Zones

FIGURE 6.1

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
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6.1 Landscape character zones

6.1.1 Landscape character zone 1: Manly Foreshore and Cove

The key features of LCZ1 are described below and illustrated in photo 6.1 to photo 6.6. The LCZ1 impact assessment is outlined in Table 6.1.



Photo 6.1 View from Manly cove beach, looking towards Manly Wharf



Photo 6.2 View from Fairlight walk near the Art Gallery & Museum, looking east



Photo 6.3 View from Manly Wharf 2, looking south-east towards Wharf 3



Photo 6.4 View from the Manly Yacht Club, looking west



Photo 6.5 View of the Manly Pavilion from the walkway outside the former Sea Life Centre



Photo 6.6 View from Smedley's Point looking north to a private residence on a rugged cliff and an ocean pool

LCZ1 surrounds the suburb of Manly, encompassing Manly Wharf, Manly Cove, Manly Beach, the North Harbour, and the rugged cliffs, small beaches and ocean pools that populate the coastline. The foreshore and cove area is a key visual asset to Manly, defining its character and attracting many residents and visitors due to the scenic, recreational and lifestyle opportunities it provides.

The Manly Wharf is a popular visitor destination due to the ferry line that runs between Manly and the Sydney Harbour; one of Sydney's most iconic tourist experiences.

Key characteristics of LCZ1 include the following:

- the coastline is a combination of natural bushland, rocky cliffs, sandy beach, ocean pools and built form
- vegetation is characterized by coastal heaths on exposed parts of the landscape and dry sclerophyll forests in protected parts
- a linear park runs parallel to Manly Cove and the East and West Esplanades, accommodating a tall row of Norfolk Island Pine trees
- in the water are many boats of different sizes coming and going, as well as docked. This includes the yellow and green Sydney ferry, and yellow and blue Fast Ferry which dock at Manly Wharf
- built form responds to the topography. On low-lying sections of coastline, built form commonly extends over the water, such as numerous ocean pools, the Manly Pavilion, the Sea Life Centre, Yacht Club and Manly Wharf
- built form includes iconic, heritage-listed buildings such as the modernist architectural style of the Manly Wharf and the Mediterranean architectural style of the Manly Pavilion
- Fairlight Walk follows much of the coastline, providing long views across the North Harbour.

Values associated with LCZ1 include:

- a 'scenic protection land' overlay is active over the coastline to protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the Manly foreshore as seen in Figure 4.2
- a local heritage overlay is also active over the harbour foreshores (item number I1) and the group of buildings that make up the Manly Rowing, Sailing, Yacht and Launch Clubs (item number I142), as seen in Figure 4.2
- a state heritage overlay is active over Manly Wharf and the Manly Pavilion as seen in Figure 4.2, due to their cultural, historic and aesthetic value
- Aboriginal cultural values associated with multiple AHIMS registered sites along the Dobroyd Head shoreline and the Guringai Resting Place – Reef Beach (NGH Environmental and Roads and Maritime Services, 2018), as well as the area's long history of habitation by the Gayemaygal people
- scenic values are associated with the attractive views from beaches, lookouts, Fairlight Walk, the ferry and nearby residences
- recreational values are associated with the beaches, harbour, ocean pools, Yacht Club and Fairlight Walk
- ecological values are associated with the seagrass meadows in Manly Cove and along the coastline
- from an international perspective, the Manly foreshore and bay are nationally important features and form a key part of Australia's character.

LCZ1 has high scenic, recreational, ecological and cultural value and makes a very strong contribution to the local character. LCZ1 therefore has a **High** landscape value.

Table 6.1 LCZ1 impact assessment

Landscape character zone 1: Manly Foreshore and Cove	
Anticipated change to landscape character	<p>The proposal site is in the centre of LCZ1.</p> <p>During operation, a new pile-supported promenade and seating space would extend over the water adjacent to the existing boardwalk. The Wharf Bar would be retained. The rest of the existing wharf would be replaced with a new Wharf 3 of a similar length, including a covered waiting area, covered gangway, and hydraulic platform. Parallel to Wharf 3, to its east, would be a public jetty (Wharf 4) consisting of large tidal steps and a ramp leading down to landings at intervals for berthing at different tidal levels.</p> <p>The new wharf design is to use the established 'kit of parts' components as much as possible, as used by other TfNSW ferry wharves, to minimise change to the existing landscape character.</p> <p>The roof canopy would have a minimal form and would be a similar height to the adjacent Wharf Bar roof, helping it to blend in. The fascias of the canopy are proposed to be painted 'heritage green' to match the existing heritage building.</p> <p>Water taxis and other small vessels would utilise Wharf 4, and Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would utilise Wharf 3.</p> <p>The construction phase is anticipated to be up to eight months. During construction, works include demolition, dredging, delivery of materials by barge, use of a barge-mounted crane, in-situ concrete pouring and construction of new structures, as well as the installation of temporary storage areas, fencing and signage.</p>
Susceptibility to change	<p>LCZ1 has a Moderate susceptibility to change, as the Wharf has state heritage value and the foreshore has local heritage value, but any change caused by the type of development would be unlikely to have a significant adverse effect on the landscape character, condition or values that could not be mitigated.</p>
Sensitivity to change	<p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscapes susceptibility to change from the type of proposed development. The sensitivity would be High, as the landscape value is High and the susceptibility to change is Moderate.</p>
Magnitude of change	<p>The magnitude of change would be Low, as the introduction of components may be new but would not be uncharacteristic within the existing landscape character, as the new structures are sensitively designed to be in keeping with the existing structures, and the increased presence of people and boats would be in keeping with existing wharf activities. Construction impacts are short-term and therefore do not significantly impact the magnitude.</p>
Significance of impact	<p>The significance of impact would be Moderate, as the sensitivity is High and the magnitude is Low.</p>

6.1.2 Landscape character zone 2: National Park and Open Space

The key features of LCZ2 are described below and illustrated in Photo 6.7 to Photo 6.10. The LCZ2 impact assessment is outlined in Table 6.2.

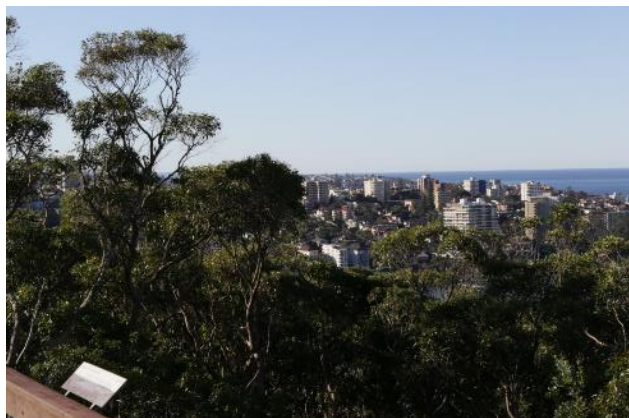


Photo 6.7 Filtered residential views through the tree canopy, looking east from Arabanoo Lookout



Photo 6.8 View towards Tania Park, looking south-west from Arabanoo Lookout

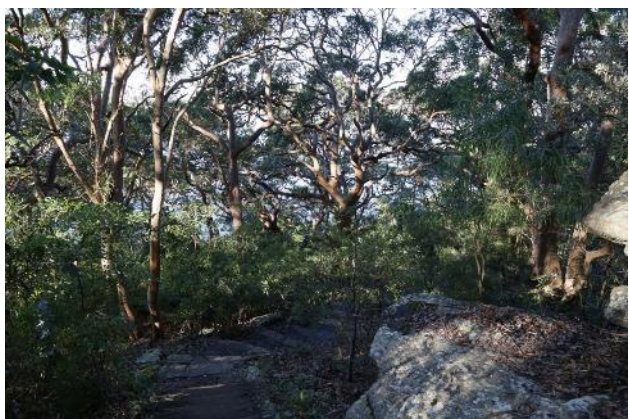


Photo 6.9 View from Angophra Track on Dobroyd Head, looking north-east towards the North Harbour



Photo 6.10 View from Reef Beach Track on Dobroyd Head, looking north-east

LCZ2 comprises Dobroyd Head to the south-west of the proposal site which forms part of the Sydney Harbour National Park, and other open spaces within the study area. Dobroyd Head is characterised by well-preserved, extensive areas of Sydney Coastal Dry Sclerophyll Forests and Sydney Coastal Heaths. Multiple walking tracks with intermittent rest areas meander through the forest.

Ivanhoe Park, Tower Hill Park, Dalley Castle Park and Gilbert Park are also part of LCZ2, situated north-west of the proposal site within residential areas. They do not have a view of the proposal site.

Key characteristics of LCZ2 include the following:

- vegetation is characterized by Sydney Coastal Dry Sclerophyll Forests and Sydney Coastal Heaths, with smaller areas of Littoral Rainforests
- vegetation in urban parks is characterized by lawn areas with scattered, mature trees and some clusters of dense vegetation
- topography is relatively flat in the urban parks, in contrast to Dobroyd head which is characterised by steep slopes, reaching a peak elevation of approximately 80 metres
- on Dobroyd Head are extensive and well-known walking tracks offering enclosed forest views, and long views across the harbour. Reef Beach Track forms part of the popular Spit Bridge to Manly Walk.

- on Dobroyd Head is Arabanoo Lookout, a popular attraction offering long views towards Manly
- Reef Beach is accessed from Reef Beach Track and offers a secluded, bush setting with long views towards Manly
- the Guringai Resting Place is located at Reef Beach; an Aboriginal reburial site where ancestral remains have been returned to Country
- Ivanhoe Park features significant Aboriginal elements, an oval, sporting facilities and the Victorian-style botanical gardens
- sports facilities such as a bowls club, tennis courts and sports ovals are situated next to Ivanhoe Park.

Values associated with LCZ2 include:

- a ‘scenic protection land’ overlay is active over the coastal areas (excludes Ivanhoe Park) to protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the Manly foreshore as seen in Figure 4.2
- Ivanhoe Park is on the Stage Heritage register, due to its 150 year history of recreation, sport and community use, as well as Aboriginal cultural heritage significance
- Aboriginal cultural values associated with multiple AHIMS registered sites on Dobroyd Head (NGH Environmental and Roads and Maritime Services, 2018), as well as the area’s long history of habitation by the Gayamaygal people
- from an international perspective, the Sydney Harbour National Park (on Dobroyd Head) is a nationally important feature and forms a key part of Australia’s character. Arabanoo Lookout is a prominent stop for tourist coaches, enhancing its prominence from an international perspective.
- the Sydney Harbour National Park (on Dobroyd Head) is zoned as ‘C1 – National Parks and Nature Reserves’ in the LEP, to protect the environmental significance of that land
- scenic and recreational values are associated with the beaches, lookouts and walking tracks
- Ecological values are associated with the well-preserved forest on Dobroyd Head as well as the urban parks.

LCZ2 has high scenic, recreational, ecological and cultural value and makes a very strong contribution to the local character. LCZ2 therefore has a **High** landscape value.

Table 6.2 LCZ2 impact assessment

Landscape character zone 2: National Park and Open Space	
Anticipated change to landscape character	LCZ2 mostly occurs outside of the study area, therefore views are infrequent and when achieved they are brief, at a distance, and/or screened by dense vegetation. The most prominent view of the proposal site from LCZ2 is from Arabanoo Lookout, as assessed in Section 7.1.1. The construction phase is anticipated to be up to eight months. During construction, distant views (from over one kilometre) of storage areas, fencing, barges, cranes, and other machinery associated with construction may be achieved. During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ2, as alterations to distant views to the Manly Wharf would be minor.
Susceptibility to change	The susceptibility to change is Low , as development of this type is unlikely to have an adverse effect on the landscape character, condition or value.
Sensitivity to change	The sensitivity of a landscape is judged on a combination of the landscape value and the landscape’s susceptibility to change from the type of proposed development. The sensitivity would be Moderate , as the landscape value is High and the susceptibility to change is Low.
Magnitude of change	The magnitude of change would be Negligible . There is no change in the landscape character as there is little or no change to the elements, features or characteristics of the landscape.
Significance of impact	The significance of impact would be Negligible , as the sensitivity is Moderate and the magnitude is Negligible.

6.1.3 Landscape character zone 3: Low Lying Urban Centre

The key features of LCZ3 are described below and illustrated in Photo 6.11 to Photo 6.16. The LCZ3 impact assessment is outlined in Table 6.3.



Photo 6.11 Narrow street with overhanging trees and outdoor café seating. Heritage facades on the left hand side



Photo 6.12 View down The Corso pedestrian mall, looking north-east



Photo 6.13 View of Manly Wharf from Wentworth Street, looking south-west



Photo 6.14 View towards Manly Wharf from the corner of Belgrave Street and the West Esplanade



Photo 6.15 Typical apartment blocks and mature Norfolk Island pine trees found in Manly's town centre



Photo 6.16 View of St Matthew's church on The Corso, looking north-east from Darley Road

LCZ3 is nestled between Manly Beach to the north-east and Manly Cove to the south-west. The Corso is the main spine of the town centre; a vibrant pedestrian mall that runs between the beach and the cove.

The Manly town centre consists of supermarkets, specialist retailers, fitness clubs, hospitality venues, hotels and civic areas. It is a popular destination with high foot traffic due to its proximity to the beaches and wharf, catering for residents and visitors year-round.

Key characteristics of LCZ3 include the following:

- The Corso pedestrian mall is a key feature; a wide, formal street, with playgrounds, water features, and a central avenue of mature Phoenix palms and Moreton Bay figs. The street is lined with late 19th Century to early 20th Century buildings occupied by shops, restaurants and bars
- development tends to be low scale on principle streets with built form generally four to six stories high, preventing the town centre from feeling too enclosed
- corner buildings tend to be slightly higher and more distinctive
- architectural styles vary, such as civic buildings (Council Chambers and St. Matthews Church) located nearby large-scale modern development
- a small number of apartment buildings and hotels reach up to 17 stories, such as the National Hotel
- footpath awnings and through-block arcades protect pedestrians and produce strongly defined and comfortable urban spaces
- most structures extend to property boundaries
- topography is relatively flat and low-lying.

Values associated with LCZ3 include:

- the town centre is of local heritage significance as shown in Figure 4.2, as it reflects the early development of Manly, most notably the intact quality of The Corso and its turn of the century streetscape, as well as key built elements
- a 'scenic protection land' overlay is active over the entirety of LCZ3 to protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the Manly foreshore as shown in Figure 4.2
- recreational value is associated with vibrant streets and laneways, as well as playgrounds on the Corso and bike and pedestrian paths
- scenic values are associated with mature street trees and heritage building facades, as well as framed views of the sea and harbour and wide vistas afforded by low-scaled buildings
- from an international perspective, Manly forms a key part of Australia's character as an encapsulation of Australian beach culture, and operates as an international tourist destination
- Aboriginal cultural values are associated with long history of habitation by the Gayemaygal people.

Character elements make a strong contribution to the local character, including locally important landscape features such as The Corso and heritage-listed buildings. LCZ3 therefore has a **High** landscape character value.

Table 6.3 LCZ3 impact assessment

Landscape character zone 3: Low Lying Urban Centre	
Anticipated change to landscape character	<p>The proposal site is not in LCZ3. The anticipated change to the landscape character of LCZ3 would be indirect and relates to modifications of the landscape character within LCZ1.</p> <p>LCZ 3 is located on low lying land and features multi-storey buildings which block most views to the proposal site. Filtered, prolonged views may be achieved from the residents and road users on East Esplanade.</p> <p>The construction phase is anticipated to be up to eight months. During construction, views of storage areas, fencing, signage, barges, cranes, and other machinery associated with construction may be achieved.</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ3, as alterations to the Manly Wharf would not be out of character.</p>
Susceptibility to change	<p>The susceptibility to change is Low, as it is unlikely that this development would have an adverse effect on the landscape character, condition or value. Mitigation measures such as appropriate screening and siting of storage areas would be effective in neutralising adverse effects, and impacts of construction would be short-term.</p>
Sensitivity to change	<p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscapes susceptibility to change from the type of proposed development. The sensitivity would be Moderate, as the landscape value is High and the susceptibility to change is Low.</p>
Magnitude of change	<p>The magnitude of change would be Negligible. There is no change in the landscape character as there is little or no change to the elements, features or characteristics of the landscape.</p>
Significance of impact	<p>The significance of impact would be Negligible, as the sensitivity is Moderate and the magnitude is Negligible.</p>

6.1.4 Landscape character zone 4: Hilly Settlement

The key features of LCZ4 are described below and are illustrated in Photo 6.17 to Photo 6.20. The LCZ4 impact assessment is outlined in Table 6.4.



Photo 6.17 View from the intersection of Victoria Parade and Darley road, looking south-east down Darley Road



Photo 6.18 Filtered view of the harbour between two houses on The Cove Avenue



Photo 6.19 View from the intersection of The Cove Avenue and Oyama Avenue, looking north



Photo 6.20 Typical residential Street demonstrating undulating topography and long views

LCZ4 includes residential areas located to the north-east and south-west of the proposal site. Residential buildings fan outwards of the centre and up the hillsides around the harbour, transitioning from four to five storey apartment buildings to stand-alone dwellings, many with large setbacks and established gardens.

Key characteristics of LCZ4 include the following:

- built form is characterized by detached dwellings in mixed architectural styles ranging from one to three stories, with large setbacks and mature gardens
- on sections of coastline with cliffs, built form tends to be set back, with a grassed area and walking track separating houses and the coast
- on sections of coastline without cliffs, residential gardens commonly extend all the way to the waterfront, such as properties on Cove Avenue, many of them featuring ocean pools or traditional pools
- houses are commonly oriented to face to views of the water
- mature street trees with large canopies provide shade and contribute to the area's lush, established character and soften the houses into their natural setting
- wide streets with parallel parking, nature strips, footpaths and building setbacks on both sides make the streets open and light

- a mix of native and non-native vegetation is present. Exotics such as palm trees and European hedging are commonplace in front gardens
- zoning is a mix of low density, medium density and general residential
- topography is gently sloping reaching approximately 60 metres at the highest points within the study area
- long, framed views are frequently achieved towards the town centre, other residential areas, the national park, Pacific Ocean or North Harbour.

Values associated with LCZ4 include:

- a 'scenic protection land' planning overlay is active over most of this LCZ, to protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the Manly foreshore as shown in Figure 4.2
- landscape items of local heritage significance include Margaret Street, the street trees on Addison road and various individual buildings and street trees due to their strong contribution to the character of the suburb
- Aboriginal cultural values are associated with long history of habitation by the Gayemaygal people.

Character elements are in reasonably good condition and that make an average contribution to the local character, include locally important features outlined above. LCZ4 therefore has a **Medium** landscape character value.

Table 6.4 LCZ4 impact assessment

Landscape character zone 4: Hilly Settlement	
Anticipated change to landscape character	<p>The proposal site is not in LCZ4. The anticipated change to the landscape character of LCZ4 would be indirect and relates to modifications of the landscape character within LCZ1.</p> <p>Despite the hilly topography, the abundance of multi-storey buildings in LCZ4 block most views to the proposal site. Distant, filtered, prolonged views of the site may be achieved from private residences, especially upper floors, but viewpoint locations are taken from publicly accessible locations only.</p> <p>The construction phase is anticipated to be up to eight months. During construction, distant, filtered views of storage areas, fencing, signage, barges, cranes, and other machinery associated with construction may be achieved.</p> <p>During operation, the proposal is not anticipated to have a significant or adverse effect on LCZ4, as alterations to the Manly Wharf would not be out of character.</p>
Susceptibility to change	<p>The susceptibility to change is Low, as it is unlikely that this development would have an adverse effect on the landscape character, condition or value. Mitigation measures such as appropriate screening and siting of storage areas would be effective in neutralising adverse effects, and impacts of construction would be short-term.</p>
Sensitivity to change	<p>The sensitivity of a landscape is judged on a combination of the landscape value and the landscapes susceptibility to change from the type of proposed development. The sensitivity would be Moderate, as the landscape value is Medium and the susceptibility to change is Low.</p>
Magnitude of change	<p>The magnitude of change would be Negligible. There is no change in the landscape character as there is little or no change to the elements, features or characteristics of the landscape.</p>
Significance of impact	<p>The significance of impact would be Negligible, as the sensitivity is Moderate and the magnitude is Negligible.</p>

7. Visual impact assessment

Based on the existing environment analysis, sensitive visual receivers were identified and viewpoint locations selected for assessment.

Sensitive visual receivers within the proposal viewshed include the following:

- road users along East Esplanade and Commonwealth Parade
- cyclists and pedestrians along Fairlight Walk
- ferry users arriving at and departing from Manly Wharf
- boat and yacht users in the North Harbour
- residents in harbour-facing apartments along the East Esplanade
- residents in harbour-facing houses in hilly, residential areas
- workers and patrons in harbour-facing retail and hospitality establishments along the East Esplanade
- workers and patrons in harbour-facing restaurants and bars in the Manly Wharf complex.

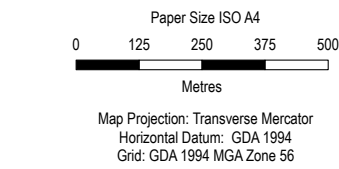
7.1 Viewpoint locations

The following section provides a visual impact assessment of the proposal from the following selected representative viewpoint locations as shown in Table 7.1 and Figure 7.1. Refer to Section 7.1.1 to Section 7.1.13 for an assessment of the visual impact for each viewpoint location.

Viewpoints have been selected to appropriately represent the most sensitive visual receivers who are in close proximity to the site, may have prolonged views to the proposal or are in LCZs of high value.

Table 7.1 Viewpoint locations

Viewpoint	Location
Viewpoint location 1 (VP01)	Arabadoo Lookout, looking north-east
Viewpoint location 2 (VP02)	Reef Beach, looking north-east
Viewpoint location 3 (VP03)	Federation Point, looking east
Viewpoint location 4 (VP04)	Manly Pavilion deck, looking east
Viewpoint location 5 (VP05)	Sea Life and Cove Beach West, looking south-east
Viewpoint location 6 (VP06)	Wharf 2, looking south
Viewpoint location 7 (VP07)	Manly Wharf stairs, looking south
Viewpoint location 8 (VP08)	Between Wharves 2 and 3, looking south-west
Viewpoint location 9 (VP09)	The Tropic bar and Kayak Centre, looking south-west
Viewpoint location 10 (VP10)	East Manly Cove Beach, looking west
Viewpoint location 11 (VP11)	Esplanade East and Ashburner Street, looking north-west
Viewpoint location 12 (VP12)	Manly Yacht Club, looking north-west
Viewpoint location 13 (VP13)	Manly Fast Ferry, looking north-east



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Viewpoints and viewedsh

FIGURE 7.1

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

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7.1.1 Viewpoint location 1: Arabanoo lookout

VP01 is located at Arabanoo Lookout on Dobroyd Head looking north-east, as shown in Figure 7.1. Refer to Table 7.2 for assessment.



Photo 7.1 Viewpoint location 1: Arabanoo lookout – existing view

Table 7.2 Viewpoint location 1 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 339789.743 N: 6257808.842 Elevation: 106.1 m VP01 is situated approximately 1.5 kilometres southwest from the proposal site and is facing in a north-east direction. This viewpoint is representative of views experienced by visitors to Arabanoo Lookout, which sits within the Sydney Harbour National Park and is accessed via a path from Dobroyd Scenic Drive.
Description of existing view	The foreground shows a wooden handrail along the perimeter of the lookout platform with an information plaque attached. The midground shows a dense native forest canopy. In the background, the North Harbour and Pacific Ocean are visible, with an isthmus between them, on which the Manly town centre lies. The Manly Wharf is just visible above the midground tree canopy, with the residential areas of Fairlight and Manly extending out to the left and right. To the right of the background, the residential properties are replaced by the continuous forest of North Head. Nestled into the North Head bushland, in the right of the background, is the North Head Quarantine Station complex.
Anticipated change to view	During operation, the introduced wharf and canopy structures may be visible in the centre of the background as well as Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels going to and from the new wharf. Introduced structures and boats would occupy a very small portion of the view as they would be over a kilometre away and partially obscured by the existing Wharf 1 and 2 structure. See Section 3 for further information. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with barges, cranes, and other ancillary structures and machinery may be achieved, as well as water taxis being redirected to other locations including Manly Sailing pier, Bavarian deck, and East pier. Refer to Section 3.3.2 for further construction information. Though visible during both phases, changes to the existing view would unlikely be noticeable at a distance of 1.5 kilometres and would be intermittently screened by vegetation as visitors move through the lookout area.
Sensitivity to change	The sensitivity to change is High , as Arabanoo lookout is a prominent stop for tourist coaches and visitors place value upon enjoyment of views of the harbour and surrounding landscape. However, this location is at approximately 1.5 kilometres from the proposal and views are intermittently screened by foreground vegetation.

Criteria	Comments
Magnitude of change	The magnitude of change is Negligible , as the change the view would be imperceptible as there is very little change to the elements, features or characteristics of the view. Being approximately 1.5 kilometres away from the proposal, the new structures and boats may be visible but would occupy a very small portion of a much wider view, to the point of being unnoticeable. Furthermore, the new structures would not be uncharacteristic within the existing view due to the existing Wharf 1 and 2 structures, which would also partially obscure the construction and operation of the new wharf. Visual impacts during the construction phase would be temporary.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is High and the magnitude of change is Negligible.

7.1.2 Viewpoint location 2: Reef Beach

VP02 is located on a coastal rock shelf just west of Reef Beach, looking north-east as shown in Figure 7.1. Refer to Table 7.3 for assessment.



Photo 7.2 Viewpoint location 2: Reef Beach - existing view

Table 7.3 Viewpoint location 2 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 340197.766 N: 6257911.459 Elevation: 13.5 m VP02 is situated approximately one kilometre south-west of the proposal site and is facing in a north-east direction. This viewpoint is representative of views experienced by users of Reef Beach which is accessed by Reef Beach track, a popular and scenic coastal walk. This viewpoint is located within Sydney Harbour National Park, on Dobroyd Head.
Description of existing view	A rocky outcrop is visible on the left side of the foreground. In the midground lies the still water of the North Harbour, with one small boat to the right of view. In the background, the low-lying town centre is in the centre of view with the Manly Wharf just visible on the water. The suburb of Fairlight rises to the left of the background, and to the right is the suburb of Manly followed by the forest of North Head.
Anticipated change to view	During operation, the introduced canopy and Wharf 3 platform may be visible in the centre of the background, as well as Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels going to and from the new wharf. Introduced structures and boats would occupy a very small portion of the view as they would be approximately a kilometre away and partially obscured by the existing Wharf 1 and 2 structure. See Section 3.2 for further information. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with barges, cranes, and other ancillary structures and machinery may be achieved, as well as water taxis being redirected to other locations including Manly Sailing pier, Bavarian deck, and East pier. Refer to Section 3.3.2 for further construction information. Though visible during both phases, changes to the existing view would unlikely be noticeable at a distance of one kilometre and would be intermittently screened by passing boats.

Criteria	Comments
Sensitivity to change	The sensitivity to change is Moderate , as visitors to the beach place value upon enjoyment of views in this setting and due to its location in a national park and on a very popular walking trail. However, viewers are at a distance of approximately one kilometre from the proposal and when views are achieved they are very distant and/or screened by passing boats.
Magnitude of change	The magnitude of change is Negligible , as the new structures would be almost entirely obscured by the existing Wharf 1 and 2 structure and the boats accessing Manly Wharf would not be uncharacteristic within the existing view. Construction impacts would be temporary and would also be significantly obscured by the existing Wharf 1 and 2 structure.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is Moderate and the magnitude of change is Negligible.

7.1.3 Viewpoint location 3: Federation Point

VP03 is located on a grassed rest area on Federation Point looking east, as shown in Figure 7.1. Refer to Table 7.4 for assessment.



Photo 7.3 Viewpoint location 3: Federation Point – existing view

Table 7.4 Viewpoint location 3 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 340831.713 N: 6258727.197 Elevation : 16.4 m VP03 is situated approximately 300 meters west of the proposal and is facing in an eastern direction. This viewpoint is representative of views experienced by pedestrians on Fairlight Walk and users of the rest area just east of the path. It is also representative of views from road users and residential properties on Commonwealth Parade, approximately 40 metres north-west of this viewpoint location.
Description of existing view	In the midground lies the still water of the North Harbour, with a few small boats and a ferry on the water, and the Manly Pavilion to the left. To the left of the background is Manly Cove Beach. Behind the beach is the East Esplanade park and a tall row of Norfolk Island Pines. In the middle of the background Manly Wharf extends over the water. The hilly residential area of Manly rises up behind the wharf and to the right of the background.
Anticipated change to view	During operation, all new structures would be obscured by the existing Wharf 1 and 2 structures. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible going to and from the new wharf. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with storage areas, fencing and signage may be achieved in the left of the background, in the East Esplanade Park. Views of barges and cranes may be achieved in the water to the right of the background. Water taxis and other small boats being redirected to the Bavarian may be visible in the centre of the background. Refer to Section 3.3.2 for further construction information. Construction impacts would be significantly obscured by the existing Wharf 1 and 2 structure and would occupy a small portion of the view. Impacts would also be intermittently screened by passing boats.

Criteria	Comments
Sensitivity to change	The sensitivity to change is High , as occupiers of residential properties on Commonwealth Parade and users of the rest area adjacent to Fairlight Walk have long viewing periods over the water. Viewers place value upon enjoyment of views in this setting.
Magnitude of change	The magnitude of change is Negligible , as the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view. Construction and operation impacts would be significantly obscured by the existing Wharf 1 and 2 structure, and visual impacts during the construction phase would be temporary.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is High and the magnitude of change is Negligible.

7.1.4 Viewpoint location 4: Manly Pavilion walkway

VP04 is located on the deck of the Manly Pavilion looking east, as shown in Figure 7.1. Refer to Table 7.5 for assessment.



Photo 7.4 Viewpoint location 4: Manly Pavilion walkway - existing view

Table 7.5 Viewpoint location 4 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 340876.63 N: 6258745.51 Elevation: 11.2 m VP04 is situated on the public walkway (boardwalk) in front of the Manly Pavilion, within the state heritage listed site. It is approximately 250 meters west of the proposal and is looking in an eastern direction. This viewpoint is representative of views experienced from the walkway outside the Pavilion, by members of the public using the walkway, workers and patrons on the Manly Pavilion outdoor dining deck, and boat users on the harbour.
Description of existing view	In the foreground and midground lies the water of the North Harbour, with a small boat on the water in the right of view, and a jetty extending out from the Sea Life building to the left. To the left of the background is Manly Cove Beach and a tall row of Norfolk Island Pines. In the middle of the background, Manly Wharf extends over the water. To the right of the background is the hilly Manly residential area, with multi-storey buildings overlooking the harbour.
Anticipated change to view	During operation, all new structures would be obscured by the existing Wharf 1 and 2 structures. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible going to and from the new wharf. During the construction phase (anticipated to be up to eight months), temporary views of barges, cranes and other boats and machinery may be achieved in the water to the right of the background, as well as water taxis and other small boats being redirected to the Bavarian. Refer to Section 3.3.2 for further construction information. Though visible during both phases, changes to the existing view would be significantly obscured by the existing Wharf 1 and 2 structure, as well as passing boats.

Criteria	Comments
Sensitivity to change	The sensitivity to change is High , as the viewpoint is within a state heritage listed site and patrons dining outdoors at the Manly Pavilion have long viewing periods. Patrons and users of the walkway place value upon the landscape and enjoyment of views of their setting.
Magnitude of change	The magnitude of change is Negligible , as the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view. Construction and operation impacts would be significantly obscured by the existing Wharf 1 and 2 structure, and visual impacts during the construction phase would be temporary.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is High and the magnitude of change is Negligible.

7.1.5 Viewpoint location 5: Sea Life and Cove Beach west

VP05 is located on Fairlight Walk looking south-east, as shown in Figure 7.1. Refer to Table 7.6 for assessment.



Photo 7.5 Viewpoint location 5: Sea Life and Cove Beach West – existing view

Table 7.6 Viewpoint location 5 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 340915.252 N: 6258845.062 Elevation: 20.6 m VP05 is situated on Cove Beach West, next to the former Sea Life Centre. It is approximately 250 meters west from the proposal and is looking in a south-eastern direction. This viewpoint is representative of views experienced by pedestrians and cyclists on Fairlight Walk, as well as beach users.
Description of existing view	In the foreground and extending into the midground the water of the North Harbour meets the sand of Manly Cove Beach. To the left, a tall row of Norfolk Island Pines, the East Esplanade Park and Fairlight Walk run parallel to the beach. In the centre of the background, Manly Wharf extends over the water. To the right of the background is the hilly residential area of Manly, with multi-storey buildings overlooking the harbour.
Anticipated change to view	During operation, all of the new structures would be obscured by the existing Wharf 1 and 2 structures. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible going to and from the new wharf. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with temporary storage areas, fencing and signage may be visible in the left of the background in the East Esplanade Park. Barges, cranes, and other boats and machinery may visible on the water in the right of the background. Water taxis and other small boats being redirected to the Bavarian may be visible in the centre of the background. Refer to Section 3.3.2 for further construction information. Though visible during both phases, changes to the existing view would be significantly obscured by the existing Wharf 1 and 2 structure, as well as passing boats.
Sensitivity to change	The sensitivity to change is High , as the Manly foreshore is of local heritage significance and users of the Cove Beach West and Fairlight Walk place value upon the landscape and enjoyment of views of their setting. Viewers are located within close proximity to the proposal site but viewing periods are short and screened by the existing wharf structures as well as passing boats and ferries.
Magnitude of change	The magnitude of change is Negligible , as the new structures would be entirely obscured and the boats accessing Manly Wharf would not be uncharacteristic within the existing view. Construction impacts would also be significantly obscured by the existing Wharf 1 and 2 structure and would occupy a small portion of the view. Some impacts would also be intermittently screened by passing boats.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is High and the magnitude of change is Negligible.

7.1.6 Viewpoint location 6: Wharf 2

VP06 is located on Wharf 2 looking south, as shown in Figure 7.1. Refer to Table 7.7 for assessment.



Photo 7.6 Viewpoint location 6: Wharf 2 – existing view

Table 7.7 Viewpoint location 6 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341184.62 N: 6258685.386 Elevation: 15.7 m VP06 is situated within the proposal site and is looking in a southern direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians on the boardwalk and users of the Manly Wharf complex.
Description of existing view	In the centre and right of the foreground is the calm water of Manly Cove. To the left of the foreground, a boardwalk with a handrail on the right side extends away from view into the midground. In the midground, Wharf 3 and the covered Wharf Bar extend out from the boardwalk over the water. In the right of the background a number of multi-storey buildings in the Manly residential area overlook the harbour, interspersed by trees. Several Norfolk Island Pines are visible to the left of the background.
Anticipated change to view	<p>During operation, in the foreground and midground, a new pile-supported promenade and public seating space would run adjacent to the existing boardwalk, extending over the water into the centre of view. In the midground, the covered Wharf Bar would be retained. The rest of the existing wharf would be replaced with a new Wharf 3 of a similar length, including a covered waiting area, covered gangway, and hydraulic platform. Directly behind Wharf 3 (to its east) would be a new public jetty (Wharf 4), which would be mostly obscured by the new Wharf 3 structures.</p> <p>The roof canopy of the new waiting area would sit directly in front of and to the right of the retained Wharf Bar canopy, at a similar height. It may partially obscure views of a small number of multi-storey buildings overlooking the harbour.</p> <p>During operation, water taxis and other small vessels would be visible coming, going and docking at Wharf 4 on the far (eastern) side of the new wharf. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the near (western) side. When in view, the larger boats may obscure views of the multi-storey buildings in the background.</p> <p>At the beginning of the construction phase the boardwalk in the foreground would be partially closed whilst the western side of the new promenade (in the foreground) is constructed. Following that, hoarding would be installed to close Wharf 3, and the demolition of Wharf 3, dredging of the Wharf 3 berth pocket area, and construction of the new Wharf 3 and 4 structures would follow. Boats usually accessing Wharf 3 would not be visible as they would be redirected during this time. Barges, cranes, excavators, a laydown area, fencing/hoarding, signage, and other ancillary structures and machinery would be visible at different stages of the construction phase. The construction phase is anticipated to be up to eight months in total. Refer to Section 3.3.2 for further construction information.</p>
Sensitivity to change	The sensitivity to change is Moderate , as users of the Manly Wharf are located in very close proximity to the proposal site but are passing through the transport hub and therefore have short term views.

Criteria	Comments
Magnitude of change	<p>The magnitude of change is Moderate, as there would be discernible changes in the existing view due to the introduction of the new promenade, wharf structures and waiting area. Although the introduced components would not be out of character or be an adverse impact on the view themselves, they would lead to a minor loss of the view of the houses in the background and the water in the foreground, a key characteristic of this view.</p> <p>Visual impacts during the construction phase would be temporary and therefore do not significantly impact the magnitude of change.</p>
Significance of impact	<p>The significance of impact is Moderate, as the sensitivity to change and the magnitude of change are both Moderate.</p>

7.1.7 Viewpoint location 7: Manly Wharf stairs

VP07 is located within the proposal site on the staircase landing on the southern side of the Manly Wharf complex. VP07 is looking south, as shown in Figure 7.1. Refer to Table 7.8 for assessment.



Photo 7.7 Viewpoint location 7: Manly Wharf stairs - existing view



Photo 7.8 Photomontage showing the proposal from viewpoint location 7

Table 7.8 Viewpoint location 7 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341220.222 N: 6258669.895 Elevation: 22 m VP07 is situated within the proposal site and is looking in a southern direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians using the stairs to access upper levels of the Wharf, and patrons and staff at the upper level restaurants and bars.
Description of existing view	In the left of the midground the wharf boardwalk runs diagonally across the view. A steel fence runs along the edge of the boardwalk with two tall lightpoles, one in the foreground and one in the midground. To its right is the harbour, extending into the right of the background. From the boardwalk Wharf 3 extends out over the water. To its east is the Wharf Bar; an open-air bar with a covered drinks preparation area. In the background a number of multi-storey buildings in Manly's residential area overlook the harbour, interspersed by trees. A few Norfolk Island Pines and East Manly Cove Beach are visible to the left of the background. To the right, Smedley's Point comes to a head and is met by a group of boats docked in the water.
Anticipated change to view	<p>The covered Wharf Bar would be retained. The rest of the existing wharf would be replaced with a new Wharf 3 of a similar length, including a covered waiting area, covered gangway, and hydraulic platform. Parallel to Wharf 3 (on the left side, to its east) would be a new public jetty (Wharf 4) which would be mostly obscured by the other introduced structures from this viewpoint. The roof canopy of the new waiting area would sit in front of and to the right of the retained Wharf Bar canopy, at a similar height. The new roof canopy, supporting columns and service pod would partially obscure views of the Wharf Bar and docked boats in the harbour. Both existing lightpoles would be replaced with similar, shorter lightpoles, in keeping with the height of surrounding structures. Several cylindrical piles would stand along the wharf in the right of the midground. An increased number of people would be visible accessing the new wharf and using the new seating area.</p> <p>During operation, water taxis and other small vessels would still be visible coming, going and docking at Wharf 4 on the left (eastern) side of the new wharf. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the right (western) side. Refer to Photo 7.8 for photomontage. When in view, large boats docking at Wharf 3 may obscure views of the harbour.</p> <p>During the construction phase, hoarding would be installed to close Wharf 3, and the demolition of Wharf 3, dredging of the Wharf 3 berth pocket area, and construction of the new Wharf structures would follow. Barges, cranes, excavators, fencing, signage, and other ancillary structures and machinery would be visible at different stages of the construction phase. Boats usually accessing Wharf 3 would not be visible as they would be redirected during this time. The construction phase is anticipated to be up to eight months in total. Refer to Section 3.3.2 for further construction information.</p>
Sensitivity to change	The sensitivity to change is High , as patrons and staff at the upper-level restaurants and bars have long viewing periods and place value upon enjoyment of views in this setting.
Magnitude of change	<p>The magnitude of change is Moderate, as there would be noticeable changes in the existing view due to the introduction of the new wharf structure. Although the new wharf structure would not be out of character or be an adverse impact on the view itself, it would lead to a partial loss of the view of the Wharf Bar and docked boats in the harbour.</p> <p>Visual impacts during the construction phase are temporary and therefore do not significantly impact the magnitude of change.</p>
Significance of impact	The significance of impact is High-Moderate , as the sensitivity to change is High and the magnitude of change is Moderate.

7.1.8 Viewpoint location 8: Between Wharves 2 and 3

VP08 is located within the proposal site on the boardwalk between Wharves 2 and 3. VP08 is looking south-west, as shown in Figure 7.1. Refer to Table 7.9 for assessment.



Photo 7.9 Viewpoint location 8: Between Wharves 2 and 3 - existing view



Photo 7.10 Photomontage showing the proposal from viewpoint location 7

Table 7.9 Viewpoint location 8 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341221.716 N: 6258672.878 Elevation: 12.6 m VP08 is situated within the proposal site and is looking in a south-western direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians using the boardwalk to access any part of Manly Wharf, as well as patrons and staff using the outdoor dining areas of lower level restaurants and bars.
Description of existing view	In the left of the foreground the wharf boardwalk runs diagonally across the view. A steel fence runs along the edge of the boardwalk, as well as one tall lightpole. To its right is the calm water of the harbour, extending into the right of the background. From the boardwalk in the midground, Wharf 3 and the Wharf Bar extend over the water. In the background a number of multi-storey buildings overlook the harbour, interspersed by trees. A few Norfolk Island Pines are visible to the left of the background. To the right, Smedley's Point comes to a head and is met by a group of boats docked in the water. In the far distance to the right, Dobroyd Head is visible.

Criteria	Comments
Anticipated change to view	<p>The covered Wharf Bar would be retained, and the rest of the wharf removed. A new promenade with a covered seating area and service pod would extend out from the existing boardwalk over the harbour. The new promenade would block the view of the water in the foreground and the service pod would obscure the southern end of the Wharf Bar. A new roof canopy with four columns would stand over the seating area, partially obscuring the view of the boats docked in the water, multi-storey buildings overlooking the harbour, and much of the sky. Beyond the seating area, a new covered gangway and hydraulic platform (Wharf 3) would extend out over the water, replacing the old wharf structure. Parallel to Wharf 3 (on the left side, to its east) would be a new public jetty (Wharf 4). From this viewpoint, both wharves would take up a small portion of the view and would be partially obscured by the introduced columns. The lightpole would be removed, and an increased number of people would be visible accessing the new wharf and using the new seating area.</p> <p>During operation, views of water taxis and other small vessels coming, going and docking at Wharf 4 would be partially screened by the introduced elements. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the right (western) side.</p> <p>During the construction phase, visual impacts would be substantial as construction activities would occupy most, if not all, of the view. Hoarding would be installed to close Wharf 3, and the demolition of Wharf 3, dredging of the Wharf 3 berth pocket area, and construction of the new Wharf structures would follow. Barges, cranes, excavators, fencing, signage, and other ancillary structures and machinery would be visible at different stages of the construction phase. Boats usually accessing Wharf 3 would not be visible as they would be redirected during this time. The construction phase is anticipated to be up to eight months in total. Refer to Section 3.3.2 for further construction information.</p>
Sensitivity to change	The sensitivity to change is High , as the viewpoint is within a state heritage listed site and patrons dining outdoors at the Manly Wharf restaurants and bars have long viewing periods. Patrons and users of the boardwalk place value upon the landscape and scenic views within this setting.
Magnitude of change	The magnitude of change is High , as there would be a substantial change to the existing view due to the introduction of the new wharf and associated infrastructure, as well as a partial loss of the view of the sky, water and houses in the background, which are key characteristics of this view. The changes would cause a view to be permanently changed and its quality somewhat diminished.
Significance of impact	The significance of impact is High , as the sensitivity to change and the magnitude of change are both High.

7.1.9 Viewpoint location 9: The Tropic Bar and Kayak Centre

VP09 is located on the boardwalk in front of the Tropic Bar and is looking south-west, as shown in Figure 7.1. Refer to Table 7.10 for assessment.



Photo 7.11 Viewpoint location 9: The Tropic bar and Kayak Centre - existing view



Photo 7.12 Photomontage showing the proposal from viewpoint location 9

Table 7.10 Viewpoint location 9 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341267.234 N: 6258655.149 Elevation: 9.8 m VP09 is situated within the proposal site and is looking in a south-western direction, towards Wharf 3. This viewpoint is representative of views experienced by pedestrians using the boardwalk to access any part of Manly Wharf, as well as patrons and staff at the Tropic Bar outdoor area, and users of the Kayak Centre.
Description of existing view	In the right of the foreground the wharf boardwalk extends away from view, with the Manly Wharf restaurants and bars to the right and the harbour to the left. In the midground, Wharf 3 and the Wharf Bar extend out from the boardwalk, over the water. In the background the forested hill of Dobroyd Head is visible beyond the harbour.
Anticipated change to view	<p>During operation, Wharf 3 would be removed and replaced with new structures of a similar length. A new public jetty (Wharf 4) would be visible to the left of the Wharf Bar, consisting of large tidal steps and a ramp leading down to landings at different intervals. Directly behind Wharf 4 would be the new Wharf 3, including a covered waiting area, covered gangway, and hydraulic platform. The new waiting area roof canopy which would sit directly behind the existing Wharf Bar canopy, extending a little further out to the left. The left side of the new roof canopy would partially obscure a small part of the forested hill of Dobroyd Head in the background. Located to the left of the waiting room canopy, the new gangway canopy would be very slim and in line with the horizon, resulting in minimal visual impact. Several new piles would be visible in the water, around the new wharves.</p> <p>During this phase, water taxis and other small vessels would be visible coming, going and docking at Wharf 4. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the far (western) side of the Wharves, and would be partially screened by the introduced elements.</p> <p>During the construction phase, hoarding would be installed to close Wharf 3, and the demolition of Wharf 3, dredging of the Wharf 3 berth pocket area, and construction of the new Wharf structures would follow. Barges, cranes, excavators, fencing, signage, and other ancillary structures and machinery would be visible at different stages of the construction phase. Boats usually accessing Wharf 3 would not be visible as they would be redirected during this time. The construction phase is anticipated to be up to eight months in total. Refer to Section 3.3.2 for further construction information.</p>
Sensitivity to change	The sensitivity to change is High , as the viewpoint is within a state heritage listed site and patrons in the Tropic Bar outdoor dining area are seated facing directly towards the proposal with long viewing periods. Patrons, users of the boardwalk, and users of the Kayak Centre place value upon the landscape and enjoyment of views of their setting.
Magnitude of change	The magnitude of change is Low , as the foreground elements would be retained, the view of Dobroyd Head in the background is already partially obscured by the existing Wharf Bar canopy, and visual impacts during the construction phase are temporary. The changes to the Manly Wharf would be visible but would not be uncharacteristic within the existing view.
Significance of impact	The significance of impact is Moderate , as the sensitivity to change is High and the magnitude of change is Low.

7.1.10 Viewpoint location 10: East Manly Cove Beach

VP10 is located on East Manly Cove Beach and is looking west, as shown in Figure 7.1. Refer to Table 7.11 for assessment.



Photo 7.13 Viewpoint location 10: East Manly Cove Beach - existing view



Photo 7.14 Photomontage showing the proposal from viewpoint location 10



Photo 7.15 Planned location of temporary storage compound, on grass to the right of view

Table 7.11 Viewpoint location 10 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341346.768 N: 6258596.574 Elevation: 0.2 m VP10 is situated approximately 100 meters east from the proposal site and is looking in a western direction. This viewpoint is representative of views experienced by pedestrians and cyclists on Fairlight Walk, and users of East Manly Cove Beach.
Description of existing view	In the foreground and extending into the midground the water of the harbour meets the sand of East Manly Cove Beach. To the right, a tall row of Norfolk Island Pines, the East Esplanade Park, Fairlight Walk and a row of streetlights run parallel to the beach. In the centre of the midground, is the Manly Wharf complex, with Wharves 1 and 2 extending over the water. Behind the wharf complex, to the right of the background is the hilly residential area of Fairlight, with multi-storey buildings overlooking the harbour, interspersed by trees. To the left of the background is the forested slopes of Dobroyd Head, with the houses of Balgowlah Heights clustered on the hill.
Anticipated change to view	<p>During operation, Wharf 3 would be replaced with new Wharf 3 and 4 structures of a similar length. A new public jetty (Wharf 4) would be visible to the left of the Wharf Bar, consisting of large tidal steps and a ramp leading down to landings at different intervals. Directly behind Wharf 4 would be the new Wharf 3, including a covered waiting area, covered gangway, and hydraulic platform. The new waiting area and gangway roof canopies would sit in line with the existing Wharf Bar canopy, extending further out to the left and partially obscuring a small part of Wharves 1 and 2.</p> <p>During this phase, water taxis and other small vessels would be visible coming, going and docking at Wharf 4. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the far (western) side of the Wharves, and would be partially screened by the introduced elements. When in view, boats accessing Wharf 3 may partially obscure views of Wharves 1 and 2 in the midground.</p> <p>During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with fencing and signage may be achieved in the right of the background, as well as a storage area in the East Esplanade Park (refer Photo 7.15). Views of barges and cranes may be achieved in the water to the left of the background. Water taxis and other small boats being redirected to the Manly Sailing pier may be visible in the left of the midground and background. Refer to Section 3.3.2 for further construction information.</p> <p>Though visible during both phases, views are at a moderate distance and changes to the existing view would be intermittently obscured by passing and docking boats.</p>
Sensitivity to change	The sensitivity to change is High , as users of Manly Cove Beach and Fairlight Walk are located within close proximity to the proposal site and place value on the enjoyment of views in this setting. Viewers have passing views of, or are adjacent to, the proposal site.
Magnitude of change	<p>The magnitude of change is Low, as the introduced structures would be visible but would not be uncharacteristic within the existing view. As the existing Wharf 1 and 2 structures are located directly behind the proposed location of the Wharf 3 upgrade from this viewpoint, the proposal would not contribute to any further loss of harbour views. The height of the proposal is in keeping with the height of the existing structures and therefore there is no loss of long views towards the horizon.</p> <p>Furthermore, the proposal would be partially obscured by the existing Wharf Bar and may also be intermittently screened by passing boats.</p> <p>Visual impacts during the construction phase are temporary and therefore do not significantly impact the magnitude of change.</p>
Significance of impact	The significance of impact is Moderate , as the sensitivity to change is Moderate and the magnitude of change is Low.

7.1.11 Viewpoint location 11: East Esplanade and Ashburner Street

VP11 is located at the intersection of East Esplanade and Ashburner Street and is looking north-west, as shown in Figure 7.1. Refer to Table 7.12 for assessment.



Photo 7.16 Viewpoint location 11: East Esplanade and Ashburner Street - existing view

Table 7.12 Viewpoint location 11 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341412.919 N: 6258544.616 Elevation: 22.1 m VP11 is situated approximately 200 meters east of the proposal site and is looking in a north-western direction. This viewpoint is representative of views experienced by pedestrians, cyclists and vehicles along East Esplanade and the southern end of Ashburner Street, as well as residents in harbour-facing dwellings on East Esplanade.
Description of existing view	The foreground shows a tarmac road which extends away from view, gently curving to the left. On the right side of the road is a concrete footpath and a residential garden with a low, trimmed hedge and a green lawn. Apartment buildings line the right side of the road into the distance. On the left side of the road, cars are parked below a row of tall Norfolk Island Pine trees. In the background, behind the pine trees, glimpses of the North Harbour can be seen, as well as several small boats and the Manly Wharf. In the distant background a hill with trees and buildings can be seen on the other side of the harbour.
Anticipated change to view	During operation it is unlikely that the proposed new wharf infrastructure would be noticeable, however filtered views of vessels using the new wharves may be achieved through the Norfolk Island Pines, such as water taxis, other small vessels, Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with a temporary storage area, fencing and signage may be achieved in the right of the midground, in the East Esplanade Park. See Figure 3.1 for planned location of compound (storage) area. Also during construction views of barges and cranes may be achieved in the centre and left of the background. Water taxis and other small boats being redirected to the Manly Sailing pier may be visible in the left of the background. Refer to Section 3.3.2 for further construction information.

Criteria	Comments
Sensitivity to change	VP11 has a Moderate sensitivity to change as road users and pedestrians on the East Esplanade are located within close proximity to the site but viewing periods are limited and significantly screened by vegetation. Occupiers of residential properties on this road have long viewing periods but are at a distance and/or screened from the study area, most significantly by the tall row of Norfolk Island Pines.
Magnitude of change	The magnitude of change is Negligible , as there would be a minor alteration to the background view due to the introduction of the new wharf structures, however the introduced components would be very significantly screened by the Norfolk Island Pines and parked cars, and therefore would not be noticeable within the existing view. Any construction impacts would be temporary and would also be significantly obscured by the trees and cars and would occupy a small portion of the view.
Significance of impact	The significance of impact is Negligible , as the sensitivity to change is Moderate and the magnitude of change is Negligible.

7.1.12 Viewpoint location 12: Manly Yacht Club

VP12 is located on the Manly Yacht Club jetty and is looking north-west, as shown in Figure 7.1. Refer to Table 7.13 for assessment.



Photo 7.17 Viewpoint location 12: Manly Yacht Club - existing view



Photo 7.18 Photomontage showing the proposal from viewpoint location 12

Table 7.13 Viewpoint location 11 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341254.88 N: 6258405.364 Elevation: 11.3 m VP12 is situated approximately 250 meters south-east of the proposal site and is looking in a north-western direction. This viewpoint is representative of views experienced by users of the Manly Yacht Club, Sailing Club and Launch Club, as well as users of the Yacht Club balcony, boats on the harbour and pedestrians on the East Esplanade near the Yacht Club.
Description of existing view	In the foreground and midground lies the water of the North Harbour, with a number of small boats. In the middle of the background sits the Manly Wharf complex and Wharves 1 and 2, partially screened by boats in the midground. To the right of the background a tall row of Norfolk Island Pines is visible, partially screening the buildings on the Esplanade behind it. To the left of the background is the hilly residential area of Fairlight, with multi-storey buildings overlooking the harbour, interspersed by trees.
Anticipated change to view	During operation, the new wharf and canopy structures would be visible in front of the existing wharf complex, behind and to the left of the Wharf Bar. Manly Fast Ferries, Captain Cook Cruises vessels and other private commercial vessels would be visible coming and going, and intermittently docked at Wharf 3 on the left (western) side of the Wharves. Water taxis and other small vessels would be visible coming, going and docking at Wharf 4 on the right (eastern) side of the new structures. During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with barges and cranes may be achieved. Storage areas, fencing, signage, and other ancillary structures and machinery may be visible in the East Esplanade Park and in the proposal site. Water taxis and other small vessels redirected to the Manly Sailing pier (just 50 metres to the west of this viewpoint) may be visible during construction. Refer to Section 3.3.2 for further construction information. Though visible during both phases, changes to the existing view would be at a moderate distance and intermittently screened by a number of boats in the foreground and midground.
Sensitivity to change	The sensitivity to change is Moderate , as users of the Manly Yacht Club, Sailing Club and Launch Club have short-term views of the proposal site, when starting or ending a boat trip, but are likely to place value on the enjoyment of views in this setting. Users of the Yacht Club dining deck have longer views, but views are screened and framed by the balcony structure, and users tend to be seated around tables rather than facing towards the proposal site. Viewers are located at a moderate distance from the site and new components would be partially screened by the existing Wharf Bar as well as passing boats and ferries.
Magnitude of change	The magnitude of change is Low , as the alteration to the Manly Wharf may be visible but would not be uncharacteristic within the existing view. Changes to the existing view would be at a moderate distance and screened by passing boats and ferries. Visual impacts during the construction phase would be temporary and therefore do not significantly impact the magnitude of change.
Significance of impact	The significance of impact is Moderate-Low , as the sensitivity to change is Moderate and the magnitude of change is Low.

7.1.13 Viewpoint location 13: Manly Fast Ferry

VP13 is located on the Manly Fast Ferry as it departs from Manly Wharf 2. It is looking north-east, as shown in Figure 7.1. Refer to Table 7.14 for assessment.



Photo 7.19 Viewpoint location 13: Manly Fast Ferry - existing view



Photo 7.20 Photomontage showing the proposal from viewpoint location 13

Table 7.14 Viewpoint location 13 assessment

Criteria	Comments
Location and view direction	Location (MGA Zone 55); E: 341155.156 N: 6258628.878 Elevation: 8.7 m VP13 is situated within the proposal site and is facing in a north-eastern direction. This viewpoint is representative of views from ferries as they depart from and arrive at the Manly Wharf.
Description of existing view	In the foreground is the water of the harbour, which extends into the background to the right. To the left of the midground are the Manly Wharf restaurants and bars; a multi-storey building with large glass windows and a boardwalk over the water. In the centre of the midground, Wharf 3 and the Wharf Bar extend out from the boardwalk, supported by wooden piles. In the centre-right of the background are the East Manly Cove Beach and East Esplanade Park, which contains a tall row of Norfolk Island Pine trees. Across the background a number of multi-storey buildings overlook the harbour, partially screened by the tall pines.
Anticipated change to view	<p>During operation, in the left of the midground, a new pile-supported promenade would extend out from the existing boardwalk, including a public seating space. To its right, the existing Wharf 3 structure would be replaced with a new wharf of a similar length, including a new covered waiting area. The roof canopy of the new waiting area would sit directly in front of and to the right of the retained Wharf Bar canopy, at a similar height. Several cylindrical piles would stand along the western edge and at the end of the wharf, in the centre and right of view.</p> <p>During operation the existing boardwalk in the midground would be replaced with a larger promenade and 'slow space', extending out over the water. In the midground, the Wharf 3 structure would be replaced with a new, slightly longer wharf structure, including a new roof canopy held up by four columns. The new roof canopy would partially obscure a small section of the Norfolk Island Pines and East Esplanade Park in the background. Water taxis and other small vessels would still be visible docking on the far (eastern) side of the new wharf, and introduced, large, commercial vessels would be visible docking on the near (western) side.</p> <p>During the construction phase (anticipated to be up to eight months), temporary visual impacts associated with temporary storage areas, fencing and signage may be visible in the right of the background in the East Esplanade Park. Barges, cranes, and other boats and machinery may visible on the water in the right of the background.</p> <p>Boats usually accessing Wharf 3 would not be visible as they would be redirected during this time. Refer to Section 3.3.2 for further construction information.</p>
Sensitivity to change	The sensitivity to change is Moderate , as the Manly to Circular Quay ferry trip is a popular attraction during which visitors place value on the scenic views in this setting. However, viewers are passing through on a departing or arriving ferry and therefore have short term views.
Magnitude of change	The magnitude of change is Low , as the introduced structures would be visible but would not be uncharacteristic within the existing view. As the existing Wharf Bar and Manly Wharf complex are located directly behind the proposed location of the Wharf 3 upgrade from this viewpoint, the proposal would only contribute to minor loss of Esplanade views. Visual impacts during the construction phase are temporary and therefore do not significantly impact the magnitude of change.
Significance of impact	The significance of impact is Moderate-Low , as the sensitivity to change and the magnitude of change are both Moderate.

8. Mitigation measures

The following section recommends mitigation measures that respond to issues arising within the assessment that have potential to adversely impact on:

- the character of the landscape
- views from nearby sensitive visual receivers.

The following mitigation recommendations address the most visual elements of the proposal as well as referencing any relevant considerations drawn from the legislation and policy review.

8.1 Mitigation recommendations

In response to issues raised by the community, the roof shelters and main roof canopy have already been reduced in size to minimise visual impacts from the proposal.

8.1.1 Design and materiality

General considerations for the detailed design phase include:

- utilise clean, minimal design of wharf components throughout, to increase visual permeability and connection to the surrounding harbour
- ensure the proposal design, siting and materiality is of high quality, sympathetic to the existing heritage context and contributes positively to the existing landscape character values
- although using standard kit of parts elements, ensure the proposal design is place-specific and ensure landscape and urban design contributes positively to the existing landscape character and principles outlined in *Beyond the Pavement* (Transport for New South Wales, 2020)
- consider utilising materials that complement the ‘waterfront’ character area as outlined in the Northern Beaches Council Public Space Vision & Design Guidelines (Northern Beaches Council, 2021)
- avoid / minimise the use of shiny or reflective materials to minimise associated visual impacts on surrounding sensitive receivers
- colours should be sympathetic and responsive to the surrounding landscape and visual context
- consider removing the roof covering on the gangway to open up viewlines
- minimise size of service pod where possible, to maintain viewlines towards Smedley’s Point and the harbour.

8.1.2 Signage and services

Considerations for the detailed design phase include:

- where possible, minimise visual impacts of signage by:
 - minimising signage dimensions
 - avoiding brightly illuminated signage
 - locating signage on buildings rather than freestanding.
- ensure the design and materiality of services components such as poles, signage and lighting, contributes positively to the heritage and waterfront context, and key view lines and views towards the water are open and unimpeded.

8.1.3 Construction activity and storage

General considerations for construction activity and storage include:

- limit clearing and earthworks to the minimum required to establish the construction sites
- take all practical measures to ensure construction equipment, storage areas, and other visible elements are located away from key views, to or from the sensitive visual receivers identified in this assessment

- ensure the site is kept tidy and general tidiness is maintained
- avoid conducting works in evenings and nights where possible, to minimize impacts from lighting
- ensure construction activities, equipment and storage areas are, where possible, located away from existing vegetation, and the dripline of canopy trees, particularly the Norfolk Island Pine trees
- where works cannot be located away from trees, provide tree protection to ensure they are not damaged
- all areas disturbed by construction and ancillary works are to be rehabilitated to their previous condition
- the temporary site compound in East Esplanade Park is to employ a neat, neutral design and screening measures to assist in blending into the surrounding area. Choice of screening is to be sympathetic to the existing context of the park (eg. neutral colours or green depending on location). See Photo 8.1 and Photo 8.2 for examples.



Photo 8.1 Sensitive screening in Royal Botanic Gardens, Melbourne



Photo 8.2 Sensitive screening in Flagstaff Gardens, Melbourne

9. Conclusion

This LVIA has been undertaken to identify the potential effects of the Manly Wharf 3 Upgrade based on its concept design.

The proposal site is located on Manly Cove, adjacent to the Manly town centre. The Manly Wharf ferries provide a key transport link between Manly and Circular Quay, Sydney; a popular tourist route featuring scenic views and iconic landmarks. The proposal site is within an internationally significant setting, with high landscape values in the wider area including scenic views of Sydney Harbour and the Sydney Harbour National Park, many heritage-listed buildings and features, and sites of Aboriginal culture and heritage significance.

A total of four landscape character zones were identified within the study area; Manly Foreshore and Cove, National Park and Open Space, Low Lying Urban Centre, and Hilly Settlement.

LCZ1 Manly Foreshore and Cove was found to have a Moderate impact, associated with the heritage values and internationally significant character of the foreshore area. The remaining landscape character zones were

found to have a Negligible impact. Overall, this assessment found there to be no significant landscape character impacts arising from the proposal.

Sensitive visual receivers in the study area include residents, pedestrians, road users, ferry and boat users, and workers and patrons in hospitality venues. Thirteen viewpoint locations were chosen to assess the visual impact of the proposal on sensitive receivers within the study area. Visual impacts were assessed using panoramas of the existing view and photomontages were created illustrating the proposed view of the proposal, from six viewpoint locations. The assessment found that the proposal would generally have Negligible to Moderate visual impacts on all viewpoint locations, except VP7 and VP8, which had more significant ratings.

VP7 and VP8 had ratings of High-Moderate and High, respectively, as they represent views from pedestrians on the Manly Wharf boardwalk, and patrons and staff in outdoor dining areas, all in close proximity to the proposal.

Mitigation measures proposed for the construction and operational stages should be incorporated into detailed design and construction management plans to reduce visual impacts.

The following Table 9.1 and Table 9.2 provides a summary of landscape and visual impacts for the proposal.

Table 9.1 Summary of landscape impacts

LCZ	Description	Sensitivity to change	Magnitude of change	Overall Rating
LCZ1	Manly Foreshore and Cove	High	Low	Moderate
LCZ2	National Park and Open Space	Moderate	Negligible	Negligible
LCZ3	Low Lying Urban Centre	Moderate	Negligible	Negligible
LCZ4	Hilly Settlement	Moderate	Negligible	Negligible

Table 9.2 Summary of visual impacts

Viewpoint	Location	Sensitivity to change	Magnitude of change	Overall Rating
VP01	Arabadoo Lookout, looking north-east	High	Negligible	Negligible
VP02	Reef Beach, looking north-east	Moderate	Negligible	Negligible
VP03	Federation Point, looking east	High	Negligible	Negligible
VP04	Manly Pavilion deck, looking east	High	Negligible	Negligible
VP05	Sea Life & Cove Beach West, looking south-east	High	Negligible	Negligible
VP06	Wharf 2, looking south	Moderate	Moderate	Moderate
VP07	Manly Wharf stairs, looking south	High	Moderate	High-Moderate

Viewpoint	Location	Sensitivity to change	Magnitude of change	Overall Rating
VP08	Between Wharves 2 & 3, looking south-west	High	High	High
VP09	The Tropic bar & Kayak Centre, looking south-west	High	Low	Moderate
VP10	East Manly Cove Beach, looking west	High	Low	Moderate
VP11	Esplanade East & Ashburner Street, looking north-west	Moderate	Negligible	Negligible
VP12	Manly Yacht Club, looking north-west	Moderate	Low	Moderate-Low
VP13	Manly Fast Ferry, looking north-east	Moderate	Low	Moderate-Low

10. References

- Department of Environment & Climate Change NSW. (2002). *Descriptions for NSW (Mitchell)* . (1979). *Environmental Planning and Assessment Act*. NSW Governmnet.
- GHD Pty Ltd. (2022). *Concept Design Report*.
- Government Architect New South Whales . (2020). *Better placed draft connecting with country* .
- Government Architect NSW. (2017). *Better Placed*.
- Government, N. (2018). *Greater Sydney Region Plan: A Metropolis of Three Cities* .
- Landscape Institute and Institute of Environmental Management & Assessment. (2013). *Guidelines for Landscape and Visual Impact Assessment (Third edition.)*. Routledge.
- Natural England, Scottish Natural Heritage and Countryside Council. (2011). *Landscape Character Assessment Guidance*.
- NGH Environmental and Roads and Maritime Services. (2018). *Preliminary Environmental Investigation*.
- Northern Beaches Council. (2013). *Development Control Plan*.
- Northern Beaches Council. (2020). *Towards 2040*.
- Northern Beaches Council. (2021). *Public Space Vision & Design Guidelines* .
- NSW Department of Environment, C. C. (2011). *Mitchell Landscapes NSW*.
- NSW Government. (1974). *National Parks and Wildlife Act 1974 No 80*.
- NSW Government. (1977). *Heritage Act 1977 No 136*.
- NSW Government. (2005). *Sydney Harbour Foreshore Area Development Control Plan*.
- NSW Government. (2005). *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* .
- NSW Government. (2012). *Plan of Management: Sydney Harbour National Park*.
- NSW Government. (2013). *Manly Local Environmental Plan* .
- NSW Government. (2018). *North District Plan*.
- NSW Government. (2019). *Local Character and Place Guideline*.
- NSW Government. (2019). *Local Character and Place Guideline 2019*.
- NSW Government. (2019). *Manly West Esplanade Heritage Activation Plan*.
- NSW Government. (2021). *Planning, industry and Environment, Design and Place State Environment Planning Policy- Draft*.
- NSW Government. (2021). *State Environmental Planning Policy (Biodiversity and Conservation) 2021* .
- Scottish Natural Heritage . (2012). *Assessing the Cumulative Impact of Onshore Wind Energy Developments* . Scottish Natural Heritage .
- TMG Development. (2011). *The Manly Ferry Wharf Conservation Management Plan*.
- Transport for New South Wales. (2020). *Beyond the Pavement*.
- Transport for New South Wales. (2020). *Environmental impact assessment practice note EIA-N04 - Guideline for landscape character and visual impact assessment, Version 2.2*.
- Transport for NSW. (2017). *Sustainable Design Guidelines (Version 4.0)*.

Appendix A

Photomontages



EXISTING VIEW



PROPOSED DESIGN

KEY PLAN



View Direction: 121° - 201°
 Horizontal Field Of View: 80°
 Camera Height: 1.7 m
 Camera Type: Canon EOS 6D
 Lens Type: 50 mm
 Photograph Time & Date: 17:14,
 16th May 2022

Location: E Esplanade, Manly Wharf,
 New South Wales
 Coordinates: 341220, 6258670
 (GDA 2020 MGA Zone 56)
 Viewpoint Elevation: 7 m
 Date of Photomontage: 17th June 2022
 Issue: v 01

Manly Wharf 3 Upgrade
 Transport for New South Wales
Viewpoint 07: Manly Wharf Stairs

GHD Pty Ltd
 Level 8, 180 Lonsdale Street
 Melbourne VIC 3000
 T 61 3 8887 8000 E melmail@ghd.com.au W www.ghd.com



EXISTING VIEW



PROPOSED DESIGN



KEY PLAN

View Direction: 122° - 202°
 Horizontal Field Of View: 80°
 Camera Height: 1.7 m
 Camera Type: Canon EOS 6D
 Lens Type: 50 mm
 Photograph Time & Date: 16:43,
 16th May 2022

Location: E Esplanade, Manly Wharf,
 New South Wales
 Coordinates: 341221, 6258672
 (GDA 2020 MGA Zone 56)
 Viewpoint Elevation: 5 m
 Date of Photomontage: 17th June 2022
 Issue: v 01

Manly Wharf 3 Upgrade
 Transport for New South Wales

Viewpoint 08: Between Wharves
 2 & 3

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 Melbourne VIC 3000
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EXISTING VIEW



PROPOSED DESIGN



KEY PLAN

View Direction: 217° - 297°
 Horizontal Field Of View: 80°
 Camera Height: 1.7 m
 Camera Type: Canon EOS 6D
 Lens Type: 50 mm
 Photograph Time & Date: 11:26,
 17th May 2022

Location: E Esplanade, Manly Wharf,
 New South Wales
 Coordinates: 34 12 67 , 62 58 655
 (GDA 2020 MGA Zone 56)
 Viewpoint Elevation: 5 m
 Date of Photomontage: 17th June 2022
 Issue: v 01

Manly Wharf 3 Upgrade
 Transport for New South Wales

**Viewpoint 09: The Tropic Bar &
 Kayak Centre**

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EXISTING VIEW



PROPOSED DESIGN



KEY PLAN

View Direction: 248° - 328°
 Horizontal Field Of View: 80°
 Camera Height: 1.7 m
 Camera Type: Canon EOS 6D
 Lens Type: 50 mm
 Photograph Time & Date: 11:22, 17th May 2022

Location: E Esplanade, Manly Wharf, New South Wales
 Coordinates: 341267, 6258655 (GDA 2020 MGA Zone 56)
 Viewpoint Elevation: 2 m
 Date of Photomontage: 17th June 2022
 Issue: v 01

Manly Wharf 3 Upgrade
 Transport for New South Wales
Viewpoint 10: East Manly Cove Beach
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 Melbourne VIC 3000
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EXISTING VIEW



PROPOSED DESIGN



KEY PLAN

View Direction:	309° - 29°	Location:	North Harbour, New South Wales	Manly Wharf 3 Upgrade Transport for New South Wales
Horizontal Field Of View:	80°	Coordinates:	341254, 6258405 (GDA 2020 MGA Zone 58)	
Camera Height:	1.7 m	Viewpoint Elevation:	2 m	Viewpoint 12: Manly Yacht Club
Camera Type:	Canon EOS 6D	Date of Photomontage:	10 th June 2022	
Lens Type:	47 mm	Issue:	v 01	
Photograph Time & Date:	10:50, 17 th May 2022	 GHD Pty Ltd Level 8, 180 Lonsdale Street Melbourne VIC 3000 T 61 3 8687 8000 E melmail@ghd.com.au W www.ghd.com		



EXISTING VIEW



PROPOSED DESIGN



KEY PLAN

View Direction: 222° - 302°
 Horizontal Field Of View: 80°
 Camera Height: 1.7 m
 Camera Type: Canon EOS 6D
 Lens Type: 50 mm
 Photograph Time & Date: 12:09,
 17th May 2022

Location: E Esplanade, Manly Wharf,
 New South Wales
 Coordinates: 341155, 6258628
 (GDA 2020 MGA Zone 56)
 Viewpoint Elevation: 5 m
 Date of Photomontage: 17th June 2022
 Issue: v 01

Manly Wharf 3 Upgrade
 Transport for New South Wales

Viewpoint 13: Manly Fast Ferry



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→ **The Power of Commitment**

Appendix F

Socio-economic impact assessment



Manly Wharf 3 Upgrade


Socio-economic Impact Assessment

Transport for NSW

1 September

→ **The Power of Commitment**



Project name		Manly Wharf 3 Upgrade					
Document title		Manly Wharf 3 Upgrade Socio-economic Impact Assessment					
Project number		12547220					
File name		12547220-REP-Manly Wharf 3 Upgrade-Socio-economic Impact Assessment.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	S. Munns	D. Keal J. McKinney	On file	S. Fallon	On file	17/08/2022
S4	0	S. Munns	D. Keal J. McKinney	On file	S. Verity		01/09/2022

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1. Introduction

1.1 Proposal background

To improve accessibility, Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure, and integrated transport infrastructure where it is needed the most. For the purposes of this study, the proposed upgrades to Manly Wharf 3 and associated activities are hereafter referred to as 'the proposal'.

For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

This Socio-economic impact assessment (SEIA) report has been prepared by GHD Pty Ltd (GHD) as part of the review of environmental factors (REF) to support the application for approval of the proposal. The SEIA provides:

- An analysis of the existing socio-economic profile of the regional, local area and communities that would potentially be impacted
- Outcomes from consultation with residents, businesses and key stakeholders
- Identification of potential socio-economic benefits and impacts emanating from the proposal
- Mitigation strategies for each identified impact.

1.2 The proposal

1.2.1 Key features

The proposal is to upgrade Manly Wharf 3 and construct a new Manly Wharf 4 under the TAP. Key features of the proposal would include:

- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular concrete platform
- retention of the existing Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a Disability Standards Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1 and Wharf 2 entrance to the new hydraulic wharf platform at Wharf 3
- installation of a new public seating space / rest 'slow space' within the new public promenade area
- construction of a new covered waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the waiting area to the Manly Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway.
- redesign of Wharf 3 to accommodate larger vessels
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.
- construction of a new arrestor at Wharf 3
- construction of two new separation piles between wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- providing conduits for opal readers to be installed in the future if required.

1.2.2 Construction overview

Workforce

Workforce numbers on site during construction would vary between 10-15 people onsite at any one time. It would be expected that peak workforce numbers would reach about 20 people during the busiest period of construction.

Start date and length of construction

It is anticipated construction of the proposal would take up to eight months to complete depending on weather and maritime conditions, with work commencing in the first half of 2023.

Ancillary facilities

A temporary site compound would be located in East Esplanade Park. This compound would be used to establish offices, lunchrooms, amenities and limited storage. The compound would only utilise the grassed area of the park and no tree clearance would be required. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

Given the limited space and road access, the preference would be to transport major machinery and equipment to site with the use of a barge. Road deliveries for concrete supply or small item deliveries would likely access the site via Sydney Road. In order to avoid turning across traffic, the access route would involve turning right onto Belgrave Street, left into the Esplanade before going 'around the block' on Wentworth Street, Darley Road and Victoria Parade so vehicles would approach the site on the correct side of the road.

Laydown areas on the marine side of Manly Wharf would be used to enable closer access to equipment and materials.

Construction stages

The construction of the proposal will be staged. The work expected to occur for each stage is shown below.

Table 1.1 Construction stages

Stage	Operation	Works
1	Wharf 2 closed Wharf 3 open	Site establishment. Construct western side of new promenade (in front of Wharf 2 berthing area). Construct concrete topping slab. Regrade a section of existing boardwalk. Construct temporary separation piles between Manly Wharf 2 and proposed crane barge location at Manly Wharf 3.
2	Wharf 2 open Wharf 3 closed	Construct hoarding on promenade to close Wharf 3. Demolish existing Wharf 3 pier and tidal steps (except for area to be retained). Demolish area of existing boardwalk to be removed Remove piles below demolished pier.
3	Wharf 2 open Wharf 3 closed	Install environmental controls (including silt curtains). Dredge Wharf 3 berth pocket.
4	Wharf 2 open Wharf 3 closed	Construct remaining promenade structure. Construct new waiting area structure. Promenade and waiting area fit-out including wharf furniture and utilities.
5	Wharf 2 open Wharf 3 closed New wharf opened	Construct Wharf 3 platform, berthing piles and install gangway. Construct Wharf 4 fixed structure. Install separation, arrestor and safety marker piles. Commission of equipment and wharf. Site clean-up and opening of the new wharf.

Further information on how the proposal would be constructed is provided in Section 3.3 of the REF.



- Legend**
- Piles**
- New Arrestor
 - New Mooring and Berthing Piles
 - New Separator Piles
 - New Steel Support Piles
 - Proposal Area
 - New Wharf Structures
 - Compound Area
 - Dredging Area
 - Existing Wharf Infrastructure
 - Provision For New Tidal Step When Funding Is Available

0 25 50 75 100
Metres

Figure 1.1 - Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unstable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by metrolife

Data source: publicNSW Imagery © Department of Customer Service 2020

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1.3 Limitations

This report: has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and Transport for NSW as set out in Section 1.5 and 2.2.8 of this report.

GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

1.4 Report structure

The report is comprised of the following sections:

- Section 2 – Methodology: a brief summary of the methods and guidance used for the assessment of the proposal
- Section 3 – Legislative and policy context: summarises the legislation and policy documents which are relevant to the proposal
- Section 4 – Existing environment: an overview of the demographic and community characteristics in the study area
- Section 5 – Stakeholder consultation: summarises the outcomes of consultation relevant to this assessment
- Section 6 – Assessment of impacts: potential socio-economic impacts that may result from construction and operation of the proposal and potential cumulative impacts
- Section 7 – Recommended mitigation and management measures: provides recommendations of proposed mitigation options for the construction and operational impacts of the proposal
- Section 8 – Conclusion: presents a summary of the socio-economic assessment findings and sets out the principal conclusions for the study.
- Section 9 – References: presents a list of references which have been utilised for this assessment.

1.5 Purpose and scope of this report

The purpose of this report is to assess the potential socio-economic impacts of constructing and operating the proposal. To achieve this the SEIA report:

- Describes the existing social environment
- Assesses the potential impacts of constructing and operating the proposal on communities
- Recommends measures to mitigate and manage the impacts identified

2. Methodology

2.1 Approach to the assessment

This SEIA has been prepared in accordance with the requirements of a comprehensive assessment under the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (NSW Government, 2020). The following sections describe the SEIA methodology.

2.2 Steps to prepare this SEIA

2.2.1 Scoping of social issues

The scoping of potential impacts was completed based on a review of the proposal design and activities which would occur during construction and operation. This informed the understanding of potential socio-economic effects, such as changes to local amenity, access and connectivity, community infrastructure facilities and community values. This information was also used in the identification of potential cumulative impacts. Findings were captured in the Scoping Checklist included as Appendix B.

2.2.2 Determining the study area

In order to determine the study area, the proposal site and its surrounds were analysed in conjunction with the proposal design and activities. While it is likely that people and businesses using and/or operating from Manly Wharf, as well as people residing and working in close proximity, to the wharf are likely to be most impacted by the proposal, it is acknowledged that socio-economic impacts are not contained within statistical or geographical boundaries, because people can travel across different geographic areas as part of their day-to-day lives. As a result, a wider study area that may be influenced by the proposal has also been considered. The study area is described below:

- The regional study area which comprises the Northern Beaches Local Government Area (LGA), provides an overview of the broader population that may be affected by the proposal.
- The local study area which comprises Manly state suburb areas (SSC)

2.2.3 Preparing the socio-economic baseline

The socio-economic baseline establishes the current social and economic characteristics within the study area for the SEIA. The socio-economic baseline is used to identify and inform the potential socio-economic impacts (both positive and negative) associated with the proposal. A socio-economic baseline has been prepared for the local and regional study area.

The local study area baseline describes:

- Key features, local amenity and character of the proposal area and surrounds
- Select demographic and economic indicators for the suburb of Manly compared to Northern Beaches LGA

The regional study area baseline describes:

- Demographic indicators
- Access and connectivity
- Community values and priorities
- Economic and employment profile

Data to inform the social baseline has been gathered from the following sources:

- Australian Bureau of Statistics (ABS) Census, 2016 (ABS, 2016)
- Economy id economic data (Economy id., 2022)
- Local, State and Australian Government websites and publications

- Various online sources
- Information from stakeholder consultation
- Information gathered during a site visit.

A list of sources used to inform this SEIA is provided in Section 11.

2.2.4 Site visit

The GHD SEIA team undertook a site visit on Friday the 8th of July. The site visit allowed for the ground truthing and verification of findings from the desktop assessment and provided a better understanding of the nature of the receiving environment.

2.2.5 Stakeholder consultation

Outcomes of stakeholder and community consultation activities conducted by TfNSW (between December 2021 and January 2022) have been assessed and incorporated into the SEIA where relevant (see Section 5).

2.2.6 Impact identification and assessment

The identification and assessment of potential socio-economic benefits and impacts of the proposal is based on initial scoping of potential socio-economic issues, further identification of these issues through concept design development for construction and operational phases of the proposal, results of stakeholder consultation, and review of other technical studies and chapters prepared for the REF.

Cumulative socio-economic impacts have also been assessed, taking into account other projects that have been approved but where construction has not yet commenced, projects where construction has commenced, and projects that have been recently completed in the surrounding area.

The socio-economic impacts have been categorised based on the *Environmental Impact Assessment Practice Note: Socio-economic assessment* (NSW Government, 2020). For this SEIA, the matters to be considered according to the Practice Note have been grouped into categories to ensure they are relevant to the nature of the proposal. The socio-economic impact categories are outlined in Table 2.1.

Table 2.1 Socio-economic impact categories

Socio-economic impact category	Matters to be considered
Property and land use	Changes that relate to the partial or complete acquisition of residential and commercial land. This can impact people's way of life due to relocation or changes to property or business.
Economy, business and employment	High-level benefits and impacts on the local and regional economy, including business development and employment opportunities. Social implications of impacts to businesses resulting from property acquisition, and changes to access and amenity. This includes how business owners, employees and customers are affected by these changes. Social implications of changes to job availability and employment resulting from impacts on businesses.
Amenity and community values	Changes to the acoustic, air quality or visual environment as a result of the proposal. Changes to amenity can impact people's way of life, and what people value about their community. This has considered the social impacts on residents and general community members.
Access and connectivity	Changes to how people move about an area for day-to-day activities. Changes to access can impact people's way of life, access to their place of work and community services, facilities and social networks, community cohesion and perceptions about safety.
Community infrastructure	Changes that relate to community infrastructure facilities in the study area, including changes to the types or availability of community services and facilities to users, and changes to access and amenity that may affect the function of the facility. This also considers changes to community wellbeing or social cohesion of the area as a result of impacts on community infrastructure and users.

The assessment of the significance of impacts considers the level of sensitivity of receptors and the magnitude of the proposed changes based on the information available at the time.

For negative impacts, sensitivity refers to the qualities of the receptor which influence its vulnerability to change and capacity to adapt. In this context, the receptor may include the environmental characteristics, communities, businesses, business clusters, social infrastructure or residences. Table 2.2 describes the levels of sensitivity for negative impacts.

Table 2.2 Level of sensitivity

Sensitivity	Example
Negligible	No vulnerability and able to absorb or adapt to change.
Low	Minimal areas of vulnerability and a high ability to absorb or adapt to change.
Moderate	A number of vulnerabilities but retains some ability to absorb or adapt to change.
High	Multiple vulnerabilities and/or very little capacity to absorb or adapt to change.

Magnitude refers to the scale, duration, intensity and scope of the proposal including how it would be constructed and operated. Qualities of magnitude include, but are not limited to:

- Scale and intensity (the types of works, operational uses and built form etc.)
- Spatial extent (e.g. the geographical area affected, which may be local, suburb, regional, state, international or to community groups etc.)
- Duration (short, medium or long-term, hours of works, frequency, reversibility etc.).

The levels of magnitude are set out in Table 2.3.

Table 2.3 Level of magnitude

Magnitude	Example
Negligible	No discernible positive or negative changes caused by the impact. Change from the baseline remains within the range commonly experienced by receptors.
Low	A discernible change from baseline conditions. The tendency is that the impact is on a small proportion of receptors over a limited geographical area and mainly within the vicinity of the proposal. The impact may be short term or some impacts may extend over the life of the proposal.
Moderate	A clearly noticeable difference from baseline conditions. The tendency is that the impact is on a small to large proportion of receptors and may be over an area beyond the vicinity of the proposal. The duration may be short to medium term or some impacts may extend over the life of the proposal.
High	A change that dominates over existing baseline conditions. The change is widespread or persists over many years or is effectively permanent.

Table 2.4 is used to assess the level of significance of the potential impacts. This is done by combining the level of sensitivity and magnitude.

Table 2.4 Assessing the level of significance

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

The level of impact within this SEIA has considered the implementation of recommended mitigation and management measures as outlined in Section 9 and those identified in other relevant technical studies prepared for the REF.

2.2.7 Recommended socio-economic impact mitigation measures

Specific mitigation and management measures developed to avoid or minimise the socio-economic impacts are identified in Section 9. These were formulated based on the findings of the socio-economic baseline study, results of stakeholder consultation, and the outcomes of the impact assessment. They have been developed using adaptive management principles, recognising that impacts may change over time, and that ongoing monitoring of impacts would provide the flexibility to accommodate such changes.

Other technical studies from the REF have been considered with regard to the effect or specific mitigation measures identified in those studies which contribute to mitigating potential socio-economic impacts identified in this report. These measures can be found in the technical components of the REF.

2.2.8 Limitations

This report is subject to the following limitations:

- The 2021 ABS Census data set was not available at the time of writing this report, therefore the socio-economic baseline has been developed using 2016 ABS Census data. Where available, more recent data has been reported in the socio-economic baseline, with sources and dates sited.
- SEIA consultation was not undertaken for this report. Outcomes of broader stakeholder and community consultation activities conducted by TfNSW (between December 2021 and January 2022) have been assessed and incorporated into the SEIA where relevant.

3. Legislative and policy context

A number of legislative and policy documents were reviewed to identify their relevance to this SEIA. The following sections summarise the relevant Commonwealth legislation, NSW legislation, and local government policies.

3.1 Commonwealth legislation and policies

Table 3.1 outlines the Commonwealth legislation and policies relevant to this SEIA.

Table 3.1 Commonwealth legislation and policies

Legislation or policy	Relevance to this SEIA
Disability Discrimination Act 1992 (Commonwealth)	The <i>Disability Discrimination Act 1992</i> (Commonwealth) (DDA) is designed to protect people with disability from discrimination. The DSAPT, made under the DDA, prescribes minimum standards of accessibility in relation to both public transport buildings and conveyances to remove discrimination from public transport services. The proposal has been designed to respond to the development standards identified under the DSAPT. This SEIA considers the changes to the existing environment that may affect accessibility. It also highlights any impacts that may affect vulnerable groups, including those who experience disability.

3.2 NSW legislation and policies

Table 3.2 outlines NSW legislation and policies relevant to this SEIA.

Table 3.2 NSW legislation and policies

Legislation or policy	Relevance to this SEIA
Future Transport Strategy 2056 (Transport for NSW, 2018)	The Strategy highlights the importance of the Sydney transport network to support a productive economy, in particular improving the freight network across the Greater Sydney region. This includes the reduction of congestion on local and arterial roads to improve freight reliability. Transport is considered an enabler of economic and social activity. The widening of Stacey Street is a key part of this Strategy and will increase the efficiency and capacity of local road networks, and as such enhance long term economic and social outcomes.

3.2.1 Transport Access Program

The TAP is an initiative of TfNSW to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

The primary objective of the TAP program is to achieve 100% DSAPT compliance for all assets, access paths and transport services within the wharf interchange.

The specific objectives of the Ferry Wharf Upgrade Program (FWUP) are to:

- Achieve 100% DSAPT compliance for all assets, access paths and transport services within the wharf interchange
- Increase the rate at which passengers embark and disembark
- Make the wharf safer for passengers to embark and disembark
- Meet current demand and enable future growth
- Enhance the efficiency of the interchange
- Improve passenger amenities and waiting areas
- Minimise construction impacts to customers and wharf operations
- Minimise the cost of ownership and maintenance

- Develop a functional, distinctive and iconic design theme that will unify and identify Sydney Harbour commuter wharves
- Discourage inappropriate activities at the wharves.
- Provide additional recreational vessel berthing if possible.

3.3 Council policies

Table 3.3 outlines local government policies relevant to this SEIA.

Table 3.3 Local government policies

Policy	Relevance to this SEIA
Local Strategic Planning Statement 2020	<p>The <i>Northern Beaches Local Strategic Planning Statement</i> (LSPS) provides a strategic framework and land use planning priorities for sustainability, infrastructure and collaboration, liveability, and productivity for the Northern Beaches LGA over the next 20-years. The LSPS reflects local values and aspirations, building on the vision set in the <i>Community Strategic Plan</i>. The LSPS is informed by the priorities identified by the Greater Sydney Region Plan and North District Plan.</p> <p>Under the Productivity theme there are a number of priorities that are identified that are relevant to this SIA which include:</p> <ul style="list-style-type: none"> – Frequent and efficient regional public transport connections – Sustainable local transport connections
Northern Beaches Transport Strategy 2038	<p>The <i>Northern Beaches Transport Strategy</i> highlights the vision for a safe, sustainable and smart transport networks within the LGA. It outlines key future directions on transport infrastructure, congestion and travel behaviour. The strategy sets out 33 future directions which sit under five key themes.</p> <p>The Plan focuses on:</p> <ul style="list-style-type: none"> – Supporting the expansion of the public transport network, including its integration with commuter parking and active travel networks – Advocating for investment and expansion of ferry travel (the ‘Blue Highway’) – Supporting the adoption of innovative technology that improve the efficiency of public transport network and experience for customers in terms of comfort and navigating the network – Using real time public transport travel data to make decision and deliver better outcomes for the community.
Destination Northern Beaches	<p><i>Destination Northern Beaches</i> provides a five-year strategic plan that aligns with the <i>NSW Visitor Economy Strategy 2030</i>. The Plan aims to deliver a set of actions to balance the economic potential of tourism in the region with a focus on protecting the environment and local lifestyle.</p> <p>The Plan highlights the need to:</p> <ul style="list-style-type: none"> – Promote already established public transport options – Continue to advocate to Transport NSW to retain the iconic Freshwater Class Manly Ferry to support local tourism

4. Existing environment

The following sections provide an overview of the regional study area before discussing the local study area. The assessment of the existing environment has been compiled using data from the 2016 Australian Bureau of Statistics (ABS) Census, Economy id and the National Skills Commission.

4.1 Regional study area

4.1.1 Overview

The Northern Beaches LGA is located in north Sydney. It extends from Manly and Seaforth in the south to Palm Beach and Ku-ring-gai National Park in the north. The LGA is primarily made up of low to medium density residential areas, with the southern end of the region more urbanised than the north.

The LGA is approximately 254 square kilometres in size and located between eight and 35 kilometres north east from Sydney CBD. It includes approximately 27 kilometres of ocean coastline. The Garigal or Caregal people are the Traditional Owners of the land occupied by Northern Beaches LGA. The Garigal people continue to live along the coastal areas of northern Sydney and out to north western Sydney.

4.1.2 Access and connectivity

The LGA is well serviced by road infrastructure and water ways (Sydney Harbour), which play an important role in the regional connectivity between northern Sydney, Sydney CBD and the Central Coast. There is one motorway – Pacific Motorway M1 – providing north-south connectivity to the west of the LGA. There are three main roads that connect the west to the east which include Mona Vale Road, Warringah Road, and Military Road and one main road that connects along the coastline, Pittwater Road.

There are several public bus services available which connect the Northern Beaches LGA to Sydney CBD and areas further west. Manly Ferry F1 and Manly Fast Ferry also connect the Northern Beaches LGA to Circular Quay. Northern Beaches LGA does not have any railway lines or stations.

4.1.3 Community values, opportunities, and challenges

Northern Beaches LGA is characterised by its beachside location and its proximity to Ku-ring-gai National Park. These two features contribute to the overall visual amenity of the area, as well as its character and lifestyle. The community value and aim to protect and enhance the natural and built environments, create a more connected and caring community, embrace the diverse sports and recreation culture and sustainability (Northern Beaches Council, 2018).

4.1.4 Economic profile

The Northern Beaches' LGA Gross Regional Product (GRP) is estimated at \$18.35 billion (Economy.id, 2021). Northern Beaches LGA economy includes a range of industries such as health care and social assistance, retail, education and training, professional, scientific and technical services, and construction (economy.id, 2021).

The top three industries in the 2016 Census for Northern Beaches LGA were professional, scientific and technical services (13.2 per cent), health care and social assistance (10.7 per cent), and retail (9.1 per cent) (ABS, 2016).

In 2016, Northern Beaches LGA's top three occupations by number of people employed were professional (28.6 per cent), manager (18.6 per cent), and clerical and administrative (13.5 per cent) (ABS, 2016).

Unemployment in Northern Beaches LGA has remained relatively consistent over the last 10 years with a slight increase in unemployment between March 2020 and June 2021, which was likely due to the COVID-19 pandemic and associated lockdowns in NSW. In March 2022, the unemployment rate in Northern Beaches LGA was 3.4 per cent, which is lower than NSW where unemployment during the same period was reported to be 4.6 per cent (National Skills Commission, 2021) (Figure 4-1).

Unemployment rates among the Northern Beaches LGA's Indigenous labour force was reported to be 3.9 per cent, significantly lower than the rest of NSW where an unemployment rate among Indigenous labour force was reported to be 15.3 per cent (Economy.id, 2021).

Unemployment rates between 2015 and 2022 for the Northern Beaches LGA and NSW are illustrated in Figure 4-1.

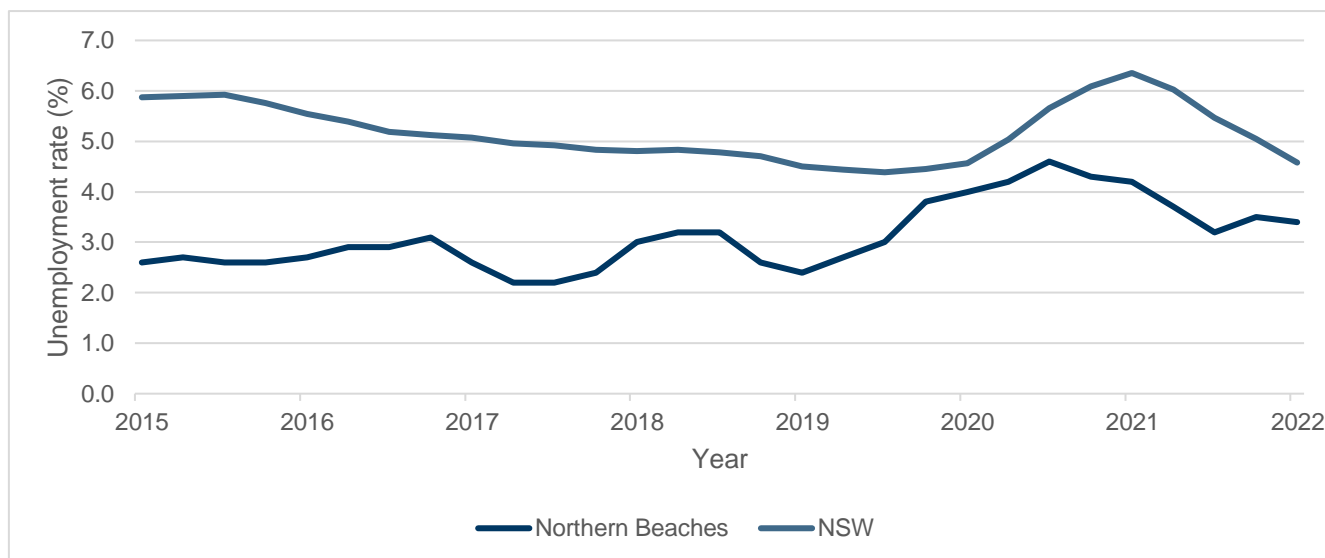


Figure 4-1 Unemployment rate, 2015 - 2022

4.1.5 Housing and accommodation

Since July 2020 the rental vacancy in the Northern Beaches LGA has been relatively low. As of May 2022, there was a 1.5 per cent residential rental vacancy rate in Northern Beaches LGA (SEQ Research, 2022). This indicates a high rental demand within the Northern Beaches LGA.

4.1.6 Key findings

Key findings most relevant to this SEIA include:

- The Northern Beaches LGA is primarily made up of low to medium density residential areas, with the southern end, including Manly, more urbanised than the north
- The LGA is well serviced and connected to Sydney CBD by road infrastructure and water ways, with Manly Ferry F1 and Manly Fast Ferry being popular public transport routes. Lower rates of unemployment amongst all populations including Indigenous persons in Northern Beaches LGA compared to NSW
- Low levels of socio-economic disadvantage for Northern Beaches LGA
- Low residential vacancy rate in Northern Beaches LGA which was similar to rest of Greater Sydney.

4.2 Local study area

4.2.1 Overview

Manly is located approximately 10 kilometres north east of the Sydney CBD. The surrounding area is urban, characterised by commercial, residential, recreational and open space areas. The proposed new wharf (Wharf 4) and upgrade of Wharf 3 will be located east of the existing wharf terminals (Wharves 1 and 2) which are situated in Manly Cove. There are two beaches located on either side of the wharf including Manly Cove Beach (to the north) and East Manly Cove Beach (to the south). Both of these beaches are attached to parks along the esplanade. These areas are valued by locals and visitors for swimming, kayaking, fishing, walking, cycling, picnicking, sailing, and yachting. There are also a number of community facilities and services located within 400 meters to the

proposal site including Manly Art Gallery and Museum, Manly Surf n Slide, Manly Yacht Club, Manly Sailing, Manly Kayak Centre, and the Manly Town Hall.

Manly Police Station is also located nearby on Belgrave Street. The closest Fire and Rescue Station is located in the suburb of Fairlight. Northern Beaches Hospital is the closest hospital to the proposal site, which is located in the Northern Sydney Local Health District (LHD). It provides emergency department care, surgery, and treatment for specialist cases to the region.

Manly Wharf 3 is a wooden jetty and pile structure and was originally used as a cargo wharf in the 1850s. In the 1930s the wharf was transformed into a “fun pier” which included several amusement rides. In 1989 it was transformed into a ferry wharf and today is used as an alternative wharf for public ferry services (Transport NSW, 2021). Manly Wharf 3 is also used by a number of commercial operators including GoSail Sydney and water taxis as well as recreational vessels. Manly Wharf 3 is also a listed NSW State Heritage item as it is the oldest surviving wharf at Manly illustrating former dependence on maritime transport and trade (Heritage NSW, 2022).

4.2.2 Economy and business

Manly Wharf houses 15 hospitality venues, one speciality store, one supermarket and one convenience store which can be broken up into the respective location/ position within the wharf as shown in Table 4.1. Businesses that are facing the water will be located directly adjacent to the proposal site with Manly Wharf Bar located alongside the proposed redevelopment. There are also a number of businesses located on the eastern side of the Esplanade which may also have views of Manly Wharf and Manly Cove and potentially the proposal site area.

Table 4.1 Businesses located at Manly Wharf

Businesses located inside Manly Wharf	Business located at Manly Wharf facing the water	Businesses located at Manly Wharf facing the Esplanade
<ul style="list-style-type: none"> – Convenience Store – Aldi – Gelatissimo – Candlicious – Chat Thai – Asagao – Stone and Peel 	<ul style="list-style-type: none"> – Sake – El Camino – Wharf Bar – The Tropic – Queen Chow – Sonoma – Hugos 	<ul style="list-style-type: none"> – Guzman and Gomez – Betty’s Burgers – Fish and Lemonade – The Bavarian – Manly Information Centre

Other businesses located in close proximity to the proposal include the Manly Kayak Centre which operates from the south-eastern end of the wharf and recreational users of the centre are permitted to use the water space surrounding the south eastern portion of the wharf and private mooring at Manly Cove (Figure 4-2).



Source: (GHD, 2022)

Figure 4-2 Manly Kayak Centre

4.2.3 Access and connectivity

Manly is accessed via land by Sydney Road from the west and Pittwater Road from the north. It is also served by two ferry services which run between Circular Quay and Manly Wharf. The Circular Quay (F1) ferry service runs approximately every 30 minutes and docks at Manly Wharf 1. Within this service there are currently two Freshwater class ferries and three Emerald class ferries. The Manly Fast Ferry (MFF) operates approximately every 20 minutes between Circular Quay and Manly Wharf 2. Manly Wharf 3 is used as an alternative wharf for passenger ferries when needed as well as hop-on/hop-off services for privately operating services from around Darling Harbour. The eastern area of Manly Cove also provides private moorings for boating vessels up to 20 metres in length.

The Esplanade, which runs parallel to Manly Cove, operates as an important road and bus zone for people accessing the wharf with bus stops located at the intersection of West Esplanade, East Esplanade and Belgrave Street. The Wharf can also be accessed via active transport such as walking with The Corso a key link between the wharf and Manly Beach. There are no dedicated on-road cycle lanes to or from the wharf.

4.2.4 Key socio-economic indicators

Table 4.2 highlights key indicators from the local study area (Manly SSC) in comparison to the regional study area (Northern Beaches LGA). As described in Section 2.2.3, multiple sources of data have been drawn upon to cover specific areas of interest in the demographic profile, including recent estimated populations, population projections and economic development indicators. Unless stated otherwise, information provided in Table 4-2 has been sourced from the ABS, 2016 Census. A detailed socio-economic profile and list of indicators for the local and regional study areas can be found in Appendix A.

Table 4.2 Key socio-economic indicators for Manly SSC and Northern Beaches LGA

Key indicator	Description
Demographic profile	
Population	Manly is located in the south of Northern Beaches LGA. At the time of the 2016 Census the suburb had a population of 15,866 people (ABS, 2016). In Manly, 0.4 per cent of people identify as Aboriginal or Torres Strait Islander, which is similar to Northern Beaches LGA (0.6 per cent).
Age profile	Manly had a median age of 36 years, which is younger than Northern Beaches LGA at 40 years. In 2016, Manly had a higher young workforce population (25-34 years) at 24.2 per cent compared to Northern Beaches LGA at 11.7 per cent.
Cultural diversity	In 2016, Manly had a high proportion of people born in non-main English-speaking countries (20.6 per cent) compared to Northern Beaches LGA (15.9 per cent). 16.6 per cent of people in Manly indicated that they speak another language at home which is similar to the LGA (15.1 per cent).
Family and housing	
Family and household composition	In 2016, Manly had a high proportion of couple families without children (53.6 per cent) compared to Northern Beaches LGA (35.9 per cent) and a lower proportion of couple families with children (35.5 per cent) compared to Northern Beaches LGA (51.4 per cent). The average household size in Manly is 2.2 persons compared to Northern Beaches LGA at 2.7 persons.
Dwellings	76.8 per cent of dwellings in Manly in 2016 were apartments, flats, or units. This is representative of the high-density nature of the locality. The broader LGA had a much lower proportion of apartments, flats, or unit (32.4 per cent) and a higher proportion of separate houses (57.7 per cent).
Economic profile	
Labour force	In 2016, 96.1 per cent of the population in Manly was employed which was similar to that of Northern Beaches LGA (96.5 per cent). The proportion of unemployed persons in Manly (24.8 per cent) was lower than Northern Beaches LGA (32.9 per cent). Manly had a similar labour force participation (67.7 per cent) when compared to Northern Beaches LGA (66.2 per cent).
Industry of employment	Within the social locality, the predominant industry in terms of contribution to employment was professional, scientific, and technical services which accounted for 20.8 per cent of the workforce. This is consistent with the broader LGA where professional, scientific and technical services was also the largest sector in terms of employment, albeit it only accounted for 13.2 per cent of the labour force. Financial and insurance services is also a significant industry in the area, comprising of 11.0 per cent of the labour force in Manly, which is higher than Northern Beaches LGA (6.7 per cent).

Key indicator	Description																											
	<table border="1"> <thead> <tr> <th>Industry</th> <th>Manly SSC (%)</th> <th>Northern Beaches (%)</th> </tr> </thead> <tbody> <tr> <td>Construction</td> <td>5.6%</td> <td>8.9%</td> </tr> <tr> <td>Retail Trade</td> <td>5.9%</td> <td>9.1%</td> </tr> <tr> <td>Accommodation and Food Services</td> <td>7.0%</td> <td>6.0%</td> </tr> <tr> <td>Financial and Insurance Services</td> <td>11.0%</td> <td>6.7%</td> </tr> <tr> <td>Professional, Scientific and Technical Services</td> <td>20.8%</td> <td>13.2%</td> </tr> <tr> <td>Administrative and Support Services</td> <td>4.8%</td> <td>3.8%</td> </tr> <tr> <td>Education and Training</td> <td>7.1%</td> <td>8.5%</td> </tr> <tr> <td>Health Care and Social Assistance</td> <td>8.5%</td> <td>10.7%</td> </tr> </tbody> </table> <p><i>Figure 4-3 Top industries of employment</i></p>	Industry	Manly SSC (%)	Northern Beaches (%)	Construction	5.6%	8.9%	Retail Trade	5.9%	9.1%	Accommodation and Food Services	7.0%	6.0%	Financial and Insurance Services	11.0%	6.7%	Professional, Scientific and Technical Services	20.8%	13.2%	Administrative and Support Services	4.8%	3.8%	Education and Training	7.1%	8.5%	Health Care and Social Assistance	8.5%	10.7%
Industry	Manly SSC (%)	Northern Beaches (%)																										
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Income	In 2016, the median weekly individual income in Manly was \$1,280. This was higher than Northern Beaches LGA which had a median weekly individual income of \$916. The median weekly household income in Manly was \$2,449, which was also higher than that of the LGA at \$2,178.																											
Tourism	<p>Tourism and hospitality are key industries and major contributors to Manly's economy. In 2019/20, the total value added from tourism and hospitality in Manly was \$1360.9 million (Economy.id, 2021).</p> <p>The ferry journey that connects Manly to Circular Quay, while used by commuters daily, is also one of the country's most famous ferry routes and is thus a tourist attraction while also providing a vital transport link for residents and tourist (Northern Beaches Council, 2022).</p>																											
Community-vulnerability profile																												
Need for assistance	In 2016, the proportion of the population who require assistance in Manly was 2.8 per cent, which was lower than the broader LGA at 3.7 per cent.																											
Mobility	66.5 per cent of people who live in Manly lived at the same address as one year ago and 36.5 per cent lived at the same address as five years ago. This is significantly lower than the rest of the Northern Beaches LGA with 79.5 per cent of people who lived at the same address as a year ago and 55.2 per cent for the past five years. This indicates a high mobility for people who live in Manly.																											
Socio-Economic Indexes for Areas (SEIFA)	<p>The ABS produces four socio-economic indices for areas (SEIFA) based on Census data, which identify areas of relative advantage and disadvantage. The Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD) was examined for the local and regional study areas.</p> <p>Socio-economic advantage and disadvantage are defined broadly by the IRSAD in terms of people's access to material and social resources and their ability to participate in society (ABS 2016). In order to capture this broad definition, the IRSAD includes a range of data points, including income, education, employment, occupation, and housing.</p> <p>Manly and Northern Beaches LGA were both placed within decile 10, placing it in the category of least disadvantage.</p>																											
Travel behaviour																												
Vehicle ownership	In 2016, Manly had a higher proportion of households without a motor vehicle (17.8 per cent) compared to Northern Beaches LGA at 6.6 per cent. However, 73.1 per cent indicated they had one to two motor vehicles per household in Manly which is similar to Northern Beaches LGA at 73.8 per cent.																											
Travel to work	A significant proportion of people travel to work by ferry in Manly (29.0 per cent) compared to Northern Beaches LGA (3.4 per cent). 30.3 per cent indicated that they drive to work in Manly, which is significantly lower than Northern Beaches LGA at 55.4 per cent.																											

4.2.5 Key findings

The analysis of the social locality found that overall, Manly is characterised by:

- A generally younger population living in the local study area compared to the rest of Northern Beaches LGA.
- A more culturally and linguistically diverse population living in Manly compared to Northern Beaches LGA.
- Lower rates of unemployment in Manly compared to Northern Beaches LGA.
- Higher median weekly income for both individuals and households compared to Northern Beaches LGA.
- Low levels of socio-economic disadvantage for both Manly and the broader Northern Beaches LGA.
- A more mobile population living in the local study area, where there are lower proportion of people who lived at the same address one and five years ago compared to Northern Beaches LGA.

5. Stakeholder consultation

As outlined in Section 2.2.5, TfNSW undertook a comprehensive engagement program with key stakeholders and communities throughout the project planning and design process (between December 2021 and January 2022).

A summary of key issues and themes raised during community engagement activities that are relevant to this SEIA is provided in Table 5.1.

Table 5.1 Summary of consultation outcomes

Theme	Issues raised
Project proposal	– Concerns about impacts to existing facilities near Wharf 3, and impacts to businesses and lessees
Design considerations	– Concern for business impact including the potential loss of commercial moorings
Environmental consideration	– Concern about biodiversity impacts and impacts to the natural marine habitat
Place making considerations	– Concern that the design will have negative impacts on the local amenity.
Construction considerations	– Concern about construction during peak summer months – Concern about noise, traffic and access impacts during construction for local residents

5.1 Key issues raised by local business and local business representatives

The following summaries key issues and concerns raised during REF engagement activities with local businesses and local business representatives.

- Concern about impacts to existing facilities near Wharf 3 and impacts to businesses and lessees trade and amenity.
- Concern for business impacts and removal of mooring pens for recreational boat hire and use.
- Concern about impacts to businesses if construction were to be undertaken during peak summer months.
- Concern that the design, including the placement and size of the new wharf (e.g., height, lighting, addition of seating and other structures (rooves), and layout of the public promenade) will have negative impacts on amenity due to visual impacts.

6. Construction impact assessment

This section assesses the socio-economic impacts associated with the construction of the proposal. The sensitivity and magnitude have been determined in accordance with the methodology outlined in Section 2. The significance rating shown in Section 2.2.6 has been applied to each social impact based on the outcome of this assessment.

Table 6.1 Socio-economic impact summary - construction

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Property and land use						
Partial lease of land from government departments to support construction	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 Transport for NSW.	Neutral Direct Temporary	Leaseholders	Negligible Land required for temporary construction arrangements will be sought via agreements with the relevant government departments responsible for the property.	Negligible While changes are expected to be limited to a small geographical area, impacts would extend over the construction phase.	Negligible
Access and connectivity						
Changes to wharf access and public transport services during construction	During construction of the western side of the promenade, Wharf 2 will be temporary closed. The anticipated closure period is approximately eight weeks. During this time Manly Fast Ferry vessels would be diverted to Wharf 3. There is no anticipated change to the frequency and availability of services. Public transport is often used by vulnerable community members, such as younger people, people who experience disability, older people and people with mobility issues, people with low levels of English and people with low incomes. These groups may experience a greater level of sensitivity to changed public transport access.	Negative Direct Temporary	Ferry passengers	Moderate Public transport is often used by vulnerable community members, who are likely to be more sensitive to changes. There is however no anticipated change to the frequency of services.	Low Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	<p>During construction, the existing Manly Wharf 3 will be temporarily closed prior to its demolition. Vessels usually using Wharf 3 including water taxis, GoSail Sydney and other commercial and recreational vessels would be redirected to other wharves around Manly Cove during this time.</p> <p>Other wharves that could be used for berthing include Sealife Pier, Manly Sailing Pier, Bavarian Deck or East Pier. This would add about a six-minute walk for commuters travelling to Manly Wharf from Manly Sailing Pier, five minutes from Sealife Pier and about a minute for those for those travelling from Bavarian Deck or East Pier.</p> <p>This may add additional travel time for people utilising these transport methods. In addition, changes may potentially create confusion as to which facility should be used for which service and could result in commuters missing a service and thus further increasing travel time.</p>	<p>Negative Direct Temporary</p>	<p>Recreational boat users Water taxi operators GoSail Sydney Vessels using Wharf 3 Wharf users</p>	<p>Moderate Increased travel time for passengers using recreational and commercial vessels that currently utilise Wharf 3.</p>	<p>Low Changes are expected to be temporary and limited to a small geographical area.</p>	<p>Moderate-Low</p>
<p>Maritime traffic and congestion</p>	<p>Construction of the proposal would increase marine traffic, as vessels would be used for construction and transporting material to site. Construction of the proposal would result in up to 15 vessels travelling between an off-site facility and the wharf each day. This would increase congestion in Manly Cove which could impact other marine activities.</p> <p>However, given that construction would occur outside of the peak summer period impacts would be limited and short-term.</p>	<p>Negative Direct Temporary</p>	<p>Maritime area users</p>	<p>Low Given that construction would occur outside of the peak summer period impacts would be limited and short-term.</p>	<p>Low Changes are expected to be temporary and limited to a small geographical area.</p>	<p>Low</p>

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Changes to pedestrian facilities and active transport routes	Temporary changes to pedestrian pathways along the promenade during construction. During the Wharf 2 closure pedestrian access to Wharf 3 would be limited to the promenade from the East Esplanade side.	Negative Direct Temporary	Wharf users	Low Given that construction would occur outside of the peak summer period impacts would be limited and short-term.	Low Changes are expected to be temporary and limited to a small geographical area.	Low
Temporary changes to the access and use of East Esplanade Park	The project proposes the use of East Esplanade Park for a temporary construction site compound including site offices, lunchrooms, and amenities. The compound would be located on the grassed area of the park and would be fenced off. Public access to this section of East Esplanade Park would be restricted during construction.	Negative Direct Temporary	Local residents	Moderate Local residents are likely to have a moderate level of sensitivity to the reduced access to East Esplanade Park.	Low Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low
On street parking	Up to twenty workers would be involved in the construction of the proposal and would likely use the off-street parking facility next to Manly Wharf thus reducing parking availability for other users. Reduced parking availability may create an inconvenience for other users including commuters, workers and tourists and may lead to an increase in time spent finding a parking, an increase in the distance between parking areas and Manly Wharf and an increase in overall travel time. Affected stakeholders are expected to be adaptable to changes, however vulnerable residents may require a little more time to adapt to changes.	Negative Direct Temporary	Off-street parking users (commuters, workers and tourists)	Low Affected stakeholders are expected to be adaptable to changes.	Moderate Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Changes to pedestrian and cycle access along the Esplanade during construction	While pedestrian and cyclist access to and from the wharf would be maintained during construction, minor detours along the Esplanade would be required during construction. This may result in minor delays for pedestrians, cyclists and other traffic travelling through or adjacent to the proposal area. Vulnerable groups may find changes to pedestrian crossings or footpaths confusing and difficult to navigate. This may lead to actual or perceived safety concerns. This may deter some people from using these paths, and disrupt lifestyles (e.g. daily tasks like going to the shops).	Negative Direct Temporary	Cyclists Pedestrians Local residents	Negligible Traffic and pedestrian control measures would be in place to communicate changes and provide alternative routes where necessary.	Low Changes are expected to be temporary and limited to a small geographical area.	Negligible
Increased traffic along haulage routes during construction	Road deliveries for concrete supply and smaller construction materials would access the proposal area via Sydney Street. Up to ten heavy vehicle trips per day (five inbound and five outbound) and 40 light vehicle trips per day (twenty inbound during the morning peak and twenty outbound during the afternoon peak) are expected during construction. These additional 50 vehicle trips per day are within typical the daily fluctuations in traffic for the area. As such, it is not likely that construction traffic would impact on the operation of the road network, or cause any delays to people travelling along those roads.	Neutral Direct Temporary	Local residents	Negligible Traffic control measures would be in place to communicate changes.	Low Changes are expected to be temporary and limited to a small geographical area.	Negligible

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Amenity and character						
Increased noise levels due to construction activities	Increased noise from construction activities may be a nuisance to some residents. During the day, this may lead to individuals changing their behaviours, spending more time indoors and closing windows to prevent excess noise. In the event of construction activities taking place at night, there is the potential to disturb people's night-time peacefulness, relaxation or sleep. This can affect some people's moods and quality of life.	Negative Direct Temporary	Local residents	Low Residents would be consulted with prior to construction and informed of periods when higher levels of noise generation are anticipated and as such are expected to be adaptable to changes.	Low Changes are expected to be temporary and limited to a small geographical area.	Low
	Vulnerable residents may be more sensitive to noise and may find it harder to adapt to amenity changes.	Negative Direct Temporary	Vulnerable residents	Moderate While residents would be consulted with prior to construction and informed of periods when higher levels of noise generation are anticipated, vulnerable residents may be sensitive to changes.	Low Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low
	Wharf users, including commuters, customers and tourists are likely to be negatively affected by increased noise levels and particularly noise associated with construction such as reverse sirens on construction vehicles, operation of heavy machinery, etc. during construction as it will alter the local amenity of the area.	Negative Direct Temporary	Wharf users	Moderate Appropriate signage would be used to inform wharf users of construction activities and impacts would be only for the duration of time spent at the wharf.	Low Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low
	Increased noise may be disruptive to businesses and be a nuisance for employees and customers, particularly those businesses in the hospitality industry located at, or in close proximity to, Manly Wharf.	Negative Direct Temporary	Businesses	Negligible Businesses would be consulted prior to changes and as such are expected to be adaptable to changes. Visitors would experience noise impacts for short durations while visiting only.	Low Changes are expected to be temporary and limited to a small geographical area.	Negligible

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Dust generated from construction activities may impact air quality on nearby residential areas	Increased dust may lead to some residents altering their way of life, such as keeping windows closed, or spending less time in their yards or on balconies. People may also need to spend more time cleaning indoor or outdoor surfaces due to settling dust while dust may also affect laundry left outside to dry, potentially causing frustration and animosity among local residents towards the proposal.	Negative Direct Temporary	Local residents	Low Residents would be consulted with prior to construction and as such are expected to be adaptable to changes.	Low Changes are expected to be managed to reduce potential health risks and would be temporary and limited to a small geographical area.	Low
	Vulnerable residents, such as older people, children and people with medical conditions such as asthma, may be more sensitive to dust.	Negative Direct Temporary	Vulnerable residents	Moderate While residents would be consulted with prior to construction, some vulnerable residents may be sensitive to air quality changes.	Low Changes are expected to be managed to reduce potential health risks and would be temporary and limited to a small geographical area.	Moderate-Low
	Increased dust levels may be considered a nuisance factor for wharf users, including commuters, customers and tourists.	Negative Direct Temporary	Wharf users	Low Appropriate signage would be used to inform wharf users of construction activities and impacts would be only for the duration of time spent at the wharf	Low Changes are expected to be managed to reduce potential health risks and would be temporary and limited to a small geographical area.	Low

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	Increased dust levels may be disruptive to businesses and be a nuisance for employees and customers, particularly those businesses in the hospitality industry located at, or in close proximity to, Manly Wharf.	Negative Direct Temporary	Businesses	Low Businesses would be consulted prior to construction and as such are expected to be adaptable to changes. Visitors would experience impacts for short durations while visiting only.	Low Changes are expected to be managed to reduce potential health risks and would be temporary and limited to a small geographical area.	Low
Changes to visual surrounds due to construction activities	Residents in Manly would be able to view construction activities and associated construction equipment and materials. This includes the construction activities at the respective wharves as well as site offices, storage areas and associated signage. This is likely to negatively affect the aesthetic nature of the area and may lead to some residents reducing use or enjoyment of outdoor areas.	Negative Direct Temporary	Local residents	Low Residents would be consulted prior to construction and as such are expected to be adaptable to changes.	Low Changes are expected to be temporary and limited to a small geographical area and impact a small number of residential receivers.	Low
	The presence of construction activities and associated equipment will negatively affect the aesthetic nature of the area for wharf users including commuters, customers and tourists.	Negative Direct Temporary	Wharf users	Low Appropriate signage would be used to inform wharf users of construction activities and impacts would be only for the duration of time spent at the wharf	Low Changes are expected to be temporary and limited to a small geographical area.	Low

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	Businesses and customers located facing Manly Wharf 2 and 3 would be able to view construction activities and associated construction equipment and materials. Water views are a key draw point for customers and tourists visiting restaurants at Manly Wharf. This may lead to patrons reducing use and enjoyment of the outdoor areas.	Negative Direct Temporary	Businesses	Moderate Businesses would be consulted prior to construction. Appropriate signage would be used to inform wharf users of construction activities.	Low Changes are expected to be temporary and limited to a small geographical area.	Moderate-Low
Impacts to a State Heritage place	The project would have an impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures. This may result in a perceived loss of character for the local area, however, as outlined in the statement of heritage impact report prepared for the REF, the proposal would not alter the maritime use and character of the Manly Wharf precinct or cause the loss of significant fabric.	Negative Direct Permanent	Local residents	Moderate Local residents are likely to have a moderate level of sensitivity to potential impacts to heritage character.	Low Changes are not expected to reduce overall character and are limited to the Manly Wharf area.	Moderate-Low
Economy, employment and business						
Impacts on parking, traffic, and access as well as reduced amenity due to construction activities may deter customers at businesses, in particular hospitality related businesses, at Manly Wharf.	The combination of reduced parking, disruptions to traffic and associated delays, changes in access and reduced amenity (noise, dust and visual) at and around business properties would occur as a result of construction activities. Businesses which overlook Manly Wharf 3 (Section 4.1.2) are likely to be more sensitive to these changes due to the impact on existing view scape likely to occur during construction of the project. These factors may result in potential customers being deterred from utilising restaurants and other businesses in Manly Wharf during construction, and/or result in other customers not returning to the area due to a negative experience.	Negative Indirect Temporary	Businesses	Moderate Businesses are likely to have a moderate level of sensitivity to potential reduction in customer visitation and income.	Low Changes are expected to be temporary and limited to the Manly Wharf area.	Moderate-Low

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	TfNSW consultation indicated that customer loss is a concern amongst operators. It should however be noted that the impact will be temporary in nature and the proposed upgrades will take place outside of the 'high season'.					
Increased employment opportunities	During construction it is estimated that 20 employment opportunities would be created. This would result in direct employment opportunities for skilled and semi-skilled workers from the area including roles such as onsite engineers and construction workers.	Positive Direct Temporary	Job seekers in regional study area	Low Considering the low level of unemployment in both the local and regional areas and because there are a number of similar job opportunities in the region, the sensitivity to change caused by an increase in job opportunities is considered to be low.	Negligible Due to the temporary nature of employment opportunities, the changes from these job opportunities are not expected to be discernible from the existing market.	Negligible (Positive)
Increased opportunities for local businesses to supply goods and services to the construction workforce	The presence of construction workers would likely increase the demand for local food and beverage and other retail services close to the site of the proposal. This is likely to increase revenue to local businesses, particularly those located in and immediately around Manly Wharf centre.	Positive Direct Temporary	Businesses	Low Considering that the anticipated work force is relatively small and because existing retailers in the area already serve a large customer base, they are not expected to be sensitive to this change.	Negligible Changes are expected to be temporary.	Negligible (Positive)

7. Operation impact assessment

This section assesses the socio-economic impacts associated with the construction of the proposal. The sensitivity and magnitude have been determined in accordance with the methodology outlined in Section 2. The significance rating shown in Section 2.2.6 has been applied to each social impact based on the outcome of this assessment.

Table 7.1 Socio-economic impact summary - operational

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Access and connectivity						
Improved accessibility of the Manly Wharf through alignment with DSAPT standards.	Currently Manly Wharf 3 does not meet DSAPT standards. The proposed upgrades will bring Manly Wharf 3 up to DSAPT standards and will result in overall improved accessibility to transport services and safety while accessing and using the wharf. This is particularly for people with a disability, people who are mobility impaired and customers with prams.	Positive Direct Long term	Wharf users People with a disability	Moderate Because Manly Wharf is a major wharf which is widely used by commuters and tourists, it is expected that these users would be sensitive to the changes.	High The changes would be long term, they would be very noticeable by wharf users, and would be experienced by a large number of users.	High-Moderate (positive)
Development of the additional Wharf (Wharf 4)	The proposal includes construction of Wharf 4, which would be located east of Wharf 3 and would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.	Positive Direct Long term	Commercial and recreational vessel operators	Moderate Because Manly Wharf is a major wharf which is widely used by commercial and recreational boats, it is expected that these users would be sensitive to the changes.	High The changes would be long term, they would be very noticeable by boat users, and would be experienced by a large number of users.	High-Moderate (positive)

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Amenity						
Increased public space	A new pile-supported promenade is proposed to be constructed alongside the existing boardwalk. The addition of the promenade would result in additional public space to the wharf area.	Positive Direct Long term	Wharf users including commuters and tourists	Moderate Because Manly Wharf is a major wharf which is widely used by commuters and tourists, it is expected that these users would be sensitive to the changes.	High The changes would be long term, they would be very noticeable for wharf users, and would be experienced by a large number of users.	High-Moderate (positive)
Impacts to visual amenity due to new canopy structure	The proposal involves the construction of a canopy structure over the new wharf waiting area. This canopy may impact the view of businesses located facing the new wharf. The roof canopy would have a minimal form and would be a similar height to the adjacent Wharf Bar roof, helping it to blend in.	Negative Indirect Long term	Businesses and customers facing Manly Wharf 3 and 4.	Low Businesses expected to adapt to these changes over time.	Low Although this is a permanent change, it is not expected that the change would be discernible from baseline conditions.	Low
Improved public facilities	The proposed upgrade works involve the installation of a new public seating space within the new public promenade area and a canopy over the new wharf waiting area. New facilities, such as seating and shelter may provide more comfort for the wharf users including commuters and other wharf users.	Positive Direct Long term	Commuters and wharf users	Moderate Because Manly Wharf is a major wharf which is widely used by commuters and tourists, it is expected that these users would be sensitive to the changes.	High The changes would be long term, they would be very noticeable by, and would be experienced by a large number of wharf users.	High-Moderate (positive)

8. Cumulative impact assessment

Other planned proposals in the area may be constructed concurrently with this proposal. This may lead to cumulative socio-economic impacts in the local and regional study area during construction and operation of the proposal.

Table 8.1 Other projects in proximity to the proposal

Project	Construction impacts	Operational impacts
FWUP, including the upgrade of Manly Wharf 3.	The broader FWUP programme of work, which includes the proposal, was identified as having a potential cumulative impact due the scale of the project. The FWUP impacts multiple wharves in the ferry system thus potentially causing cumulative delays in transport system.	The FWUP would have a beneficial cumulative impact through improved passenger amenity and consistent ferry wharf design across the network. It would result in improvements to: <ul style="list-style-type: none"> – Safety for commuters – Recreational facilities – Improved travel times – Improved customer experience due to upgraded facilities – The public domain and quality of customer experience.
West Esplanade activation plan	Construction of the West Esplanade activation plan may overlap with construction of the proposal. During this time residences and businesses along East and West Esplanade may experience elevated noise, reduced visual amenity, general disturbances and potential inconveniences from increased activities in the local area.	Operations of the proposal and the West Esplanade activation plan would result in a rejuvenated Manly Cove area with improved public waterfront access. History in the Manly Cove area would be highlighted through both the proposal and the West Esplanade area.
Former Manly Sea Life project	If construction of the Former Manly Sea Life project were to coincide with the proposal, then access to the Manly Cove front would be disrupted on both the East Esplanade and West Esplanade sides of Manly Wharf. This would result in cumulative noise, air, visual amenity, socio-economic and transport impacts.	Operation of the proposal and the Former Manly Sea Life project would result in a rejuvenated Manly Cove area with improved public waterfront access. Recreational spaces provided by the Former Manly Sea Life project would be more accessible due to the proposal.

9. Recommended mitigation and management measures

To avoid, minimise and manage the socio-economic impacts arising from the construction and operation of the proposal as assessed in Sections 6 through 8, a number of mitigation measures have been developed which are shown in Table 9.1.

The mitigation measures suggested in this SEIA focus on ongoing consultation and communication with impacted stakeholders, and, along with those listed in other technical reports prepared for this REF, are expected to manage potential social and economic impacts resulting from the proposal.

Table 9.1 Recommended mitigation measures

Social impacts / benefits	Mitigation measure	Description	Timing
Impacts to local residents and businesses	Community and Stakeholder Engagement Strategy	<p>TfNSW has been engaging with the local community and key stakeholders during the planning stages of the Manly Wharf Upgrade proposal.</p> <p>TfNSW will continue to manage and deliver community and stakeholder engagement strategy in the lead up to and during construction of the proposal. This will help to ensure that:</p> <ul style="list-style-type: none"> – The community and stakeholders have a high level of awareness of all processes and activities. – The community and stakeholder are made aware of any potential disturbances and/or disruptions well in advance of them occurring. – Accurate and accessible information is made available. – A timely response is given to issues and concerns raised by the community. – Feedback from the community is encouraged. – Opportunities for input are provided. 	Pre-construction and construction
Impacts to local residents and businesses	Communication management plan	<p>A proposal-specific communication management plan will be developed by the primary construction contractor in accordance with the Community and Stakeholder Engagement Strategy and implemented to define the specific requirements for engagement during delivery of the proposal.</p> <p>Engagement will include, and not be limited to, notifications and provision of signage.</p> <p>This will be developed and implemented to ensure that residents and businesses are notified in a timely manner about:</p> <ul style="list-style-type: none"> – Works commencing and work activities. – Potential for impacts including changed wharf access, wharf closures, access and use of East Esplanade Park, impacts to heritage, noisy construction activities and out-of-hour work. – Accurate information is accessible. – Enquiries and complaints are managed in a timely manner. <p>The communication management plan would define the requirements for the complaints management system to be implemented throughout the duration of the proposal, including 24-hour, seven days a week phone line, postal and email address for written enquiries, and publication of contact details.</p>	Construction

Social impacts / benefits	Mitigation measure	Description	Timing
Impacts to business	Consultation and communication with businesses	Early and ongoing direct consultation with businesses would occur throughout the detailed design phase to ensure that businesses are given notice of any design features and construction activities that may impact their business operations. It will be important to continue consultation throughout the construction period to understand and mitigate any access impacts.	Pre-construction and construction
Employment and business opportunities	Local and Indigenous employment and procurement	<p>Aligned with TfNSW's Aboriginal Participation Strategy (TfNSW, 2021). TfNSW has committed to prioritising opportunities for Indigenous workers and procurement in its proposals in line with the NSW's Governments Aboriginal Procurement Policy (NSW Government, 2021).</p> <p>This includes local and Indigenous participation commitment in its tender documents which outline the sub-contracting, employment, training, Indigenous and community contributions that contractors would need to deliver.</p>	Pre-construction

10. Conclusion

This report has assessed the potential positive and negative social impacts resulting from the construction and operation of the proposal, as well as cumulative impacts that may occur due to other developments in the surrounding area.

During construction, the potential positive social impacts due to the proposal include increased employment opportunities, and increased opportunities for local businesses to supply goods and services to construction workers. Various negative social impacts may also occur during construction, the most significant of which include:

- Changes to wharf access and public transport services
- Changes to access and use of East Esplanade Park
- A reduction in availability of on street parking during working hours
- Change in the amenity of areas (increased noise and dust and visual impacts), impacting both local residents as well as businesses located in or overlooking Manly Wharf
- Impact on the heritage significance of Wharf 3.

Importantly, all the above impacts (with the exclusion of the impact on the heritage significance of Wharf 3) will be temporary in nature and are not believed to have a level of significance above 'moderate low'.

During operation, the only negative impact is associated with the proposed canopy structure over the new wharf waiting area which may have an adverse impact on the amenity of the area as the view of businesses located facing the new wharf will be altered, albeit the significance of this is considered low. There are however various positive impacts during operation including:

- Improved accessibility through alignment with DSAPT standards
- Development of an additional wharf allowing for greater accessibility for small commercial and recreational vessels
- Increased public space and public facilities.

Other major projects taking place in the vicinity of, and at the same time as, the proposal may lead to cumulative impacts such as reduced amenity in the surrounding areas, increased travel times, and construction fatigue for some residents, business owners and wharf users. However, during operation the cumulative impacts of the proposal along with the other developments occurring in the area is likely to contribute to the rejuvenation of the Manly Cove area as well as improving the public transportation system.

While the proposal will ultimately improve the accessibility, connectivity and public facilities at Manly Wharf, the recommended mitigation measures identified in this report should be implemented to assist with the management of potential socio-economic impacts. Particular focus should be placed on communication with affected businesses, residents, wharf users and the general community prior to and during construction. If implemented successfully it is expected that potentially negative impacts will be mitigated to an acceptable level.

11. References

Australian Government. (1992). *Disability Discrimination Act 1992*

Australian Bureau of Statistics (ABS) (2016). *Census – General Community Profile*. Retrieved from: <https://www.abs.gov.au/census/find-census-data/search-by-area>

Economy.id (2021). *Northern Beaches Council – economic profile*. Retrieved from: <https://economy.id.com.au/northern-beaches>

Heritage NSW (2022). Heritage Item – Pier (former Fun Pier), Manly Wharf. NSW Government. Retrieved from: <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020093>

National Skills Commission (2021). *Small Area Labour Markets (SALM)*. Australian Government. Retrieved from: <https://www.nationalskillscommission.gov.au/topics/small-area-labour-markets#DecemberQuarter2021>

Northern Beaches Council (2018). *Shape 2028 - Northern Beaches Community Strategic Plan 2018-2028*. Retrieved from: <https://www.northernbeaches.nsw.gov.au/council/publications/strategic-framework/community-strategic-plan>

Northern Beaches Council (2022). *All aboard! Manly Ferries in the 1930-60s*. Retrieved from: <https://www.northernbeaches.nsw.gov.au/things-to-do/arts-and-culture/manly-art-gallery-museum/collections/collection-stories/all-aboard>

NSW Government. (2021). *Aboriginal Procurement Policy*

SQM Research (2022). *Residential Vacancy Rates: Northern Beaches*. Retrieved from: https://sqmresearch.com.au/graph_vacancy.php?sfx=®ion=nsw%3A%3AWollongong&t=1

SEIFA. (2016). *2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016*. Retrieved from Australian Bureau of Statistics: <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IRSA D~20>

TfNSW. (2020). *Environmental Impact Assessment Practice Note: Socio-economic Assessment (EIA-N05)*

TfNSW. (2021). *Transport for NSW Aboriginal Participation Strategy*

TfNSW. (2018). *Future Transport Strategy 2056*

Appendix A

Demographic profile

Table A-1 Demographic summary

Indicator	Manly (SSC)	Northern Beaches (LGA)
Population		
Total persons	15,866	252,878
Service age groups (persons) – place of usual residence		
Babies and pre-schoolers (0-4)	5.4%	6.2%
Primary schoolers (5-11)	5.7%	9.8%
Secondary schoolers (12-17)	3.9%	7.4%
Tertiary education and young workforce (18-24)	6.4%	7.0%
Young workforce (25-34)	24.2%	11.7%
Career and home building (35-49)	24.2%	22.8%
Senior workforce (50-64)	15.5%	18.3%
Retirees (65-74)	8.2%	8.9%
Seniors (75-84)	4.2%	5.2%
Elderly (85+)	2.3%	2.7%
Cultural diversity		
Indigenous persons	0.4%	0.6%
Persons born in Non-Main English-Speaking countries	20.6%	15.9%
Language spoken at home other than English	16.6%	15.1%
Dwelling characteristics		
Family households	60.4%	74.8%
Lone person household	30.1%	21.8%
Group household	9.6%	3.5%
Family characteristics		
Total families	3,965	67,745
Couple family with children	35.5%	51.4%
Couple family without children	53.6%	35.9%
One parent family	9.2%	11.6%
Other family	1.6%	1.1%
Other characteristics		
Need for assistance	2.8%	3.7%
Dwellings – occupancy		
Total occupied dwellings	83.2%	90.6%
Unoccupied private dwellings	16.8%	9.4%
Dwelling structure		
Separate House	11.3%	57.7%
Semi-detached, terrace house, townhouse	11.1%	9.0%
Flat, unit or apartment	76.8%	32.4%
Other dwellings	0.4%	0.5%

Indicator	Manly (SSC)	Northern Beaches (LGA)
Tenure type		
Fully owned	26.6%	34.5%
Owned with a mortgage	19.1%	35.5%
Owned (fully or with a mortgage)	45.7%	70.0%
Rented (Total):	50.9%	25.9%
Real estate agent	72.5%	69.5%
State or territory housing authority	4.5%	4.7%
Person not in same household	20.0%	20.6%
Housing co-operative/community/church group	1.4%	2.1%
Other landlord type	0.7%	1.6%
Landlord type not stated	0.9%	1.5%
Other Tenure Type	0.7%	1.6%
Individual income		
Median Individual Income (\$/weekly)	\$1,280	\$916
Negative/Nil Income	6.4%	8.1%
\$1-\$149	2.5%	4.2%
\$150-\$299	3.1%	4.7%
\$300-\$399	3.6%	5.4%
\$400-\$499	4.3%	6.1%
\$500-\$649	4.6%	6.5%
\$650-\$799	4.6%	6.7%
\$800-\$999	6.2%	7.7%
\$1,000-\$1,249	8.1%	8.7%
\$1,250-\$1,499	6.7%	6.6%
\$1,500-\$1,749	6.9%	6.0%
\$1,750-\$1,999	5.5%	4.4%
\$2,000-\$2,999	11.6%	8.3%
\$3,000 or more	14.5%	9.0%
Household income		
Median Household Income (\$/weekly)	\$2,449	\$2,178
Negative/Nil income	1.5%	1.1%
\$1-\$149	0.5%	0.5%
\$150-\$299	1.3%	1.2%
\$300-\$399	1.9%	1.7%
\$400-\$499	3.3%	3.9%
\$500-\$649	2.6%	2.9%
\$650-\$799	2.7%	3.9%
\$800-\$999	3.5%	4.3%
\$1,000-\$1,249	4.9%	6.0%
\$1,250-\$1,499	4.2%	5.5%
\$1,500-\$1,749	4.3%	4.9%

Indicator	Manly (SSC)	Northern Beaches (LGA)
\$1,750-\$1,999	4.3%	4.9%
\$2,000-\$2,499	10.5%	10.5%
\$2,500-\$2,999	5.3%	7.4%
\$3,000-\$3,499	5.2%	5.6%
\$3,500-\$3,999	10.9%	7.0%
\$4,000 or more	22.1%	17.8%
Labour force		
Total labour force	9,344	134,320
Total employed	96.1%	96.5%
Employed full-time	70.9%	62.7%
Employed part-time	24.8%	32.9%
Unemployed persons	3.9%	3.5%
Labour force participation	67.7%	66.2%
Occupation		
Managers	22.0%	18.6%
Professionals	39.5%	28.6%
Technicians and trades	6.9%	11.3%
Community and personal service	8.2%	9.4%
Clerical and administrative	9.8%	13.5%
Sales	7.5%	9.1%
Machinery operators and drivers	1.3%	2.7%
Labourers	2.9%	5.1%
Key industry		
Agriculture, Forestry and Fishing	0.2%	0.3%
Mining	0.2%	0.2%
Manufacturing	2.9%	4.4%
Electricity, Gas, Water and Waste Services	0.4%	0.6%
Construction	5.6%	8.9%
Wholesale Trade	2.7%	4.1%
Retail Trade	5.9%	9.1%
Accommodation and Food Services	7.0%	6.0%
Transport, Postal and Warehousing	2.3%	2.8%
Information Media and Telecommunications	4.6%	3.6%
Financial and Insurance Services	11.0%	6.7%
Rental, Hiring and Real Estate Services	3.1%	2.4%
Professional, Scientific and Technical Services	20.8%	13.2%
Administrative and Support Services	4.8%	3.8%
Public Administration and Safety	3.5%	4.2%
Education and Training	7.1%	8.5%
Health Care and Social Assistance	8.5%	10.7%
Arts and Recreation Services	2.2%	2.0%

Indicator	Manly (SSC)	Northern Beaches (LGA)
Other Services	2.6%	3.7%
Mobility		
Lived at same address 1 year ago	66.5%	79.5%
Lived at same address 5 years ago	36.5%	55.2%
Transport		
Households without a motor vehicle	17.8%	6.6%
One motor vehicle	49.5%	35.1%
Two motor vehicles	23.6%	38.7%
Three motor vehicles	4.5%	11.2%
Four or more motor vehicles	1.5%	5.7%
Journey to work		
Train	8.2%	2.7%
Bus	10.3%	12.8%
Ferry	29.0%	3.4%
Tram (includes light rail)	0.0%	0.0%
Taxi	0.2%	0.2%
Car, as driver	30.3%	55.4%
Car, as passenger	2.3%	3.8%
Truck	0.3%	0.7%
Motorbike/scooter	1.5%	1.2%
Bicycle	2.0%	1.0%
Other	0.6%	0.5%
Walked only	7.8%	3.4%
Worked at home	6.9%	7.1%
Did not go to work	6.7%	8.3%
Used public transport	47.2%	18.7%
Active Transport	9.7%	4.4%

Appendix B

Scoping checklist

Table B-1 Project scoping checklist

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
Property impacts	Are property acquisitions likely?	No				N/A	N/A
	Is there a potential for displacement of residents or businesses due to property acquisition?	No				N/A	N/A
	Will there be impacts on vulnerable groups (i.e. elderly, people in need of assistance, communities that demonstrate higher levels of disadvantage)?		Yes			Yes – improved accessibility benefits could be enhanced through ongoing consultation with stakeholders	Vulnerable groups include people with a disability, mobility impaired customers and customers with prams.
	Will the project impact upon any property improvements?	No				N/A	N/A
	Does the project result in fragmentation of rural properties?	No				N/A	N/A
Changes to population and demography	Will residents need to relocate as a result of property acquisition?	No				N/A	N/A
	Will the project's construction result in a large influx of workers to the study area?	No				N/A	Project located in an urban area, construction workforce not likely to result in significant social impacts for local community

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
Economy	Will the project impact on local employment?			Yes		Impact could be enhanced by liaising with local business chamber and/or Indigenous groups about local employment and procurement opportunities	Local workforce could be employment in construction
	Will the local population benefit from improvements in income as a result of the project?			Yes		Impact could be enhanced by liaising with local business chamber and/or Indigenous groups about local employment and procurement opportunities	Potential increase in income for those employed on the project.
Business and industry	Does the project impact (either directly or indirectly) on businesses/ commercial enterprises, including agricultural businesses?		Yes			Yes – through ongoing consultation with affected businesses	Changes to access in construction and operation may affect businesses. Changes to amenity during construction may deter customers at businesses at Manly Wharf. Business opportunities in procurement Construction workforce spend at local businesses

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	Are impacts on businesses likely to have flow on effects for employees?		Yes			Yes – through ongoing consultation with affected businesses	Changes to amenity may be disruptive for employees.
	Is the project likely to have direct or indirect effects on the regional economy?		Yes			N/A	Business opportunities in procurement
	Will the project result in changes in access to or bypass of businesses?		Yes			Yes – consultation with affected businesses, maintain access during construction	Changes to access during construction.
	Does the project impact on the composition of regional industries (ie tourism, agriculture, mining and resources, manufacturing)?	No				N/A	N/A
Social infrastructure	Will the project impact (directly or indirectly) any community services or facilities such as hospitals, schools, recreational facilities, aged care, etc?		Yes			Yes – maintain alternate access during construction	A portion of Esplanade Park will be utilised for the construction compound during the construction period. Access to that area of the park will be restricted, temporarily, during construction.

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	Will the project impact on places that are used by the homeless for shelter or socially disadvantaged to congregate?	Unknown				N/A	N/A
Community values, including community health and safety, and community cohesion/ severance	Does the project impact on any places of Aboriginal or non-Aboriginal heritage?		Yes			N/A	The project would have an impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it would involve the partial demolition of the existing 1990s structures.
	Does the project impact on any places likely to be of importance to the local community (i.e. environmental areas, local parks, local monuments, etc)?		Yes			Access to the rest of the park will be maintained during construction.	A portion of Esplanade Park will be utilised for the construction compound during the construction period. Access to that area of the park will be restricted, temporarily, during construction.
	Do sections of the community have a strong attachment to place (e.g. large number of generations of a family have lived in the same area)?	NA	Unknown			NA	NA

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	Is there a potential for impacts (real or perceived) on community health or safety due to emissions to air or water, noise or chemical hazards?	Unknown				Yes – construction environmental management plans are expected to manage these changes	Potential noise and air quality impacts at nearby residents and sensitive receivers during operation. To be confirmed with Air Quality assessment
	During construction, is there a potential for impacts (real or perceived) on community health or safety due to emissions to air or water, noise or chemical hazards?	NA	Unknown			NA	NA
	Is there the potential for severance of communities or towns?	No				NA	NA
	Will the project change the way people use and access community facilities?	No				NA	NA
	Will the project change the unique character of the place or community in which it is located?	No				NA	NA
	Will the project result in changes to places of commemoration or memorialisation or with other intangible values?	No				NA	NA

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
Local amenity	Will the project change the amenity for residents, businesses, or community facilities? (i.e. through changes in air quality, visual and landscape impacts, noise and vibration)		Yes			Yes – through ongoing consultation with affected businesses	Potential visual impacts from the proposed canopy structure over the new wharf waiting area. This canopy may impact the view of businesses located facing the new wharf.
	During construction, will the project change the amenity of residents, businesses or community facilities? (i.e. through changes in air quality, visual and landscape impacts, noise and vibration)		Yes			Yes – construction environmental management plans are expected to manage these changes	Potential for amenity change on nearby residents, businesses and community facilities due to construction activities
Access and connectivity	Will the project change:						
	– travel patterns (e.g. introduce turning restrictions, traffic signals, road closures, new connections, etc)	No				NA	NA
	– cyclist facilities or access	No				NA	NA

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	– pedestrian access (i.e. access to public transport, and to/ within commercial precincts, town centres, recreational locations, shops)	Yes				Yes – benefits could be enhanced through ongoing consultation with stakeholders	Improved pedestrian experience for wharf customers through upgrades and widening to the existing promenade and boardwalk, development of a hydraulic platform and gangway, improved canopy coverage, modified gradients and upgraded lighting and signage.
	– public transport services or facilities	Yes				Yes – maintain public transport services during construction Ongoing consultation with impacted stakeholders.	Changes in access and temporary changes to operations at Wharf 2 and 3. No impacts to the availability and frequency of services.
	– parking	No				NA	NA
	– property access	No				NA	NA

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	<ul style="list-style-type: none"> – access for people with special needs (i.e. people with mobility difficulties, elderly, children, etc). 	Yes				Yes – benefits could be enhanced through ongoing consultation with stakeholders	<p>Improved pedestrian experience for wharf customers through upgrades and widening to the existing promenade and boardwalk, development of a hydraulic platform and gangway, improved canopy coverage, modified gradients and upgraded lighting and signage.</p> <p>This will result in overall improved accessibility and safety at Manly Wharf, particularly for people with a disability, mobility impaired customers and customers with prams.</p>
	During construction, will the project:						
	<ul style="list-style-type: none"> – generate large volumes of traffic 	No				NA	NA
	<ul style="list-style-type: none"> – change pedestrian, cyclist or property access 	Yes				Yes – maintain alternate access during construction	Changed pedestrian access during construction of the new promenade.

Issue	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents / special interest groups / businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	– alter public transport services or facilities	Yes				Yes – maintain public transport services during construction Ongoing consultation with impacted stakeholders.	Changes to wharf access and public transport services during construction.
	– alter travel patterns	No				NA	NA
	– impact on traffic flow.	No				NA	NA



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→ **The Power of Commitment**

Appendix G

Land transport impact assessment



Manly Wharf 3 Upgrade


Construction Traffic and Access Impact Management Plan

Transport for NSW

July 2022

➔ **The Power of Commitment**



Project name		Manly Wharf 3 Upgrade					
Document title		Manly Wharf 3 Upgrade Construction Traffic and Access Impact Management Plan					
Project number		12547220					
File name		12547220-REP Wharf 3 Traffic Assessment Rev 1.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	M Lucas	J Akstein J McKinney	On-file	Sam Fallon	On file	20/06/22
S4	1	M Lucas	J McKinney		Sam Fallon	On file	12/07/22

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Appendices

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1. Introduction

Transport for NSW proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre

The existing wharf is located at the western end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes two ferry terminals (Wharves 1 and 2), a third tidal step wharf (Manly 3) and a restaurant and retail section. It also supports a transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

1.1 Subject site

Manly Wharf is a passenger terminal wharf located within the suburb of Manly, within the Northern Beaches LGA at the junction of West Esplanade, East Esplanade and Belgrave Street in Manly.

The regional setting of Manly Wharf is displayed in Figure 1.1.

Manly Wharf 3 is located to the east of Manly Wharves 1 and 2. Surrounding land use comprises well-established retail and restaurants, and as a result, the area is mainly commercial. The local context and setting of Manly Wharf are displayed in Figure 1.2.



0 250 500 750 1,000
Metres

Legend
 Proposal area

Figure 1.1 - Regional Setting

Whilst every care has been taken to generate the structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.
 World Street Map, Woolahra Municipal Council, Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Data source: Mapbox, The Service, Created by mfrade



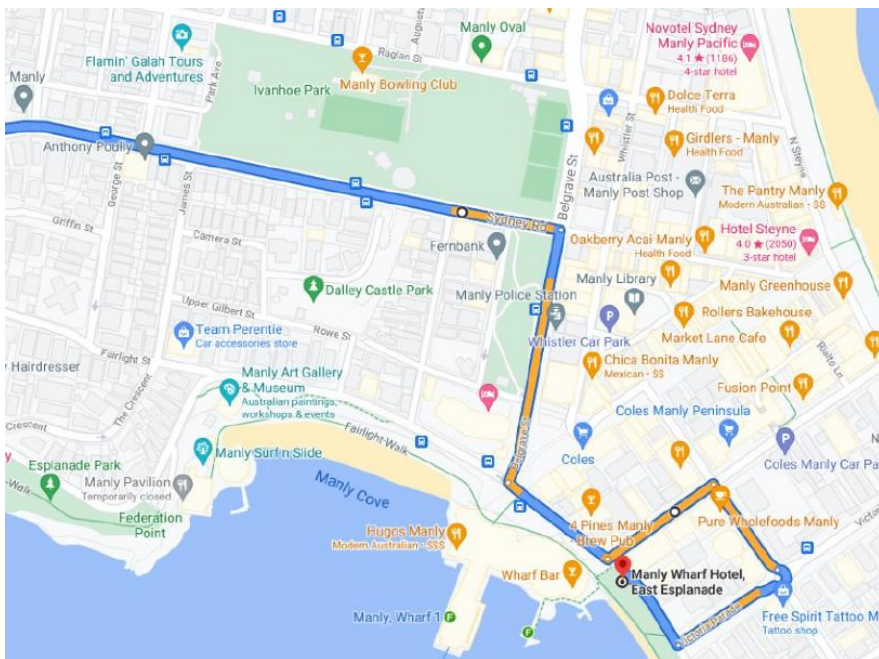
Figure 1.2 - Local Setting

1.2 Literature review

The Manly Wharf 3 – Concept Design - Constructability Report (November 2021) was prepared by BESIX Watpac to provide advice on the feasibility, methodology and sequencing of the proposal. Key data included in the report is as follows:

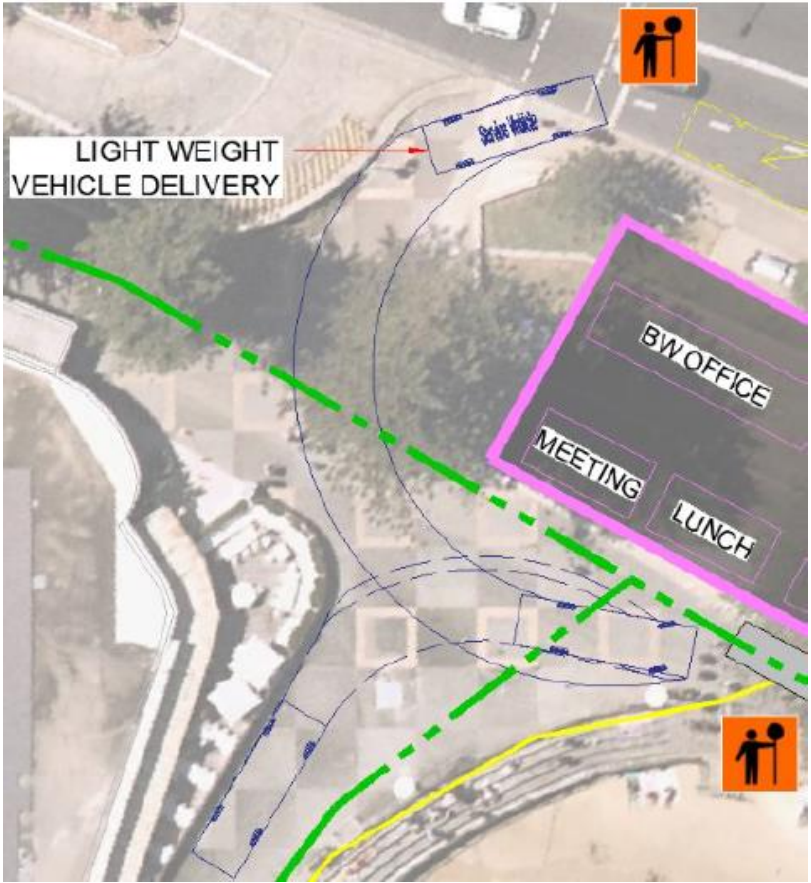
- as the wharf does not have direct access to roads, and to minimise the impacts on the adjoining road network, the majority of deliveries will be undertaken by barges
- road deliveries will be directed along Sydney Road, Belgrave Street, East Esplanade and then travel in a one way loop around Wentworth Street, Darley Road and Victoria Street (refer to Figure 1.3). The route is intended to minimise potential impacts on Manly's busiest streets
- land side deliveries will occur via the Esplanade, directly opposite Wentworth Street adjacent to the Manly Wharf Hotel (refer to Figure 1.4).
- Figure 1.4 includes a swept path analysis of a service vehicle accessing the site. Traffic controllers will be required to facilitate the safety of all road users when vehicles enter/exit the site or are undertaking reverse manoeuvres
- a site compound will be constructed in the grassed area between the Esplanade and Fairlight Walk (refer to Figure 1.5). The compound will provide site offices, lunchrooms and other amenities. Vehicle access will not be provided at the site compound
- during concrete pours, a concrete bay will be required on the southern side of the Esplanade, adjacent to the site compound location (refer to Figure 1.6). The pours are intended to occur between 4:00 am – 12:00 pm to minimise impacts on the nearby bars and restaurants. Traffic controllers will be used to manage the movement of trucks during concrete pours. It is noted that the proposed area designated for concrete pours has signage designating it as a bus zone, however, it does not operate as a bus stop.

Discussions regarding the staging of the construction of the proposal are provided in Section 4.3.



Source: Manly Wharf 3 – Concept Design – Constructability Report

Figure 1.3 Delivery route



Source: Manly Wharf 3 – Concept Design – Constructability Report

Figure 1.4 Delivery area



Source: Manly Wharf 3 – Concept Design – Constructability Report

Figure 1.5 Site compound location



Source: Manly Wharf 3 – Concept Design – Constructability Report modified by GHD.

Figure 1.6 Proposed concrete bay location on the Esplanade

It is noted that:

- the use of the Esplanade as a concrete bay will need to be discussed and agreed upon with Council and Sydney Buses.
- there is also the potential to utilise the delivery area shown in Figure 1.4, with appropriate traffic control, to support concrete pours. This arrangement will also require concurrence by Council.

1.3 Study objectives

The purpose of this assessment is to review the landside traffic and transport impacts of the construction activity associated with the proposal for inclusion in the Review of Environmental Factors.

2. Existing conditions

2.1 Road hierarchy

Functional road classification involves the relative balance of the mobility and access functions. TfNSW define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

Arterial Roads – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.

Sub-Arterial Roads – can be managed by either TfNSW or the local council (e.g., Northern Beaches Council). Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub-region, or provide connectivity from arterial road routes (regional links).

Collector Roads – provide connectivity between local roads and the-arterial road network and typically carry between 2,000 and 10,000 vehicles per day.

Local Roads – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

2.2 Road network characteristics

2.2.1 The Esplanade

The Esplanade (refer to Figure 2.1) functions as a collector road and typically provides a single travel lane in either direction.

In proximity to Manly Wharf:

- the Esplanade is designated as a 30 km/h, high pedestrian activity area
- wide footpaths are provided on both sides of the Esplanade
- signalised pedestrian crossings are provided at the Esplanade's intersection with Belgrade Street and Wentworth Street.



Figure 2.1 The Esplanade looking east towards Manly Wharf

The Esplanade operates as an important bus zone. Designated bus lanes and long bus shelters (up to 40 m) are provided on the southern side of the Esplanade (between Euston Street and Wentworth Street) to support interchange activity with the adjoining ferry wharf.

2.2.2 Belgrave Street

Belgrave Street (refer to Figure 2.2) functions as a collector road which typically provides two travel lanes in either direction.

Time restricted parking is typically provided on the eastern side of Belgrave Street, north of Gilbert Street.

The speed limit on Belgrave Street is typically 50 km/h, with a 30 km/h high pedestrian activity area for (approximately) 180 m north of the Esplanade.

Wide footpaths are provided on both sides of Belgrave Street.

A bus zone and taxi zone are provided on the eastern side of Belgrave Street between Gilbert Street and the Esplanade. An additional taxi zone is on the eastern side of Belgrave Street to the north of Gilbert Street.

A large bus zone with supporting shelters is provided on the western side of Belgravia (adjacent to Gilbert Park) north of Gilbert Street



Figure 2.2 Belgrave Street from the Esplanade

2.2.3 Wentworth Street

Wentworth Street (refer to Figure 2.3) functions as a collector road which typically provides a single travel lane in either direction.

Time restricted parking is typically provided on both sides of Wentworth Street.

The speed limit on Belgrave Street is typically 50 km/h, with a 30 km/h school zone between Darley Street and South Steyne.

Wide footpaths are provided on both sides of Wentworth Street.

An on-road cycle path is provided on the northern side of Wentworth Street, while bike logos are provided on the southern side of Wentworth Street.



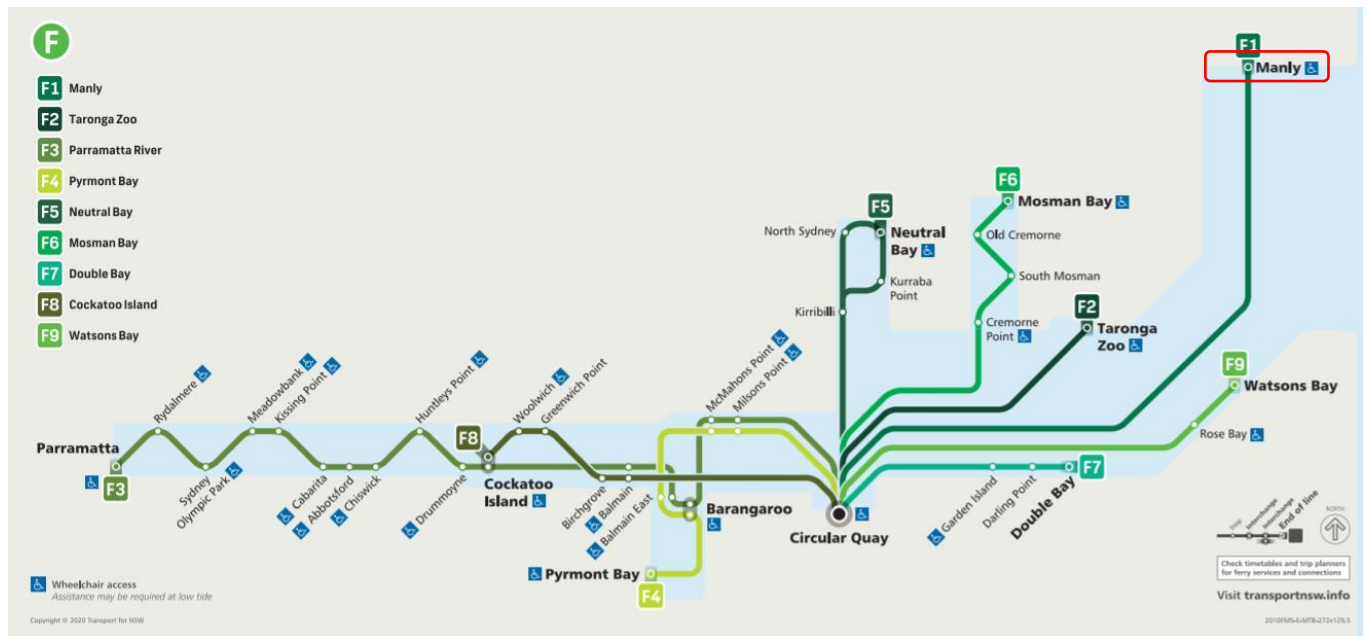
Figure 2.3 Wentworth Street from the Esplanade

2.3 Public Transport

2.3.1 Ferry services

Manly Wharf serves the Circular Quay (F1) ferry service. Figure 2.4 shows the location of Manly Wharf in the context of the wider Sydney Ferries network.

Ferry services typically operate with half-hour frequencies on weekdays and weekends.



Source: TfNSW

Figure 2.4 Sydney Ferry network

As displayed in Figure 1.2, three wharves are currently provided at Manly Wharf.

The main Wharves 1 and 2 are located to the western end of the interchange and provide the bulk of the passenger ferry services. A ferry service to and from Circular Quay operates from Wharf 1, provided by Transdev Sydney Ferries. A ferry service to and from Circular Quay operates from Wharf 2, provided by Manly Fast Ferries.

Wharf 3 is unmanned and currently is used mostly by Captain Cook Cruises (CCC) and Manly Fast Ferries (MFF), who provide a number of timetabled ferry services to the city and Watsons Bay. Water taxis and other recreational boats also embark and disembark passengers

2.3.2 Buses

As stated previously, a large number of bus stops are provided in proximity to Manly Wharf, predominantly on the Esplanade and Belgrave Street. The locations of these bus stops are displayed in Figure 2.5.



Source: TfNSW Visitor Guide to Public Transport

Figure 2.5 Manly Wharf bus stops

The bus services operating at Manly Wharf are detailed in Table 2.1 and Figure 2.6.

Table 2.1 Manly Wharf bus services.

Route	Direction	Frequency (interval in minutes)				
		AM Peak	Off Peak	PM Peak	Saturday	Sunday
141	Austlink via Seaforth & Frenchs Forest	50-60 mins	60 mins	30-50 mins	60 mins	60 mins
142	Allambie heights	40 mins	40 mins	20 mins	60 mins	60 mins
144	Chatswood via St Leonards	8-11 mins	10 mins	10 mins	10 mins	10 mins
161	Manly to North Head loop service	20 mins	60 mins	40 mins	60 mins	60 mins
162	Seaforth	10-12 mins	45-60 mins	15-20 mins	60 mins	60 mins
166	Frenchs Forest	nil	20 mins	10 mins	20 – 30 mins	20 – 30 mins
167	Warringah Mall	20 mins	20 mins	20 mins	20 mins	20 mins
199	Palm Beach via Dee Why & Mona Vale	10 mins	10 mins	10 mins	10 – 15 mins	10 – 15 mins
144N	North Sydney (night service only)	nil	30 mins (night)	nil	30 mins (night)	60 mins (night)
150X	Milsons Point	10 mins	nil	nil	nil	nil
170X	Wynyard	10 mins	nil	nil	nil	nil



Source: TfNSW

Figure 2.6 Manly Wharf bus services

2.4 Active Transport

As detailed in Section 2.2, the key roads in proximity to Manly Wharf typically provide wide concrete footpaths. Additionally:

- signalised pedestrian crossings are provided at the intersection of the Esplanade/Belgrave Street, the Esplanade/Wentworth Street and Belgrave Street/Gilbert Street
- Wentworth Street provides on-street cycle paths
- a shared path is provided along the frontage of Manly Cove (refer to Figure 2.7) that provides direct access to Manly Wharf
- 30 km/h High Pedestrian Activity Areas (HPAAs) are located on the Esplanade, Belgrave Street and Wentworth Street (as described in Section 2.2).



Figure 2.7 Manly Cove shared path

2.5 Taxi

Taxi ranks are provided on Belgrave Street to the north and south of Gilbert Street.

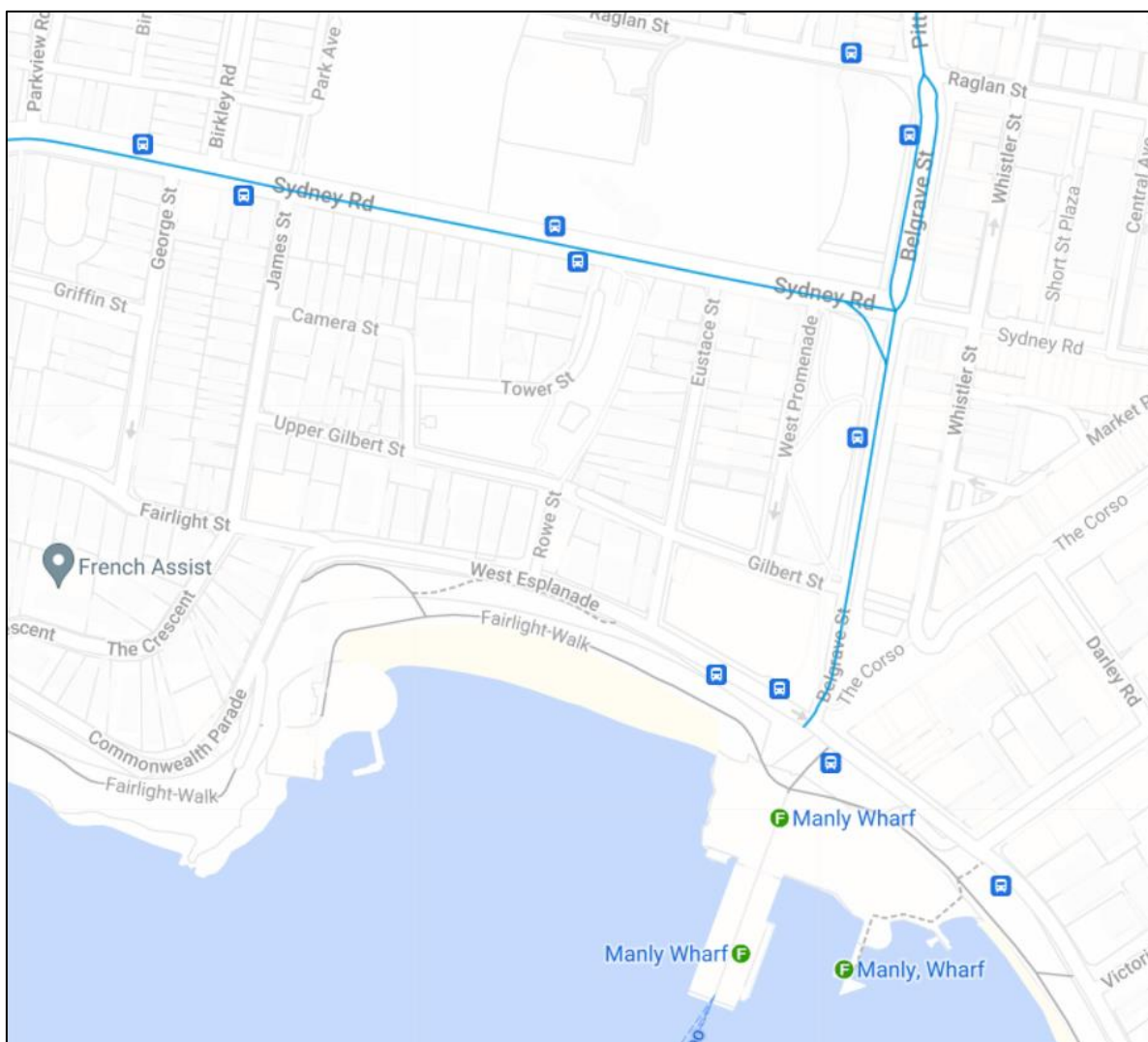
2.6 Car parking

On-street car parking in proximity to Manly Wharf is typically time-restricted (between 30 minutes and two hours). The time-restricted parking supports the operation of the Manly town centre and discourages commuters from parking on the road network in proximity to Manly Wharf.

An underground off-street public parking facility is located adjacent to the north of Manly Wharf and is accessed via the signalised intersection of the Esplanade and Wentworth Street.

2.7 Freight routes

The TfNSW Restricted Access Vehicle (RAV) Map (refer to Figure 2.8) indicates that Sydney Street and Belgrave Street are authorised as “short combination” routes. A short-combination truck has fewer than six axles and a maximum allowable total mass of 42.5 tonnes.



Source: TfNSW

Figure 2.8 Freight routes

2.8 Traffic volumes

To identify the traffic volumes in the proximity of the construction site, GHD engaged Trans Traffic Survey Pty Ltd to undertake turning movement counts at the intersections of Belgrade Street/the Esplanade and Wentworth Street/ the Esplanade on Thursday 31st March 2022.

The traffic surveys were undertaken for the following peak periods:

- 6:30 am – 9:30 am
- 4:00 pm – 7:00 pm.

The identified peak hours of activity were:

- 8:15 am – 9:15 am
- 5:00 pm – 6:00 pm.

The peak hour traffic volumes and pedestrian volumes identified in the traffic surveys are displayed in Figure 2.9 for the AM peak hour and Figure 2.10 for the PM peak hour.

A copy of the outputs of the traffic survey outputs is included in Appendix A.

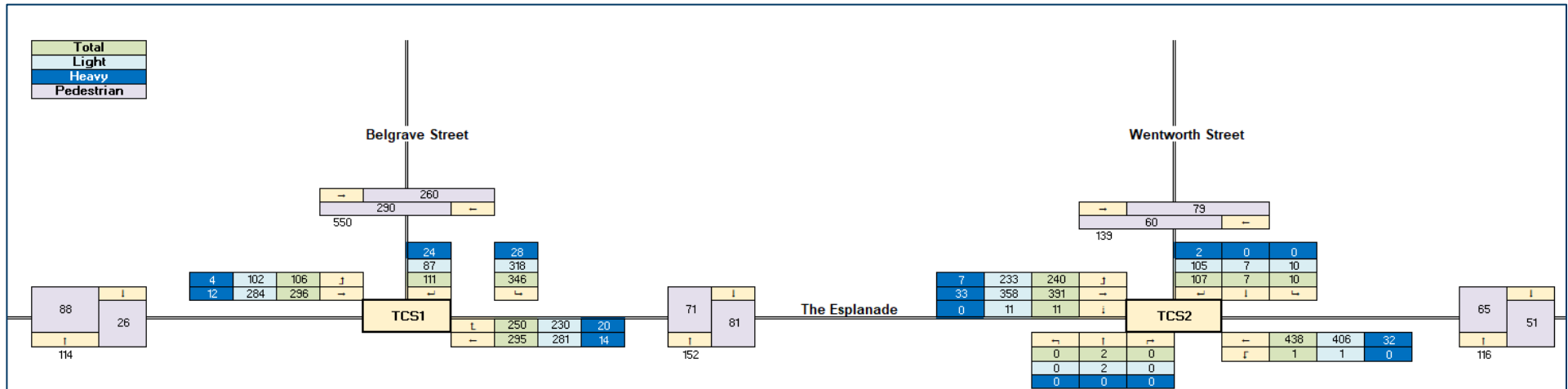


Figure 2.9 am peak hour traffic volumes – existing situation

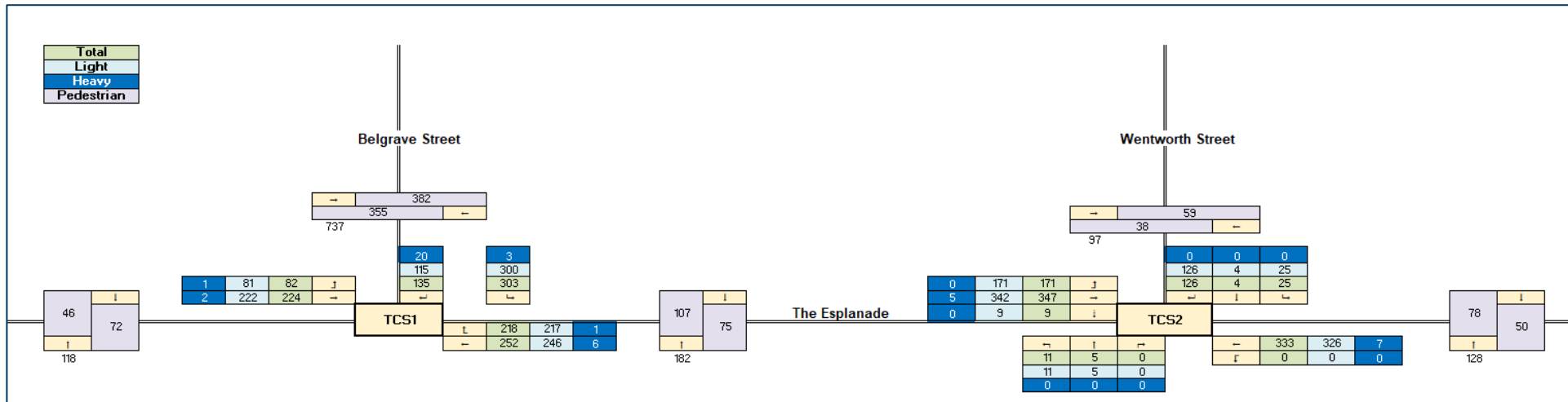


Figure 2.10 pm peak hour traffic volumes – existing situation

2.9 Current intersection performance

The performance of an existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. SIDRA 9.0 intersection modelling software was used to assess the proposed peak-hour operating performance of intersections on the surrounding road network.

The criteria for evaluating the operational performance of intersections are provided by the Guide to Traffic Generating Developments (TfNSW, 2002) and reproduced in Table 2.2. The criteria for evaluating the operational performance of intersections are based on a qualitative measure (i.e., Level of Service – LoS A), which is applied to each band of average vehicle delay.

Table 2.2 Level of Service Criteria for Intersections

Level of Service	Average Delay per Vehicle (seconds/veh)	Traffic Signals, Roundabouts	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

Source: Guide to Traffic Generating Developments (TfNSW 2002)

The layout of the intersections of interest, as modelled in SIDRA 9 as a network, is displayed in Figure 2.11.

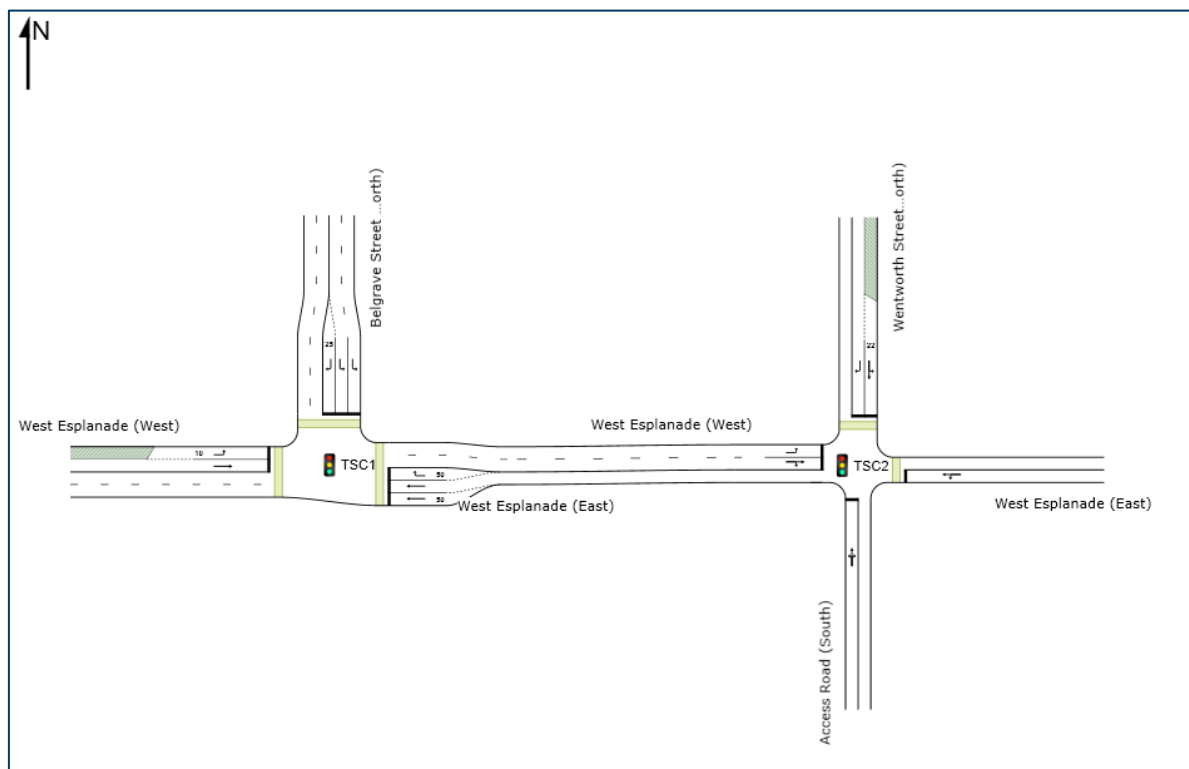


Figure 2.11 SIDRA intersection layout

To determine the intersection phasing and timing, GHD purchased SCATS data from TfNSW for 31 March 2022 (corresponding to the date of the traffic surveys) for both the intersections of interest. The phasing plans used to inform the SIDRA analysis are included in Appendix B

The results of the SIDRA intersection modelling analysis, based on the existing traffic volumes and road geometry, are summarised in Table 2.3.

Table 2.3 Current intersection performance

Intersection	AM Peak			PM Peak		
	Av Delay (sec)	LOS	95 th % Queue (m)	Av Delay (sec)	LOS	95 th % Queue (m)
Belgrave Street/the Esplanade						
The Esplanade (east)	22.8	C	68	20.9	C	34
Belgrave Street	28.6	C	50	28.7	C	29
The Esplanade (west)	45.6	D	130	31.9	C	45
Total	31.2	C	-	26.5	C	-
Wentworth Street/the Esplanade						
South access road	34.4	C	1	34.5	C	3
The Esplanade (east)	10.5	B	85	9.5	A	35
Wentworth Street	38.8	D	39	39.9	D	28
The Esplanade (west)	7.1	A	34	6.7	A	17
Total	12.3	B	-	13.3	B	-

The results in Table 2.3 indicate that the intersection of Belgrave Street and the Esplanade and Wentworth Street and the Esplanade are currently operating with an acceptable LoS.

The SIDRA outputs are included in Appendix C.

3. The proposal

Transport for NSW proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal involves the upgrade of Manly Wharf 3 and construction of a new Manly Wharf 4 under the TAP.

Key features of the proposal would include:

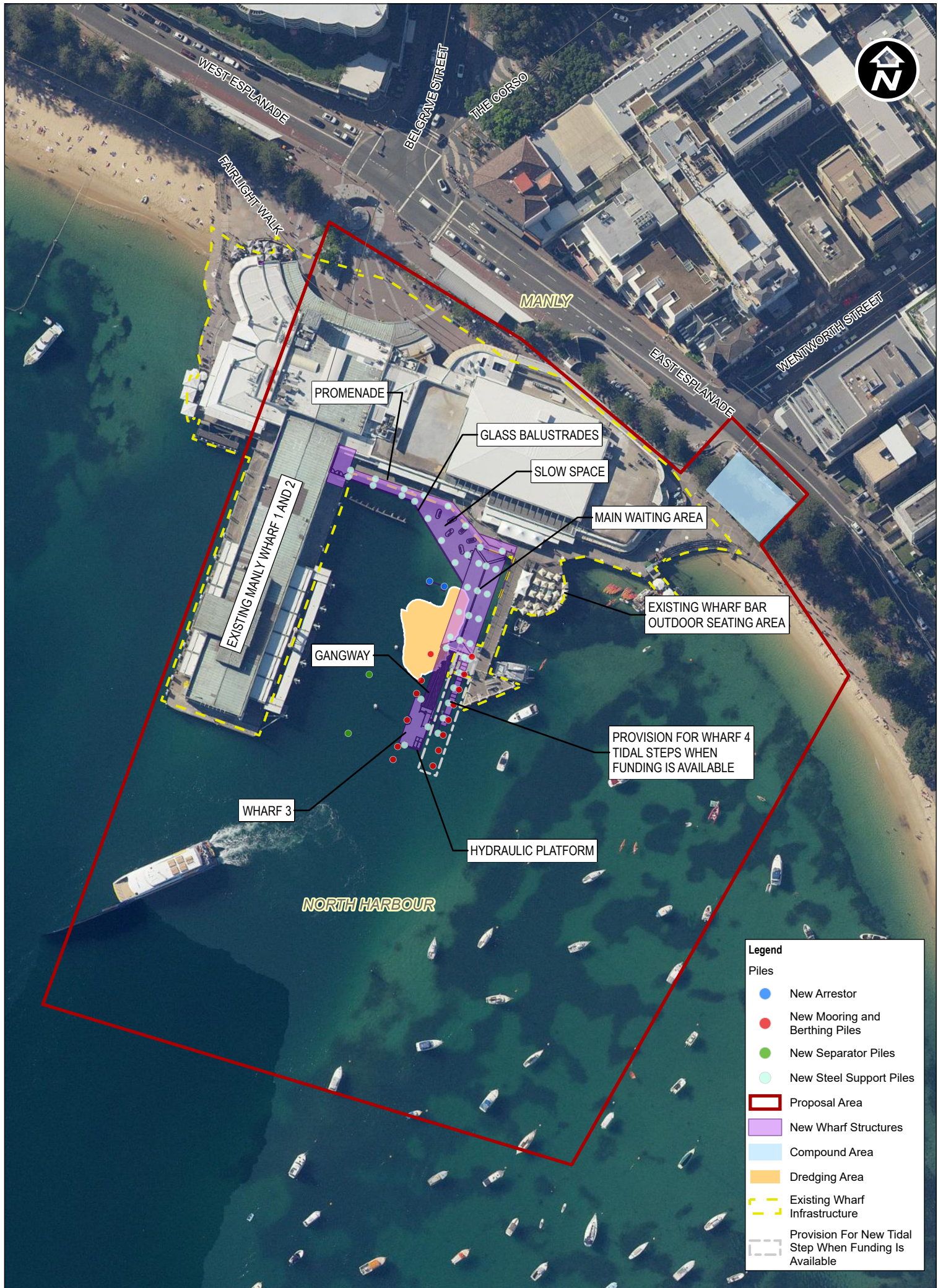
- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- retention of the existing Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- construction of a DSAPT compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- installation of a new public seating/rest 'slow space' within the new public promenade area
- construction of a new covered waiting area accessed via the new promenade area
- installation of a new 18 metre aluminium gangway connecting the waiting area to the Wharf 3 hydraulic platform
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate for larger vessels
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels.
- construction of a new arrestor at Wharf 3
- construction of two new separation piles between Wharves 2 and 3
- limited dredging of material at the Wharf 3 berth pocket area
- upgrade of safety and security features including lighting, CCTV security cameras and tactile ground surface indicators, where required
- wharf booking information screens system
- providing conduits for opal readers to be installed in the future if required.

The objectives of the proposal are to provide:

- facilities that are accessible to the disabled, ageing and parents with prams
- a reliable and durable ferry wharf that is suitable for ferry operations in this location
- an additional wharf to service smaller commercial and recreational vessels
- comfortable and protected environments for customers from sunny, wet and windy weather while accessing and waiting for transport services
- service and ticketing information that is accurate, up-to-date and accessible, making it easier for customers to navigate and use the service
- safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

Key features of the proposal are displayed in Figure 3.1.

Construction of the proposal will be staged so that all work impacting the operation of Wharf 2 would be conducted first. During this time, Wharf 2 would be closed while Wharf 3 could continue to operate and receive vessels. Once these initial works are completed, Wharf 2 can reopen and be used during the remainder of the construction period.



- Legend**
- Piles**
- New Arrestor
 - New Mooring and Berthing Piles
 - New Separator Piles
 - New Steel Support Piles
 - Proposal Area
 - New Wharf Structures
 - Compound Area
 - Dredging Area
 - Existing Wharf Infrastructure
 - Provision For New Tidal Step When Funding Is Available

0 25 50 75 100
Metres

Figure 3.1 Key features of the proposal

Whilst every care has been taken to generate wharf structures, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the data being inaccurate, incomplete or unsuitable in any way and for any reason.

World Street Map: Esri, HERE, Garmin, NGA, USGS, NSW Department of Finance and Services, 2017, Office of Environment and Heritage NSW, Created by inroads

Data source: publicNSW Imagery © Department of Customer Service 2020

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4. Construction impacts

4.1 Overview

It is anticipated construction of the proposal will take eight months to complete depending on weather and maritime conditions, commencing in the first half of 2023.

The construction works would typically take place within standard working hours, as follows:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm.

For safety reasons, the piling may need to take place late at night or early in the morning when the water is calm and the harbour is least busy, with about 40 staggered night-shifts (from 11:00 pm to 7:00 am) proposed across the eight-month construction period time. As detailed in the EPA Guidelines, in these circumstances:

- all works would be undertaken in accordance with out-of-hours work (OOHW) permits issued by Transport for NSW
- the noisiest work would be timed to minimise potential sleep disturbance (i.e. prior to 10:00 pm)
- the nearby community would be informed prior to the proposed works being undertaken.

Approval from Transport for NSW would be required for any out of hours work and the affected community would be notified as outlined in Transport for NSW's *Construction Noise and Vibration Strategy* (Transport for NSW, 2019).

4.2 Ancillary facilities

A temporary site compound would be located in East Esplanade Park (refer to Section 1.1). This compound would be used to establish offices, lunchrooms, amenities and limited storage. The compound would only utilise the grassed area of the park. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

The compound would likely be utilised during the work hours described above. Due to the proximity of the compound to sensitive receivers some hours may be adjusted to reduce the impacts on nearby businesses. For example, concrete pouring would occur outside of hospitality venue business hours for safety and business continuity reasons.

Vehicle access and parking within the site compound will not be provided. Accordingly, swept path analysis has not been provided at this location.

4.3 Construction staging

The proposal would be built under Transport for NSW specifications as managed by the Contractor. This will include a Construction Traffic Management Plan (TMP). The TMP would cover transport and traffic management, consultation with Council, TfNSW and affected businesses or community for any lane closures or occupation of bus zones during all stages of construction. This is further discussed in Section 4.12

The construction of the proposal would likely occur in the stages set out in Table 4.1. Staging for the work was identified in the 'Manly Wharf 3 – Concept Design – Constructability Report' (BESIX Watpac, 2021) and has been refined during design development. These construction stages are discussed in more detail in the sections below.

Table 4.1 Staging plan for the proposal

Stage	Operation	Works
1	Wharf 2 closed Wharf 3 open	<ul style="list-style-type: none"> – Site establishment including: <ul style="list-style-type: none"> • Establish site compound • Hoarding • Safe pedestrian access • Establish on-site laydown area • Delineate water-side construction area with floating booms, allowing for barge anchoring locations and extent of barge reach. • Install environmental perimeter controls – Construct western side of new promenade (in front of Wharf 2 berthing area) – Construct concrete topping slab – Regrade a section of existing boardwalk – Construct temporary separation piles between Manly Wharf 2 and proposed crane barge location at Manly Wharf 3
2	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> – Construct hoarding on promenade to close Wharf 3 – Demolish existing Wharf 3 pier and tidal steps (except for area to be retained) – Demolish area of existing boardwalk to be removed – Remove piles below demolished pier
3	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> – Install environment controls (including silt curtains) – Dredge Wharf 3 berth pocket
4	Wharf 2 open Wharf 3 closed	<ul style="list-style-type: none"> – Construct remaining promenade structure – Construct new waiting area structure – Promenade and waiting area fitout including wharf furniture and utilities.
5	Wharf 2 open Wharf 3 closed New Wharf opened	<ul style="list-style-type: none"> – Construct Wharf 3 platform, berthing piles and install gangway – Construct Wharf 4 fixed structure – Install separation, arrestor and safety marker piles – Commissioning of equipment and wharf – Site clean-up and opening of the new Wharf

The land based plant and equipment expected to be used during the construction of the proposal includes:

- cranes
- trucks
- scissor lift
- power generator
- light vehicles
- excavator
- compressor
- welding equipment
- concrete truck
- concrete pump
- hand tools

4.4 Haulage Routes

In accordance with the information in the Constructability Report (refer to Section 1.1) and the RAV map (refer to Figure 2.8), the haulage routes for construction will include Sydney Road and Belgrave Street.

Given the limited space and road access, the preference would be to ship any major machinery and equipment via barge to the project site. Road deliveries for concrete supply or small item deliveries would likely access the site compound would drive down Sydney Road, then turn right onto Belgrave Street and the East Esplanade before

going around the block on Wentworth Street, Darley Road and Victoria Parade so vehicles would be on the correct side of the road and not be crossing the road to pull over (refer to Figure 1.3).

4.5 Traffic generation

As detailed in the Constructability Assessment (refer to Section 1.1), the majority of deliveries during the construction of the proposal will occur using barges.

A maximum of five truck movements (inbound and outbound) are expected at Manly Wharf per day during the eight month construction period.

Workforce numbers on site during construction will generally vary between 10-15 people on site at any one time. It would be expected that peak workforce numbers will reach about 20 people during the busiest period of construction.

4.6 Traffic impacts

The construction activity at Manly Wharf will generate a maximum of 50 vehicle trips per day, as follows:

- up to five inbound and five outbound heavy vehicle trips per day.
- up to 20 inbound light vehicles in an AM peak and 20 outbound trips in a PM peak hour

It is expected that a maximum of 50 vehicle trips per day will fall within typical fluctuations of daily traffic movements on surrounding local streets and therefore not adversely affect the operation of the existing road network in proximity to Manly Wharf. It is expected that there would not be any impact on the performance of the relevant intersections.

4.7 Traffic management and access

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

- closure of Wharf 2, with no ferry services running from Wharf 2 during construction of the promenade. Vessels would be redirected to Wharf 3 during this time
- closure of the existing Wharf 3 prior to its demolition. Vessels usually using Wharf 3 would be redirected to other wharves around the Manly Cove during this time.
- establishment of a temporary compound area in East Esplanade Park, with no public access allowed to this area
- introduction of construction traffic along East Esplanade during the *in-situ* concrete pour
- installation of hoarding to segregate the proposal construction areas from the public space. The hoarding would leave enough room for a buffer zone around the working area whilst provided a pathway wide enough for the public to navigate through the promenade.
- way-finding signage would also be provided for safe pedestrian movement, and passenger onboarding and disembarking during construction.
- information to boating and vessel operators would be provided during construction and clear delineation of water-side works would be undertaken to maintain safe navigation to and from operational sections of Manly Wharf.

4.8 Impacts to parking

As detailed in Section 2.6, the roads in proximity to Manly Wharf are time-restricted and, accordingly, are not suitable for workers.

It is recommended that workers be directed to park in the underground off-street public parking facility, located adjacent to the north of Manly Wharf. Preferably, workers could utilise the robust public transport offering in the area.

A maximum of 20 workers will need to be accommodated within the car park. Accordingly, the parking impacts associated with the construction of the proposal are expected to be minor.

4.9 Impacts to public transport

The construction of the proposal is not expected to impact the bus services operating at and in proximity to Manly Wharf.

A preliminary assessment indicates that approximately 25 concrete truck movements will be required during construction. Assuming a maximum of five concrete trucks per day (in accordance with the information provided by TfNSWthe Client), a concrete bay will be required for a total of five days during the construction of the proposal.

During concrete pours, a concrete bay may be required on the southern side of the Esplanade, adjacent to the site compound location. This area currently has signage designating it as a bus zone, however it does not operate as a bus stop. The bus lane is approximately 65 metres in length, and, if required, could be temporarily shortened (if required) to support the layover of buses and concrete trucks.

Alternatively, there is also the potential to utilise the delivery area shown in Figure 1 4, with appropriate traffic control, to support concrete pours. In this circumstance, the impacts on the bus zone on the Esplanade would be negligible.

As described in the Manly Wharf 3 – Concept Design - Constructability Report (BESIX Watpac, 2021) at least one berth at Manly Wharf will be available during the full construction period.

Wharf 1 and 2 will continue to take services through the demolition of Wharf 3 and the construction of new Wharves 3 and 4. During construction of elements immediately adjacent to Wharf 2, Wharf 2 will be required to shut for a short period, however Wharf 1 will remain operational. Construction programming and staging will endeavour to minimise this window.

The timetable will be moderately impacted during construction as follows (BESIX Watpac, 2021):

- services may be reduced while Wharf 2 is closed for the construction works adjacent to Wharf 2 – some services may be able to be moved to Wharf 1, timetable permitting or continue to utilise existing Wharf 3 prior to demolition.
- services may be reduced while Wharf 3 is closed and 3 and 4 are under construction – some services may be able to be moved to Wharf 2, timetable permitting.

Typically, the construction of the proposal is expected to have a negligible impact on the operation of public transport services.

4.10 Road closures

Road closures are not proposed on the road network for the duration of the proposed construction works.

4.11 Impacts to active travel

All the active transport facilities identified in Section 2, will be maintained during the construction of the proposal.

Pedestrian and cyclists' access/egress to and from Manly Wharf will be maintained during the construction of the proposal.

4.12 Mitigation measures

4.12.1 Construction Traffic Management Plan

Prior to the commencement of construction, a Construction Traffic Management Plan (CTMP) would need to be prepared for the proposal by the Contractor and would include at a minimum:

- ensuring adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised
- maximising safety and accessibility for pedestrians and cyclists

- ensuring adequate sight lines and providing traffic control to allow for safe entry and exit from the site
- ensuring access to businesses and residential properties are not impacted
- managing impacts and changes to off-street parking and requirements for any temporary replacement provision
- parking locations for construction workers away from busy residential/commercial areas and details of how this would be monitored for compliance
- routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses
- measures to manage traffic flows around the area affected by the wharf upgrade, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the CTMP.

Consultation with the relevant road authorities would be undertaken during the preparation of the CTMP. The performance of all project traffic arrangements must be monitored during construction.

4.12.2 Monitoring of Traffic Guidance Schemes

During construction, the Contractor shall, each morning, prior to work commencing, ensure all signage is erected in accordance with the Traffic Guidance Schemes (TGSs) and clearly visible. After work hours, each evening, upon completion of work, the Contractor is to ensure signage is either covered or removed as required.

Any variation to the layout of the TGSs on site is to be recorded and certified by Transport for NSW accredited personnel. The associated TGS road signage would inform drivers of works activities in the area, including truck movements in operation.

TGSs are to be developed in accordance with Transport for NSW Traffic Control at Works Sites v.06 2020 and *AS1742.3 – Traffic Control for Works on Roads as part of a Construction Traffic Management Plan* and be coordinated with the onsite staging requirements.

4.12.3 Access to adjoining properties

Access to all adjoining properties would be maintained for the duration of works.

4.12.4 Method of communicating traffic changes

Prior to the commencement of works on site, the Contractor in consultation with TfNSW is to inform neighbouring properties of proposed works, impacts and site contact information as per the Community Consultation Plan (to be developed prior to construction). Notification can be provided by various means including, but not limited to:

- letterbox distribution
- email distribution
- project website.

Prior to construction works progressing, the following is proposed:

- access to all adjoining properties would be maintained at all times. Should the detailed design and construction staging of the proposal identify impacts to residents/businesses, property owners, affected occupants and other wharf users would be consulted and notified in advance of the scheduled works
- property owners and wharf users should be notified of proposed works, via signage to capture frequent users of the wharf, in accordance with the Community Consultation Plan.

4.12.5 Environmental controls

The following environmental requirements are to be adhered to:

- all vehicles transporting loose materials should have the entire load covered and/or secured to prevent any large items, excess dust or debris from depositing onto the roadway during travel to and from the site
- the Contractor would monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles, to maintain the safety of all road users
- vehicles operating to, from and within the site shall do so in a manner which does not create unreasonable or unnecessary noise or vibration
- public roads would not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances
- all subcontractors must be inducted by the Contractor to raise awareness and understand that all relevant environmental control procedures, including traffic and transport controls are to be met.

4.13 Roadwork speed limits

Temporary roadwork speed limits are one of many traffic controls that can be implemented to manage the speed of traffic approaching and passing through a work site. However, they can, over long distances, have a significant impact on road user delay.

Any roadwork speed zones set up on the Esplanade must be logical and credible, as well as enforceable. When considering the use of a roadwork speed zone on the Esplanade, they would:

- only be used where they are self-enforcing or would be enforced
- not be used alone but with other traffic control signs and devices
- not be used in place of more effective traffic controls
- only be used while road works are in progress or the lower speed road conditions exist.

4.13.1 Construction speed zone

When night works are required, special consideration would be taken to determine appropriate changes in the speed limit depending on the location and type of works. As mentioned before, the Contractor would aim to minimise impact to overnight freight vehicles.

As required by Transport for NSW's Traffic Control at Work Sites Manual, when working adjacent to traffic in side streets, the speed limit selection would be based on the following criteria:

- degree of vehicular and pedestrian conflicts
- type and extent of the work
- characteristics of the road and proximity of workers to passing traffic.

4.13.2 Speed zone authorisation

An application to Council must be made for any proposed adjustment to speed limits, whether they are temporary (tactical), such as those required for short-term road occupancies, longer term such as those for the duration of a construction stage, or permanent. A Speed Zone Authorisation (SZA) application usually accompanies a Road Occupancy License (ROL) application where a change in speed limit is proposed as part of a road occupancy. The SZA application would be forwarded to Council's Interface Manager. Councils generally require at least ten working days to process the application and would grant or reject the application within this period. All SZAs would comply with the over-arching road safety and traffic management principles, objectives and targets outlined in the CTMP.

4.14 Staff inductions

All staff and subcontractors engaged on site would be required to undergo a site induction. The induction would outline the requirements of the CTMP, including site access routes, environmental and occupational health and safety responsibilities, emergency procedures, potential carpooling opportunities and vehicle height/weight restrictions.

Additionally, the Site Manager would discuss CTMP requirements regularly as a part of “toolbox talks”.

4.15 Occupational health and safety

Any workers required to undertake works or traffic control shall be suitably trained and hold the required accreditation to carry out works on site and would also be inducted. All traffic control personnel would be required to hold Transport for NSW accreditation in accordance with the Transport for NSW Traffic Control at Worksites manual.

4.16 Contact of emergency services

In the event of a construction traffic incident on the public road network, it would be the responsibility of the Site Manager to ensure that emergency services are notified. The emergency services include but are not limited to:

- fire
- ambulance
- police
- phone “000” in cases of emergency.

Furthermore, it is the responsibility of the Site Manager to advise the emergency services of any restriction of vehicular access to public and private areas (1) one week prior to implementation.

Emergency procedures and communications protocols will be specified in a Safety Management Plan.

4.17 Certificates and approvals

Relevant approvals are to be obtained from Council and other relevant authorities as required to facilitate the works. Approvals that may need to be obtained for items such as but not limited to:

- roadwork speed zone
- council road opening permits
- hoarding/fencing approvals
- crane and barricades
- oversize and articulated vehicle use on local roads.

4.18 Obtaining approvals

The Contractor would obtain the necessary approvals, as required by the *Roads Act 1993* and NSW traffic acts and regulations, prior to conducting any works. The Contractor is required to seek the concurrence of the relevant road authority prior to undertaking works. The Contractor would ensure that all public roads to be used by construction traffic would be identified prior to construction and that management methods would be undertaken so that construction traffic uses the identified roads.

The specific areas of approval would include:

- all construction works and/or any changes to existing infrastructure
- the installation and/or changes of any regulatory traffic control device

The road authority responsible for roads affected by the construction of the proposal is the Northern Beaches Council.

Approval from the Northern Beaches Council would be required prior to the installation of temporary traffic controls/devices and/or occupying the local road network.

The Contractor's submission to Council would include:

- brief details of the works to be undertaken
- any relevant design drawings of the works
- program of the works
- copies of TGSs
- if applicable, details of SZA
- contact details of a construction site representative.

Specific consultation would be undertaken with council and local residents regarding instances of special deliveries through local access roads (as required).

5. Summary

5.1 Construction impacts

The following impacts are likely to be generated by the construction activities associated with the construction of the proposal:

- the construction of the proposal is expected to generate a maximum of 50 vehicle trips per day. These increases are expected to fall within typical fluctuations of daily traffic movements and, therefore not adversely alter the existing operation of the road network in proximity to Manly Wharf
- minor traffic delays associated with TGS implementation used to slow down and control vehicle movements during periods of construction.
- the impacts of the construction of the proposal on the active transport and public transport facilities/services are expected to be negligible.

5.2 Construction mitigation measures

The following list summarises the measures that are required prior to the commencement of and during the execution of the construction period:

- a CTMP will need to be prepared for the proposal by the Contractor. This will include the provision of TGSs which will detail the construction signage and traffic controller requirements
- during construction, the Contractor shall, each morning, prior to work commencing, ensure all signage is erected in accordance with the TGS
- prior to the commencement of works on site, the Contractor in consultation with TfNSW is to inform neighbouring properties of proposed works, impacts and site contact information as per the Community Consultation Plan (to be developed prior to construction)
- when night works are required, special consideration would be taken to determine appropriate changes in the speed limit depending on the location and type of works
- an application to Council must be made for any proposed adjustment to speed limits (if required)
- all staff and subcontractors engaged on site would be required to undergo a site induction. Additionally, the Site Manager would discuss CTMP requirements regularly as a part of “toolbox talks”.
- any workers required to undertake works or traffic control shall be suitably trained and hold the required accreditation to carry out works on site and would also be inducted.
- in the event of a construction traffic incident on the public road network, it would be the responsibility of the Site Manager to ensure that emergency services are notified.
- the Contractor would obtain the necessary approvals, as required by the Roads Act 1993 and NSW traffic acts and regulations, prior to conducting any works.

5.3 Conclusion

It is considered that the construction of the proposal would minimise adverse impacts on the road system, public transport services and pedestrian access during construction, subject to the implementation of a detailed CTMP and other measures prior to construction by the Contractor.

It is expected that the construction impacts of the proposal on the traffic and transport facilities in proximity to Manly Wharf will be negligible.

Appendix A

Traffic Survey Outputs

TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

trafficsurvey.com.au



Intersection of E Esplanade and Belgrave St, Manly

GPS -33.799171, 151.284454

Date:	Thu 31/03/22
Weather:	Fine
Suburban:	Manly
Customer:	GHD

North:	Belgrave St
East:	E Esplanade
South:	N/A
West:	E Esplanade

Survey Period	AM:	6:30 AM-9:30 AM
	PM:	4:00 PM-7:00 PM
Traffic Peak	AM:	8:15 AM-9:15 AM
	PM:	5:00 PM-6:00 PM

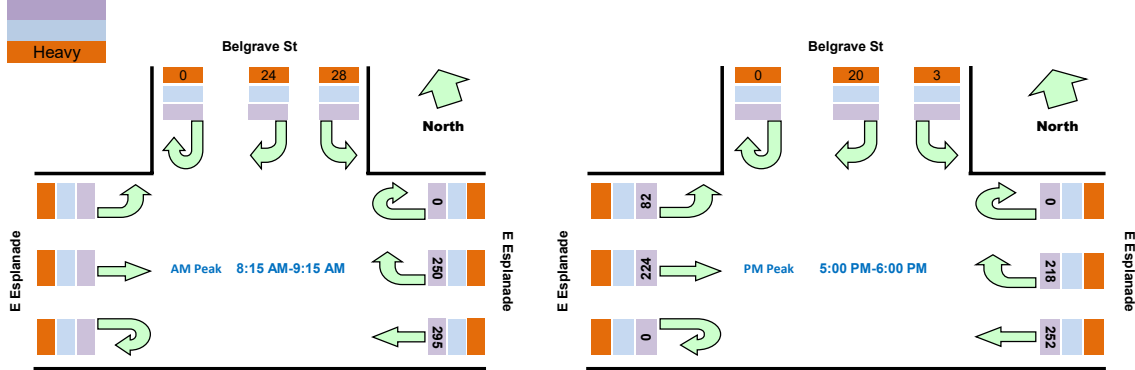
All Vehicles

Time		North Approach Belgrave St			East Approach E Esplanade			West Approach E Esplanade			Hourly Total	
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	Hour	Peak
6:30	6:45	0	19	34	0	36	43	0	45	8	930	
6:45	7:00	0	21	51	0	36	47	0	74	11	1043	
7:00	7:15	0	25	43	0	36	53	0	46	18	1139	
7:15	7:30	0	18	52	0	56	75	0	62	21	1232	
7:30	7:45	0	18	72	0	54	68	0	63	23	1325	
7:45	8:00	0	29	85	0	57	77	0	64	24	1349	
8:00	8:15	0	31	81	0	47	65	0	53	37	1353	
8:15	8:30	0	30	97	0	70	74	0	68	38	1404	Peak
8:30	8:45	0	22	89	0	66	58	0	67	20	1289	
8:45	9:00	0	26	77	0	51	79	0	87	20		
9:00	9:15	0	33	83	0	63	84	0	74	28		
9:15	9:30	0	27	60	0	42	51	0	59	23		
16:00	16:15	0	29	65	0	58	54	0	46	24	1094	
16:15	16:30	0	41	50	0	46	60	0	60	23	1132	
16:30	16:45	0	26	78	0	42	54	0	42	30	1135	
16:45	17:00	0	31	58	0	48	50	0	60	19	1192	
17:00	17:15	0	25	79	0	62	73	0	59	16	1214	Peak
17:15	17:30	0	35	66	0	48	64	0	52	18	1161	
17:30	17:45	0	43	72	0	61	69	0	58	26	1147	
17:45	18:00	0	32	86	0	47	46	0	55	22	1049	
18:00	18:15	0	30	70	0	35	48	0	59	19	979	
18:15	18:30	0	34	70	0	40	52	0	47	26		
18:30	18:45	0	28	57	0	40	41	0	58	7		
18:45	19:00	0	34	51	0	37	36	0	46	14		

Peak Time		North Approach Belgrave St			East Approach E Esplanade			West Approach E Esplanade			Peak total
Period Start	Period End	U	R	L	U	R	WB	U	EB	L	
8:15	9:15	0	111	346	0	250	295	0	296	106	1404
17:00	18:00	0	135	303	0	218	252	0	224	82	1214

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic



TRANS TRAFFIC SURVEY

TURNING MOVEMENT SURVEY

trafficsurvey.com.au



Intersection of E Esplanade and Wentworth St, Manly

GPS -33.799885, 151.285552

Date:	Thu 31/03/22
Weather:	Fine
Suburban:	Manly
Customer:	GHD

North:	Wentworth St
East:	E Esplanade
South:	Carpark
West:	E Esplanade

Survey Period	AM: 6:30 AM-9:30 AM
	PM: 4:00 PM-7:00 PM
Traffic Peak	AM: 8:15 AM-9:15 AM
	PM: 5:00 PM-6:00 PM

All Vehicles

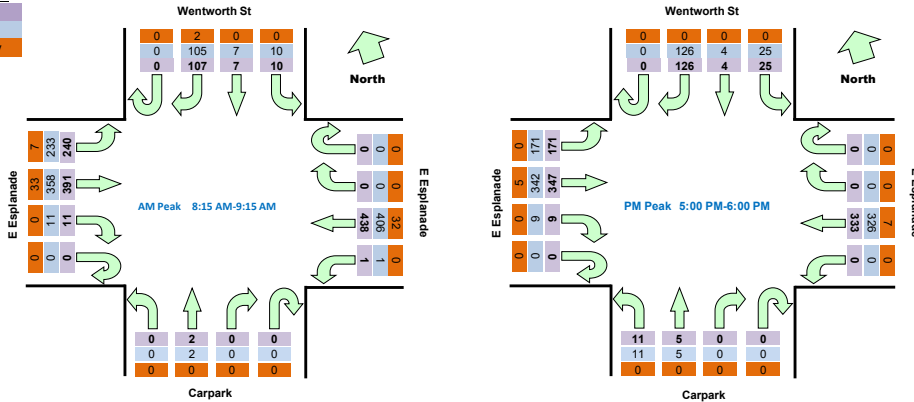
Time		North Approach Wentworth St				East Approach E Esplanade				South Approach Carpark				West Approach E Esplanade				Hourly Total	Peak
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Hour	Peak
6:30	6:45	0	13	1	6	0	0	66	0	0	0	0	0	0	0	0	19	823	
6:45	7:00	0	17	1	11	0	0	66	0	0	0	2	0	0	4	96	25	921	
7:00	7:15	0	14	0	6	0	0	74	0	0	0	1	1	0	4	60	25	992	
7:15	7:30	0	29	0	6	0	0	102	0	0	0	0	0	0	1	70	43	1061	
7:30	7:45	0	19	2	3	0	0	103	0	0	0	1	0	0	3	80	52	1122	
7:45	8:00	0	30	1	8	0	0	104	0	0	1	0	0	0	2	87	60	1144	
8:00	8:15	0	36	0	7	0	0	76	0	0	0	1	0	0	2	82	50	1150	
8:15	8:30	0	22	1	1	0	0	122	0	0	0	1	0	0	4	102	59	1207	Peak
8:30	8:45	0	20	2	2	0	0	104	1	0	0	0	0	0	3	97	56	1114	
8:45	9:00	0	30	1	3	0	0	100	0	0	0	1	0	0	2	105	57		
9:00	9:15	0	35	3	4	0	0	112	0	0	0	0	0	0	2	87	68		
9:15	9:30	0	27	1	6	0	0	66	0	0	0	0	0	0	0	64	55		
16:00	16:15	0	29	1	2	0	0	79	0	0	0	1	4	1	1	69	41	902	
16:15	16:30	0	21	2	3	0	0	83	1	0	0	1	2	0	4	82	24	957	
16:30	16:45	0	19	0	9	0	0	74	0	0	0	1	3	0	2	80	38	975	
16:45	17:00	0	24	0	6	0	0	72	0	0	0	3	2	0	1	81	36	1013	
17:00	17:15	0	39	1	8	0	0	93	0	0	0	1	3	0	0	96	42	1031	Peak
17:15	17:30	0	31	1	8	0	0	79	0	0	0	2	2	0	2	73	43	966	
17:30	17:45	0	29	1	2	0	0	98	0	0	0	1	3	0	4	83	43	950	
17:45	18:00	0	27	1	7	0	0	63	0	0	0	1	3	0	3	95	43	893	
18:00	18:15	0	25	0	4	0	0	58	1	0	1	0	0	0	4	90	35	827	
18:15	18:30	0	20	2	13	0	0	69	1	0	0	0	3	0	4	70	43		
18:30	18:45	0	25	0	4	0	0	52	1	0	2	4	4	0	4	73	38		
18:45	19:00	0	10	2	3	0	0	56	0	0	0	2	7	0	1	70	26		

Peak Time	North Approach Wentworth St	East Approach E Esplanade	South Approach Carpark	West Approach E Esplanade	Peak total													
Period Start	Period End	U	R	SB	L	U	R	WB	L	U	R	NB	L	U	R	EB	L	Peak total
8:15	9:15	0	107	7	10	0	0	438	1	0	0	2	0	0	11	391	240	1207
17:00	18:00	0	126	4	25	0	0	333	0	0	0	5	11	0	9	347	171	1031

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.

Graphic

Total
Light
Heavy



Appendix B

Signal phasing drawings

0159.279.VV.0863

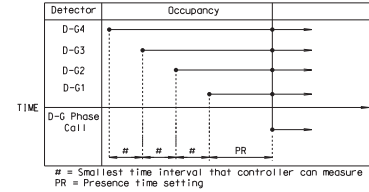
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DATE IN SERVICE : 04/12/73



NOTES

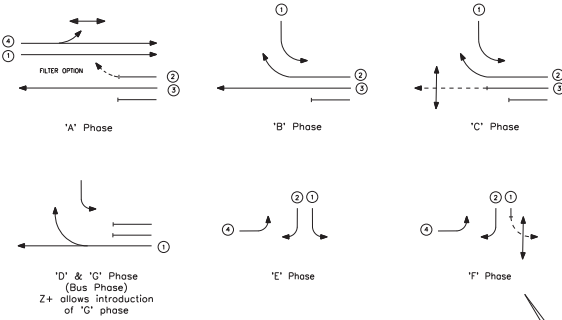
1. This site is SCATS linked
2. Special STOP sign (R1-202) placed on post 3
3. All push-buttons are audio-tactile
4. Kerb ramps to be constructed at all pedestrian crossings in accordance with the Model Drawing MD.R15.C01.A
5. Roadworks in Belgrave st and East Esplanade to be constructed in accordance with Woolacotts Civil Works Plan Project No.251033 for the Manly Interchange Project
6. Departure section of 'A-B-C1' Detector to avoid roadway concrete collar. Loop cable screen to be cut to a separate Pavement Junction Box in Kerb.
7. The D-G detector is on 11m loop with separate inputs to both sections of each 4.5m loop. These are labelled D-G1, D-G2, D-G3 and D-G4 corresponding to Detectors 8, 9, 10 and 11. The Detector Specification attempts to show the logic of operation. For a D-G presence call to occur, detectors must be activated and stay occupied in succession from D-G4 to D-G1. When the D-G1 detector presence timer has expired, a D and G call is placed. See the following diagram.



8. The presence of XSF Bit 1 causes all D-G detectors to operate as conventional presence timed detectors.

POSTS

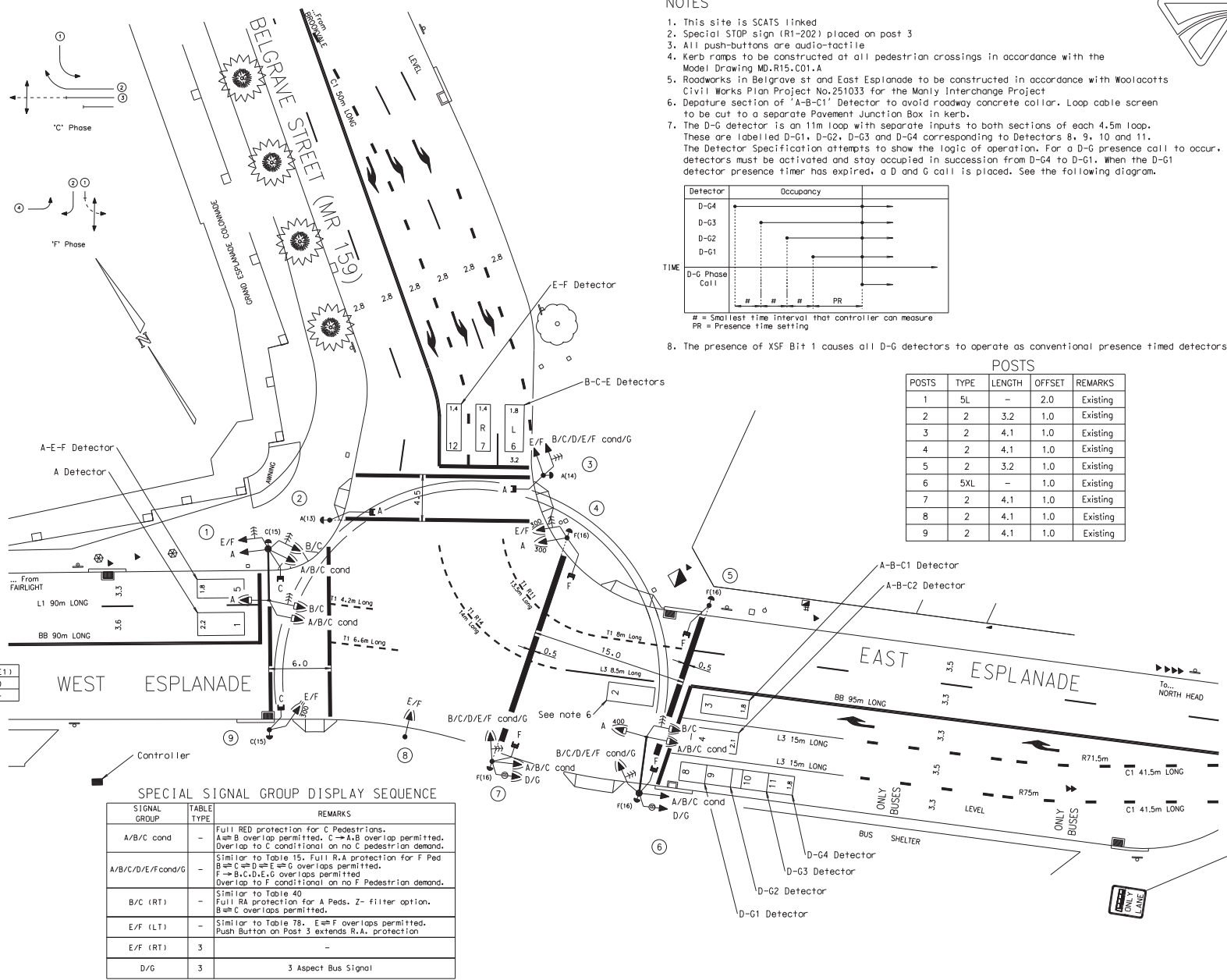
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3	2	4.1	1.0	Existing
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5	2	3.2	1.0	Existing
6	5XL	-	1.0	Existing
7	2	4.1	1.0	Existing
8	2	4.1	1.0	Existing
9	2	4.1	1.0	Existing



MOVEMENTS

DETECTOR SPECIFICATION

DETECTOR	SPECIFICATION					
A	FN	A(L)	A(E1)			
	SG	A	A			
	DS	-	-			
A-B-C1	FN	B(PR)				
APPROACH	SG	A				
DEPARTURE	DS	Z-				
A-B-C1	FN	A(L),B(L)	B(L)	B(CL)		
SG	A,B,C	B	C			
APPROACH	DS	Z-	Z-	A-B-C1(NG),XSF2		
CONTO	FN	A(E2)	B(E2)	C(E2)		
A-B-C1	SG	A	B	C		
APPROACH	DS	Z-A-B(PR),B(NXT),C(NXT)	-	B(NEXT)		
A-B-C2	FN	A(PR)	A(E3)	B(E3)	C(E3)	
SG	A/B	A	B	C		
DS	-	B(NEXT)	A(NEXT)	A(NEXT),B(NEXT)		
A-E-F	FN	A(PR)	A(E4)	E(E4)		
SG	A	A	E			
DS	-	-	-	A(NEXT)+A(PB1),A-E-F(PR),F(NEXT)		
A-E-F	FN	F(E4)				
SG	F					
DS	-	-	-	A(NEXT)+A(PB1),A-E-F(PR),E(NEXT)		
B-C-E	FN	B(CPR)	B(E1)	C(E1)	E(E1)	F(E1)
SG	B,C,D,E,G	A	C	E	F	
DS	C,D,E,G	A(NEXT)	A(NEXT)	A(NEXT)	A(NEXT)	
D-G1	FN	D(PR)	G(PR)		D(E1)	D
SG/PS	D/G	D/G				
DS	D-G1(DE1),XSF1	D-G2(DE1),XSF1,Z+				
D-G2	FN	Set F Log	Set F Log			
SG/PS	D	G				
DS	D-G3(DE1),XSF1	D-G3(DE1),XSF1,Z+				
D-G3	FN	Set F Log	Set F Log			
SG/PS	D	G				
DS	D-G4(DE1),XSF1	D-G4(DE1),XSF1,Z+				
D-G4	FN	Set F Log	Set F Log			
SG/PS	D	G				
DS	XSF1	XSF1,Z+				
E-F	FN	E(L)	E(CL)	E(E2)	F(E2)	
SG	E/F	F	E	F		
DS	F	E-F(NG),XSF3	F(NEXT)	E(NEXT)		
A	FN	A(PB)	B(L)			
P.B.	SG	A(WALK)	A,A(WALK)			
DS	-	C,D,E,F,G				
C	FN	C(PB)	B(L)			
P.B.	SG	C(WALK)	C,C(WALK)			
DS	-	A,D,E,F,G				
F	FN	F(PB)	B(L)			
P.B.	SG	F(WALK)	F,F(WALK)			
DS	-	A,C,D,E,G				



SPECIAL SIGNAL GROUP DISPLAY SEQUENCE

SIGNAL GROUP	TABLE TYPE	REMARKS
A/B/C cond	-	Full RED protection for C Pedestrians. A=B overlap permitted, C → A,B overlap permitted. Overlap to C conditional on no C pedestrian demand.
A/B/C/D/E/F cond/G	-	Similar to Table 15. Full R.A protection for F Ped B=C → D → E → G overlaps permitted. F → B,C,D,E,G overlaps permitted. Overlap to F conditional on no F Pedestrian demand.
B/C (RT)	-	Similar to Table 40
B/C (RT)	-	Full RA protection for A Peds. Z- filter option. B=C overlaps permitted.
E/F (LT)	-	Similar to Table 78. E=F overlaps permitted. Push Button on Post 3 extends R.A. protection
E/F (RT)	3	-
D/G	3	3 Aspect Bus Signal

A ORIGINAL ISSUE
RE-DESIGNED SCHEMATIC PLAN (R15) WITH PARALLEL PED FACILITY.
LANEWAYS ASSIGNED LABELS - SPEC & NOT 1500001 POSTS, LANTIERES & 1500002 POSTS, LANTIERES, MODIFIED PARKING MARKING
15.1.1. 08/11/01
B ISSUE NETWORK OP'S WITHIN 'N' PLAIN CORRECTION TO 'N' THROUGH BUS LANE EAST ESPLAN. 17/12/01
R-1.1. 15.1.1. 17/12/01
T.C. 15556- J.J. NEWCOMB
EYE LANTIERE MOVED TO POST 8
U.S. L.V.C. 10/05/04

PUBLIC UTILITY LEGEND	REFERENCE PLANS	U.S.D. Ref. Map 198 810
HYDRANT	SYMBOLS/ABRS. V0002-6	1:5.G. Et 327 044
STOP VALVE	STD POSIT. V0001-5	CO-ORDS N:1 258 561
GAS VALVE	DET SCHED EXP V0018-10	Refer to Sheet 15 Issue A for original details
SEWER MANHOLE	PRES. DETECT V0005-17	For original details
ELECTRICAL	SSG DIS. SEQ. V0018-8	DESIGNED J BATES
TELECOM PIT		
TELECOM LIGHT POLE		
POWER POLE		
STAY POLE		
TELECOM BOX	SURVYOR : N/A	
TELECOM PILLAR	DATE : N/A	

DESIGN APPROVAL APPROVED
T. LAWRENCE
NAME ... T. LAWRENCE
TRANSPORT & URBAN PLANNING
11-6-99

RTA ACCEPTANCE RECOMMENDED
DATE 11-6-99

Roads and Traffic Authority, N.S.W.
MANLY COUNCIL AREA
TRAFFIC SIGNALS AT INTERSECTION OF
EAST ESPLANADE, WEST ESPLANADE (SR 205)
AND BELGRAVE STREET (MR 159) - MANLY
DESIGN LAYOUT
TCS No 0863

EXISTING	PROPOSED	ISSUE
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FILE 279 TS 116	SUPERSEDES SHEET/ISSUE 20/B	SHEET 20
REGN. 0159.279.VV.0863		

7000.279.VV.3030

DRAWN BY CADD
DO NOT AMEND MANUALLY

DATE IN SERVICE : XX/XX/XX

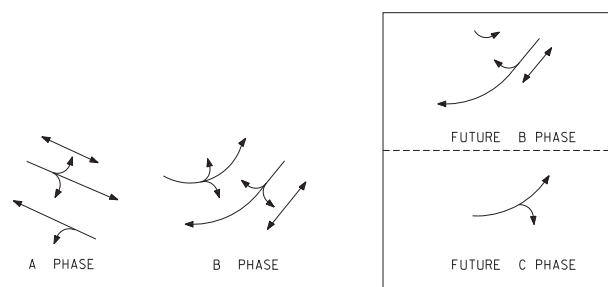


POSTS

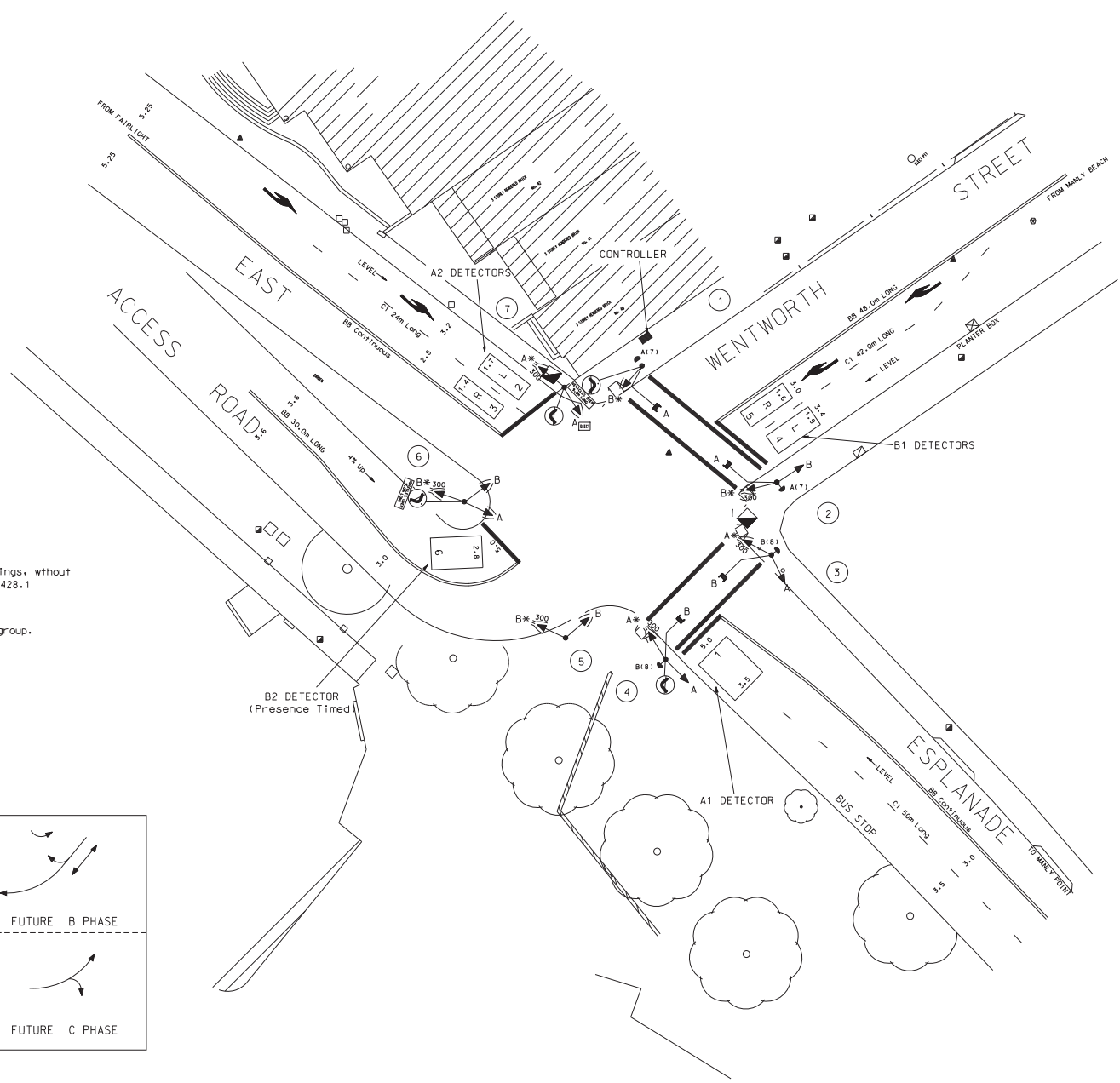
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3	2	4.1	EXIST	0.9
4	2	4.1	EXIST	1.0
5	2	4.1	EXIST	1.2
6	2	4.1	EXIST	2.5
7	2	4.1	EXIST	0.8

NOTES:

- This site is SCATS linked.
- Special stop sign (R1-202) placed on posts 2 & 6.
- All kerb ramps to be constructed at all pedestrian crossings, without tactile ground surface indicators in accordance with AS 1428.1
- All Push buttons are audio tactile.
- Lanterns thus marked * to be wired to a separate signal group.



MOVEMENTS



A ORIGINAL ISSUE	B ISSUE	C ISSUE	D ISSUE
Road widening in East Esplanade	Road widening in East Esplanade	Plan amended to suit W.M.E. in Esplanade	Detector numbers revised
TIPA: 10.10.01	TIPA: 10.10.01	19.06.06	19.06.06
PLAN AMENDED TO SUIT W.M.E. IN ESPLANADE			
DETECTOR NUMBERS REVISED			
F.P.P. 19.06.06			

PUBLIC UTILITY LEGEND		REFERENCE PLANS		I.U.S.D. R9996 Mod 198/810	
HYDRANT	□	SYMBOLS/ABBS.	V0003-6	I.S.G.	E1 326 342
STOP VALVE	▲	SIG POSIT.	V0001-5	CO-ORDS	N 1 258 514
GAS VALVE	■	DET SCHED EXP	V0018-10	DESIGNED	ROSS NETTLE
SEWER MANHOLE	⊗	PRES. DETECT	V0005-17	CHECKED	
TELECOM PIT	⊙	SSG DIS. SEQ.	V0018-8		
ELECT LIGHT POLE	○				
POWER POLE	○				
STAY POLE	○				
TELEPHONE BOX	⊗	SURVEYOR	TAYLOR-TOMPSON	DATE	21/11/00
TELECOM PILLAR	⊙	DATE	2000	RECOMMENDED	

APPROVED	THIS DRAWING IS RECOMMENDED FOR ACCEPTANCE
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES	NETWORK OPERATIONS TEAM LEADER
NAME: ROSS NETTLE	DATE: 11/01/01
POSITION: DIRECTOR	DATE: 21/11/01
DATE: 10-01-01	DATE: 21-11-01

Roads and Traffic Authority, N.S.W.
MANLY COUNCIL AREA
TRAFFIC SIGNALS AT INTERSECTION OF
EAST ESPLANADE,
WENTWORTH STREET & ACCESS ROAD
MANLY
DESIGN LAYOUT
TCS No 3030

DESIGN OFFICE PARRAMATTA - SYDNEY TECHNICAL SERVICES		ISSUE
CADD FILE: VV3030_1D.dgn		D
SCALE 1:2000		
FILE 279 TS 176	SUPERSEDES SHEET/ISSUE	
REGN. 7000.279.VV.3030		SHEET 1

Appendix C

SIDRA outputs

MOVEMENT SUMMARY

Site: TSC1 [West Esplanade / Belgrave Street (AM) - SH (Site Folder: General)]

Network: N101 [AM Peak Hour (Network Folder: General)]

8:15 - 9:15 AM

Site Category: Base Year

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h HV] %		ARRIVAL FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: West Esplanade (East)														
5	T1	298	5.7	298	5.7	* 0.389	21.9	LOS C	9.3	67.8	0.64	0.55	0.64	16.2
6	R2	250	8.0	250	8.0	* 0.385	24.0	LOS C	8.5	63.3	0.70	0.74	0.70	14.8
Approach		548	6.8	548	6.8	0.389	22.8	LOS C	9.3	67.8	0.66	0.64	0.66	15.5
North: Belgrave Street (North)														
7	L2	355	10.4	355	10.4	0.288	25.3	LOS C	6.6	50.1	0.71	0.69	0.71	7.9
9	R2	111	21.6	111	21.6	* 0.312	39.1	LOS D	4.9	41.1	0.86	0.74	0.86	10.4
Approach		466	13.1	466	13.1	0.312	28.6	LOS C	6.6	50.1	0.74	0.70	0.74	8.8
West: West Esplanade (West)														
10	L2	106	3.8	106	3.8	0.165	14.3	LOS B	2.7	19.3	0.50	0.57	0.50	18.2
11	T1	296	4.1	296	4.1	* 0.896	56.8	LOS E	17.8	129.3	0.96	1.10	1.32	5.6
Approach		402	4.0	402	4.0	0.896	45.6	LOS D	17.8	129.3	0.84	0.96	1.10	7.5
All Vehicles		1416	8.1	1416	8.1	0.896	31.2	LOS C	17.8	129.3	0.74	0.75	0.81	10.8

MOVEMENT SUMMARY

Site: TSC2 [West Esplanade / Wentworth Street (AM) - SH (Site Folder: General)]

Network: N101 [AM Peak Hour (Network Folder: General)]

8:15 - 9:15 AM

Site Category: Base Year

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h HV] %		ARRIVAL FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Access Road (South)														
1	L2	1	0.0	1	0.0	0.010	35.3	LOS D	0.2	1.1	0.78	0.55	0.78	5.4
2	T1	2	0.0	2	0.0	0.010	33.4	LOS C	0.2	1.1	0.78	0.55	0.78	11.3
3	R2	1	0.0	1	0.0	0.010	35.6	LOS D	0.2	1.1	0.78	0.55	0.78	10.6
Approach		4	0.0	4	0.0	0.010	34.4	LOS C	0.2	1.1	0.78	0.55	0.78	9.9
East: West Esplanade (East)														
4	L2	1	0.0	1	0.0	0.412	12.4	LOS B	11.4	85.1	0.53	0.47	0.53	20.2
5	T1	438	7.3	438	7.3	0.412	10.5	LOS B	11.4	85.1	0.53	0.47	0.53	16.3
Approach		439	7.3	439	7.3	0.412	10.5	LOS B	11.4	85.1	0.53	0.47	0.53	16.3
North: Wentworth Street (North)														
7	L2	10	0.0	10	0.0	* 0.056	42.3	LOS D	0.8	5.3	0.86	0.64	0.86	11.8
8	T1	7	0.0	7	0.0	0.056	40.3	LOS D	0.8	5.3	0.86	0.64	0.86	10.1
9	R2	116	9.5	116	9.5	0.314	38.4	LOS D	5.1	38.7	0.85	0.74	0.85	8.3
Approach		133	8.3	133	8.3	0.314	38.8	LOS D	5.1	38.7	0.85	0.73	0.85	8.8
West: West Esplanade (West)														
10	L2	243	4.1	243	4.1	0.274	12.5	LOS B	4.7	33.9	0.39	0.53	0.39	21.4
11	T1	297	13.1	297	13.1	0.315	2.8	LOS A	2.0	15.8	0.13	0.13	0.13	26.8
12	R2	11	0.0	11	0.0	* 0.315	5.1	LOS A	2.0	15.8	0.13	0.13	0.13	26.9
Approach		551	8.9	551	8.9	0.315	7.1	LOS A	4.7	33.9	0.25	0.31	0.25	24.0
All Vehicles		1127	8.2	1127	8.2	0.412	12.3	LOS B	11.4	85.1	0.43	0.42	0.43	18.5

MOVEMENT SUMMARY

Site: TSC1 [West Esplanade / Belgrave Street (PM) - SH (Site Folder: General (2))]

Network: N101 [PM Peak Hour (Network Folder: General)]

5:00 - 6:00 PM

Site Category: Base Year

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h HV] %		ARRIVAL FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: West Esplanade (East)														
5	T1	255	3.5	255	3.5	* 0.334	21.2	LOS C	4.6	33.1	0.60	0.51	0.60	16.4
6	R2	218	0.5	218	0.5	* 0.302	20.4	LOS C	4.9	34.1	0.75	0.70	0.75	16.0
Approach		473	2.1	473	2.1	0.334	20.9	LOS C	4.9	34.1	0.67	0.60	0.67	16.2
North: Belgrave Street (North)														
7	L2	309	2.9	309	2.9	0.226	23.9	LOS C	3.2	23.3	0.68	0.67	0.68	8.3
9	R2	135	14.8	135	14.8	* 0.408	39.6	LOS D	3.7	29.5	0.87	0.75	0.87	10.3
Approach		444	6.5	444	6.5	0.408	28.7	LOS C	3.7	29.5	0.74	0.69	0.74	9.1
West: West Esplanade (West)														
10	L2	82	1.2	82	1.2	0.089	14.1	LOS B	1.2	8.8	0.49	0.56	0.49	18.4
11	T1	224	0.9	224	0.9	* 0.653	38.4	LOS D	6.4	45.1	0.91	0.76	0.92	7.7
Approach		306	1.0	306	1.0	0.653	31.9	LOS C	6.4	45.1	0.80	0.71	0.80	9.7
All Vehicles		1223	3.4	1223	3.4	0.653	26.5	LOS C	6.4	45.1	0.73	0.66	0.73	12.0

MOVEMENT SUMMARY

Site: TSC2 [West Esplanade / Wentworth Street (PM) - SH (Site Folder: General (2))]

Network: N101 [PM Peak Hour (Network Folder: General)]

5:00 - 6:00 PM

Site Category: Base Year

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Access Road (South)														
1	L2	11	0.0	11	0.0	0.040	35.0	LOS D	0.4	2.9	0.78	0.61	0.78	5.5
2	T1	5	0.0	5	0.0	0.040	33.1	LOS C	0.4	2.9	0.78	0.61	0.78	11.3
3	R2	1	0.0	1	0.0	0.040	35.3	LOS D	0.4	2.9	0.78	0.61	0.78	10.6
Approach		17	0.0	17	0.0	0.040	34.5	LOS C	0.4	2.9	0.78	0.61	0.78	7.9
East: West Esplanade (East)														
4	L2	1	0.0	1	0.0	0.303	11.5	LOS B	4.9	34.7	0.48	0.42	0.48	20.9
5	T1	333	2.1	333	2.1	0.303	9.5	LOS A	4.9	34.7	0.48	0.42	0.48	16.9
Approach		334	2.1	334	2.1	0.303	9.5	LOS A	4.9	34.7	0.48	0.42	0.48	17.0
North: Wentworth Street (North)														
7	L2	25	0.0	25	0.0	0.103	43.8	LOS D	0.8	5.7	0.87	0.68	0.87	11.4
8	T1	4	0.0	4	0.0	0.103	41.8	LOS D	0.8	5.7	0.87	0.68	0.87	9.8
9	R2	136	7.4	136	7.4	* 0.390	39.2	LOS D	3.8	27.9	0.87	0.76	0.87	8.2
Approach		165	6.1	165	6.1	0.390	39.9	LOS D	3.8	27.9	0.87	0.75	0.87	8.9
West: West Esplanade (West)														
10	L2	172	0.6	172	0.6	0.189	14.7	LOS B	2.4	16.6	0.45	0.56	0.45	20.2
11	T1	352	2.8	352	2.8	0.337	2.9	LOS A	1.6	11.1	0.14	0.13	0.14	26.8
12	R2	9	0.0	9	0.0	* 0.337	5.1	LOS A	1.6	11.1	0.14	0.13	0.14	26.9
Approach		533	2.1	533	2.1	0.337	6.7	LOS A	2.4	16.6	0.24	0.27	0.24	24.1
All Vehicles		1049	2.7	1049	2.7	0.390	13.3	LOS B	4.9	34.7	0.43	0.40	0.43	18.0



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→ **The Power of Commitment**

Appendix H

Procedure for Aboriginal Cultural Heritage Consultation and Investigation

29 July 2022

Lisa Monaghan
Business Partner
Infrastructure and Place
Transport for NSW

Dear Lisa Monaghan

Preliminary assessment results for *Manly Wharf 3* based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist (see attached), was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure, however, the cultural heritage potential of the study area appears to be reduced due to past disturbances such as the construction of the existing wharves and landscaping of the foreshore.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff Christopher Williams to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Archaeological Finds Procedure*.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely / faithfully

A handwritten signature in cursive script that reads "Noni Ross".

Noni Ross
Aboriginal Cultural and Heritage Officer – Sydney
Transport for NSW

Appendix I

Statement of Heritage Impact


Manly Wharf 3 Transport Access Program Upgrade

Statement of Heritage Impact

Report to GHD

October 2022



 artefact

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Document history and status

Revision	Date issued	Author	Reviewed by	Date approved	Revision type
1	17 June 2022	Gabriela McPherson	Scott MacArthur	17 June 2022	17 June 2022
2	19 July 2022	Gabriela McPherson	Scott MacArthur	19 July 2022	Updated based on Client comments
3	21 July 2022	Gabriela McPherson	Scott MacArthur	22 July 2022	Final
4	05 October 2022	Jess Mauger	Scott MacArthur	05 October 2022	Final

Project number & name:	21070 Manly Wharf Statement of Heritage Impact
Authors:	David Ward, Gabriela McPherson
Project manager:	Scott MacArthur
Name of organisation:	Artefact Heritage
Document version:	Final Revision – Revision 4

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EXECUTIVE SUMMARY

Project Background

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Manly Wharf 3 is located within the Local Government Authority (LGA) area of the Northern Beaches, about 11 kilometres northeast of Circular Quay. The Manly Wharf Complex is located at the western end of Manly Cove and includes two ferry terminals (Wharf 1 and 2), a third tidal step wharf (Wharf 3), a restaurant and retail precinct. It also supports a transport interchange which includes a bus interchange, kiss and ride and cycle parking. Wharves 1 and 2 (constructed 1941) currently operate Sydney Ferries (TransDev) and Manly Fast Ferries vessels serving as the primary embarkation/disembarkation point for the Manly to Sydney ferries. The Manly Fun Pier, constructed 1931, was demolished in the 1990s and replaced by the current Wharf 3, which serves commercial commuter services, commercial vessels (including cruises) on a booking basis.

In its current configuration, Manly Wharf 3 (Wharf 3) does not meet the *Disability Standards for Accessible Public Transport (DSAPT)* or *Disability Discrimination Act 1992 (DDA)* requirements, as it does not allow for equitable access to the wharf or boarding of the ferry. Transport for New South Wales (TfNSW) have identified the following objectives as part of the project Review of Environmental Factors (REF):

- Provide facilities that are accessible to the disabled, ageing and parents with prams
- Provide a reliable and durable ferry wharf that is suitable for all ferry operations in this location
- Provide an additional wharf to service smaller commercial and recreational vessels
- Provide comfortable and protected environments for customers from sunny to wet and windy weather while accessing and waiting for transport services
- Provide service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- Provide safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- Provide efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

To achieve the above objectives the proposed works (the proposal) include:

- Partial removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- Retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- Construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- Construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- A new public seating space / rest 'slow space' within the new public promenade area
- Construction of a new covered main waiting area accessed via the new promenade area
- Installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- Installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels
- Construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. Water taxis) and recreational vessels at a range of tidal levels.
- Construction of a new vessel arrestor at Wharf 3
- Construction of two new separation piles between Wharves 2 and 3
- Limited dredging of material at the Wharf 3 berth pocket area
- Upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- Wharf booking information screens system
- Providing conduits for opal readers to be installed in the future if required.

Artefact Heritage (Artefact) has been engaged by GHD to provide a Statement of Heritage Impact (SOHI) to assess the potential heritage impacts of the above proposal on the Manly Wharf Complex and provide the relevant mitigation measures and recommendations to avoid or reduce the heritage impacts of the proposal on the Manly Wharf Complex.

Conclusion

This report concludes the following:

- The proposed works will result in a **minor positive** indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and wharf 1 and 2) and have a **major adverse** direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it will involve the partial demolition of the existing 1990s structures. The proposed works will:
 - Make the precinct more easily accessible
 - Increase the amount of public domain and seating space encouraging more people to dwell within the Manly Wharf area
 - Compliment the wharf precinct by adding to the wharf amenity
 - Retain all existing significant fabric
 - Retain the existing commercial uses within the wharf
 - Be consistent with the ongoing operation of the area as a wharf precinct
 - Future proofing the wharf by increasing the functional capacity for vessels and passengers
- The proposed works have been designed to be sympathetic in design and scale with the existing Manly Wharf, therefore resulting in a **moderate positive** impact to the heritage significance of the site.
- The construction works could result in **minor adverse** impacts on the heritage significance of the Manly Wharf listing, and therefore the recommendations below should be followed mitigate the potential impacts on the heritage significance of the site.
- The new wharf will have **major adverse** indirect impact on the heritage significance of the Manly Pier (wharf 3) as it will result in its demolition. Despite this, the proposed new Wharf 3 scale and design will result in a **minor positive** impact on the heritage significance of the entire Manly Wharf precinct.
- Refer to *Manly Wharf 3 upgrade – Maritime Archaeological Assessment* written by Comber Consultants, dated 6th July 2022 for impacts on maritime archaeology

Recommendations

General Recommendations

The following management guidelines should be followed for all aspects of the proposed works:

- The works have been designed to minimise and avoid impacts on original and highly significant fabric. However, works that require impacts to original fabric, i.e. the proposed connection between the new Wharf 3, and highly significant fabric of Wharf 2, should be 'made good' once works are complete, in accordance with the guidelines, *How to Carry Out Work on Heritage Buildings & Sites* (NSW Heritage Office 2002). This could include:
 - Reinstating/replacing fabric with identical materials;
 - Where internal surfaces are to be made good after works, care should be taken to ensure that modern materials and finishes that match existing are used for repair work; and
 - Repair should generally match the original element but should be identifiable as new work.
- Where the works could impact original and highly significant heritage fabric, only tradespersons with experience in working with modern heritage materials should undertake works;
- The methods, tools and materials used should not cause inadvertent damage to original and highly significant heritage fabric within the study areas. Should unexpected damage to significant historic fabric occur, the advice of a heritage specialist should be sought before repairs are made;
- All works are to be undertaken in accordance with the principles and objectives of the *Burra Charter: the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (the *Burra Charter*);
- Where options exist for alternative installation methodologies and materials, that achieve the desired functional outcome, preference should be given to the option that has the least deleterious impact on significant heritage fabric.
- A site interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include interpretation surrounding any reclaimed or salvaged material proposed for reuse in the project. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf.
- A site signage strategy should be developed and implemented across all TfNSW Wharf assets as part of the proposed works to ensure the signage does not negatively impact on the significant fabric.

Design Recommendations

Prior to the finalisation of the detailed design, the following elements should be reviewed by a suitably qualified heritage specialist. The purpose of this review is to minimise or mitigate the direct and indirect impacts of the proposed works on the significance of Manly Wharf and the retained highly significant fabric:

- The interface detail between the new boardwalk and Wharf 2.
- The potential gangway roof structure.
- The proposed painting colour scheme.
- The implementation of the proposed signage strategy.
- The implementation of the proposed interpretation strategy (including any materials salvaged and proposed for reuse within the project).
- Any salvaged materials proposed for reuse.

Protection of Heritage Fabric During Works

The following recommendations and mitigation measures are provided to minimise potential direct impact to original and highly significant fabric of the subject sites:

- A Construction Cultural Heritage Management Plan management plan (CCHMP) should be produced and reviewed by a suitably qualified heritage consultant prior to the commencement of work. The CMP should set out appropriate fabric protection to be installed to all adjacent significant fabric for the duration of the works , and the proposed noise and vibration monitoring which will be implemented for the duration of the works

The following recommendations and mitigation measures are provided in order to minimise potential indirect impacts to the heritage items in the vicinity:

- If any inadvertent damage occurs to original and highly significant fabric within and in the vicinity of the study area due to the proposed works, the damage must be reported immediately to the Project Manager and the relevant Heritage Specialists. Damage is to be made good in accordance with specialist heritage advice.

Mitigation measures

To mitigate any potential impacts of the proposed works on the significance of the site, a site interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include any reclaimed or salvaged material. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf.

Prior to the commencement of works a Photographic Archival Recording (PAR) should be undertaken of the project site. The PAR should record all elements proposed for demolition within the project boundary, including Manly Pier (Wharf 3), and their interface with the retained highly significant fabric only. Archival recording should be carried out by measured drawing and photographically in accordance with NSW Heritage Council guidelines: *'How to Prepare Archival Records of Heritage items'* and *'Photographic Recording of Heritage Items Using Film or Digital Capture'* and the final document should be lodged with the State Library of NSW.

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1.0 INTRODUCTION

1.1 Project background

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Manly Wharf 3 is located within the Local Government Authority (LGA) area of the Northern Beaches, about 11 kilometres northeast of Circular Quay. The Manly Wharf Complex is located at the western end of Manly Cove and includes two ferry terminals (Wharf 1 and 2), a third tidal step wharf (Wharf 3), a restaurant and retail precinct. It also supports a transport interchange which includes a bus interchange, kiss and ride and cycle parking. Wharves 1 and 2 (constructed 1941) currently operate Sydney Ferries (TransDev) and Manly Fast Ferries vessels serving as the primary embarkation/disembarkation point for the Manly to Sydney ferries. The Manly Fun Pier, constructed 1931, was demolished in the 1990s and replaced by the current Wharf 3, which serves commercial commuter services, commercial vessels (including cruises) on a booking basis.

In its current configuration, Manly Wharf 3 (Wharf 3) does not meet the *Disability Standards for Accessible Public Transport (DSAPT)* or *Disability Discrimination Act 1992 (DDA)* requirements, as it does not allow for equitable access to the wharf or boarding of the ferry.

Artefact Heritage (Artefact) has been engaged by GHD to provide a Statement of Heritage Impact (SOHI) to assess the potential heritage impacts of the above proposal on the Manly Wharf Complex and provide the relevant mitigation measures and recommendations to avoid or reduce the heritage impacts of the proposal on the Manly Wharf Complex.

1.2 Site location

The subject site is located within what is commonly known as Manly Wharf. Manly Wharf is located at the junction of East Esplanade, West Esplanade and Belgrave Street in Manly, NSW, 2095. It is located within the Northern Beaches Local Government Area (LGA) and comprises of Lot 1, 2 and 3 of DP 1170245. The Wharf is situated in the crescent-shaped Manly Cove between Smedley's Point, Manly Point and Federation Point.



Figure 1: Main entry to Manly Wharf 1 and 2. Source: Artefact, 2022



Figure 2: Aerial view of Manly Wharf 1 and 2 (orange), Manly Wharf Bar seating area (green) and Manly Wharf 3 (blue). Source: Northern Beaches Review, 2022¹ with Artefact overlay

¹ Morton, Nadine, "Manly Aquarium, wharf" Crews investigating Manly Cove sites ahead of upgrades' Northern Beaches Review, 1 October 2021n



Figure 3: View of Manly Wharf 1 and 2 (orange), Manly Wharf Bar seating area (green) and Manly Wharf 3 (blue) from the ocean. Source: Artefact, 2022

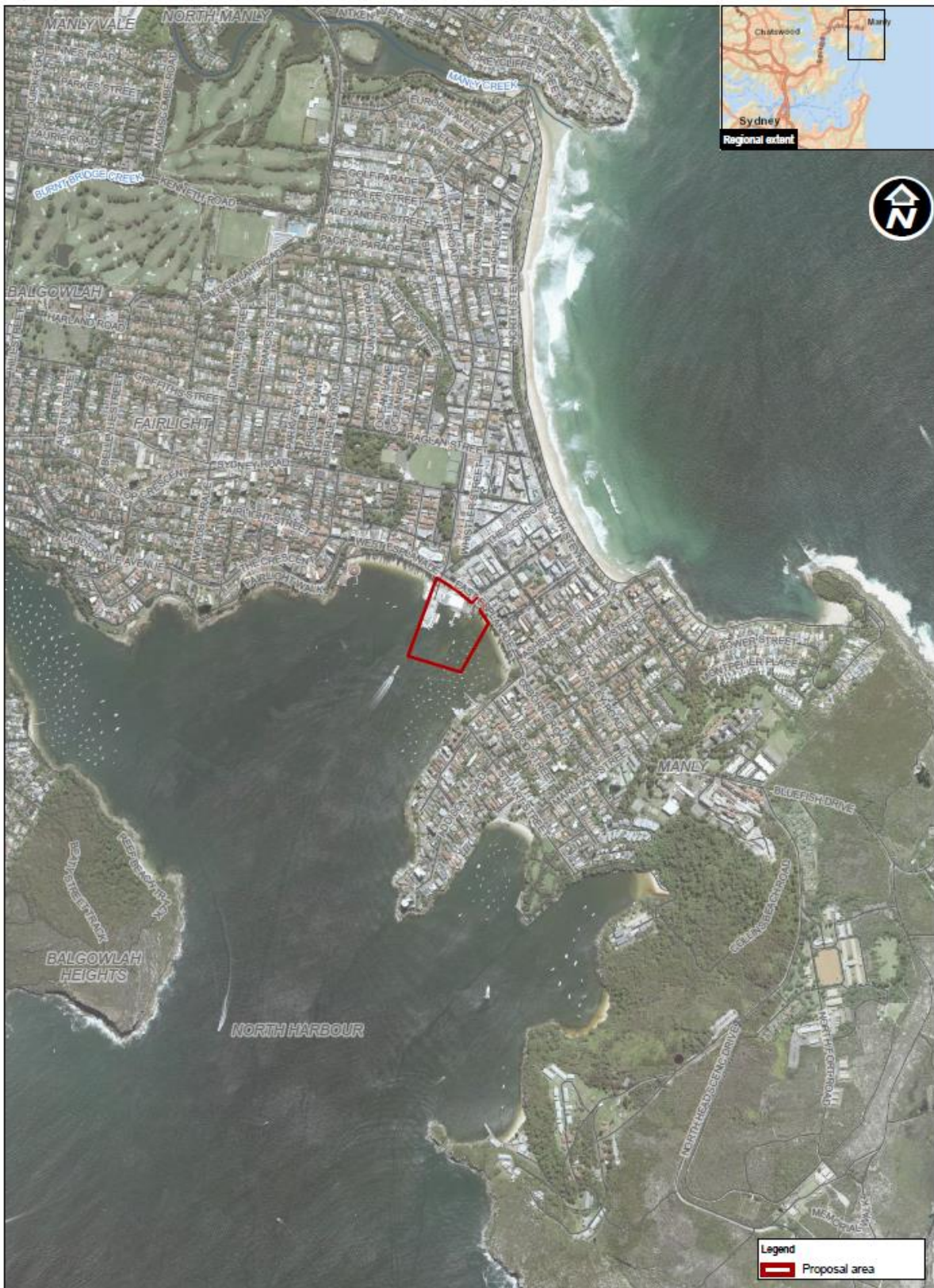


Figure 1.1 - Regional Setting

Figure 4: Regional setting of study area (Manly) and subject site (Manly Wharf). Source: Transport for New South Wales (TfNSW), 2022



Document Path: D:\GIS\GIS_Mapping\21070_Manly_Wharf_REF\MXD\Subject_site.mxd

Figure 5: Map of study area (Manly) and subject site (Manly Wharf). Source: Artefact, 2021



Figure 1.2 - Local Setting

Figure 6: Map of subject site (Manly Wharf) within the local context of Manly. Source: TfNSW 2022

1.3 Proposed works

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 and build a new Wharf 4 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. In its current configuration, Manly Wharf 3 (Wharf 3) does not meet the *Disability Standards for Accessible Public Transport (DSAPT)* or *Disability Discrimination Act 1992 (DDA)* requirements, as it does not allow for equitable access to the wharf or boarding of the ferry. Transport for New South Wales (TfNSW) have identified the following objectives as part of the project Review of Environmental Factors (REF):

- Provide facilities that are accessible to the disabled, ageing and parents with prams
- Provide a reliable and durable ferry wharf that is suitable for all ferry operations in this location
- Provide an additional wharf to service smaller commercial and recreational vessels
- Provide comfortable and protected environments for customers from sunny to wet and windy weather while accessing and waiting for transport services
- Provide service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- Provide safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- Provide efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

To achieve the above objectives the proposed works (the proposal) include:

- Partial removal of the existing 1990s Manly Wharf 3 timber wharf structure, piles and triangular platform
- Retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- Construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- Construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- A new public seating space / rest 'slow space' within the new public promenade area
- Construction of a new covered main waiting area accessed via the new promenade area
- Installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- Installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels

- Construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. Water taxis) and recreational vessels at a range of tidal levels.
- Construction of a new vessel arrestor at Wharf 3
- Construction of two new separation piles between Wharves 2 and 3
- Limited dredging of material at the Wharf 3 berth pocket area
- Upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- Wharf booking information screens system
- Providing conduits for opal readers to be installed in the future if required.

The key features of the proposal are illustrated in Section 6.0.



Figure 1.3 - Key features of the proposal

Figure 7: Site map showing key features of Manly Wharf 3 proposal. Source: TfNSW 2022

1.4 Report methodology

The following SoHI has been prepared in accordance with the following guidance documents:

- *Assessing Heritage Significance*, NSW Heritage Office, 2001
- *Statements of Heritage Impact*, NSW Heritage Office and Department of Urban Affairs & Planning, 2002
- *Design in Context: Guidelines for Infill Development in the Historic Environment*, NSW Heritage Office and Royal Australian Institute of Architects, 2005
- *The Burra Charter*, Australia ICOMOS (The International Council on Monuments and Sites), 2013.

1.5 Report limitations

This SoHI addresses the proposed works to Wharf 3 as part of the TfNSW TAP upgrades only.

This report assesses the built heritage (non-Aboriginal) impacts of the proposal to Wharf 3 and its surrounds in the context of the wider Manly Wharf site. Aboriginal cultural heritage is not assessed as part of this report. This SoHI has been informed by, and should be read in conjunction with, the following reports:

- *Manly Ferry Wharf, Conservation Management Plan*, Architectural Projects, 2011
- *Manly Wharf, Statement of Heritage Impact*, GML, 2003
- *Manly Wharf, State Heritage Inventory Report*, Heritage NSW, 2021
- *Manly Wharf 3 Concept Design: Key Stakeholder Workshop 1*, 9 July 2021

1.6 Authorship

This report was prepared by David Ward (Heritage Consultant) and Gabriela McPherson (Heritage Consultant), finalised by Jess Mauger (Senior Heritage Consultant) and reviewed by Scott MacArthur (Principal).

2.0 STATUTORY CONTEXT

2.1 Overview

This section discusses the relevant heritage management framework applicable to the proposed works and to the study area. This overview includes information about all statutory and non-statutory registers and planning instruments relevant to heritage management at all three levels of government.

2.2 Identification of heritage listed items

There are several items of legislation potentially relevant to the study area: heritage listed items within and adjacent to the study area were searched for on the following relevant state and federal statutory heritage registers:

- World Heritage List (WHL)
- Commonwealth Heritage List (CHL)
- National Heritage List (NHL)
- State Heritage Register (SHR)
- Manly Local Environmental Plan (LEP) 2013
- Section 170 Heritage and Conservation Registers.

Non-Statutory registers were also searched, including:

- Register of the National Estate (RNE)
- Documentation and Conservation of buildings, sites and neighbourhoods of the Modernist Movement (DOCOMOMO)
- Australian Institute of Architects Register of Significant Architecture
- The National Trust (NSW).

Refer to Section 2.3, Table 1 and Table 2 for details of Statutory and Non-Statutory heritage listings of the Manly Wharf, and items in the near vicinity

2.1 Relevant legislation

2.1.1 NSW Heritage Act 1977

The *NSW Heritage Act 1977* (Heritage Act) is the primary legislation affording protection to heritage items in NSW. Under the Heritage Act, 'items of environmental heritage' include places, buildings, works, relics, moveable objects, and precincts identified as significant. Significance is based on historical, scientific, cultural, social, archaeological, architectural, natural, or aesthetic values. State significant items can be listed on the NSW SHR and are given automatic protection under the

Heritage Act against any activities that may damage an item or affect its heritage significance. The Heritage Act also protects 'relics', which can include archaeological material, features, and deposits.

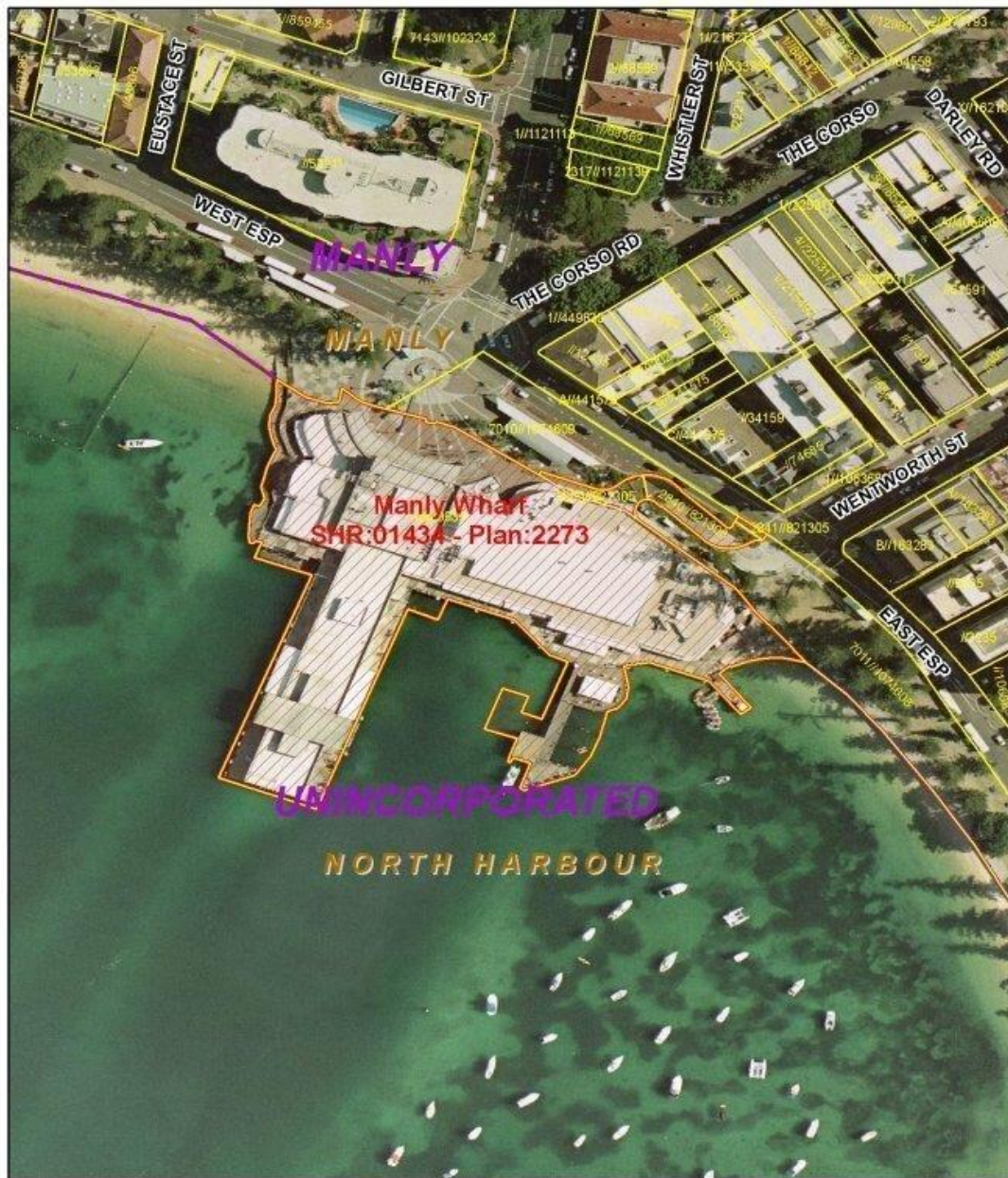
Under the Heritage Act, all government agencies are required to identify, conserve, and manage heritage items in their ownership or control. Section 170 of the Act requires all government agencies to maintain a Heritage and Conservation Register that lists all heritage assets and an assessment of the significance of each asset. They must also ensure that all items inscribed on its list are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Government on advice of the NSW Heritage Council.

2.1.2 State Heritage Register (SHR)

The SHR was established under Section 22 of the Heritage Act. It is a list of places and objects of importance to the people of NSW, including archaeological sites. It is administered by Heritage NSW and includes a diverse range of over 1,500 items, in both private and public ownership. To be listed, an item is deemed to be of heritage significance for the whole of NSW. To carry out activities within the curtilage of an item listed on the SHR, approval must be gained from the Heritage Council through a Section 60 permit. In some circumstances, under Section 57(2) of the Heritage Act, a Section 60 permit may not be required if works are undertaken in accordance with Standard Exemptions for Works Requiring Heritage Council Approval, through agency specific exemptions or site-specific exemptions in an endorsed Conservation Management Plan (CMP) or as part of the gazettal of the item where works are minor and have minimal or no impact on the heritage significance of the place.

Manly Wharf is listed as an item of State significance on the SHR (item no. 01434).

Heritage Council of New South Wales
Plan under the Heritage Act, 1977



State Heritage Register

Gazettal Date: 18 April 2000

0 10 20 40 60 80
Metres

Scale: 1:2,000

Produced by: Naomi Nelson

Legend

-  SHR Curtilage
-  Land Parcels
-  LGAs
-  Suburbs

Figure 8: State Heritage Register curtilage for Manly Wharf. Source: Heritage NSW²

² NSW Heritage, accessed 9 June 2021,
<https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=5051365>

2.1.3 Section 170 Heritage and Conservation Register

Under the Heritage Act all government agencies are required to identify, conserve, and manage heritage items in their ownership or control. Section 170 (S170) requires all government agencies to maintain a Heritage and Conservation Register listing all heritage assets. They must ensure that all items inscribed on its list are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Government on advice of the NSW Heritage Council.

Manly Wharf is listed as an item of state significance on the Roads and Maritime (now Transport for NSW) S170 Register (item no. 4920067).

2.1.4 Environmental Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) provides a legislative framework for the protection and management of matters of national environmental significance, that is, flora, fauna, ecological communities, and heritage places of national and international importance. Heritage items are protected through their inscription on the World Heritage List (WHL), Commonwealth Heritage List (CHL), or the National Heritage List (NHL). The EPBC Act stipulates that a person who has proposed an action that will, or is likely to, have a significant impact on a World, National or Commonwealth Heritage site must refer the action to the Minister for Sustainability, Environment, Water, Population and Communities (hereafter Minister). The Minister will then determine if the action requires approval under the EPBC Act. If approval is required, an environmental assessment would need to be prepared. The Minister would approve or decline the action based on this assessment. A significant impact is defined as “an impact which is important, notable, or of consequence, having regard to its context or intensity.” The significance of the action is based on the sensitivity, value and quality of the environment that is to be impacted, and the duration, magnitude, and geographic extent of the impact. If the action is to be undertaken in accordance with an accredited management plan, approval is not needed, and the matter does not need to be referred to the Minister.

The subject site is not listed on the CHL or NHL. However, the subject site is located within 3km of North Head which is listed on the following registers under the EPBC Act:

- Commonwealth Heritage List: North Head Artillery Barracks, Historic, Listed Place, ID 105431
- National Heritage List: North Head, Historic, Listed Place, ID 105759

The proposal would not impact either of these listings.

2.1.5 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land using planning and development consent processes. The EP&A Act requires that environmental impacts be considered prior to land

development; including impacts on cultural heritage items and places, and archaeological sites and deposits. Proposed works are subject to assessment under Part 5 of the EP&A Act. The EP&A Act also requires that local governments prepare planning instruments (such as Local Environmental Plans – LEPs – and Development Control Plans – DCPs) in accordance with the EP&A Act to provide guidance on the level of environmental assessment required.

2.1.5.1 Manly Local Environmental Plan 2013

Planning decisions within Local Government Areas (LGAs) are guided by Local Environmental Plans (LEPs). The study area falls within the boundaries of the Northern Beaches LGA and is subject to the *Manly Local Environmental Plan 2013*.

Clause 5.10 of the *Manly Local Environmental Plan 2013* outlines the following objectives pertaining to heritage conservation:

1) *Objectives The objectives of this clause are as follows—*

(a) *to conserve the environmental heritage of Manly,*

(b) *to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,*

(c) *to conserve archaeological sites,*

(d) *to conserve Aboriginal objects and Aboriginal places of heritage significance.*³

The subject site of Manly Wharf is identified an item of State significance listed under item no. 145 in Schedule 5 of the Manly LEP 2013.

The Pier (former Fun Pier, Manly Wharf) is listed as an item of local significance under item no. 146 of the Manly LEP 2013.

2.1.5.2 Manly Development Control Plan 2013

The Manly Development Control Plan 2013 (DCP) was developed in accordance with Section 74C of the EP&A Act. It is to be read in conjunction with the *Manly LEP 2013*. The DCP supplements the LEP and provides more detailed provisions to guide development.

Section 5.1.2.5 “Critical Views to be Kept Open” states the following in reference to Manly Wharf:

5.1.2.5 Critical Views to be Kept Open

a) Part of the significance and character of The Corso derives from the views from within the street space out to Manly Cove and to the Ocean Beach. Two longer

³ NSW Government, “Manly Local Environmental Plan 2013,” 2013, <https://legislation.nsw.gov.au/view/html/inforce/current/epi-2013-0140#statusinformation>.

views within the visual catchment of The Corso are from Sydney Harbour as the ferry approaches Manly Wharf; and down Sydney Road, from Fairlight looking east to Shelly Beach headland.

b) Critical views identified in a) above must be protected from intrusion and are to be kept open.⁴

2.1.6 State Environmental Planning Policy (Transport and Infrastructure) (TISEPP) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (the Transport and Infrastructure SEPP) aims to facilitate the effective delivery of transport and infrastructure across NSW. The Transport and Infrastructure SEPP assists local government, the NSW Government and the communities they support, by simplifying the process for providing essential infrastructure in areas such as education, hospitals, roads and railways, emergency services, water supply and electricity delivery.

The Transport and Infrastructure SEPP outlines the planning rules for these works and facilities, including:

- Where such development can be undertaken.
- What type of infrastructure development can be approved by a public authority under Part 5 of the EP&A Act following an environmental assessment (REF) (known as ‘development without consent’)
- What type of development can be approved by the relevant local council, Minister for Planning or Department of Planning under Part 4 of the EP&A Act (known as ‘development with consent’)
- What type of development is exempt or complying development
- The relationship of other statutory planning instruments to the Transport and Infrastructure SEPP.

This SOHI will form part of the REF submission to Transport for NSW for assessment under Part 5 of the EP&A Act. While the TISEPP overrides the controls included in the LEPs and DCPs, the proponent is required to consult with the relevant local councils when development “is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area”.

The proposal triggers the notification requirements with Northern Beaches Council under the following sections of TISEPP:

Section 2.10 (1)(e) - Would the work involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council

⁴ Northern Beaches Council, “Manly Development Control Plan 2013,” 2013.

management or control? If so, would this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?

Section 2.11 (1) – Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential? [relevant listings Manly Wharf (SHI: 4920067; LEP: I145 and I146)]

Section 2.14 - Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?

Transport for NSW has been consulting with Northern Beaches Council since July 2021 to develop a design with consideration of their feedback.

2.1.7 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Manly Wharf is listed as a Heritage Item of State significance in SEPP (Biodiversity and Conservation) 2021 Part 2 (and the Sydney and Middle Harbour Heritage Map) as item 18. The heritage provisions in relation to the Sydney Harbour Catchment are in Chapter 10.5 in the Biodiversity and Conservation SEPP. This outlines the protection of heritage items within the Sydney Harbour catchment area and what kinds of development can occur at or near a heritage item with or without consent from the relevant consent authority. The Heritage provisions in the SEPP Chapter 10.5 generally reflect the current model heritage provisions prepared by Heritage NSW and aim to protect places and items of Aboriginal and non-Aboriginal heritage significance and views associated with the heritage significance of heritage items.

2.2 Non-statutory registers

2.2.1 National Trust Register (NSW)

The National Trust was established in 1945. The Trust's mission is to safeguard the built, natural, and cultural heritage of Australia for future generations. The National Trust owns or manages over 300 heritage places across Australia, and the National Trust of Australia (NSW) maintains a Register of landscapes, townscapes, buildings, industrial sites, cemeteries and other items or places which the Trust deems to have cultural significance worthy of conservation. Currently, there are over 12,000 items on the Trust's Register.

Manly Wharf is listed on the National Trust Register and falls within the curtilage of the National Trust "Manly Urban Conservation Area."

2.2.2 Documentation and Conservation of Buildings, Sites and Neighbourhoods of the Modernist Movement, Australia (DOCOMOMO)

DOCOMOMO Australia is a national non-for-profit organisation established in 1999. The organisation documents and conserves significant places from the Modernist Movement.

Manly Wharf is recognised on the DOCOMOMO Register.

2.3 Heritage listings

2.3.1 Statutory heritage listings – summary

Statutory registers provide legal protection for heritage items. In NSW, the Heritage Act and the EP&A Act provide for heritage listings. The SHR, the Section 170 Heritage & Conservation Registers and the environmental heritage schedules of LEPs and SEPPs are statutory listings. Places on the World, National and Commonwealth Heritage Lists are protected under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). A search of all relevant registers was undertaken in April 2022. This search found twenty-one items listed on statutory heritage registers within the vicinity of Manly Wharf.

The result of the statutory heritage register search is provided in Table 1 and in Figure 9.

Table 1: Statutory heritage listings for Manly Wharf and nearby items

Item	Address	Significance	Listing	Place ID (Item No.)	Distance from Subject site
Manly Wharf					
Manly Wharf	West Esplanade, Manly, NSW, 2095	State	SHR	#01434	Within
Manly Wharf	West Esplanade, Manly, NSW, 2095	State	SREP 26	Sch.4, Item 18	Within
Manly Wharf (façade and street returns only)	West Esplanade, Manly, NSW, 2095	State	RMS S170	#4920067	Within
Manly Wharf	East and West Esplanades, Manly, NSW, 2095	State	Manly LEP 2013	#1145	Within

Item	Address	Significance	Listing	Place ID (Item No.)	Distance from Subject site
Pier (former fun Pier, Manly Wharf)	East and West Esplanades, Manly, NSW, 2095	Local	Manly LEP 2013	#1146	Within
Heritage Conservation Areas					
Manly Town Centre Heritage Conservation Area (LEP)		Local	Manly LEP 2013	C2	40m
East Esplanade					
Two terrace houses	41–42 East Esplanade, Manly, NSW, 2095	Local	Manly LEP 2013	#1150	65m
Manly Rowing, Sailing, Yacht and Launch Club	East Esplanade, Manly, NSW, 2095	Local	Manly LEP 2013	#1142	230m
Monument – memorial (broken fountain)	East Esplanade (East Esplanade Park), Manly, NSW, 2095	Local	Manly LEP 2013	#1144	220m
Park/ Reserve	East Esplanade, Manly, NSW, 2095	Local	Manly LEP 2013	#1143	Adjacent
West Esplanade					
Manly Cove Pavilion	West Esplanade, Manly, NSW, 2095	State	Manly LEP 2013	#1249	250m
Governor Phillip Monument	West Esplanade, Manly, NSW, 2095	Local	Manly LEP 2013	#1248	30m
Park	West Esplanade, Manly, NSW, 2095	Local	Manly LEP 2013	#1251	Adjacent

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Item	Address	Significance	Listing	Place ID (Item No.)	Distance from Subject site
Belgrave Street					
Civic buildings – Council Town Hall Administration building, police station and courthouse	1-3 Belgrave Street, Manly, NSW, 2095	Local	Manly LEP 2013	#182	180m
The Corso					
Group of commercial buildings	The Corso, Manly, NSW, 2095	Local	Manly LEP 2013	#1106	<100m
Street Trees	The Corso (from Whistler Street to Sydney Road), Manly, NSW, 2095	Local	Manly LEP 2013	#1104	<100m
2 cast iron pedestals (former street lights)	The Corso (central reservation, between The Esplanade and Darley Road), Manly, NSW, 2095	Local	Manly LEP 2013	#1102	<100m
Monument – war memorial (cenotaph)	The Corso, Manly, NSW, 2095	Local	Manly LEP 2013	#1103	100m
Wentworth Street					
Street Trees	Wentworth Street, Manly, NSW, 2095	Local	Manly LEP 2013	#1246	60m
Fairlight Foreshore					
Esplanade Park and Fairlight Pool	Fairlight Foreshore, North Harbour, Manly, NSW, 2095	Local	Manly LEP 2013	#149	800m
Harbour Foreshore					
Harbour Foreshores	Manly municipal area boundary adjacent to the Harbour	Local	Manly LEP 2013	#11	Adjacent



Figure 9: Map of relevant heritage listings. Source: Artefact, 2021

2.3.2 Non-statutory heritage listings

A search of all relevant non-statutory listed items and conservation areas was conducted in April 2022. This search found three items listed on non-statutory registers within the Manly Wharf vicinity. The result of the non-statutory heritage register search is provided in Table 2.

Table 2: Non-statutory listings for Manly Wharf and adjacent areas

Item	Address	Significance	Listing	Place ID (Item No.)	Distance from Subject site
Manly Wharf					
Manly Wharf	West Esplanade, Manly, NSW, 2095	State	DOCOMOO	-	Within
Manly Wharf	West Esplanade, Manly, NSW, 2095	Classified	National Trust	-	within
Heritage Conservation Areas					
Manly Urban Conservation Area	Manly Cove, Sydney Road, West Promenade	Classified	National Trust	-	Within

3.0 HISTORICAL BACKGROUND

3.1 Aboriginal histories of Manly

A number of references suggest that certain areas of land ('estates' or 'country'), in the Sydney region, were associated with a named clan.⁵ Analysis of historical records by Attenbrow suggests that the Manly Cove area formed part of the Gayamaygal clans area (also referred to as Kai'yamaygal, Gayamaygal, Gamaragal or Cameragal.⁶).⁷

Several place names were recorded in early European records related to North Head including Boree (Bora) and Car-rang-gel (Garungal/ Carrangle)⁸.

The Gayamaygal people were a coastal group who utilised the sea and harbour for resources including diet, which consisted of fish and shellfish, in addition to seabirds.⁹ The harbour was an important part of the Guringai culture in the area, as the Guringai were skilled at canoeing and fishing.¹⁰

After European settlement, the Aboriginal people of Manly became reputable for their strength and *karajdi* (doctors) amongst the British.¹¹ The town Manly itself was named by Governor Phillip after the 'confident and manly behaviour' of the Aboriginal people.¹² In search of freshwater, Phillip explored Port Jackson by boat and reached Manly Cove. According to Phillip's journals, the Guringai men waded out to meet the Europeans and were curious about their boats, impressing the Europeans and challenging the image of the Aboriginal people as weak and timid that James Cook had presented.¹³ In the early years of the colony, interactions between the northern beaches Aboriginal people and the Europeans were mostly amicable, with several meetings occurring at Manly and often including women and children.¹⁴

At North Head, there is considerable evidence of long and enduring Aboriginal history. There are at least thirty-five Aboriginal places present on the head, including rock engravings, rock shelters with art or artefact deposits, camp sites, middens, and burials. Most of the sites are concentrated on the

⁵ Aboriginal Heritage Office, 2015. 'Filling a Void: A Review of the Historical Context for the use of the word 'Guringai', p.37; Attenbrow, V., 2010. *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, second edition. University of New South Wales Press: Sydney, p.22-30; Irish, P., 2017. *Hidden in Plain View*. New South Publishing, p. 17

⁶ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*. Accessed online 23/8/2019 at: https://dictionaryofsydney.org/entry/manly_cove_kaiymay

⁷ Attenbrow, V., 2010. *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, UNSW Press, p.23-35

⁸ Attenbrow, V., 2002. *Sydney's Aboriginal Past: Investigating the archaeological and historical records*, p 9

⁹ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*.

¹⁰ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*.

¹¹ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*.

¹² Ashton, P., 2008. 'Manly.' *Dictionary of Sydney*.

¹³ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*.

¹⁴ Karskens, G., 2015. 'Manly Cove, Kai'yamay.' *Dictionary of Sydney*.

western, harbour side of the heads, which is sheltered, littered with coves and beaches, and closer to fresh water sources.¹⁵

3.2 Manly Wharves 1 and 2

The SHI provides the following succinct description of the historical development of Manly Wharf (wharves 1 and 2):

*First wharf constructed in 1856 on the same site as the present wharf [1 and 2]. (Anglin 1990:2033). Lumby (2016) says the date was 1855, and the wharf was built by English-born merchant and Manly enthusiast, Henry Gilbert Smith, who envisaged the place as a seaside resort. Smith bought up land in 1853 and eventually acquired an interest in steam ferries serving the locality. As well as building a house known as 'Fairlight', Smith was responsible for [building] cottages, a hotel, church, school, pleasure grounds and swimming baths. He also had much to do with planting the first Norfolk Island pines (*Araucaria heterophylla*) on the ocean front (Lumby, 2016, 1).*

Improvements were made to the wharf in the first half of the 20th century. These were swept away at the end of the inter-war era after the Maritime Services Board decided to construct an 'imposing' new wharf during 1938 following several years of local agitation. A fire at the wharf in 1939 precipitated further action (ibid, 2016, 2).

The MSB engaged gifted young modernist architect Arthur Baldwinson (1908-68), not long after his return from several years working in England, to design major reconstructions of the ferry wharves at Manly and Circular Quay (ibid, 2016, 2)

The wharf [1 and 2] was built in a modernistic transport idiom with typical stylistic features of the era such as play of circular and rectangular geometric terms, bayed façade to the water (marine connotations), wide arc plan at entrance, clock tower with fins, flat roofing marked by wide fascia board. The current entrance was originally designed as a tram terminus and turning area. The structure was subjected to major alterations to the wharf wings involving a T-shaped clerestory. (Stapleton, 1981).

The Manly wharf [1 and 2] was completed in 1941 (ibid, 2016, 2).¹⁶

¹⁵ Australian Heritage Database, 2006. 'North Head.' *Australian Heritage Database*. Accessed online 23/8/2019 at: http://www.environment.gov.au/cgi-bin/ahdb/search.pl?mode=place_detail;place_id=105759

¹⁶ Heritage NSW, State Heritage Inventory, "Manly Wharf."

3.3 Manly Fun Pier

The Manly Fun Pier was located where Manly Pier (Manly Wharf 3) is now located. The following description is a summary of the historical development of the Manly Fun Pier.

The Manly Fun Pier started life as a cargo wharf at Manly Cove in the 1850s. In 1927 the cargo wharf was closed and in 1931 it was reopened as the Manly Amusement Pier.[1] and promoted with the slogan "Built for fun in 31".

During its life, the Fun Pier saw a number of renovations (including a substantial renovation in 1980/81).

It was eventually demolished in the late 1980s when the passenger wharf was extended and redeveloped in 1989. The new complex opened in 1990 and had an amusement centre in the basement level which was operated by the American company TILT [arcade].

The amusement centre closed when the wharf was again substantially redeveloped in 2000.¹⁷

The Port Jackson and Manly Steam Ship Company ‘...spent £10,000 converting the cargo wharf to an amusement park which was officially opened on December 19, 1930’.¹⁸ After the closure in 1989¹⁹ and subsequent demolition of the Manly Fun Pier, Manly wharf was extended to the east in the 1990s. This extension included the construction of the current day Wharf 3, a carousel and Ferris wheel (whose locations are now partially occupied by the Manly Wharf Hotel outdoor seating area) additional retail, food, and beverage outlets as well as a public boardwalk connecting Manly Pier (Wharf 3) to the existing Wharves 1 and 2.

¹⁷ Metherell, Terry; George Champion; Shelagh Champion (2005). "Manly Council Local Studies Collection - Manly Wharf Fact Sheet"

¹⁸ Morcombe, John, 'Manly had its own fun pier for almost 60 years', *The Daily Telegraph*, Published 26.06.2015.

¹⁹ Morcombe, 'Manly had its own fun pier for almost 60 years', 26.06.2015

3.4 Manly Wharf



Figure 10: Postcard featuring a coloured sepia photograph of Manly Wharf, c1890s. Source: Josef Lebovic Gallery collection, National Museum of Australia²⁰



Figure 11: photo of original Manly Wharf dated 1890. Source: Home and Away – 35271, State Library of NSW

²⁰ National Museum of Australia <https://collectionsearch.nma.gov.au/icons/piction/kau2/index.html#/home?usr=CE&umo=72790181>, viewed 7 April 2022



Figure 12: photo of Manly Wharf, c1920s. Source: State Archives & Records Authority of NSW.



Figure 13: photo of Manly Wharf clock tower dated 1936. Source: State Archives & Records Authority of NSW



Figure 14: photo of original Manly Wharf dated 1937. Source: State Library of NSW.



Figure 15: photo of Manly Wharf during construction for the new wharf 1 and 2 dated May 1940. Source: Northern Beaches Council Library Service; courtesy of Manly, Warringah and Pittwater Historical Society.

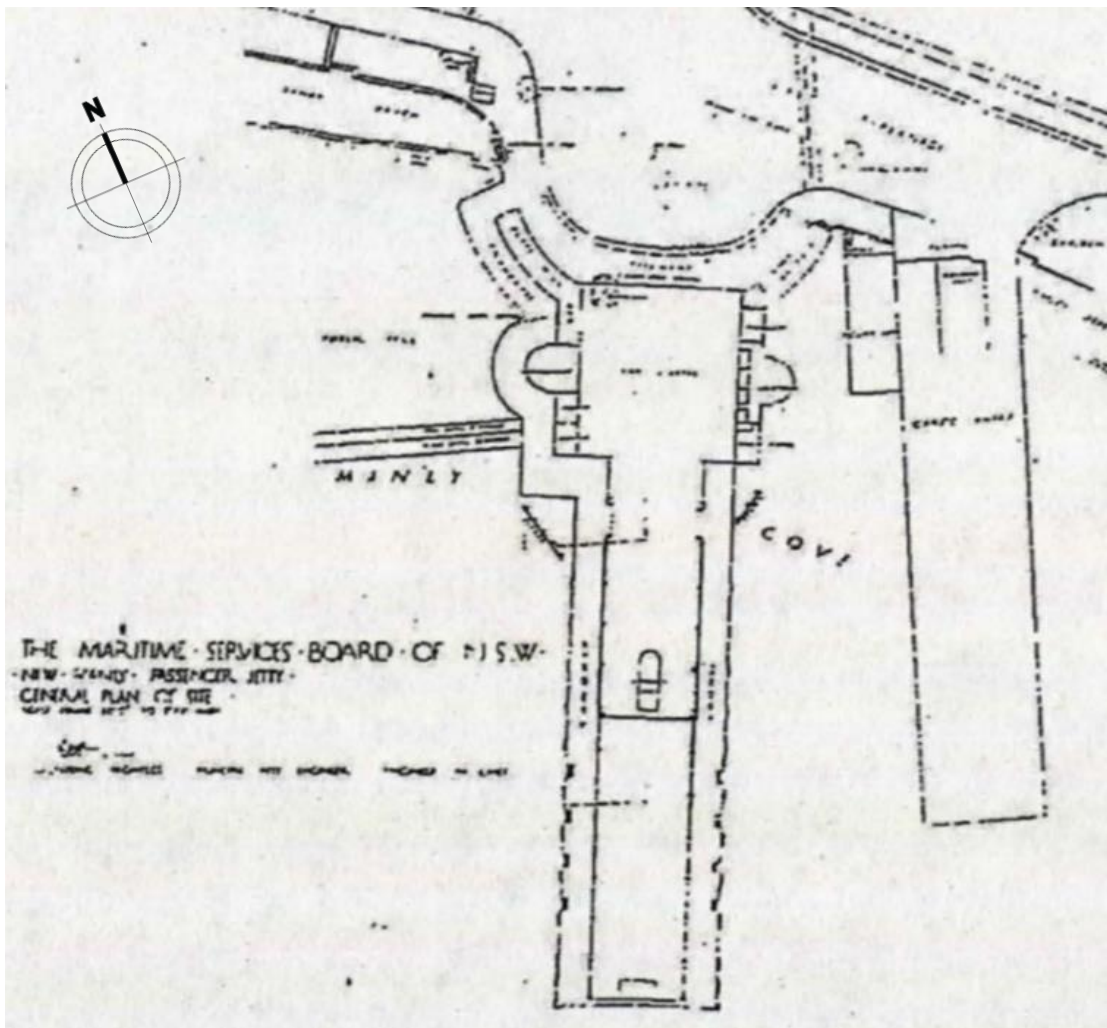


Figure 16: Detail Floor Plan of Manly Ferry Wharf 1 and 2 with the Fun Pier visible to the east of the New Passenger Jetty (NTS). Plan dated, 1940. Source: MSB Plan No. K1/130.



Figure 17: photo of former Manly Fun Pier dated 1940. Source: Northern Beaches Council Library



Figure 18: photo of current Manly Wharf 1 and 2 with the Manly Fun Pier behind, dated 1947. Source: State Archives & Records Authority of NSW.

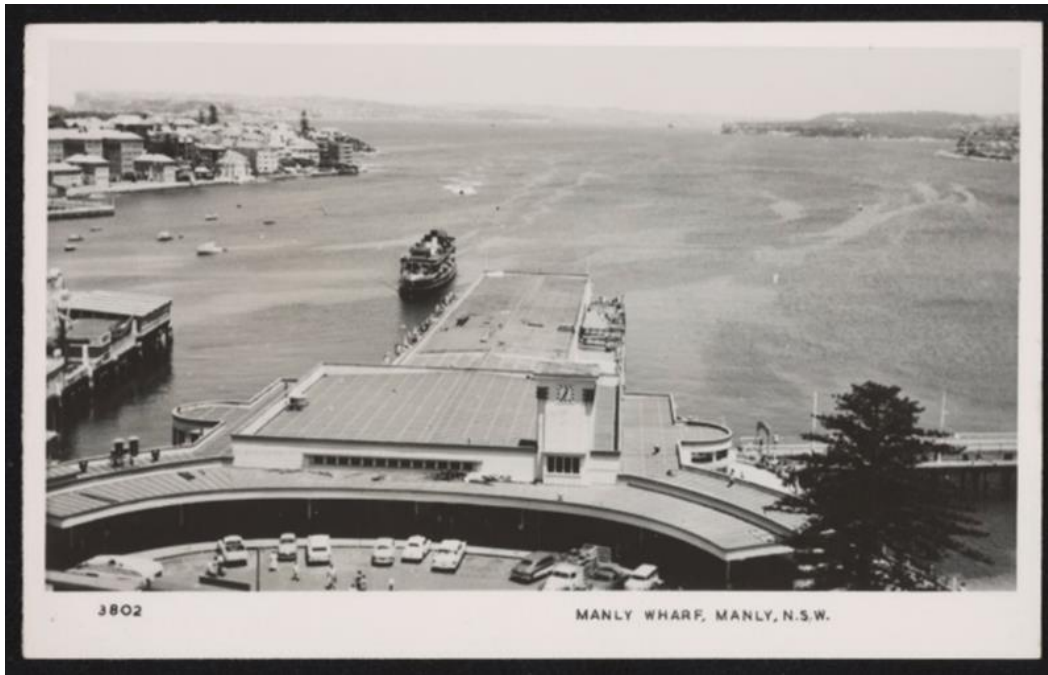


Figure 19: Postcard featuring a photograph of the current Manly Wharves 1 and 2 with the Manly Fun Pier visible in the east, c1950s. Source: Josef Lebovic Gallery collection no. 1, National Museum of Australia²¹



Figure 20: photograph showing Many Fun Pier after the addition of the surrounding walkway added after the Ghost Train fire at Luna Park in 1979, and prior to its demolition in the late 1980's,²²

²¹ National Museum of Australia <https://collectionsearch.nma.gov.au/icons/piction/kau2/index.html#/home?usr=CE&umo=72790181>, viewed 7 April 2022

²² Geoff Eastwood (2017). Manly Fun Pier, Trove NLA <https://trove.nla.gov.au/work/231515997?keyword=manly%20pier> accessed 2nd June 2022



Figure 21: photo of former Manly Fun Pier dated 1980. Source: Northern Beaches Council Library²³



Figure 22: photo of former Manly Fun Pier dated 1990. Source: Fairfax Media Archives²⁴

²³ (1980). 'Manly Fun Pier'. <https://northernbeaches.recollect.net.au/nodes/view/39630> accessed 2nd June 2022

²⁴ (1990). 'New Manly wharf opens to the public'. <https://www.gettyimages.com.au/detail/news-photo/new-manly-wharf-opens-to-the-public-part-of-the-news-photo/1079777034> accessed 10 June 2022



Figure 23: photo of former Manly Fun Pier Merry Go Round and Ferris Wheel dated 1991. Source: The Daily Telegraph²⁵



Figure 24: photo of former Manly Fun Pier Merry Go Round and Ferris Wheel dated circa 2000²⁶

²⁵ Morcombe, 'Manly had its own fun pier for almost 60 years', 26.06.2015

²⁶ 'Old and New fun pier', *The History Spot*, <https://www.pinterest.com.au/pin/290693350920362800/> accessed 10 June 2022

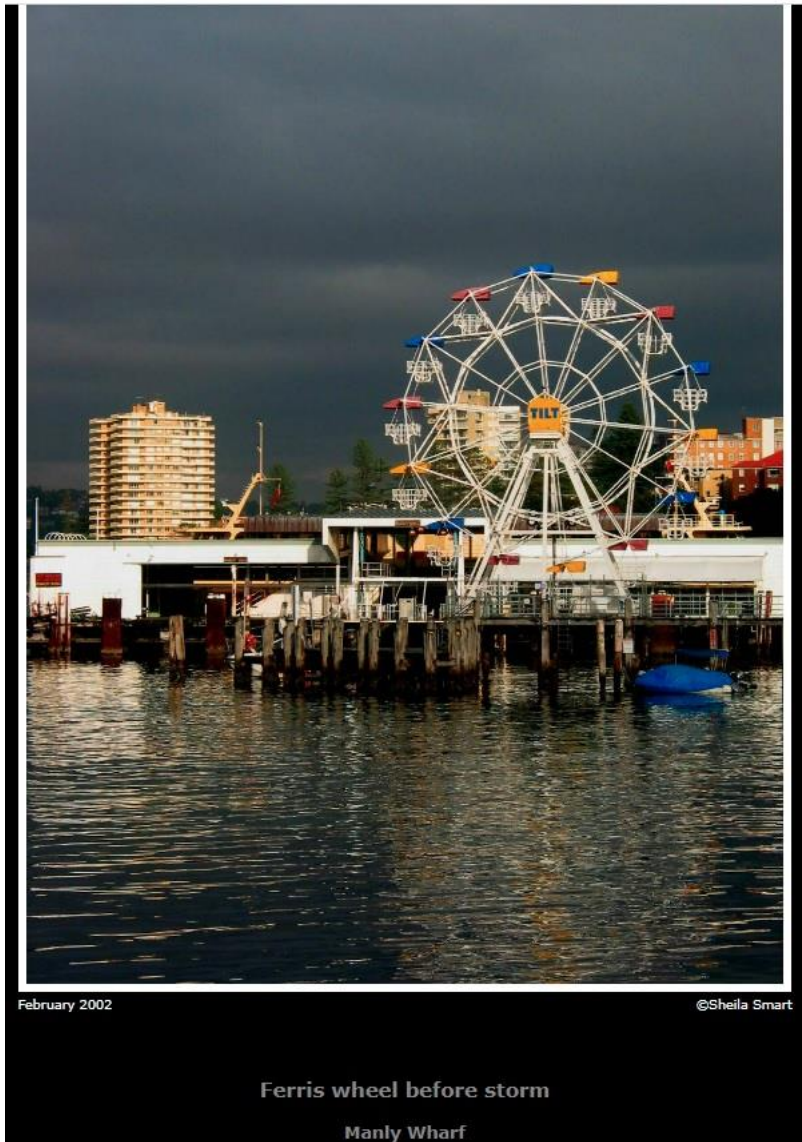


Figure 25: photo of former Manly Fun Pier Ferris Wheel dated 2002. Source: Sheila Smart²⁷

²⁷ 2002, 'Ferris wheel before storm Manly Wharf, Sheila Smart, <https://www.pbase.com/image/1785565> accessed 10 June 2022

4.0 DESCRIPTION AND PHYSICAL EVIDENCE

4.1 Site Inspection

An inspection of the subject site was conducted on 7 September 2021 by Scott MacArthur (Principal) of Artefact Heritage. The aim of the site inspection was to identify any potential impacts on the significance of Manly Wharf as a result of the proposal. The inspection was undertaken on foot and a photographic record was made.

4.2 Site and context

Manly Wharf is located at the junction of East Esplanade, West Esplanade and Belgrave Street in Manly, NSW, 2095. Manly Wharf 1 and 2 have been constructed in the same location as the first Manly Wharf (constructed in 1855 by Henry Gilbert Smith) and Manly Wharf 3 (Manly Pier) is a 1990s extension to the east. A public boardwalk connects Wharves 1/2 and 3.

The Manly Ferry Wharf CMP 2011 provides the following description of the subject site and study area:

Manly Ferry Wharf is located along Manly Cove, between Smedleys Point and Manly Point to the south and Federation Point to the west. Within [the] immediate vicinity of the site at Manly Cove [...] [is] the Manly Yacht Club and Sailing club to the south-east. To the north-east of the wharf are the Manly Esplanade, Manly Town Centre, and the Corso. Further north is Manly Beach and North Steyne Beach.

According to the NSW Heritage Branch State Heritage Inventory Statement of Significance: "Manly Ferry Wharf is a dominate feature of Manly Cove, viewed from the harbour approaches, from the harbour beach and from the main cross streets of Manly which conjoin at the terminus. Its form is sympathetic to its position, the curved entrance reflecting the arc of the beach and its stylistic idiom having strong maritime connotations- ship shape and ship like. It is an excellent example of mid-forties stylisation and preoccupation with geometric forms while it also retains original shopfitting elements and signs."²⁸

²⁸ Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP)," 2011, 16, 97.532.



Document Path: D:\GIS\GIS_Mapping\21070_Manly_Wharf_REF\MXD\Subject_site.mxd

Figure 26: Map of study area and subject site: Manly Wharf (Source: Artefact, 2021)

The Manly CMP 2011 describes the setting and views around the subject site as follows:

Manly Ferry Wharf is visible from Manly Cove as one arrives by water. The scale of the existing wharf is dwarfed by the scale of the adjacent buildings along the Corso. The existing Norfolk Pines act as a fine visual screen to these buildings.

The site of the Manly Ferry Wharf and Manly Cove is visible at vantage points around the cove. From these distant views the height of the clock tower is difficult to distinguish from the scale of adjacent buildings which dwarf the wharf.

Some parts of the site are also visible from the southern end of The Corso. The site is fully exposed to view from the beaches on East and West Esplanades. Although the wharf and other buildings on the site obscure views of either beach from opposite sides of the cove, the arc of Norfolk Island Pines is visible, above the roof-lines of the wharf building and the retail arcade. Views of the site from the road pavements and adjacent footpaths of West and East Esplanades are partially obscured by the Norfolk Pines.

The site is visible from Manly Cove, and from Wentworth Street and Belgrave Street, which intersect with East and West Esplanades. Views from these two streets of Manly cove are mostly obscured by the existing buildings on site. All of Manly cove is visible from the site. Most of North harbour is visible, in a 90 degree arch between south and west. Dobroyd Head is a major visual element, in the centre of this view. There are also some longer distance views of Middle Head, Vaucluse and Rose Bay, almost due south.²⁹

²⁹ Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP)," 17.

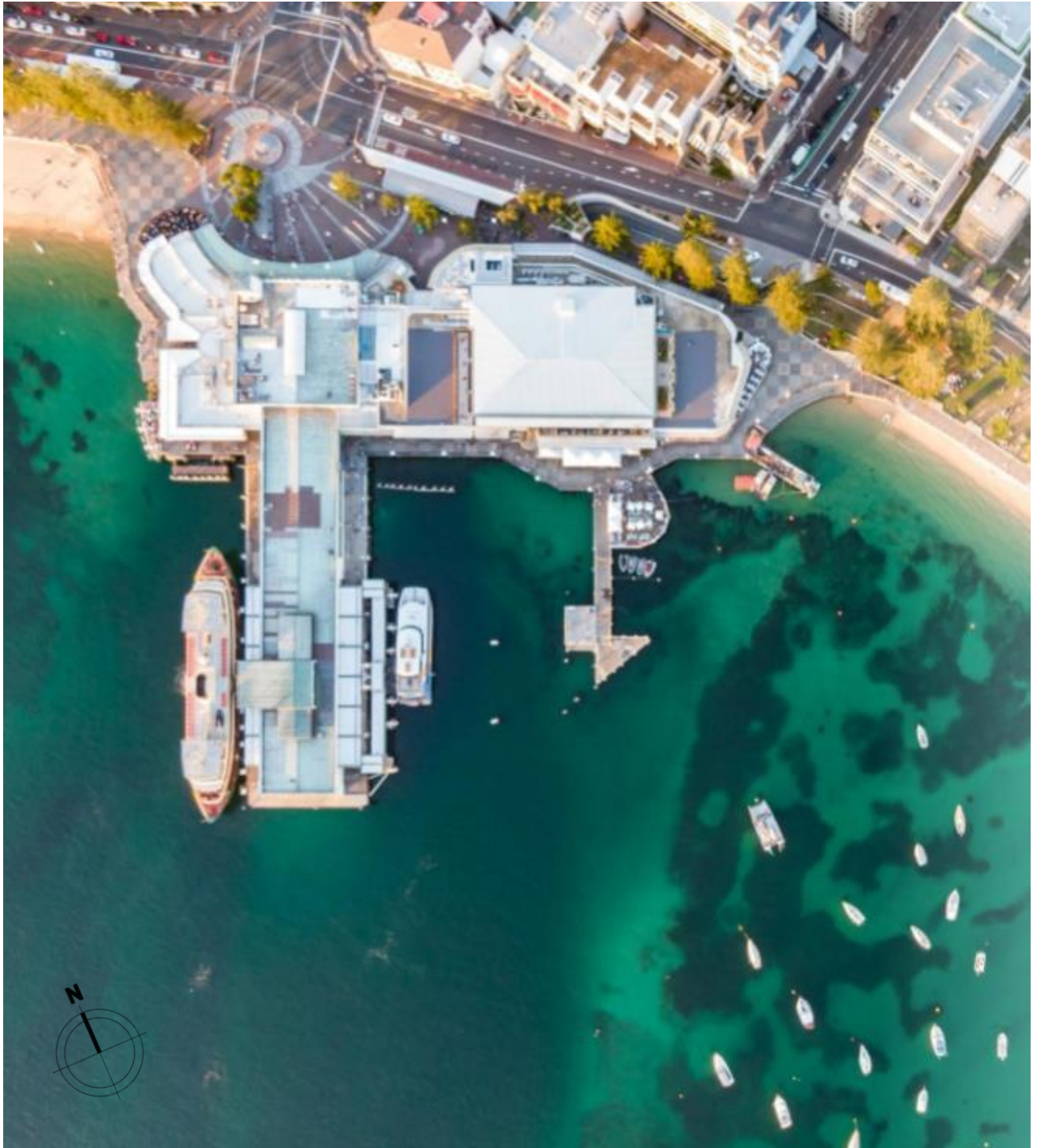


Figure 27: Manly Ferry Wharf (Source: GHD, 2021)



Figure 28 Plan showing the project boundary and an overlay of the new proposal over the existing Wharf. (Source: TfNSW, 2022)

4.3 Item description

Manly Wharf is made up of two buildings which are linked by a public boardwalk; the passenger Ferry Wharf on the western side (Wharf 1 and 2 constructed in 1941) and Wharf 3 (Manly Pier) on the eastern side (constructed in 1990).

The physical condition of the Wharf is described in the State Heritage Inventory as follows:

A broad wharf supported on timber piers and with a concrete platform. The superstructure is constructed of steel and timber. The facade and side walls form an important architectural design, similar to the Circular Quay ferry terminals. (Blackmore, Ashton, Higginbotham, Rich, Burton, Maitland, Pike, 1985).

The original part of the wharf [wharf 1 and 2] was built in a modernistic transport idiom, with typical stylistic features of era including play of circular and rectangular geometric terms, bayed façade to the water (marine connotations), wide arc plan at entrance, clock tower with "fins", flat roofing marked by wide fascia board. The current entrance was originally designed as a tram terminus and turning area. Timber clad framed structure opening and large internal spaces, concrete deck to west enclosed by "ship" railing. Some original shop fittings, signage etc. Subjected to major alterations to the wharf wings involving a T-shaped clerestory (Stapleton, 1981).³⁰



Figure 29: Entrance to Manly Wharf from Belgrave St / East Esplanade. Photograph taken looking west (Source: Artefact, 2021)



Figure 30: Entrance to Manly Wharf from Belgrave St / East Esplanade. Photograph taken looking southwest (Artefact, 2021)

³⁰ Heritage NSW State Heritage Inventory, "Manly Wharf."

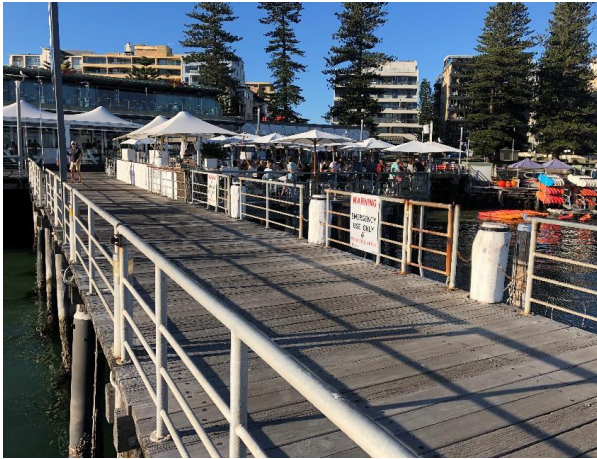


Figure 31: view of Wharf 3 pier looking north towards the Wharf bar outdoor seating (Artefact, 2021)



Figure 32: view looking north along the Wharf 3 pier towards the boardwalk and Wharf Bar outdoor seating (Artefact, 2021)



Figure 33: view of the timber piers structure of Wharf 3, looking east (Artefact, 2021)



Figure 34: view of the timber piers structure of Wharf 3, looking east (Artefact, 2021)



Figure 35: view of the Manly Wharf Bar outdoor seating area, the site of the former carousel. Photo taken looking to the south (Artefact, 2021)



Figure 36: view of the Manly Wharf Bar outdoor seating area, the site of the former carousel. Photo taken looking north east (Artefact, 2021)



Figure 37 Detail view of Wharf 3 timber decking (Artefact, 2021)



Figure 38 View towards steps leading down to Wharf 3 passenger area. Photo looking northwest (Artefact, 2021)

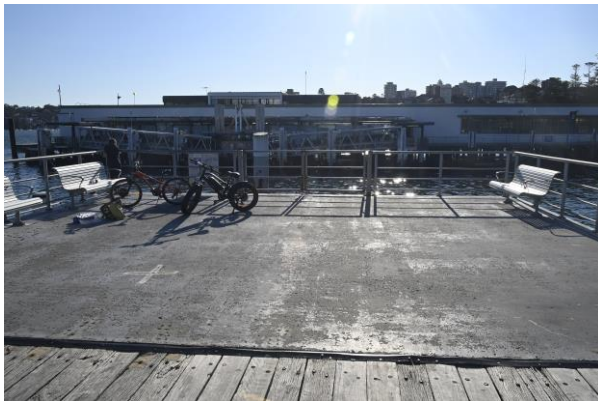


Figure 39 Wharf 3 concrete deck, site of the former Ferris Wheel. Photo looking west (Artefact, 2021)

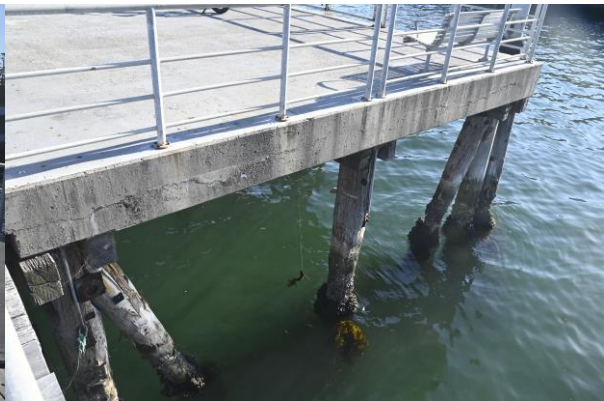


Figure 40 Detail view of Wharf 3 concrete deck and timber piers. The concrete deck is the site of the former Ferris Wheel. (Artefact, 2021)



Figure 41 View to the southeast from the end of Wharf 3 (Artefact, 2021)



Figure 42 Corroded metal piles at the end of Wharf 3 (Artefact, 2021)



Figure 43 Timber piers on Wharf 3 (Artefact, 2021)



Figure 44 Detail view of gangway from Wharf 3 (Artefact, 2021)



Figure 45 Substructure: Wharf 3 (Artefact, 2021)



Figure 46 View south from Wharf 3 (Artefact, 2021)



Figure 47 Concrete ramp down to Wharf 3 (Artefact, 2021)



Figure 48 Detail of concrete stairs at Wharf 3 (Artefact, 2021)



Figure 49 View southwest from Wharf 3. Wharves 1 & 2 can be seen on the right (Artefact, 2021)



Figure 50 View of private ferry seen from Wharf 3 looking towards Wharf 2 (Artefact, 2021)



Figure 51 Hospitality venue (Manly wharf bar) adjacent to Wharf 3 (Artefact, 2021)



Figure 52 Public promenade (Artefact, 2021)

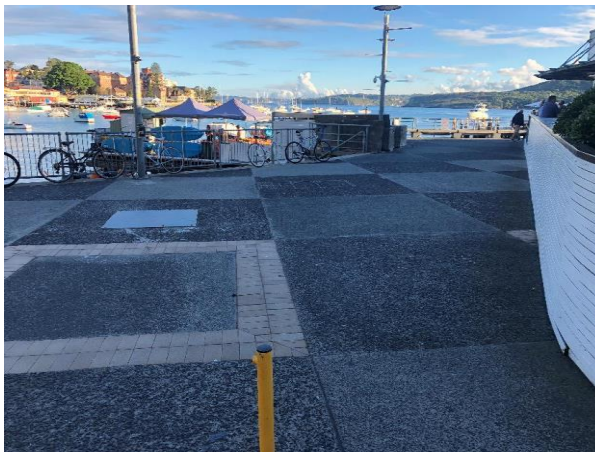


Figure 53 Public promenade east of Wharf 3 (Artefact, 2021)

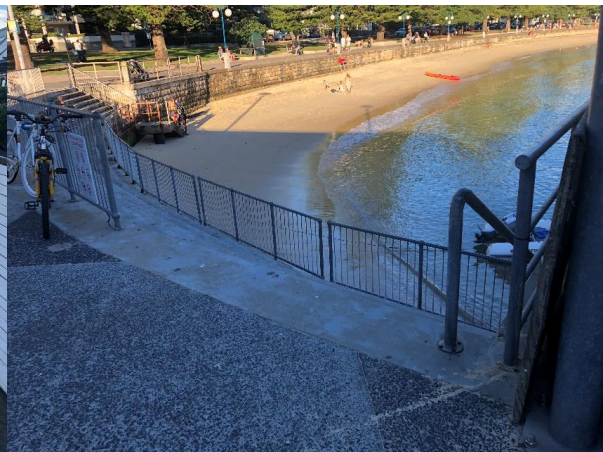


Figure 54 Beach and promenade east of Manly Wharf (Artefact, 2021)



Figure 55: Panoramic views of Manly Wharf 3 and surrounds looking northwest (Artefact, 2021)



Figure 56: Panoramic views of Manly Wharf 3 and surrounds looking to the northeast (below) (Artefact, 2021)

4.4 Analysis of current condition

Analysis of the condition is informed by the earlier studies cited above and by the site inspection conducted by Artefact in 2021. This assessment of condition only relates to Manly Wharf 3.

Wharf 3 is built on timber and concrete piers, with timber framing and decking. The timber decking is showing signs of decay, and it is noted that there are various areas where there is damaged or missing decking. There are visible signs of repair where decking has been replaced with newer timber materials. The timber wharf and gangway are supported with metal clad piles and timber piers. The metal cladding is showing signs of rust and the timber piers appear weathered but in good condition

The wharf and gangway are accessed via concrete stairs and ramps which are all generally in good condition.

The public promenade and boardwalk which links Wharf 1/2 and Wharf 3 / retail area is of a mixture of concrete and timber framed construction and appears to be in fair condition.

The retail and food arcade and underground carpark have a predominantly concrete structure; with concrete piers and retaining walls, and a concrete frame. These are all in good condition and appear well maintained.

5.0 ASSESSMENT OF HERITAGE SIGNIFICANCE

5.1 Significance assessment criteria

Determining the significance of heritage items or a potential archaeological resource is undertaken by utilising a system of assessment centred on the Burra Charter of Australia ICOMOS. The principles of the charter are relevant to the assessment, conservation and management of sites and relics. The assessment of heritage significance is outlined through legislation in the Heritage Act and implemented through the NSW Heritage Manual, the Archaeological Assessment Guidelines and the 2009 Assessing Significance for Historical Archaeological Sites and 'Relics.

If an item meets one of the seven heritage criteria, and retains the integrity of its key attributes, it can be considered to have heritage significance. The significance of an item or potential archaeological site can then be assessed as being of local or state significance.

'*State heritage significance*', in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

'*Local heritage significance*', in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

Table 3: NSW heritage assessment criteria

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

Criteria	Description
F – Rarity	An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history.
G – Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area).

Grading of significant elements

This assessment of significant elements was based on the standard grades of significance set out in the NSW Heritage Office publication 'Assessing Heritage Significance'. The following table lists the different grades of significance in line with the relevant NSW Heritage guidelines.

Table 4: Grades of significance

Grading	Justification	Status
Exceptional	Rare or outstanding element directly contributing to an item's local and State significance	Fulfils criteria for local or state listings
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfils criteria for local or state listings
Moderate	Elements of typical representative quality. Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or state listings
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfill criteria for local or State listing
Intrusive	Damaging to the item's heritage significance	Does not fulfill criteria for local or State listing

5.2 Significance of Manly Wharf

5.2.1 Assessment of significance

Manly Wharf (in its entirety) is a recognised item of both State and local heritage significance. The significance assessment contained in the Manly CMP 2011³¹ is presented in Table 5 with additional commentary from Artefact Heritage included in bold:

Table 5: Significance assessment for Manly Wharf (wharves 1, 2 and 3)

Criterion	Explanation
A – Historical Significance	<i>The Manly Ferry Wharf has high historical significance for its age and association with the development and continuation of Manly as a seaside resort of Sydney from the earliest days of European settlement.</i>
	<i>The Manly Ferry Wharf has high historical significance for its associations with the early development of Manly as recreation destination.</i>
	<i>The Manly Ferry Wharf has high historical significance as the site of the first wharf constructed in 1856. It has been a major means of access to Manly since that time.</i>
	<i>The Manly Ferry Wharf has high historical significance as a record of the redevelopment of the area and wharf facilities at the end of Manly's second boom period as a resort (c. 1910-1940)</i>
	<i>The Manly Ferry Wharf has high historical significance as part of the renovation project of both Circular Quay and Manly Ferry Wharf for the Maritime Services Board in the 1940s.</i>
	<i>The Manly Ferry Wharf has historical significance as a reflection of developments in urban transport and infrastructure in that period.</i>
	<i>The Manly Ferry Wharf has historical significance as a rare surviving example of a maritime building designed in a Modernist style of the mid-twentieth century.</i>
	<i>The historical significance of the Manly Wharf relates to Wharf 1 and 2.</i>
B – Associative Significance	<i>The Manly Ferry Wharf has historical associative significance because of its association with Arthur Baldwinson.</i>
	<i>The associative significance of the Manly Wharf relates to Wharf 1 and 2</i>

³¹ Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP)," 2011, 30-32.

Criterion	Explanation
<p>C – Aesthetic or Technical Significance</p>	<p><i>The Manly Ferry Wharf has high aesthetic significance as a largely intact example of modern maritime architecture associated with Sydney Harbour transport.</i></p>
	<p><i>Manly Ferry Wharf has high aesthetic significance as the more impressive of the Wharf structures, Circular Quay and Manly Ferry Wharves produced for the Maritime Services Boats in the late 1940's.</i></p>
	<p><i>The low sweeping form of the Corso façade firmly anchored by a solid cubic tower has high aesthetic significance for its contribution to the context of the sweeping beach and line of the trees which is now an integral part of this mainland view of Manly.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance for its strong contribution to views of the harbour from the Corso.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance as an example of a later Interwar Modern style building, in a maritime context, comprised by later alterations. Nevertheless, the building over the ferry pier retains its flat linear and rectangular form and the main (north) façade composition, with its clocktower, flat parapets and curved awning, is mostly intact. The groove weatherboard cladding and timber frame windows are features which give the exterior much of its distinctive period character.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance as a major project by an important Sydney Modernist Architect: Arthur Baldwinson.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance as a largely intact maritime structure both externally and internally.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance as a representative example of Manly's development in the Interwar periods, characterised by the Modernist Style.</i></p>
	<p><i>Manly ferry Wharf has aesthetic significance as a component of the Manly Cove Setting.</i></p>
	<p><i>The Manly Ferry Wharf has aesthetic significance for the positive contribution of the low building scale to the topographical setting of Manly Ferry Wharf. The aesthetic significance of the Wharf is enhanced by its visual relationship with the curved lines of the beach, seawalls, and pavement promenades of the East and West Esplanades. From several directions the Wharf is also seen with a background of Norfolk Island Pines. The location of the Wharf in the centre of Manly Cove, visible from many points around the North harbour, is symbolic of its central role as a maritime entry to Manly.</i></p>
<p><i>The Manly Ferry Wharf [including wharf 3] has high aesthetic significance for its contribution to the aesthetic quality of Manly Harborside.</i></p>	
<p><i>The aesthetic and technical significance of the Manly Wharf relates predominantly to Wharf 1 and 2</i></p>	

Criterion	Explanation
<p>D – Social Significance</p>	<p><i>Manly Ferry Wharf has high social significance as the gateway to manly, it has always been a principal “stepping off point” for both the East and West Esplanades.</i></p> <p><i>The Manly Ferry Wharf has high social significance for the role that it plays in the life and social structure of the residents and tourists of Manly, Moreover, its association and continual use as a transport service dating back to the British Colony, give the building a high degree of social significance; both now and in the past.</i></p> <p><i>The Manly Ferry Wharf has social significance for its identity as part of the image of Manly, with its twin ocean and harbor beaches connected by The Corso.</i></p> <p><i>The Manly ferry has high social significance for its ability to reflect the long continuous history of Manly as a resort and its association with thousands of tourists who hold memories of their ferry trip and first impressions of Manly.</i></p> <p><i>The Manly Ferry Wharf in association with the fun pier has social significance, for its ability to reflect the long continuous history of Manly Ferry Wharf as the location of retail, transport, and recreation.</i></p> <p><i>The Manly Ferry Wharf has social significance as a major centre of social interaction, both for visitors and residents.</i></p> <p><i>The Manly Ferry Wharf has social significance with its history of commercial activities mostly oriented towards tourism.</i></p> <p>Manly Ferry Wharf, including Wharf 3, provides a sense of place for the local community, visitors and tourists and daily commuters.</p>
<p>E – Research Potential</p>	<p><i>Manly Wharf is considered to have high research potential as a working example of the evolutionary process of water transport on Sydney Harbour</i></p> <p>Manly Wharf has high research potential due to being within the vicinity of potential marine habitats for various endangered species: including Little Penguins, various seagrass (Zostera, Halophila, Posidonia Australis) and Synathiformes (Sea horses, seas dragons).</p>
<p>F – Rarity</p>	<p><i>Manly Wharf is a rare surviving working example of a maritime building designed in the Modernist style of the mid- twentieth century. It is a rare example of maritime architecture of a leading Sydney Modernist architect.</i></p> <p>The rarity of Manly Wharf relates predominantly to Wharf 1 and 2</p>

Criterion	Explanation
G – Representativeness	<i>Manly Wharf is representative of many maritime industrial buildings which have developed around Sydney foreshore in response to transport and industrial requirements.³²</i>

The integrity of Manly Wharf (specifically the main entrance and Wharf 1 and 2) has been further described in the Manly Ferry Wharf CMP 2011 as:

The main front form of The Manly Wharf located remains highly intact externally. Internally it has been extensively changed by various tenancy fitouts. The original Manly Ferry Wharf [1 and 2] has been extensively altered in a number of significant phases that include additions to the east and west including the welcoming arms, the tower and the clerestory and changes to the wharf structure. The remaining buildings retains its original external character which is exceptional for a wharf structure. Internally the plan layout has been extensively altered and all finished have been painted or replaced but the industrial structure can be understood.³³

The following grading of significance has been prepared with reference to the Manly Ferry Wharf CMP 2011 and the Manly Wharf CMP 2001.

Table 6: Grades of significance for Manly Wharf components

Component	Description	Grading
<i>Exterior: Manly Ferry Wharf 1 and 2 (1940's fabric)</i>		
The South Elevation of the Wharf [1 and 2]	<i>The southern elevation is iconic for its significant views facing onto Sydney Harbour, which has always been a key component of Manly Cove, and a key component of Manly Wharf since its genesis.</i>	High
The West Elevation of Wharf 1	<i>The 1941 Manly Ferry Wharf 1 is located on the western half of the site and predominately includes fabric dating from 1941 and additions and modifications from later periods. Hydraulic access ramps were added in 1981.</i>	High

³² Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP)," 30–32.

³³ Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP),".

Component	Description	Grading
The East Elevation of Wharf 2	<p>The 1941 Manly Ferry Wharf 2 is located on the eastern half of the site and predominately includes fabric dating from 1941 and additions and modifications from later periods.</p> <p>Hydraulic access ramps were added in 1981.</p>	High
<p>Manly Wharf Interchange; The Corso Façade including the Clerestory, Welcoming Arms and Clock tower (1940's fabric)</p>		
The Corso Façade (North Elevation)	<p>The façade facing the Corso consists of a curved canopy area with shops behind the east and west curve. This side of the wharf has a retail arcade, through which passengers pass on the way to the existing bus interchange and The Corso. The northern elevation of the section remains highly intact, retaining most of its original character, despite having been narrowed by the installation of additional shops.</p> <p>The northern elevation, including the Tower and front welcoming arms, are the most significant component of the building and form the urban front to the Corso</p> <p>The northern elevation, more than any other element of the wharf, identifies the original Moderne Maritime character of the building. With its horizontal emphasis provided by the grooved weatherboarding and the timber framed strip window provide a distinct character. The distinctive features of the façade include the square clock tower, with a flat parapet, the flat parapets of the straight main roof, with the lettering "MANLY WHARF"</p>	Exceptional
The West Elevation	<p>The western elevation accommodates various food outlets but retains most of its original character. The western elevation identifies the original Moderne Maritime character of the building with its horizontal emphasis provided by the grooved weatherboarding to the Clerestory and clock tower.</p>	High
The East Elevation	<p>The eastern elevation accommodates various retail units which obscure the original 1940's fabric. The Clerestory and clock tower of the eastern elevation retains the original Moderne Maritime character of the building with its horizontal emphasis provided by the grooved weatherboarding.</p>	Moderate

Component	Description	Grading
Under Awning Space	<i>The ceiling is lined to the underside of the fascia in a flush finish which contrasts with the texture of the fascia. The fascia, soffit and beam have been modified by the removal of some detail</i>	<i>High</i>
The Welcoming Arms	<i>The Corso façade is characterised by two welcoming arms comprising an enclosed area accommodating service and a cantilevered awning of slightly different radius which has a deep fascia sheeted in timber boarding. Distinctive 1940 feature pertaining to a significant period of development. The eastern part of the welcoming arms has been modified as part of 1990s extension.</i>	<i>Exceptional</i>
The Clock Tower	<i>Another distinctive feature of the façade is the square clock tower, with a flat parapet. The tower boarding is vertical with small, neat cover strips. Distinctive 1940 feature pertaining to a significant period of development.</i>	<i>Exceptional</i>
Manly Wharf Interior; The Manly interchange and wharf 1 and 2 (1940's fabric)		
Manly interchange main space	<p><i>The Manly interchange main spaces includes the Clerestory and provides a large room, roughly square in shape, which is lit by linear high level windows. The structure combines two types of portal frame to accommodate to the curve plan of the Welcoming arms. The columns were originally painted in two colours.</i></p> <p><i>The main space contains the following original fabric from 1941:</i></p> <ul style="list-style-type: none"> <i>The square plan higher roof, parapet walling around it, timber board ceiling, and its supporting structural steel framework</i> <i>The semi-circular west facing parapet and strip window beneath.</i> 	<i>Exceptional</i>
South Glazed Waiting Area	<i>The South-Glazed Waiting Area is part of the original 1941 large internal planned waiting area facing south, with iconic views</i>	<i>Exceptional</i>

Component	Description	Grading
Remnant Service Areas	<i>The service areas throughout Manly Wharf have undergone extensive works which have reduced their integrity. The service areas have been demolished and partially rebuilt on the eastern half and been heavily modified and concealed within retail alterations on the west.</i>	Low
Planning and Circulation Spaces	<i>Planning is cross axial with the major axis on the line of the passenger movement. The second axis which leads to the toilets and services was expressed by two semicircular apses to the building, of which the eastern apse has been substantially demolished.</i>	Moderate
Manly Wharf bar and restaurants including Wharf 3 (1990s fabric)		
Manly Boardwalk including Wharf 3	<i>The Manly Pier (Wharf 3) and Boardwalk are utilitarian structures constructed of highly weathered concrete and timber piles, and timber decking. The materiality and construction style are generally sympathetic to the 1940's building fabric.</i>	Low
The East Elevation to Wharf 3	<i>The east elevation of the Wharf dates entirely from 1990. The construction of the retail component of Wharf 3 required partial removal of the original 1941 curved ends. The lower carpark level is below mean tide level. The eastern extension which connects the eastern half of the building, façade returns, and adjacent public promenade is also part of the 1990 fabric. Its contemporary construction and scale are generally sympathetic to the 1940s building by virtue of its scale and linear form.</i>	Low
Manly Wharf bars and restaurants [adjacent to Wharf 3]	<i>The 1990s arcade accommodates a variety of retail, food and beverage offerings that activate the site and attract a wide variety of visitors. Its contemporary construction and scale are generally sympathetic to the 1940s building by virtue of its scale and linear form.</i>	Low

5.2.2 Statement of cultural significance

The *Manly Ferry Wharf Conservation Management Plan 2011 (Manly CMP 2011)* provides the following statement of cultural significance (statement of significance) for Manly Wharf: note that this statement of significance predominantly relates mainly to Wharf 1 and 2. Additional commentary relating to Wharf 3 has been added by Artefact in **bold**.

Manly Ferry Wharf is significant as the gateway to Manly, and for its association with thousands of tourists who hold memories of the ferry trip and first impressions of Manly.

The Manly Ferry Wharf is significant for its age and association with the development and continuation of Manly as a seaside resort of Sydney from the earliest days of European settlement. The low sweeping form has significance for its contribution to the context of the sweeping beach and line of the trees which is now an integral part of this mainland view of Manly. The Manly Ferry Wharf is significant for the positive contribution of the low building scale to the topographical setting of Manly Cove. The Wharf is enhanced by its visual relationship with the curved lines of the beaches, seawalls, and pavement promenades of East and West Esplanades.

The Manly Ferry Wharf's association with the fun pier is significant, for its ability to reflect the long continuous history of Manly Ferry Wharf as the location of retail, transport, and recreation.

The Manly Ferry Wharf has historical significance as a major project by an important Sydney Modernist Architect: Arthur Baldwinson. The main (north) façade composition, with its clocktower, flat parapets and curved awning is most intact. The grooved weatherboard cladding and timber frame windows are features which give the exterior much of its distinctive period character.

The Manly Wharf is significant as a site representing the redevelopment Manly and its wharf facilities; particularly during Manly's second boom period as a resort (1910-1940), when both Circular Quay and Manly Ferry Wharf were constructed for the Maritime Services Board. The Manly Ferry Wharf is significant as a reflection of the developments in urban transport and infrastructure in that period.

Manly Ferry Wharf is significant as a rare surviving, working example of a maritime building designed in the Modernist style of the mid-twentieth century. It is a rare example of maritime architecture.³⁴

³⁴ Architectural Projects Pty Ltd, "Manly Ferry Wharf Conservation Management Plan (CMP)," 34–35.

Whilst the Wharf 3 portion of the 1990s extension strengthens the narrative of the ongoing progression and development of Manly Wharf as a transport and retail hub, it is considered to be of little local significance when viewed in the context of the overall Manly Wharf precinct.

6.0 PROPOSED WORKS

6.1 Overview of works

Transport for NSW (TfNSW) proposes to upgrade Manly Wharf 3 and build a new Wharf 4 (the proposal) as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most. In its current configuration, Manly Wharf 3 (Wharf 3) does not meet the *Disability Standards for Accessible Public Transport (DSAPT)* or *Disability Discrimination Act 1992 (DDA)* requirements, as it does not allow for equitable access to the wharf or boarding of the ferry. Transport for New South Wales (TfNSW) have identified the following objectives as part of the project Review of Environmental Factors (REF):

- Provide facilities that are accessible to the disabled, ageing and parents with prams
- Provide a reliable and durable ferry wharf that is suitable for all ferry operations in this location
- Provide an additional wharf to service smaller commercial and recreational vessels
- Provide comfortable and protected environments for customers from sunny to wet and windy weather while accessing and waiting for transport services
- Provide service and ticketing information that is accurate, up to date and accessible, making it easier for customers to navigate and use the service
- Provide safety features including extra lighting, help points, fences, CCTV coverage and other security measures for passenger safety
- Provide efficient interchanges with other modes of transport, both public and private and supporting wayfinding signage.

To achieve the above objectives the proposed works (the proposal) include:

- Removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform
- Retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area
- Construction of a new pile-supported promenade that runs adjacent to the existing boardwalk
- Construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3
- A new public seating space / rest 'slow space' within the new public promenade area
- Construction of a new covered main waiting area accessed via the new promenade area
- Installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform
- Installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels

- Construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (e.g. Water taxis) and recreational vessels at a range of tidal levels.
- Construction of a new vessel arrestor at Wharf 3
- Construction of two new separation piles between Wharves 2 and 3
- Limited dredging of material at the Wharf 3 berth pocket area
- Upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required
- Wharf booking information screens system
- Providing conduits for opal readers to be installed in the future if required.

Construction of the proposal may be staged so that all work impacting the operation of Wharf 2 would be conducted first. During this time, Wharf 2 would be closed while Wharf 3 could continue to operate and receive vessels. Once these initial works are completed, Wharf 2 can reopen and be used during the remainder of the construction period.

For the purposes of this report, the proposal footprint, proposal area and compound area have been defined as follows:

- proposal footprint – the area directly impacted by proposed works, including the removal of structure (Figure 58), installation of new wharf structures and dredging area (Figure 57)
- proposal area – the area around the proposal footprint required for construction including the compound areas (Figure 57)
- compound area – the temporary facilities required for construction, including for example an office and amenities compound, construction compound and materials storage compound. The possible locations of the compound areas are shown on Figure 57, however, the exact locations would be determined prior to construction.



Figure 57 Plan showing the project boundary and an overlay of the new proposal over the existing Wharf. (Source: TfNSW, 2022)



Figure 3.2 - Proposal Footprint – construction, dredging and demolition areas

Figure 58 Proposal Footprint showing construction and demolition areas (source: TfNSW, 2022)

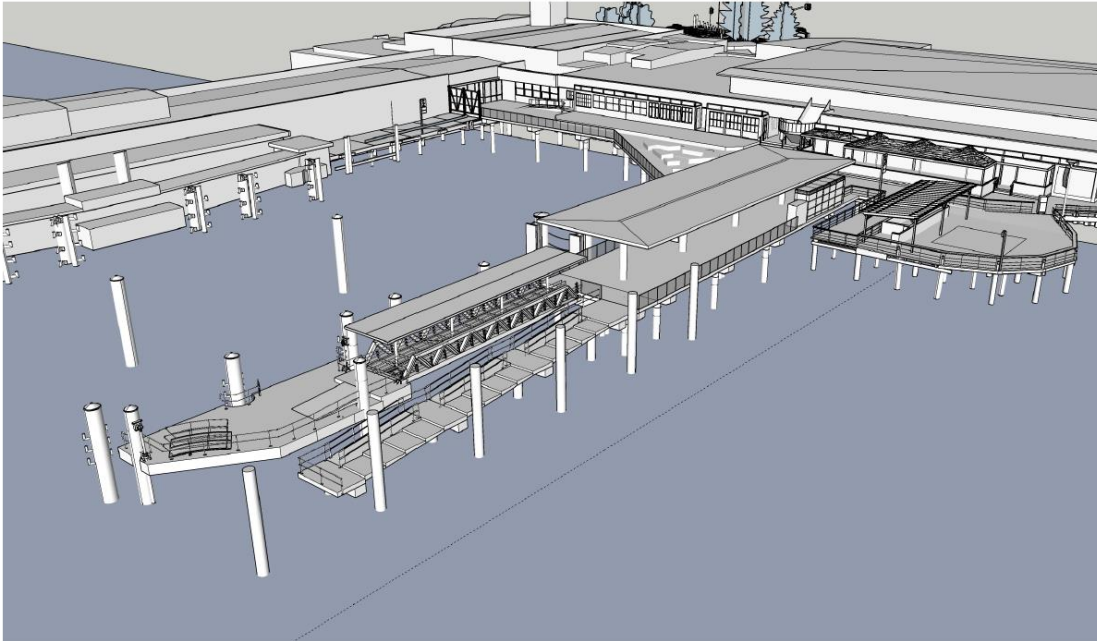


Figure 59: View of proposed design looking north west. Source: GHD 2022

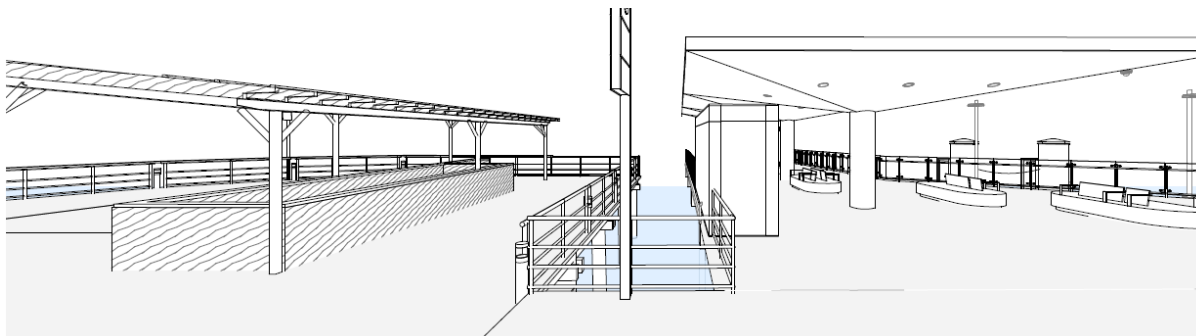


Figure 60: View of proposed main waiting area and awning (right) (existing Wharf Bar awning is on the left). Source: GHD 2022

6.2 Detailed design proposal

6.2.1 The Promenade

A new pile-supported promenade is proposed to be constructed alongside the existing boardwalk. The addition of the promenade would extend the boardwalk width from 4.7 metres to 8.4. New light poles would be provided along the edge of the new promenade at regular intervals to illuminate this route sufficiently to comply with the DSAPT requirements.

The promenade would be paved with coloured concrete and exposed aggregate concrete. The widened boardwalk and 'slow space' concrete surface area would be decorated with indigenous and coastal motifs. Design of the concrete art was developed through consultation with local indigenous groups in accordance with a Connecting with Country approach.

The promenade would feature a DSAPT compliant access path between the Wharf 1-2 entry point and the hydraulic wharf platform at Wharf 3.

6.2.2 'Slow space'

The new promenade would feature a public seating area. The 'slow space' would be 54 square metres and triangular in shape. The intention of the 'slow space' is to provide a space for people to informally meet and gather. The design would be developed further, in conjunction with the local community and indigenous groups, to provide an opportunity for the incorporation of public art and the telling of indigenous stories through its design.

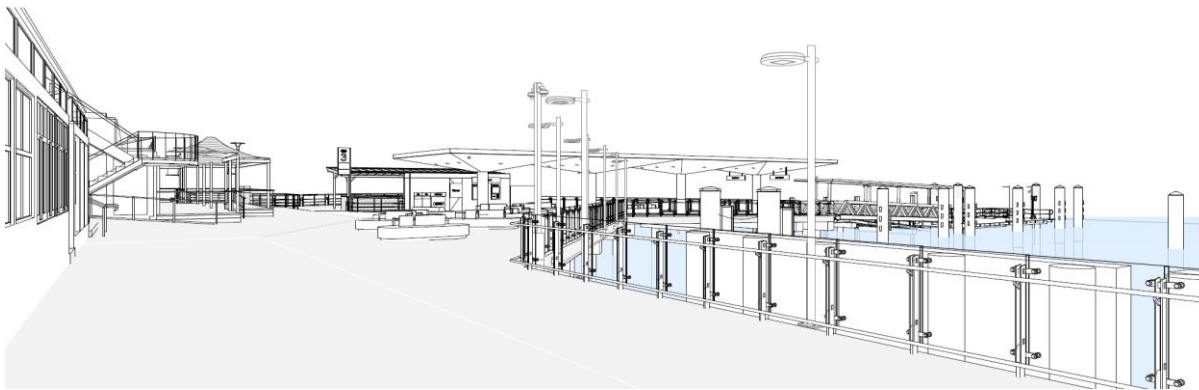


Figure 61: Artistic impression of the new boardwalk and slow space. Source: GHD, 2022

6.2.3 Main waiting area

The new sheltered main waiting area would be adjacent to the new promenade to the west and would overlook the existing Wharf Bar outdoor seating area to the east. The area would feature bench seating including some benches with DDA compliant armrests. Space in the main waiting area has been left to allow future installation of four Opal fixed location readers.



Figure 62: Artistic impression of the new main waiting area. Also visible is the roof canopy, service pod, glass balustrades and bench seating. Source: GHD, 2022

6.2.4 Main roof canopy

The main waiting area is proposed to be sheltered by a rectangular roof canopy. This roof has been designed to match the shape of the Wharf 1 and 2 building but on a smaller scale.

The fascia's of the main roof canopy would be painted 'heritage green' to match the green fascia's of the existing Manly Wharf building, shown in Figure 63. The angled soffits, or underside, would be covered in an off-white composite timber cladding. This would create a geometric surface, similar to the horizontal cladding on the existing Manly Wharf buildings. The main roof canopy would feature downlights to illuminate the waiting area below.



Figure 63: Photo of existing Manly Wharf entrance showing heritage green fascia. Source: TfNSW, 2022

6.2.5 Wharf 3

The proposal involves construction of a new Wharf 3 which would be suitable for large, commercial vessels.

6.2.5.1 Dredging

Construction of Wharf 3 would involve limited dredging of material at the northern face of Wharf 3 berth pocket area.

6.2.5.2 Gangway

An aluminium gangway would connect the southern edge of the main waiting area with the Wharf 3 hydraulic platform. It is also proposed that the gangway would have a roof canopy however, this would be investigated further in detailed design.

6.2.5.3 Hydraulic platform

A new hydraulic platform would be installed at Wharf 3, accessed via the gangway. The hydraulic platform would not have a roof and would feature a surface fall to support drainage, metal balustrades and an emergency ladder.

6.2.6 Wharf 4

The proposal includes construction of Wharf 4, which would be located east of Wharf 3 and would be suitable for small commercial vessels (e.g. water taxis) and recreational vessels at a range of tidal levels. Wharf 4 would be rectangular in shape and run parallel to Wharf 3.

Wharf 4 would consist of large tidal steps alongside a ramp leading down to four landings at for vessel berthing.

6.2.7 Arrestors and separation piles

The proposal includes construction of a new arrestor at Wharf 3, and construction of new arrestors at Wharf 4, if required. Installation of two new separation piles would occur between Wharves 2 and 3.

6.3 Heritage design guidelines

In July 2021, Artefact produced Draft Heritage Design Guidelines for the purpose of providing a preliminary assessment of heritage impacts of the proposal. To avoid or mitigate the potential impacts of the proposed works on the heritage significance of Manly Wharf, the report set out a number of design guidelines which have been used by the wharf design team to inform the proposed design.

The guidelines were developed using the conservation best practice principles of the Burra Charter and the conservation policies established in the Manly Wharf CMP (2011).

The current proposal has been assessed against the draft heritage design guidelines below:

Table 7: Conservation design principles and guidelines for Manly Wharf 3

Conservation Principles	Compliance with the design (Y/N)	Discussion
Overarching Conservation Principles		
Heritage places should be managed in accordance with their heritage values.	Y	The project has produced a considered design which is sympathetic to the heritage context and urban domain. The design has undergone an extensive options analysis process which has enabled the project to choose a design which considers not just compliance, safety, and functionality but visual appeal, materiality and sensitivity to heritage values.
The heritage values of heritage items, sites and conservation areas must be understood before making decisions about their future use and/or adaptation.		The project has undertaken a Statement of Heritage Impact and commissioned these Heritage Design Guidelines for the works to ensure heritage values are well understood.
When proposing change to heritage places, the Burra Charter principle 'do as much as necessary and as little as possible' should be adopted.		The design adheres to the key principles of the Burra Charter. Whilst the project removes and upgrades the existing Wharf 3, it does so in a sympathetic manner and avoids adverse impacts to Wharves 1 and 2, which are of particular significance. Design elements such as the size of the passenger waiting area, the roof canopy size and the form and scale of the wharf have been designed to minimise visual clutter and ensure the new development does not dominant or detract from the existing heritage values.

Conservation Principles	Compliance with the design (Y/N)	Discussion
New development should respect its heritage context in terms of scale, form, siting, setbacks, materials and articulation.	Y	The design is sympathetic to the existing wharf building in that the roof canopy is lower in height, is not attached to the existing building, and does not project as far into the harbour. The materiality is sympathetic to and references the existing building through the use of horizontal linear cladding recalling the weatherboards of the existing building facades, and a concrete floor finish which will tie in with the existing concrete boardwalks. The overall design language is simple and minimal and does not compete with or attempt to replicate period features of the existing building.
Statements of significance must be used to guide decisions about future use, adaptation and development of heritage places.	Y	The project design team have been guided by significance gradings and statements of significance regarding elements of the Manly Wharf 1 and 2 areas which are of particular heritage value.
The conservation policies in the Conservation Management Plan should be used to provide detailed guidance for decisions about this heritage place.	Y	The CMP conservation policies have been taken into account during the design process for this project and are assessed in detail in the Statement of Heritage Impact for the project.
The advice of suitably qualified and experienced heritage consultants should be sought when proposing change to heritage items or when proposing new development in the vicinity of heritage places.	Y	The project has engaged qualified and experienced heritage specialists with built heritage and architectural experience.
The advice of suitably qualified and experienced archaeologists (Aboriginal and historic) should be sought when proposing any ground disturbance works.	Y	The project has engaged qualified and experienced Aboriginal and historic archaeologists as well as marine archaeologists.

Conservation Principles	Compliance with the design (Y/N)	Discussion
Infill Development		
<p>The guidelines <i>Design in Context: Guidelines for Infill Development in the Historic Environment</i> (NSW Heritage Office and Royal Australian Institute of Architects, 2005) should be used to guide the design of new infill development in the vicinity of heritage items.</p>	Y	<p>The project has produced a considered design which is sympathetic to the heritage context and urban domain. The options analysis has considered materiality, form, scale, setbacks and colour palates to ensure the design is sympathetic to the context of the place but is also evidently new.</p>
<p>Infill development should be designed to respond to adjacent heritage items in terms of scale, form, setbacks, materials, colours and articulation.</p> <ul style="list-style-type: none"> • Scale: if new roofs or other vertical features (including shade structures) are located close to Wharf 1 and 2 then they should be at the same height or lower than the existing Wharf 1 and 2 roofs. • Form: the highly linear and orthogonal compositional form of Wharf 1 and 2 is an important part of the 'Maritime Moderne' design language and this should be expressed in the plan form and elevational resolution of the new Wharf 3 piers, roof and shade structures. • Setbacks: the new structure should be setback sufficiently from Wharf 1 and 2 to maintain significant views of the east façade. More generous setbacks will allow taller vertical structures to be constructed without impeding these significant views. 	Y	<p>Scale: The proposed roof canopy is physically separate from the existing building and lower than the existing Wharf 1 and 2 roofs.</p> <p>Form: In plan, the proposal reinforces the linear and orthogonal compositional form of Wharf 1 and 2 in such that the position and orientation of the new Wharf 3 and 4 structure mimics that of the Wharf 1 and 2 building projecting out into the harbour, albeit at a much smaller scale. This is also evident in elevation as the roof canopy and facia are a predominantly linear, horizontal element, with minimal columns supporting it. These columns do not obstruct views to and from the existing wharf building.</p> <p>Setbacks: The proposed roof canopy is set back from the existing building to the north, with its efficient structural arrangement minimising the impact on views to and from the east and south facades of the existing wharf building.</p> <p>Materials: The design incorporates materials that both acknowledge the design of the existing Wharf 1 and 2 building fabric, whilst both meeting the design life and functional requirements of a modern commuter wharf. For example the soffit of the roof canopy will be clad in horizontal linear cladding recalling the weatherboards of the existing building facades, and a concrete floor finish will tie in with the existing concrete boardwalks.</p>

Conservation Principles	Compliance with the design (Y/N)	Discussion
<ul style="list-style-type: none"> Materials: the incorporation of materials that acknowledge the 'Maritime Moderne' design language of the 1940s period Wharf 1 and 2 fabric is recommended. This would include strongly profiled linear cladding elements that recall the weatherboards of the wall and clerestory cladding, and timber decking. Colours: the colour palette of the original 1941 colour 'Maritime Moderne' scheme should be referenced for the new structures. "The paint finish generally is cream with brown, and buff on the capping members to the main shapes and to the awning. The hoods to the windows are in pale green".³⁵ Articulation: the attenuated linear expression of the 'Maritime Moderne' style should be acknowledged in the design of new elements. Ground and roof planes should be regular with an emphasis on horizontal continuity. Frequent changes in levels or irregular geometries should be avoided. 		<p>Colours: The proposed palette of materials references the existing 'Maritime Moderne' scheme, with an off-white finish to the soffit cladding, pale green fascia's, and light grey roof finish, all matching and sympathetic to the existing building.</p> <p>Articulation: The proposed roof canopy has a linear expression in both plan and elevation and is not stepped or irregular in geometry.</p>

Change to Heritage Items and Significant Fabric

Decisions about change to an individual heritage item should be guided by its significance as a whole and of its individual components. Where this information is unavailable, an assessment should be made to guide any adaptations or alterations. Generally, there are greater opportunities to adapt/alter heritage items of local significance than items of state significance.

Y

Design decisions have been guided by significance gradings and statements of significance, especially regarding elements of the Manly Wharf 1 and 2 areas which are of particular heritage value. Majority of the place's values are well understood and established.

³⁵ Manly Ferry Wharf, Manly, NSW, Australia, DOCOMOMO. <http://impressive.net/people/gerald/> date: 25/10/2005

Conservation Principles	Compliance with the design (Y/N)	Discussion
<p>Decisions about change to significant fabric should be guided by the fabric's relative level of heritage significance (as identified in Section 5.3.3).</p> <ul style="list-style-type: none"> • Generally, fabric of highest significance (Exceptional or High) in Wharf 1 and 2 should be retained and conserved. Some adaptation may be possible for fabric of High significance. Fabric of Moderate significance should be retained and conserved, but more extensive adaptation/alteration may be possible. Fabric of Little significance, including the Manly Pier, could be removed or adapted as required. Intrusive fabric should be removed. • Proposals for change which would result in the loss of or otherwise adversely impact elements and fabric of Exceptional and High significance should not proceed unless: <ul style="list-style-type: none"> ○ a) it would result in the recovery of elements of greater significance ○ b) it can be demonstrated that the change is necessary for the long-term conservation and use of the heritage item or ○ c) there is no feasible alternative. • Proposals for change must be considered within the context of the heritage item as a whole. Generally, piecemeal or incremental change should be avoided, unless the change would result in the recovery of significant elements/fabric. • New work should be distinguishable from significant fabric. 	<p>Y</p>	<p>No modifications are proposed to the exceptional or high fabric of Wharf 1 and 2 with the exception of the installation of some additional wayfinding signage, and the external boardwalk adjacent to Wharf 2 to improve accessibility.</p> <p>The existing Manly pier will be demolished up to the edge of the Wharf Bar outdoor area and the existing boardwalk (including some areas of existing balustrading and light poles) will be demolished.</p> <p>The proposed works should be accompanied by an overall interpretation strategy across the TfNSW wharf assets to ensure that the new signage is sympathetic to the retained significant fabric. All new structures will be clearly identifiable as new and whilst contemporary in design, are minimal and sympathetic to the significant Manly Wharf buildings.</p>

Conservation Principles	Compliance with the design (Y/N)	Discussion
New Development in Heritage Landscape		
New development in heritage landscapes and public spaces should be avoided. Any modification to the forecourt of the Manly Wharf 1 and 2 for access improvements should be carefully considered to maintain the highly significant space.	Y	<p>There will be no new development in heritage landscapes or public spaces. New works will be limited to the existing Wharf 3 area.</p> <p>No modification to the Manly Wharf 1 and 2 forecourt is proposed.</p>
If new development is unavoidable, it should be integrated into existing development where possible. Careful modification of existing structures in this highly significant setting would be preferable to new interventions.	Y	<p>New development is unavoidable in order to cater for future passenger demand at Manly Wharf and has been designed to integrate sensitively with the existing development and offers significant public realm improvements and benefits for both commuters and the general public.</p> <p>The new development is in line with and enhances the existing purpose of the heritage place, which is intrinsically a transport facility.</p>
Identified views and vistas of the Wharf in its setting should be preserved.	Y	The position, size, and design of the new structure has been optimised to minimise impact on key vistas both to and from the existing Wharf building, including from the existing restaurants and bars.
Heritage Guidelines — Fabric		
Adaptation and modification of significant fabric for access compliance should seek to conserve significant exterior fabric and interior spaces and fabric. Impacts to significant spaces and fabric, such as its removal, should be avoided or minimised.	Y	<p>Adaptation and modification to significance fabric has been largely avoided wherever feasible as part of the design.</p> <p>The current proposal does not contemplate the modification or removal of significant fabric. The boardwalk works adjacent to Wharf 2 have been designed to not impact the significant exterior and interior fabric.</p>

Conservation Principles	Compliance with the design (Y/N)	Discussion
Regrading and other modifications of decking to enhance accessibility should seek to avoid changes in levels that could obscure or damage significant building fabric including the walls of Wharf 1 and 2.	Y	Regrading is minimal and will not obscure or damage significant fabric of Wharf 1 and 2.
A signage policy for the Wharf should be developed to provide holistic and integrated guidelines for the design and installation of new wayfinding and commercial signage.	Y/N	<p>Signage has been developed to provide a consistent design language across the Wharf and to conform to TfNSW's standards.</p> <p>This ensures that a holistic approach is taken across the precinct which is consistent with the wider ferry network.</p> <p>A signage policy has yet to be developed for this precinct.</p>
Interpretation of the former Manly Fun Pier is encouraged. The Fun Pier was largely located between Wharf 1 and 2 and the current Manly Pier, so interpretation of its location in the proposed works would be restricted to a section of the new promenade and part of the new Manly Wharf 3, depending on its final configuration. This could include interpretive inlays in the decking. Interpretive overlays with images of the former Fun Pier could be applied on vertical planes (including glass or metal screens or balustrades).	Y	The design of the public realm and 'slow space' areas will be developed further in future project stages with input from the local community and First Nations people and will seek to incorporate elements of both Indigenous culture and potentially make reference to the more recent historical elements such as the Manly Fun Pier. There is an opportunity to retain and reuse some of the timber from the existing pier in the design of the bench seating and possibly other public art elements.
New services such as security cameras and lighting should be attached to new elements rather than significant fabric. The need for and number of these elements should be rationalised. Where these services must be attached to significant fabric, existing penetrations should be used in preference to disturbing significant fabric, and new cabling concealed rather than surface mounted.	Y	New services will be restricted to the new Wharf 3 and 4 structure.

Conservation Principles	Compliance with the design (Y/N)	Discussion
New fixtures and fittings should be designed to be safe and functional, but complementary to the aesthetic values of the place. The extensive use of glazing for balustrades and screens is encouraged to minimise adverse visual impacts of the new Wharf 3 structure on the setting of Wharf 1 and 2. Balustrades, fixtures and fittings could reference nautical influences (like tensioned wire balustrades with turnbuckles and timber jetty decking) where functionally appropriate.		<p>All new elements are optimised for safety and functionality but are also aesthetically complementary to the heritage place.</p> <p>Glazed balustrades are used to the entire edge of the new promenade and passenger waiting area. To the edge of the retained portion of jetty, balustrades will match existing in this location.</p>

7.0 HERITAGE IMPACT ASSESSMENT

7.1 Introduction

The objective of a SoHI is to evaluate and explain how a proposed development or other change will affect the heritage values of a heritage place. A SoHI should also address how the heritage values of a place can be retained, and how any impacts be minimised or avoided, or be enhanced by the proposed works.

7.1.1 Assessment against CMP policies

The following table records the policies that are assessed as being directly relevant to the proposed works. A full list of policies can be seen in the Conservation Management Plan 2001³⁶:

Table 8: Assessment of proposal against CMP policies

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
6.2.1. General constraints arising out of cultural significance	6. Constraints & opportunities	The Manly ferry should be retained and conserved.	Yes.	The proposal retains the existing use of the Manly Ferry Wharf. The proposal involves an upgrade to Wharf 3 only and does not directly impact the central wharf building or Wharves 1 and 2. The proposal respects the heritage values of the Manly Ferry Wharf complex.
6.2.1.		No new work or activity should be carried out which will detract from or obscure physical evidence of the major phases of development of the 1940s.	Yes	The proposal does not involve any direct works on 1940s fabric. The proposal is an upgrade of Wharf 3 (the previous location of the demolished Manly fun pier). The vista to the eastern side of the Manly Ferry Wharf (Wharf 2) will be partially obscured from the eastern esplanade by the proposal.
6.2.1.		Architectural and decorative features which date from the 1940s should be conserved.	Yes	There is no direct impact on 1940s fabric by the proposal.

³⁶ Architectural Projects, Conservation Management Plan, 2001.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
6.2.1.		No new building should detract from an understanding of the original Wharf particularly as viewed from the Corso and in distant views from the ferry.	Yes	The proposal does not have any impact on/does not detract from the view from the Corso or from the Manly ferry on arrival at the wharf.
6.2.1.		New works or activities at the place should not diminish its evocative character.	Yes	The proposal will be understood as new infrastructure adjacent to Wharf 2 and to the public promenade. As such it does not detract from the character of the Manly Ferry Wharf.
6.3. Significance of items in the vicinity		The proposed changes will have a significant improvement on reinforcing a consistency of detail which is recognizable as a later layer on these buildings.	Yes	The new works will be recognisable as a new development and sympathetic in use and scale to the wider Manly Ferry Wharf.
6.7.2. NSW Heritage Act		(abbreviated): The item is legally protected under the Heritage Act and requires approval from the NSW Heritage Council for major changes.	Yes, provided that relevant approval processes are followed.	S60 approval and adherence to any conditions of approval is required prior to the commencement of works.
7.1.1. Guidelines for development	7. Statement of conservation policy	New development should encourage mixed use and active street level uses at street level.	Yes	The proposal maintains existing use of the Manly Ferry Wharf by smaller boats (e.g., tourist boats, water ferries) and retains and respects nearby commercial (hospitality) activities.it provides additional street level activation via the new public promenade and seating space.
7.1.1.		Colours should be predominantly light.	Yes	Details of proposed colours to be reviewed by a suitable qualified heritage specialist prior to their finalisation.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.1.1.		Existing public access to the waterside internally and externally should not be reduced by any new work.	Yes	The proposal retains and, in some areas, widens the existing public access and increases the accessibility and use of Wharf 3 and 4.
7.1.1.		Scope exists for a building volume above the 10.5 limit if the volume was significantly smaller and setback from the existing building edge so that it would not be visible at close views and would merge with horizontals at distant views.	N/A	The proposal does not involve an increase in building volume.
7.1.1.		(abbreviated) The future conservation and development of the place should be carried out in accordance with the principles of the Burra Charter.	Yes	The heritage design guidelines as set out in Section 6.3 show compliance of the design with the principles set out in the Burra Charter.
7.1.1.		The conservation policy focuses on retaining the building as a viable commercial facility, while protecting its cultural significance as The Manly Ferry Wharf.	Yes	The proposal respects the significance of the wharf as a public gathering space and transport hub whilst promoting the ongoing commercial use of the Wharf.
7.1.1.		(abbreviated) New work should not be at the expense of existing significant spaces.	Yes	The proposal does not negatively impact existing elements of significance.
7.3.1. Policy - approval	Approvals	Before doing work to any part of the building or lodging a development application of a Section 60 application, the proponent should liaise with heritage architect from the relevant authority.	Yes	The design development process has included advice and input from Artefact's Principal – Built Heritage (heritage architect).

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.3.2. Policy – archaeology approval		(abbreviated) An application for archaeological investigation is required prior to any excavation.		Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment written by Comber Consultants</i> , dated 6th July 2022 for impacts on maritime archaeology
7.4.1. Policy – fabric conservation	Conservation of building fabric	No significant item identified in this plan should be despoiled and/or removed from the building prior to understanding the significance of the item and its contribution to the significance of the place.	Yes	The significance of the Wharf 3 structure is addressed later in this section.
7.4.1.		(abbreviated) The grading of significance of the various elements of the building is a valuable planning tool, and it assists in developing a consistent approach. The grades of significance generate different requirements.	Yes	Refer to the impact assessment later in section
7.4.1.		(abbreviated) Surviving building fabric shall be retained and conserved and only considered for removal or alteration where there is no appropriate alternative.	Yes	The fabric of the existing Wharf 3 structure is not considered significant and is not proposed to be retained. Due to the existing condition of the Wharf 3 structure, its reuse is not recommended.
7.4.1.		(abbreviated) Where fabric of high significance is removed a thorough recording should be made.	Yes	No fabric of high significance is proposed to be removed therefore no recording is required.
7.4.1.		(abbreviated) Fabric of moderate significance should generally be retained.	Yes	No fabric of moderate significance is proposed to be removed or directly impacted in any way.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.4.1.		(abbreviated) The building should exemplify the principal period of its development. The existing building should be retained. This includes the following building elements: The Welcoming Arms; The remnant curved sections; The original wharf loading; The high volume clerestory space.	Yes	the proposal does not directly impact any items from the principal period of development; including; The Welcoming Arms; The remnant curved sections; The original wharf loading; The high volume clerestory space.
7.4.2. Policy - significance		(abbreviated) refers to section 5.10 of the CMP in relation to grading of significance and whether to retain, conserve, remove, etc. fabric according to significance.	Yes	No fabric of moderate or high significance is proposed to be removed or directly impacted in any way.
7.4.4. Policy - finishes		(abbreviated) It is desirable that finishes never intended for painting should continue to be appropriately maintained.	Yes	The proposal will not impact any fabric beyond the existing Wharf 3 structure. There is no painting proposed for the retained fabric of Manly Wharf 1 and 2.
7.5. - Background	Intervention	(abbreviated) Article 3 of The Burra Charter refers to respect for existing fabric and minimal physical intervention.	Yes	The proposal involves no intervention to the significant fabric of the Manly Wharf. The new Wharf 3 scale and design is sympathetic and respectful to the Manly Wharf significant fabric and scale.
7.5.1. – Policy – restrict intervention		It is desirable that intervention into building fabric for non-conservation purposes should generally be restricted to approved programs of re-use or upgrading of service areas and facilities.	Yes	The proposal is for upgrading works to make the wharf more publicly accessible. The proposal involves no direct works to retained significant fabric.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.5.2. Policy – minimise impact of intervention		It is desirable that where intervention in significant fabric is unavoidable, the loss of cultural significance should be minimised. Such intervention should occur in areas of lower rather than higher significance.	Yes	No fabric of high or moderate significance is proposed to be removed or directly impacted by the works. The proposal is located within an area of low or negligible heritage significance.
7.8.1. Policy – urban design	Setting – urban design	The architectural impact of the building derives from its form, facades and landmark quality. Key views of the building available from Manly Cove should be preserved. No further additions should occur to the Manly Ferry Wharf.	Yes	The proposal is an upgrade of Wharf 3 and does not negatively impact the landmark quality, facades, or form of the wider Manly Ferry Wharf. The scale of the proposal will ensure that key views from Manly Cove are retained. No additions are proposed to the Manly Wharf as part of the proposal.
7.8.2. Policy – detracting external additions		Any new work should reduce the impact of detracting external additions. New development should be controlled so as not to detract from the significance of the place. Therefore additions to the building should be located away from and be visually separated from the Welcoming Arms.	Yes	The proposal is located away from The Welcoming Arms. The scale of the proposal has been designed to be sympathetic with the existing fabric of high significance including the Welcoming Arms.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.9.4. Policy – façade changes	Exterior	The interpretation of the building would benefit by a better understanding of the original construction phase of the 1941 wharf and the 1990 additions.	N/A	While this policy is not directly linked to the proposal, it does relate to the interpretative potential of the place and more precisely to a key interpretative theme that can be captured in any interpretation of the proposed works at Wharf 3. It is recommended that a project interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include any reclaimed or salvaged material proposed for reuse within the project. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf.
7.12.1. Policy – original signage	Signage & internal lighting	The existing original signage should be retained.	Yes	Existing signage systems are to be retained.
7.12.3. Policy – Signage and external lighting		Signs and external lighting must be consistent with the relevant signage and lighting policies of the Manly Ferry Wharf.	Yes	Existing signage systems and lighting are to be retained. New proposed signage and lighting are consistent with the Manly Wharf Ferry lighting policies and the overall Manly Wharf signage strategy.
7.12.4. Policy – coordinated signage		Coordinated signage should be designed for the building that complements the appearance of original fabric and the overall character of the place is sufficiently flexible to allow for changes in occupancy.	Yes	The detailed signage design should be provided to a suitably qualified heritage specialist for review prior to its implementation.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.13.1. Policy – Retain and Interpret Building Evolution	Interpretation	Evidence of the progressive evolution of the building where significant fabric should be respected and retained and interpreted.	Yes	Significant fabric is not directly impacted by the proposal. The project will provide further opportunities to interpret the history and ongoing use and significance of the Manly Ferry Wharf as a public transport and commercial hub.
7.13.2. Policy – Appropriate Interpretation		(abbreviated) The heritage significance of the building should be interpreted on site by appropriate methods making reference to existing/ extant evidence that can be utilised in interpretation as the starting point	Pending formulation of interpretation policy	It is recommended that a project interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include any reclaimed or salvaged material proposed for reuse within the project. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf.
7.13.3. Policy – Interpretation of Original Use		As the buildings historical significance derives from its original and continuing function as a commuter wharf, conservation should primarily be aimed at retaining and recovering this aspect of the significance.	Yes	The proposal enhances the use of the place as a public and private commuter wharf by increasing its accessibility.
7.14.1. Policy – Future Use	Future use	The future use of the building should be compatible with its conservation and ideally remain as wharf with some retail activity	Yes	The proposal retains the ongoing use of the place as a public and private commuter wharf.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
7.16.1. Archaeology Permit	Archaeology monitoring	In accordance with the Heritage Act 1977, any excavation where relics may be disturbed, requires an excavation permit		Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment</i> written by Comber Consultants, dated 6 th July 2022 for impacts on maritime archaeology
17.16.2. Policy - Archaeology		All work involving excavation areas of a site that has archaeological potential should be carried out under archaeological supervision by a qualified archaeologist		Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment</i> written by Comber Consultants, dated 6 th July 2022 for impacts on maritime archaeology
17.16.3. Policy - Archaeology		Based on the significance of the site it is the recommendation of the CMP that any ground disturbance on the property in the future be subject to further archaeological monitoring		Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment</i> written by Comber Consultants, dated 6 th July 2022 for impacts on maritime archaeology
7.18.1. Policy – Skills and experience	Appropriate skills and experience	Relevant and experienced professional conservation advice should be provided for all conservation, maintenance, adaptation and repair works proposals and programs on the building.	N/A	Maintenance, adaptation or repair to existing fabric are not currently proposed as part of the works.

7.2 Methodology

This assessment has been prepared using the Statements of Heritage Impact 2002,³⁷ prepared by the NSW Heritage Office, contained within the NSW Heritage Manual, as a guideline.

7.2.1 Impact terminology

A detailed assessment is provided for direct, potential direct, indirect and archaeological impacts. Each type of impact is described in Table 9.

Table 9: Terminology for heritage impact types

Impact	Definition
Direct	Impacts resulting from works located within the curtilage boundaries of the heritage item.
Potential direct	Impacts resulting from increased noise, vibrations and construction works located outside the curtilage boundaries of the heritage item.
Indirect	Impact to views, vistas and setting of the heritage item resulting from proposed works outside the curtilage boundaries of the heritage item.
Archaeological	Impacts to potential archaeological remains located within the curtilage boundaries of the heritage item.

Specific terminology and corresponding definitions are used in this assessment to consistently identify the magnitude of the project's impacts on heritage items or archaeological remains. The terminology and definitions are based on those contained in guidelines produced by the International Council on Monuments and Sites (ICOMOS)³⁸ and the Heritage Council of NSW³⁹ and are shown in Table 10.

Table 10: Heritage Impact Rankings

Ranking	Definition
Major adverse	Actions that would have a severe, long-term and possibly irreversible impact on a heritage item. Actions in this category would include partial or complete demolition of a heritage item or addition of new structures in its vicinity that destroy the visual setting of the item. These actions cannot be fully mitigated.
Moderate adverse	Actions that would have an adverse impact on a heritage item. Actions in this category would include removal of an important part of a heritage item's setting or temporary removal of significant elements or fabric. The impact of these actions could be reduced through appropriate mitigation measures.
Minor adverse	Actions that would have a minor adverse impact on a heritage item. This may be the result of the action affecting only a small part of the place or a distant/small part of the setting of a heritage place. The action may also be temporary and/or reversible.
Little or no	Actions that are so minor that the heritage impact is considered negligible.

³⁷ NSW Heritage Office 2002

³⁸ Including the document *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*, ICOMOS, January 2011.

³⁹ <https://www.environment.nsw.gov.au/resources/heritagebranch/heritage/material-threshold-policy.pdf>

Ranking	Definition
Minor positive	Actions that would bring a minor benefit to a heritage item, such as an improvement in the item's visual setting.
Moderate positive	Actions that would bring a moderate benefit to a heritage item, such as removal of intrusive elements or fabric or a substantial improvement to the item's visual setting.
Major positive	Actions that would bring a major benefit to a heritage item, such as reconstruction of significant fabric, removal of substantial intrusive elements/fabric or reinstatement of an item's visual setting or curtilage.

7.3 Heritage impact assessment

This section assesses the potential direct impacts of the proposed development on the heritage item based on the questions included in the Heritage NSW guideline Statements of Heritage Impacts.

Table 11. Heritage Impact Assessment

Impact	Discussion
What aspects of the proposal respect or enhance the heritage significance of the study area?	The proposed works will not modify or remove any significant 1940's fabric. The proposed works will remove structures of little significance and replace them with contemporary structures whose materiality is sympathetic to the 1940's Manly Wharf fabric. The scale of the proposal is consistent with the existing Wharf 3 structure ensuring the views towards the heritage items are retained and enhanced. An interpretation strategy will also be produced as part of the works, to ensure the ongoing interpretation of the Manly wharf precinct.
What aspects of the proposal could have a detrimental impact on the heritage significance of the study area?	The proposed works will not have a detrimental impact on the heritage significance of Manly Wharf as it does not impact on any significant fabric, it does not negatively impact the views towards or away from the heritage item and will make the Wharves more easily accessible to the general public who interact with the wharves on a daily basis.
Have more sympathetic options been considered and discounted?	The proposed works are the most sympathetic as they do not modify or demolish any significance fabric. The works will also create a precinct which is more easily accessible to less mobile members of the public encouraging its ongoing function as a transport hub.
Demolition of a building or structure	
Have all options for retention and adaptive re-use been explored?	The majority of the 1990s structures proposed for demolition (Wharf 3 and the public boardwalk) are of low significance and therefore their demolition will not negatively impact on the significance of Manly Wharf. To successfully achieve the requirements of the TAP program (i.e. providing accessible access Wharf 2 and 3) the retention of the structures is not feasible and adaptive reuse is not relevant.
Can all of the significant elements of the heritage item be kept, and any new development be located elsewhere on the site?	The proposal will not result in the demolition or removal of any highly significant fabric. To allow the ongoing functionality of the Wharf the proposed Wharf 3 will be positioned in the same location as the current Wharf 3, and therefore will not negatively impact on the significance of Manly Wharf.

Impact	Discussion
Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?	Demolition is essential to achieve the aim of the TAP upgrade of Manly Wharf (i.e. to provide accessible access to Manly Wharf)
Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why not?	Yes. The heritage design guidelines produced by Artefact Heritage have been incorporated into the current proposal. Refer to section 6.3.
Major additions	
How is the impact of the addition on the heritage significance of the item to be minimised?	In July 2021, Artefact Heritage assessed the preliminary proposal on the significance of Manly Wharf. Based on the assessment Artefact produced a set of heritage design guidelines which aimed to mitigate or minimise the impacts of the proposal on the significance of Manly Wharf. These design guidelines have been used by the Wharf design team to inform the current proposal. The current proposal is consistent with and strengthens the ongoing operation of the site as a wharf precinct Refer to section 6.3.
Can the additional area be located within an existing structure? If not, why not?	No, demolition is essential to achieve the aim of the TAP upgrade of Manly Wharf (i.e. to provide accessible access to Manly Wharf)
Will the additions tend to visually dominate the heritage item?	No, the scale of the proposed works is consistent with the existing Manly Wharf 3 structures and therefore will not visually dominate or detract from the significance Manly Wharf structures.
Are the additions sited on any known, or potentially significant archaeological deposits? If so, have alternative positions for the additions been considered?	Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment</i> written by Comber Consultants, dated 6 th July 2022 for impacts on maritime archaeology
Are the additions sympathetic to the heritage item	The proposed works will be sympathetic to the existing heritage items in terms of scale and materiality. The scale of the proposal is consistent with the current Wharf 3 structure, and the proposed materials are clearly identifiable as new as well as being sympathetic with the existing wharf structures.
New development adjacent to a heritage item	
How is the impact of the new development on the heritage significance of the item or area to be minimised?	In July 2021, Artefact Heritage assessed the preliminary proposal on the significance of Manly Wharf. Based on the assessment Artefact produced a set of heritage design guidelines which aimed to mitigate or minimise the impacts of the proposal on the significance of Manly Wharf. These design guidelines have been used by the Wharf design team to inform the current proposal. Refer to section 6.3.
Why is the new development required to be adjacent to a heritage item?	To allow the ongoing functionality of the Wharf the proposed, Wharf 3 will be positioned in the same location as the current Wharf 3.
How does the curtilage allowed around the heritage item contribute to the retention of its heritage significance?	A functional structural exclusion zone has been established around Wharf 1 and 2 to allow safe movement of ferries from the existing docking areas, and a similar exclusion zone is required for the new Wharf 3 and 4. These have the effect of providing a generous open and unencumbered setting for Wharf 1 and 2, that restricts physical and visual impacts on the heritage values of the place.

Impact	Discussion
<p>How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?</p>	<p>The scale of the proposed works is consistent with the existing Manly Wharf 3 structures and therefore will adversely change the views to the significance Manly Wharf structures. The contemporary materiality of the wharf will provide a positive impact on the heritage significance of Manly Wharf and the views from the heritage items.</p>
<p>Is the development sited on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?</p>	<p>Refer to <i>Manly Wharf 3 upgrade – Maritime Archaeological Assessment</i> written by Comber Consultants, dated 6th July 2022 for impacts on maritime archaeology</p>
<p>Is the new development sympathetic to the heritage item? In what way (e.g. form, siting, proportions, design)?</p>	<p>The proposed works will be sympathetic to the existing heritage items in terms of scale and materiality. The scale of the proposal is consistent with the current Wharf 3 structure, and the proposed materials are clearly identifiable as new as well as being sympathetic with the existing wharf structures</p>
<p>Will the additions visually dominate the heritage item? How has this been minimised?</p>	<p>No, the scale of the proposed works is consistent with the existing Manly Wharf 3 structures and therefore will not visually dominate or detract from the significance Manly Wharf structures.</p>
<p>Will the public, and users of the item, still be able to view and appreciate its significance?</p>	<p>Yes. The scale of the proposed works is consistent with the existing Manly Wharf 3 structures, allowing the ongoing views to the significant Manly wharf structures. An interpretation strategy will be produced as part of the proposed works, which will ensure the ongoing interpretation of the Manly wharf precinct.</p>

7.4 Heritage impact on nearby heritage items

The following table identifies any potential impacts of the proposal on the nearby heritage items which are set out in section 2.3 above.

Table 12: Impact of proposal on statutory heritage listings for Manly Wharf and nearby items

Item	Address	Significance	Proposal impact Y/N	Discussion
Manly Wharf				
Manly Wharf	West Esplanade, Manly, NSW, 2095	State SHR #01434	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)
Manly Wharf	West Esplanade, Manly, NSW, 2095	State SEEP (Biodiversity and Conservation) Part 2, Item 18	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)
Manly Wharf (façade and street returns only)	West Esplanade, Manly, NSW, 2095	State RMS S170#4920067	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)

Item	Address	Significance	Proposal impact Y/N	Discussion
Manly Wharf	East and West Esplanades, Manly, NSW, 2095	State Manly LEP 2013 #1145	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)
Pier (former fun Pier, Manly Wharf)	East and West Esplanades, Manly, NSW, 2095	Local Manly LEP 2013#1146	Y	The proposal will result in the partial demolition and replacement of the 1990s Manly Pier.
Heritage Conservation Areas				
Manly Town Centre Heritage Conservation Area (LEP)		Local Manly LEP 2013 C2	Y	The proposal will indirectly impact this LEP listing as it involves the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is included in the LEP). Despite this the proposal will have an overall positive impact on the Manly Wharf and greater Manly town centre as it will result in an improved public experience of commuters at the wharf (via increased accessibility), it will retain the existing retail tenancies and will provide new public domain and dwell spaces.
East Esplanade				
Two terrace houses	41–42 East Esplanade, Manly, NSW, 2095	Local Manly LEP 2013 #1150	N	The proposal will not result in any modifications to the East Esplanade façade. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.

Item	Address	Significance	Proposal impact Y/N	Discussion
Manly Rowing, Sailing, Yacht and Launch Club	East Esplanade, Manly, NSW, 2095	Local Manly LEP 2013 #I142	Y	The proposed Wharf 3 will be consistent with the current scale of the Manly Pier. Whilst the new Wharf will be potentially visible from the yacht club the scale and materiality will provide have a positive indirect visual impact on this listing.
Monument – memorial (broken fountain)	East Esplanade (East Esplanade Park), Manly, NSW, 2095	Local Manly LEP 2013#I144	N	The proposal will not result in any modifications to the East Esplanade façade. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Park/ Reserve	East Esplanade, Manly, NSW, 2095	Local Manly LEP 2013 #I143	Y	The proposed Wharf 3 will be consistent with the current scale of the Manly Pier. Whilst the new Wharf will be potentially visible from the park, the scale and materiality will provide have a positive indirect visual impact on this listing.
West Esplanade				
Manly Cove Pavilion	West Esplanade, Manly, NSW, 2095	State Manly LEP 2013 #I249	N	The proposal will not result in any modifications to the West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Governor Phillip Monument	West Esplanade, Manly, NSW, 2095	Local Manly LEP 2013 #I248	N	The proposal will not result in any modifications to the West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.

Item	Address	Significance	Proposal impact Y/N	Discussion
Park	West Esplanade, Manly, NSW, 2095	Local Manly LEP 2013 #I251	N	The proposal will not result in any modifications to the West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Belgrave Street				
Civic buildings – Council Town Hall Administration building, police station and courthouse	1-3 Belgrave Street, Manly, NSW, 2095	Local Manly LEP 2013 #I82	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
The Corso				
Group of commercial buildings	The Corso, Manly, NSW, 2095	Local Manly LEP 2013 #I106	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Street Trees	The Corso (from Whistler Street to Sydney Road), Manly, NSW, 2095	Local Manly LEP 2013 #I104	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.

Item	Address	Significance	Proposal impact Y/N	Discussion
2 cast iron pedestals (former street lights)	The Corso (central reservation, between The Esplanade and Darley Road), Manly, NSW, 2095	Local Manly LEP 2013 #I102	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Monument – war memorial (cenotaph)	The Corso, Manly, NSW, 2095	Local Manly LEP 2013 #I103	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Wentworth Street				
Street Trees	Wentworth Street, Manly, NSW, 2095	Local Manly LEP 2013 #I246	N	The proposal will not result in any modifications to the West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.
Fairlight Foreshore				
Esplanade Park and Fairlight Pool	Fairlight Foreshore, North Harbour, Manly, NSW, 2095	Local Manly LEP 2013 #I49	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.

Item	Address	Significance	Proposal impact Y/N	Discussion
Harbour Foreshore				
Harbour Foreshores	Manly municipal area boundary adjacent to the Harbour	Local Manly LEP 2013 #11	N	The proposal will not result in any modifications to the East/ West Esplanade façade or Wharf 1 and 2. The new Wharf 3 will be consistent with the current scale of the Manly Pier and therefore will not cause any indirect visual impacts on this listing as it will not be directly visible this site.

Table 13: Non-statutory listings for Manly Wharf and adjacent areas

Item	Address	Significance	Proposal impact Y/N	Discussion
Manly Wharf				
Manly Wharf	West Esplanade, Manly, NSW, 2095	State DOCOMOO	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)
Manly Wharf	West Esplanade, Manly, NSW, 2095	Classified National Trust	Y	The proposal will directly impact this listing as it proposes the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is a part of this listing). Despite this the proposal will have an overall positive impact on the Manly Wharf site as it will not directly impact any highly significant fabric, and the works will improve the public experience of the wharf (via increased accessibility and new public domain and dwell spaces)

Item	Address	Significance	Proposal impact Y/N	Discussion
Heritage Conservation Areas				
Manly Urban Conservation Area	Manly Cove, Sydney Road, West Promenade	Classified National Trust	Y	The proposal will indirectly impact this LEP listing as it involves the partial demolition of the 1990s Manly Pier/ Wharf 3 (which is included in the LEP). Despite this the proposal will have an overall positive impact on the Manly Wharf and greater Manly town centre as it will result in an improved public experience of commuters at the wharf (via increased accessibility), it will retain the existing retail tenancies and will provide new public domain and dwell spaces

7.5 Direct (physical) heritage impacts

The proposed works will have a **major adverse** direct impact on the significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it will involve the partial demolition of these existing 1990s structures. Despite this, the proposed works will result in a **minor positive** impact on the significance of the overall Manly Wharf precinct (including the 1940's buildings and wharf 1 and 2), as they will:

- Make the precinct more easily accessible
- Increase the amount of public domain and seating space encouraging more people to swell within the Manly Wharf area
- Retain all existing significant fabric
- Retain the existing commercial uses within the wharf
- Future proof the wharf by increasing its functional capacity for vessels and passengers
- The proposed works have been designed to be sympathetic in design and scale with the existing Manly Wharf, therefore resulting in a **moderate positive** impact to the significance of the site.

7.6 Potential direct heritage impacts

The proposal will result construction works and vibration directly adjacent to the significant 1940's fabric of the existing Manly Wharf. This could result in **minor adverse** impacts on the retained structures and significance of the Manly Wharf listing. The recommendations included in section 8.0 should be followed to ensure the potential impacts on the significance of the site are mitigated.

7.7 Indirect (visual) heritage impacts

The new wharf will be located in the same location as the existing Manly Wharf 3 and therefore will have **little or no** indirect impact on the heritage significance of the Manly Wharf. Whilst the new Wharf 3 will result in a partial visual obstruction of the view of Wharf 2 from East Esplanade, the new scale and design of Wharf 3 and 4 will result in a **minor positive** impact on the significance of the Manly Wharf precinct.

7.8 Impacts to potential marine archaeological remains

Refer to *Manly Wharf 3 upgrade – Maritime Archaeological Assessment written by Comber Consultants*, dated 6th July 2022 for impacts on maritime archaeology

7.9 Cumulative impacts

The introduction of the new wharf structure represents one of the more significant changes at the Manly Ferry Wharf since the construction of the existing central wharf building in the 1940s. Other significant changes since the mid-20th century include the removal of the Manly Fun Pier and the addition of the new retail space in the early 2000s. Each of these changes (except for the removal of the Manly Fun Pier) represents a major extension to the capacity of the place for commercial or maritime use rather than an incremental loss of fabric or significance. The upgrading of Wharf 3 (the proposal) also represents a significant change without altering the maritime use and character of the Manly Ferry Wharf and without the loss of significant fabric.

8.0 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

This report concludes the following:

- The proposed works will result in a **minor positive** indirect impact on the heritage significance of the overall Manly Wharf precinct (including the 1940's buildings and wharf 1 and 2) and have a **major adverse** direct impact on the heritage significance of the Manly Pier (Wharf 3) portion of the Manly Wharf precinct as it will involve the partial demolition of the existing 1990s structures. The proposed works will:
 - Make the precinct more easily accessible
 - Increase the amount of public domain and seating space encouraging more people to dwell within the Manly Wharf area
 - Compliment the wharf precinct by adding to the wharf amenity
 - Retain all existing significant fabric
 - Retain the existing commercial uses within the wharf
 - Be consistent with the ongoing operation of the area as a wharf precinct
 - Future proofing the wharf by increasing the functional capacity for vessels and passengers
- The proposed works have been designed to be sympathetic in design and scale with the existing Manly Wharf, therefore resulting in a **moderate positive** impact to the heritage significance of the site.
- The construction works could result in **minor adverse** impacts on the heritage significance of the Manly Wharf listing, and therefore the recommendations below should be followed mitigate the potential impacts on the heritage significance of the site.
- The new wharf will have **major adverse** indirect impact on the heritage significance of the Manly Pier (wharf 3) as it will result in its demolition. Despite this, the proposed new Wharf 3 scale and design will result in a **minor positive** impact on the heritage significance of the entire Manly Wharf precinct.
- Refer to *Manly Wharf 3 upgrade – Maritime Archaeological Assessment* written by Comber Consultants, dated 6th July 2022 for impacts on maritime archaeology

General Recommendations

The following management guidelines should be followed for all aspects of the proposed works:

- The works have been designed to minimise and avoid impacts on original and highly significant fabric. However, works that require impacts to original fabric, i.e. the proposed connection between the new Wharf 3, and highly significant fabric of Wharf 2, should be

'made good' once works are complete, in accordance with the guidelines, *How to Carry Out Work on Heritage Buildings & Sites* (NSW Heritage Office 2002). This could include:

- Reinstating/replacing fabric with identical materials;
 - Where internal surfaces are to be made good after works, care should be taken to ensure that modern materials and finishes that match existing are used for repair work; and
 - Repair should generally match the original element but should be identifiable as new work.
- Where the works could impact original and highly significant heritage fabric, only tradespersons with experience in working with modern heritage materials should undertake works;
 - The methods, tools and materials used should not cause inadvertent damage to original and highly significant heritage fabric within the study areas. Should unexpected damage to significant historic fabric occur, the advice of a heritage specialist should be sought before repairs are made;
 - All works are to be undertaken in accordance with the principles and objectives of the *Burra Charter: the Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (the *Burra Charter*);
 - Where options exist for alternative installation methodologies and materials, that achieve the desired functional outcome, preference should be given to the option that has the least deleterious impact on significant heritage fabric.
 - A site interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include interpretation surrounding any reclaimed or salvaged material proposed for reuse in the project. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf.
 - A site signage strategy should be developed and implemented across all TfNSW Wharf assets as part of the proposed works to ensure the signage does not negatively impact on the significant fabric.

Design Recommendations

Prior to the finalisation of the detailed design, the following elements should be reviewed by a suitably qualified heritage specialist. The purpose of this review is to minimise or mitigate the direct and indirect impacts of the proposed works on the significance of Manly Wharf and the retained highly significant fabric:

- The interface detail between the new boardwalk and Wharf 2.
- The potential gangway roof structure.
- The proposed painting colour scheme.
- The implementation of the proposed signage strategy.

- The implementation of the proposed interpretation strategy (including any materials salvaged and proposed for reuse within the project).
- Any salvaged materials proposed for reuse.

Protection of Heritage Fabric During Works

The following recommendations and mitigation measures are provided to minimise potential direct impact to original and highly significant fabric of the subject sites:

- A Construction Cultural Heritage Management Plan management plan (CCHMP) should be produced and reviewed by a suitably qualified heritage consultant prior to the commencement of work. The CMP should set out appropriate fabric protection to be installed to all adjacent significant fabric for the duration of the works, and the proposed noise and vibration monitoring which will be implemented for the duration of the works

The following recommendations and mitigation measures are provided in order to minimise potential indirect impacts to the heritage items in the vicinity:

- If any inadvertent damage occurs to original and highly significant fabric within and in the vicinity of the study area due to the proposed works, the damage must be reported immediately to the Project Manager and the relevant Heritage Specialists. Damage is to be made good in accordance with specialist heritage advice.

8.2 Mitigation measures

To mitigate any potential impacts of the proposed works on the significance of the site, a site interpretation strategy should be developed and implemented across the TfNSW wharf assets. The strategy should include interpretation for the retained W1/W2, the new works proposed for W3 and should include any reclaimed or salvaged material. The interpretation strategy should ensure the ongoing interpretation of the historical development of the Manly wharf,

Prior to the commencement of works a Photographic Archival Recording (PAR) should be undertaken of the project site. The PAR should record all elements proposed for demolition within the project boundary, including Manly Pier (Wharf 3), and their interface with the retained highly significant fabric only. Archival recording should be carried out by measured drawing and photographically in accordance with NSW Heritage Council guidelines: *'How to Prepare Archival Records of Heritage items'* and *'Photographic Recording of Heritage Items Using Film or Digital Capture'* and the final document should be lodged with the State Library of NSW.

9.0 REFERENCES

Architectural Projects Pty Ltd. Conservation Plan and Urban Guidelines for Manly Wharf (CMP), 2001.

Manly Ferry Wharf Conservation Management Plan (CMP), 2011. 97.532.

GHD. "Manly Wharf 3 Concept Design Key Stakeholder Workshop 1," July 9, 2021.

Heritage Office. "Manly Wharf." State Heritage Inventory, April 11, 2001.

<https://www.heritage.nsw.gov.au/search-for-heritage/state-heritage-inventory/>.

Northern Beaches Council. "Manly Development Control Plan 2013," 2013.

NSW Government. "Manly Local Environmental Plan 2013," 2013.

<https://legislation.nsw.gov.au/view/html/inforce/current/epi-2013-0140#statusinformation>.

State Environmental Planning Policy (Infrastructure) (ISEPP) 2007," 2007.

<https://legislation.nsw.gov.au/view/html/inforce/current/epi-2007-0641#statusinformation>.



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Appendix J

Biodiversity impact assessment



Manly Wharf 3 Upgrade

Biodiversity Assessment Report

Prepared for Transport for New South Wales

Manly Wharf 3 Upgrade

Biodiversity Assessment Report

Transport for New South Wales | 16 November 2022


Prepared by Cardno, now Stantec (NSW/ACT) Pty Ltd for Transport for NSW on behalf of GHD Pty Ltd



Document controls

Approval and authorisation

Title	Manly Wharf 3 Upgrade Biodiversity Assessment Report
Accepted on behalf of Transport for NSW by:	
Signed:	
Dated:	

Title	Manly Wharf 3 Upgrade Biodiversity Assessment Report
Accepted on behalf of GHD Pty Ltd by:	Stewart Verity GHD Project Director for the Manly Wharf 3 Upgrade
Signed:	
Dated:	16 November 2022

Document status

Document status	Date	Prepared by	Reviewed by
Draft	12/07/2022	Jake Ludlow	Kate Reeds
Draft	23/08/2022	Jake Ludlow	Craig Blount
Final	5/09/2022	Jake Ludlow	Craig Blount
Final Update	16/11/2022	Jake Ludlow	Kate Reeds

Executive summary

The proposal forms part of the Ferry Wharf Upgrade Program and the Transport Access Program (TAP) and is focused on the upgrade of Manly Wharf 3 (the proposal). This includes a number of water-based activities and small land based compound area for construction of the new wharf and removal of the existing wharf. The proposal involves upgrade of the existing Wharf 3 and construction of a new Manly Wharf 4 under the TAP.

The biodiversity assessment described the existing environment within the study area and assessed impacts to biodiversity as a result of construction and operation of the proposal. The biodiversity assessment was informed by a review of existing information and data in the study area and the study locality, as well as a field survey of the marine study area.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council. It is also located at the western end of Manly Cove and is part of the greater Manly Wharf Complex which includes a ferry terminal, restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

The study area is located within a highly modified, urban foreshore, characterised by a low sandstone seawall along the length of the foreshore and surrounded by hardstands with some landscaped gardens (East Esplanade Park) and fringed with mature Norfolk Island Pines. No remnant terrestrial vegetation or PCTs occur within the study area. A significant feature of the subtidal study area were large patches of seagrasses (including mixed and monospecific beds of *Zostera muelleri* subsp. *capricorni*, *Halophila* sp. and *Posidonia australis*) located adjacent to the existing Wharf 3 structure and extending generally south, south-east of the existing Manly Wharf.

Existing timber pilings provided artificial habitat for encrusting invertebrates and macroalgae. The seabed within the study area otherwise consisted of un-vegetated soft sediment (marine sand) and no other marine vegetation such as mangrove or saltmarshes were recorded.

The marine vegetation and habitat in the study area provides potential habitat for a number of urban, disturbance tolerant native species, although features of the study area also provide potential habitat for several threatened fauna species with a moderate to high likelihood of occurrence. These included:

- Seven microbats listed under the *Biodiversity Conservation Act 2016* (BC Act).
- Little Penguin population in the Manly Point Area (*Eudyptula minor*), listed as an endangered population under the BC Act.
- White's Seahorse (*Hippocampus whitei*) listed as endangered under the *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Black Rockcod (*Epinephelus daemeli*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

The proposal is not expected to remove any terrestrial vegetation (trees or shrubs) and any impacts to terrestrial biodiversity would be limited to disturbance of mown lawn or hardstands. Nonetheless, the risks of the spread/introduction of weeds and diseases and the potential for erosion and sediment mobilisation associated with construction activities would be managed in accordance with the relevant Transport for NSW (TfNSW) guidelines.

The proposal would involve the removal of about 290 cubic metres of material (marine sands) from an area of about 388 square metres of seabed (dredge area). This will overlap with a small area of seagrass (low density *Zostera* and *Halophila*) and potentially macroalgae. One arrestor pile would also be driven into a small patch of low density *Zostera* and *Halophila*. Direct shading of the new boardwalk and potentially scouring from the fast

ferry operating out of the new Wharf 3 may also indirectly affect small patches of *Halophila* and low density *Zostera* and *Halophila*. A small residual loss of seagrass would therefore be expected, however, removal of the old Wharf 3 structure and relocation of fast ferry operations alongside the new Wharf 3, may allow recolonisation of seagrass into areas of seabed previously shaded or disturbed by vessel scour.

Under Section 199 of the FM Act, consultation with NSW DPI (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to removal of structures and piling. Section 205 of the FM Act states that a permit to 'harm' marine vegetation would be required.

Offsets for the residual loss of seagrass and macroalgae should be considered in accordance with the *Guideline for Biodiversity Offsets* (NSW Roads and Maritime Services, 2016), *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013) and in consultation with NSW DPI (Fisheries).

Removal of existing timber piles and wharf structure would result in the loss of attached encrusting biota and some macroalgae, however, the majority of these species are common in Manly Cove and surrounds and over time, the new piles would be recolonised. Overall, there would be a net increase in artificial surface for re-colonisation of biota.

Sediment mobilisation from activities that would disturb the seabed and vessel wash/scour were identified as potential impacts. However, the study area is likely to be frequently exposed to elevated levels of sediment, associated with rainfall, sea conditions and vessel traffic in the waters of Manly Cove. Thus, with the appropriate controls, a slight, temporary increase in these impacts is not expected to substantially impact marine biodiversity and likely to be within the level of natural variability.

Construction related noise from dredging and particularly from pile driving has potential to impact marine fauna such as Syngnathids and Little Penguins including an Area of Outstanding Biodiversity Value (AOBV) which is habitat for Little Penguins. Mitigation measures have therefore been recommended to reduce the potential for noise related impacts to these species in particular. This would include pre-construction clearance surveys, deployment of marine fauna observers, timing of piling outside of important breeding seasons and noise reduction measures.

Caulerpa was present within the study area and movements of vessels, plant and equipment could further spread *Caulerpa* (and potentially other marine pests) within Manly Cove and to other unaffected estuaries. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided.

Overall, the proposal is not expected to facilitate any key threatening processes and is unlikely to significantly impact threatened species. Disturbances to potential habitat would largely be temporary and constitute a very small proportion of available habitat. The proposal would not permanently fragment or isolate threatened species or populations or substantially impact any species' lifecycle. Survey for microbats, Black Rockcod, Little Penguin and White's Seahorse prior to the commencement of construction activities is recommended so that individuals in the area are not harmed. Species impact statements (SISs) or referrals are not therefore recommended for the proposal.

Considering the above and assuming recommended mitigation measures are implemented, the proposal is unlikely to significantly impact biodiversity.

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Appendix A Species recorded

Appendix B Habitat assessment table

Appendix C Assessments of significance

Glossary

Definitions	
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act for the purpose of assessing certain impacts on threatened species and threatened ecological communities, and their habitats, and the impact on biodiversity values.
Commonwealth Minister	Australian Minister for the Environment
Compound area	Temporary facility for construction, including for example an office and amenities compound, construction compound and materials storage compound. Compound area is shown on Figure 1-1.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Where a primary action is a substantial cause of a secondary event or circumstance which has an impact on a protected matter (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf).
Dredge area	Refers to the location of dredging, an area of about 0.04 hectares
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (NSW OEH, 2014).
The harbour	Sydney Harbour
Indirect impact	Where an event or circumstance is a direct consequence of the action (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf). Indirect impacts include but not limited to: <ul style="list-style-type: none"> (a) indirect impacts on adjacent vegetation and habitat during construction (b) indirect impacts on adjacent vegetation and habitat during operation (c) impacts on adjacent vegetation and habitat arising from a change in land-use patterns (NSW OEH, 2017)
Matters of National Environmental Significance	A Matter of National Environmental Significance (MNES) protected by a provision of Part 3 of the EPBC Act.
Microbats	Microchiropteran bats
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.

NSW landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (Mitchell, 2002).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Population	A group of organisms, all of the same species, occupying a particular area (NSW OEH, 2017).
Proposal	The new wharf proposed to be constructed at Manly Wharf 3 and as described in Section 3 of the Review of Environmental Factors.
Proposal area	The area directly impacted by the proposed works including installation and removal of structures. The proposal area is shown in Figure 1-1.
Study area	The area directly affected by the development and any additional areas likely to be affected by the development, either directly or indirectly. The study area is shown in Figure 1-2.
Study locality	Refers to an area within five kilometres of the study area (for the purpose of the background search). The study locality is shown in Figure 1-3.

Abbreviations

AASS	Actual acid sulfate soils/sediments
AOBV	Area of Outstanding Biodiversity Value
AoS	Assessment of Significance
ASS	Acid sulfate soils/sediments
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BoM	Bureau of Meteorology
CCTV	Closed circuit television
CEMP	Construction environmental management plan
CFU	Colony forming unit
Coastal Management SEPP	NSW State Environmental Planning Policy (Coastal Management) 2018
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DoE	Commonwealth Department of the Environment (former)
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
DSAPT	Disability Standards for Accessible Public Transport 2002
EAC	East Australian Current
EEC	Endangered ecological community
EES	Environment, Energy and Science group (in DPIE)
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Federal).
FM Act	NSW Fisheries Management Act 1994
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
KFH	Key Fish Habitat

LGA	Local Government Area
MNES	Matters of National Environmental Significance
NIMPIS	National Introduced Marine Pest Information System
NPWS	National Parks and Wildlife Service
NTU	Nephelometric turbidity unit
OCP	Organochlorine pesticides
OEH	NSW Office of Environment and Heritage (former)
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soils/sediments
PCT	Plant community type
PMST	Protected Matters Search Tool
PTS	Permanent temporary shift
REF	Review of Environmental Factors
ROV	Remotely operated vehicle
SIS	Species impact statement
TAP	NSW Government's Transport Access Program
TAPs	Threat Abatement Plans
TBDC	Threatened Biodiversity Data Collection
TBT	Tributyltin
TEC	Threatened ecological community
TfNSW	Transport for New South Wales
TTS	Temporary temporal shift
WQOs	Water quality objectives
µS/cm	Micro siemens per centimetre
µg/L	Micrograms per litre
µPa	Micro pascal
dB	Decibel

1 Introduction

1.1 Proposal identification

Transport for New South Wales (TfNSW) proposes to upgrade Manly Wharf 3 ('the proposal') as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

The proposal is located within the local government authority area (LGA) of Manly Council and is about 11 kilometres northeast of Circular Quay. The proposal lies south of the intersection of Belgrade Street and East and West Esplanade, at the southern end of the Manly town centre. It is also located at the western end of Manly Cove and is part of the greater Manly Wharf Complex. The Manly Wharf Complex includes a ferry terminal, restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

1.2 The proposal

Key features of the proposal relevant to the Biodiversity Assessment Report (BAR) would involve the following key features:

- removal of the existing Manly Wharf 3 timber wharf structure, piles and triangular platform.
- retention of the current Wharf Bar outdoor seating area, and retention of a small area of the timber wharf immediately adjacent to the Wharf Bar outdoor seating area.
- construction of a new pile-supported promenade that runs adjacent to the existing boardwalk.
- construction of a Disability Standards for Accessible Public Transport (DSAPT) compliant access path where required along the promenade from the Wharf 1-2 entry to the hydraulic wharf platform at Wharf 3.
- a new public seating space / rest 'slow space' within the new public promenade area.
- construction of a new covered main waiting area accessed via the new promenade area.
- installation of a new 18 metre aluminium gangway connecting the main waiting area to the Wharf 3 hydraulic platform.
- installation of a new hydraulic platform (Wharf 3) supported by three piles, accessed by the new gangway. Wharf 3 has been designed to accommodate larger vessels.
- construction of a fixed structure (Wharf 4) supported by six piles, consisting of large tidal steps alongside a ramp leading down to landings at intervals for berthing at different tidal levels. The ramped structure would be at a maritime-compliant grade suitable for assisted access for less-mobile passengers. Wharf 4 would be suitable for small commercial vessels (ie water taxis) and recreational vessels at a range of tidal levels.

- construction of a new vessel arrestor at Wharf 3.
- construction of two new separation piles between Wharves 2 and 3.
- limited dredging of material at the Wharf 3 berth pocket area.
- upgrade of safety and security features including lighting, closed circuit television (CCTV) security cameras and tactile ground surface indicators, where required.
- wharf booking information screens system.
- providing conduits for opal readers to be installed in the future if required.

The design and staging have been developed to reduce impacts to the environment including on noise and existing seagrass. Dredging design has been altered to minimise seagrass impacts.

About 290 cubic metres of material would be removed as a part of the in-situ dredging. This is based on the size of the berthing pocket, including a one metre offset, a 1:5 batter and a 0.5 metre deep over-dredging allowance (refer Figure 1-1). Dredging would be undertaken from a barge mounted excavator.

The volume of dredge spoil that would be produced will be about 350 cubic metres, accounting for a 1.2 bulking factor. All dredge spoil would be contained on hopper barges for offsite re-use or disposal to a licensed facility, depending on waste classification.

A temporary site compound would be located in East Esplanade Park (refer Figure 1-1). This compound would be used to establish offices, lunchrooms, amenities and limited storage. The compound would only utilise the grassed area of the park and no tree clearance would be required. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

A laydown area on the marine side of Manly Wharf would be used to enable closer access to equipment and materials (refer Figure 1-1). Once the expansion of the western side of the new wharf is completed, the laydown area would be moved to the newly constructed expanded promenade area.

It is anticipated construction of the proposal would take up to eight months depending on weather and maritime conditions, commencing in the first half of 2023. Construction of some elements of the proposal would require closures of the existing wharves. This is discussed further in Section 3 of the REF.

Figure 1-1 shows the key features of the proposal.



Key Features of the Proposal

MANLY COVE, NSW

Legend

- Proposal Area
 - Laydown Area
 - Dredging Area
 - Demolition Area
 - Compound Area
 - New Wharf Structure
- 80% Pile Arrangement**
- Arrestor
 - Mooring and Berthing Piles
 - Separator Piles
 - Steel Support Piles

FIGURE 1-1

1:1,800 Scale at A4



1.3 Legislative context

A REF is prepared to satisfy Transport for NSW's duties under section 5.5 of the *Environmental Planning and Assessment Act 1979* (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 that activity" and in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the Manly Wharf 3 upgrade, and assesses the biodiversity impacts of the proposal.

Sections 7.2A of the *Biodiversity Conservation Act 2016* (BC Act) and Part 7A of the *Fisheries Management Act 1994* (FM Act) require that the significance of the impact on threatened species, and threatened ecological communities (TECs) is assessed using a five-part test (BC Act) or the 7-part test (FM Act). Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Significance of impacts on nationally listed threatened species, ecological communities and migratory species are to be assessed in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment (DoE), 2013). If significant impacts are considered likely, then the action is deemed a controlled action and a referral is required.

1.4 Definitions

- Biodiversity Assessment Report (BAR) - this report.
- The proposal - refers to the Manly East wharf upgrade as described in Section 1.2.
- Proposal area - refers to the area directly impacted by the proposed works including the installation and removal of structures and the dredge area (Figure 1-1).
- Study area – refers to the biodiversity study area, an area of about 4.7 hectares (Figure 1-2).
- Dredge area – refers to the location of dredging, an area of about 0.04 hectares (Figure 1-1).
- Compound area – refers to the temporary facility required for construction, an area of about 0.04 hectares (Figure 1-1).
- Demolition area – refers to the locations of wharf structures to be demolished, an area of about 0.05 hectares.
- Study locality - refers to an area within five kilometres of the study area (for the purpose of the background research) (Figure 1-3).



Study Area

MANLY COVE, NSW

Legend


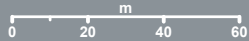
 Study Area

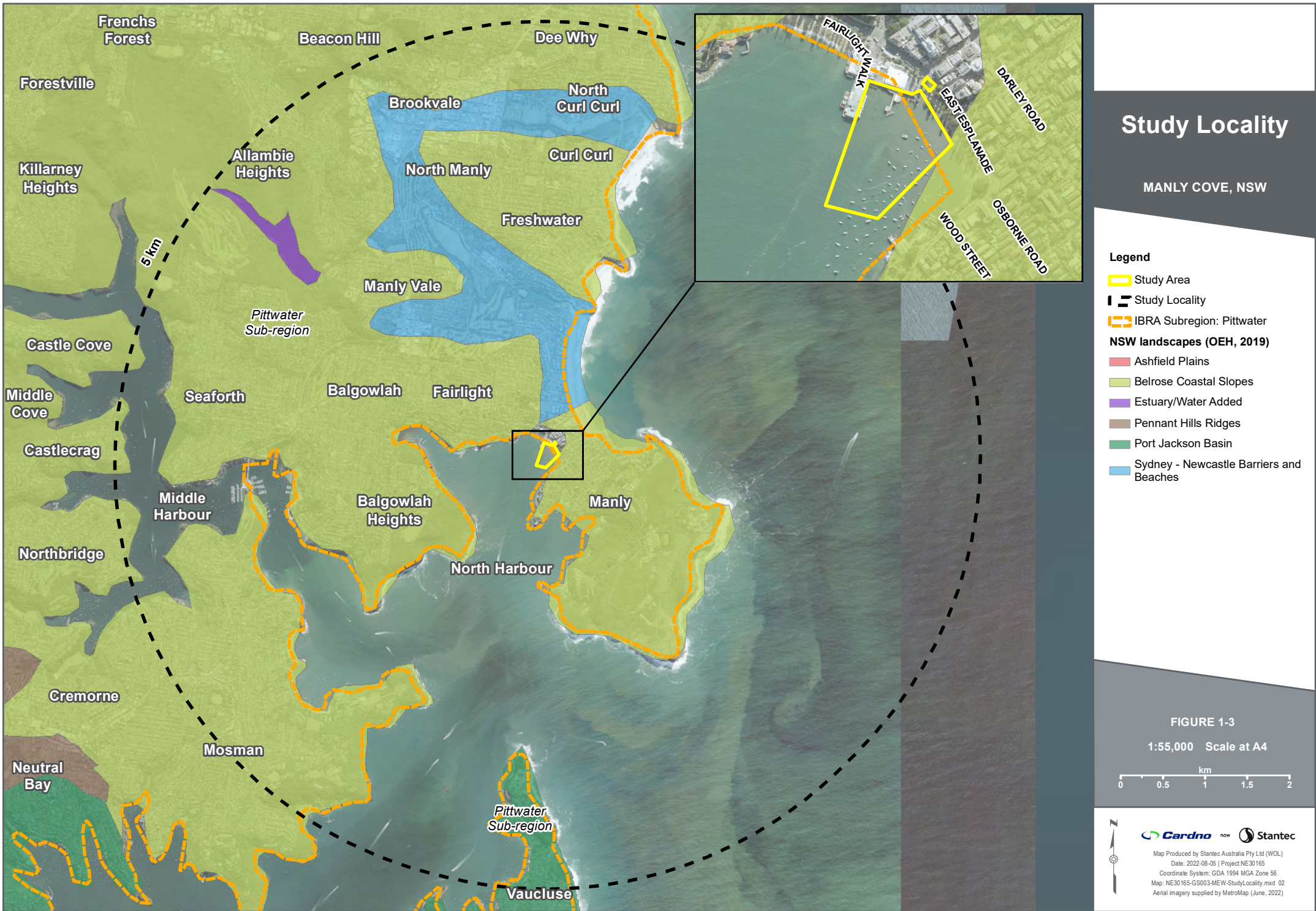
FIGURE 1-2

1:2,000 Scale at A4



 now 

Map Produced by Stantec Australia Pty Ltd (WOL)
Date: 2022-08-05 | Project: NE30165
Coordinate System: GDA 1994 MGA Zone 56
Map: NE30165-GS002-MEW-StudyArea.mxd 02
Aerial imagery supplied by MetroMap (June, 2022)



Frenchs Forest

Beacon Hill

Dee Why

Forestville

Brookvale

North Curl Curl

Killarney Heights

Allambie Heights

North Manly

Curl Curl

Freshwater

5 km

Pittwater Sub-region

Manly Vale

Castle Cove

Middle Cove

Seaforth

Balgowlah

Fairlight

Castlecrag

Middle Harbour

Balgowlah Heights

Manly

Northbridge

North Harbour

Cremorne

Mosman

Neutral Bay

Pittwater Sub-region

Vaucluse

FAIRLIGHT WALK

EAST ESPLANADE

DARLEY ROAD

WOOD STREET

OSBORNE ROAD

2 Methodology

2.1 Personnel

This BAR was prepared by the following personnel:

- Jake Ludlow (BSc) – Ecologist.
- Kate Reeds (BSc, MSc) – Principal Ecologist.

2.2 Background research

A review of information and database searches were completed in April 2022 to gain an understanding of biodiversity values within the study locality. Reviewed sources included:

- *Soil Landscapes of the Sydney 1:100, 000 Sheet* (Chapman & Murphy, 1989).
- *The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489* (NSW Office of Environment and Heritage (OEH), 2016).
- NSW Department of Planning, Industry and Environment – Environment, Energy and Science (DPIE-EES) Vegetation Classification.
- NSW BioNet.
- NSW DPIE-EES Threatened Biodiversity Data Collection (TBDC).
- NSW Department of Primary Industries (NSW DPI) Fish Communities and Threatened Species Distribution of NSW (NSW DPI, 2016).
- NSW DPI Threatened species lists.
- NSW DPI Listed Protected Fish Species.
- NSW DPI Spatial Data Portal. Estuarine Macrophytes (NSW DPI, 2022a).
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) formerly Commonwealth Department of Agriculture, Water and the Environment Protected Matters Search Tool (PMST).
- Atlas of Living Australia.
- National System for the Prevention and Management of Marine Pest Incursions.
- National Introduced Marine Pest Information System (NIMPIS, 2022).

Contemporary aerial imagery from Nearmap was used to identify potential vegetation and habitat to assist in the creation of presumptive maps.

Sensitive ecological sites were identified through searches of the following:

- Regional Conservation Plans prepared by the former NSW OEH.
- Areas of Outstanding Biodiversity Value (AOBV) (formerly Critical Habitat) register.
- Important habitat to threatened species as mapped for the BAM (accessed through the Biodiversity Offsets and Agreement Management System (BOAMS)).
- NSW DPI Critical Habitat register.
- NSW DPI key fish habitat maps (NSW DPI, 2022b).
- Commonwealth DCCEEW Register of Critical Habitat.

- the Bureau of Meteorology's (BoM's) Groundwater Dependent Ecosystems (GDEs) Atlas.
- DCCEEW Directory of Important Wetlands Australia.
- Resilience and Hazards State Environmental Planning Policy (SEPP) (Chapter 2 - Coastal Management) maps.
- Locations of NSW marine parks and reserves available from NSW DPI, Marine Parks website.

This report considers all coastal marine/estuarine and terrestrial species and ecological communities. Riverine and oceanic species and ecological communities have been excluded from this report as no habitat occurs in or near the study area. Diadromous species (fish that migrate between fresh and salt water) have been included.

As the study area is located within coastal waters (within three nautical mile limit seaward of the state/territorial sea baseline), matters in Commonwealth waters have not been considered in this report.

2.3 Habitat assessment

A habitat assessment was completed to assess the likelihood of occurrence of each threatened or migratory species, population or ecological community identified to potentially occur within the study locality. The likelihood of occurrence criteria is detailed in Table 2-1.

Species are considered 'likely to occur' (ie have a moderate to high likelihood of occurrence) where:

- The geographic distribution of the species is known or predicted to include the Interim Biogeographic Regionalisation for Australia (IBRA) subregion in which the proposal is located, and
- The proposal area contains habitat features or components associated with the species, or
- Past or current surveys undertaken in the proposal footprint indicate the species is present.

A test of significance (under the BC Act or FM Act) and/or an assessment of significance (under the EPBC Act; collectively known as Assessments of Significance (AoSs)) for species considered 'likely to occur' by the habitat assessment has been completed unless otherwise discussed in Section 3.12.

Table 2-1: Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie for breeding or important life cycle periods such as winter flowering resources), has been recorded recently (within 20 years) in the locality (five kilometres) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.

Likelihood	Criteria
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (five kilometres). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

2.4 Field survey

Cardno, now Stantec was commissioned by GHD Pty Ltd to undertake a seagrass/marine vegetation survey of the study area and targeted surveys for White's Seahorse (*Hippocampus whiteii*) and the Little Penguin (*Eudyptula minor*) (discussed in Section 2.5). The aims of the survey were to ground-truth the results of the background research and habitat assessment with particular consideration given to species of conservation concern likely to occur such as White's Seahorse and the Little Penguin.

The field survey of the foreshore and marine areas and targeted surveys for White's Seahorse within the study area was carried out on 15 February 2022. Survey for Little Penguins was carried out at dusk between times of 7:00 pm and 8:20 pm on 10 March 2022 at specific locations within the study area where the species has historically nested.

Background research and habitat assessment did not indicate the presence of remnant terrestrial vegetation within the study area (ie the compound area), due to the area being highly modified. Therefore a terrestrial field survey was not carried out, however, personnel from GHD provided photographs of the compound area which were reviewed.

2.4.1 Weather and sea conditions

The weather and sea conditions during the aquatic field survey and targeted surveys are summarised in Table 2-2. Conditions during the aquatic survey on 15 February 2022 were sunny with light northerly winds. There was up to 37.4 millimetres of rainfall in Sydney within seven days prior to the aquatic field survey (Elders, 2022) and water visibility was up to four metres. The aquatic field survey was completed on an ebb tide. The wind direction during the survey was from the south-east and water visibility of the water was relatively poor due to recent rain events.

Table 2-2: Weather and sea conditions during the field surveys on 15 February 2022 and 10 March 2022. BoM station ID 066196 (source: BoM, 2022a; WillyWeather, 2022; Elders, 2022)

Date	Temperature range (°C)	Rainfall (mm)	Wind direction (9am/3pm)	Max wind speed (km/h)	High tide	Low tide
15/02/2022	20.8-24.6	0	N/NNE	46	08:30am (1.70 m) 09:05pm (1.30 m)	02:00am (0.60 m) 3:10pm (0.40 m)
10/03/2022	17.4-21.7	0	SW/SSE	52	02:18am (1.48 m) 2:50pm (1.13 m)	09:07am (0.72 m) 8:27pm (0.78 m)

2.5 Vegetation and fauna surveys

The terrestrial portion of the study area included a small portion of the highly modified foreshore of East Esplanade Park. Vegetation was entirely landscaped grass with planted native/exotic vegetation. Due to the lack of remnant vegetation categorisation of plant community type (PCT) identified from background research, TEC commensuration checks were not required. A brief walkover of the compound area was completed by GHD, with species type identified by Cardno, now Stantec.

2.5.1 Targeted flora surveys

Background research did not indicate the presence of remnant terrestrial vegetation, therefore no targeted threatened flora surveys were considered necessary.

2.5.2 Targeted fauna surveys

Due to the presence of seagrass and artificial habitats (ie piles) targeted surveys for the threatened White's Seahorse (listed under as endangered under the EPBC Act and FM Act) included a swim through of piles beneath the existing wharf and review of underwater remotely operated vehicle ROV footage from the seagrass survey.

Survey for Little Penguins was carried out at dusk between 7:00 pm and 8:20 pm on 10 March 2022 and included on the foreshore of Manly Cove and the beneath the existing wharf.

2.5.3 Aquatic survey

The extent of the study area for the aquatic field survey is indicated in Figure 1-2. The survey was carried out on 15 February 2022. The aims of the survey were to ground-truth the results of the background research and habitat assessment with particular consideration given to species of conservation concern likely to occur such as White's Seahorse and the Little Penguin.

Presumptive vegetation and habitat maps based on the results of the background research were developed to inform the field surveys. The maps were created for the study area using

ArcGIS 10.8 from an orthorectified aerial Nearmap image captured on 6 August 2021. This aerial imagery was selected based on the high resolution and water clarity within the study area. Potential vegetation and habitat were outlined on a preliminary map layer via on-screen digitising at a scale of no more than 1:800 to demarcate boundaries as polygons from imagery and from the latest habitat mapping undertaken by NSW DPI in 2018 (NSW DPI, 2022a). Presumptive map data were loaded onto a tablet connected to a GPS receiver (for added accuracy) and field survey data collected on the tablet.

Fieldwork was carried out from a five metre survey vessel within the study area using a combination of an underwater ROV and/or bathyscope. Generally, all areas below high tide were surveyed from the vessel. The vessel navigated to areas of potential marine vegetation and habitat to verify, describe and classify the presumptive map into categories below.

Seagrasses, where detected, were classified as follows:

- Species:
 - *Posidonia* (*Posidonia australis*).
 - *Zostera* (*Zostera muelleri* subsp. *capricorni*).
 - *Halophila* (*Halophila* spp.).

Estimates of seagrass density were made by ranking each observation point using three categories for each of three species known to occur in the study area as per King and Barclay (1986):

- Density:
 - High (greater than 50 per cent cover) (ie Pos-3).
 - Medium (between 15 and 50 per cent cover, inclusive) (ie Pos-2).
 - Low (less than 15 per cent cover) (ie Pos-1).

2.6 Data analyses and mapping

Following completion of the field survey, polygons drawn on the presumptive maps were refined and reclassified as per the field data collected using the same methods described above for creating presumptive maps. Where areas comprised more than one species (ie *Zostera* with an understorey of *Halophila*), these were differentiated by the most abundant species while co-occurring species present were also described.

2.7 Limitations

Survey efficacy is influenced by a range of factors. Fieldwork for this study was completed during summer. For this type of survey, limitations are generally due to a single, short duration survey that does not account for seasonal or other temporal variation. The detection of certain species may be affected by:

- Seasonal migration (particularly migratory and transient species).
- Seasonal availability of food for fauna.
- Weather conditions during the survey period (some species may go through cycles of activity related to specific weather conditions).
- Species lifecycle (cycles of activity related to breeding).

These potential limitations have been addressed by applying the precautionary principle in cases where the survey methodology may have given a false negative result (ie a species that could reasonably be expected to occur, based on previous records and available habitat, was not observed). All species (including threatened species) have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population.

3 Existing environment

3.1 Environmental setting

Sydney Harbour (the harbour) is of high aesthetic, ecological and socio-economic importance to Sydney. The harbour is a drowned valley, tidal estuary (Roy, et al., 2001; Sydney Institute of Marine Science, 2014) about 30 kilometres long and occupies about 5000 hectares (Birch, 2006). The foreshores are highly urbanised and the harbour has a large volume of commercial and private boating activities. The harbour is the final destination for runoff from about 50,000 hectares of catchment, of which at least 86 per cent is urbanised and/or industrialised since the 1800s (Birch, 2006). Reclamation and vegetation clearing have resulted in major alterations to ecological function, hydrology and physio-chemical attributes of the estuary (Birch, 2006). Despite these alterations the harbour has shown signs of recovery in more recent times (Johnston, et al., 2015).

The study area lies within the Pittwater Subregion of the Sydney Basin Bioregion (NSW National Parks and Wildlife Service, 2003a) between the Belrose Coastal Slopes landscape (Mitchell, 2002) (Figure 1-3). The Pittwater Subregion geology is characterised by Triassic Hawkesbury Sandstone within ridge capping's of Ashfield Shale. Exposed valleys are typified by Narrabeen sandstones with Quaternary coastal sands along the coast. Characteristic landforms of the Pittwater subregion include a Hornsby plateau of quartz sandstone with the occasional shale caps, small beach, dune and lagoon barrier systems with steep coastal cliffs and rock platforms.

The study area is located within Manly Cove, north-west of the entrance to Sydney Harbour. The study area is bounded by Manly Point to the south-east and Federation Point from the west and is within the Sydney Harbour Foreshores and Waterways Area and Sydney Metropolitan Catchment Management Area.

3.2 Coastal processes and hydrology

The poleward flowing East Australian Current (EAC) brings nutrient depleted waters to the entrance of the harbour and water at the entrance of the harbour is continually being renewed (Sydney Institute of Marine Science, 2014). Water circulation in drowned valley estuaries, such as Sydney Harbour, is dominated by tidal currents as opposed to wind stress (Roy, et al., 2001; Sydney Institute of Marine Science, 2014). Tides are predominately semi-diurnal, reverse every six hours but can vary considerably spatially and temporally. Tidal velocities can reach up to 0.25 metres per second with the most distant branches of the estuary usually experiencing slower velocities, sometimes up to an order of magnitude less (Sydney Institute of Marine Science, 2014). In some areas of the estuary, tide-induced residual circulation forms a number of gyres at regions of complex geometry which may force the retention of biota or pollutants (Das, et al., 2000).

Three common wind patterns are known on the harbour. The strongest of the three originate from the south (southerlies) and occur about 17 per cent of the time. The most frequent of the three (about 22 per cent of the time) are north-easterlies while the least common of the three patterns are westerlies which usually occur during the winter months (Sydney Institute of Marine Science, 2014). Generally, the wave climates at Manly Cove are characterised by a combination of wind and boat waves (ie vessel traffic) and a mixture of swell that come in through the harbour entrance.

3.3 Soil and sediment properties

The present-day harbour comprises five environmental/sedimentological units including:

- Harbour entrance (marine flood-tide delta sands).
- Lower estuary (sands); within study area.
- Central estuary (muddy sands).
- Upper estuary (muds).
- Off-channel bays (muds) (Birch, 2006).

The study area lies within two alluvial/fluvial geological units (Qhb and Qhf) and is underlain by Hawkesbury Sandstone (Rh) which bounds Manly Cove to the north-west and south-east. These geological units are described below:

- Qhb: Coarse quartz sand with varying amounts of shell fragments.
- Qhf: Medium to fine 'marine' sand.
- Rh: Medium to coarse-grained quartz sandstone, very minor shale and laminite lenses.

The surrounding steep headlands and foreshores (ie North Head) are both naturally and artificially cut and include pockets of fringing native vegetation. GHD (2021) undertook a geotechnical and contamination investigation within the proposal area. One borehole (BH2) was drilled within the Wharf 3 berthing area, where loose to medium marine sands were recorded to a total depth of 17.95 metres. No bedrock materials were encountered, although historical geophysical surveys indicate a paleochannel is present with sandstone bedrock about 60 metres below the surface (GHD, 2021).

3.3.1 Acid sulfate soils/sediments

Acid sulfate soils/sediments (ASS) is the common name given to naturally occurring soils and sediments that contain iron sulfate (pyrite). Acid sulfate soils/sediments are defined as either:

- Actual ASS (AASS) - highly acidic soils or sediments with pH <4, or
- Potential ASS (PASS) - soils or sediments containing sulphuric material that have not been oxidised but have potential for oxidation to generate high acidity.

Based on the field investigations conducted by GHD in 2021, the likely presence of AASS or PASS with marine sediment at Manly Wharf is considered low. However, laboratory analysis of AASS or PASS was not undertaken. Under the *Manly Local Environment Plan 2013* the terrestrial portion of the study area is mapped as Class 2 ASS, thus any works below the natural ground surface or works by which the water table is likely to be lowered would need to be managed with an ASS management plan. Land-based below ground works are not anticipated.

3.3.2 Soil and sediment quality

Soils and sediments of Sydney Harbour are historically known to contain heavy metals, asbestos, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and organochlorine pesticides (OCPs) (Birch, 2006). Some concentrations of heavy metals in sediments in Sydney Harbour have been documented to be the highest in Australia and internationally (Montoya, 2015). About 20 per cent of all copper, lead and zinc were found in four bays in the Parramatta estuary in the early 2000s: (1) Iron Cove; (2) Rozelle and Blackwattle Bays; (3) Homebush Bay; and (4) Hen and Chicken Bay. These bays are about 12 kilometres

upstream of the study area. Other areas where heavy metals have been detected in sediments are located in small, highly concentrated areas of upper parts of tributaries and bays but are usually low in concentrations. GHD, 2021 undertook preliminary contamination sampling within the study area (BH2) and identified the presence of organometal, tributyltin (TBT). TBT concentrations within samples analysed from BH2 exceeded the adopted *Australian and New Zealand Guidelines for fresh and marine water quality 2018* (ANZG, 2018) sediment toxicant values. TBT is rapidly absorbed by organic materials (ie algae) or adsorbed onto suspended particles in the water column (Burton et al., 2004). It is then readily incorporated into tissues of lower trophic organisms (ie filter feeders and zooplankton) and accumulated into higher trophic organisms through predation (Berge et al., 2004). TBT has also been linked to endocrine disruptive effects such as imposex in gastropods (male characteristics appearing in female organisms) (Smith, 1981).

Burning of waste, chemical manufacturing and certain industrial processes have also introduced dioxins into the sediments of Sydney Harbour (Montoya, 2015). Short term high concentration exposure to humans may result in lesions and altered liver function whereas long term exposure has been linked to impairments of the immune system, nervous system and endocrine system (Montoya, 2015). Once in an aquatic environment, dioxins can absorb quickly to particulate organic matter before settling in bottom sediments. They are mostly resistant to biological and chemical breakdown in the aquatic or terrestrial environment hence, are persistent in estuarine sediments. Effects on biota include lethality, reproductive impairment, developmental abnormalities, endocrine/immune/neurological system dysfunctions and wasting syndrome (Montoya, 2015). Following detection of this substance in the late 1980s, total fin-fish bans were implemented in Homebush Bay in 1989 extending to a commercial fishing ban upstream of the Gladesville Bridge in 1990. Dioxin analysis was not included in the laboratory analysis undertaken by GHD, 2021 based on the significant distance between historical industrial areas (ie Parramatta River) where dioxins are known to be present.

Microplastics are tiny plastic fragments, fibres and granules (generally smaller than five millimetres in diameter) (Montoya, 2015). These can either be manufactured as microplastics or a result of breakdown of larger plastic debris. Microplastics in the water column can settle in the sediment following accumulation of microbial films, algae and invertebrates and/or the adherence to other particles. A large number of compounds in plastics can interfere with biologically important processes resulting in endocrine disruption and carcinogenesis. Furthermore, marine plastic debris has been found to accumulate waterborne pollutants up to 100 times greater than sediments (Browne, et al., 2013). The highest concentrations of microplastics in sediments have been recorded in Sydney Harbour and Middle Harbour with some areas containing an order of magnitude greater than other estuaries internationally (Montoya, 2015).

3.4 Water quality

Generally, water quality of Manly Cove is of high standard, primarily due to the close proximity to the entrance of Sydney Harbour which results in steady tidal flushing. However, during large rain events and/or large swell events or a combination of both (ie East Coast Low pressure systems) Manly Cove can experience elevated turbidity and suspended sediments. Suspended sediments attenuate light penetration through the water column and thereby limit pelagic and benthic primary production (the process of converting light energy into biomass). As the suspended matter settles to the seabed it may also smother benthic organisms and affect the type of organisms and plants that can exist in this environment. Fluctuations in light and rates of sedimentation occur naturally in Sydney Harbour due to regular resuspension of particulate matter by the tidal currents, wind-driven mixing and runoff events. Any activities which involve seabed disturbance have the potential to increase sedimentation and turbidity beyond the natural range. Water quality can be impacted by

stormwater run-off from the surrounding catchment and may not be suitable for swimming due to the presence of several potential sources of faecal contamination. Table 3-1 presents the indicative water quality objectives (WQOs):

Table 3-1: Sydney Harbour lower estuary WQOs trigger values (NSW DPIE, 2006)

Analyte (units)	Sydney Harbour WQO trigger value (lower estuary)
pH (pH units)	7.0-8.5 (pH units)
Salinity ($\mu\text{S}/\text{cm}$)	125-2200 $\mu\text{S}/\text{cm}$
Dissolved oxygen (% saturation)	80-110%
Turbidity (NTU)	0.5-10 NTU
Total nitrogen ($\mu\text{g}/\text{L}$)	300 $\mu\text{g}/\text{L}$
Total phosphorous ($\mu\text{g}/\text{L}$)	30 $\mu\text{g}/\text{L}$
Chlorophyll-a ($\mu\text{g}/\text{L}$)	4 $\mu\text{g}/\text{L}$
Enterococci (colony forming units/100 mL) (primary contact)	>150 (CFU/100 mL)
Enterococci (colony forming units/100 mL) (secondary contact)	>1000 CFU/100 mL)

3.5 Terrestrial vegetation

The study area is located on a highly modified, urban foreshore. The study area does not contain remnant vegetation or riparian vegetation, remnant vegetation in the study locality is generally associated with nearby National Parks. Commercial and residential buildings closely fringe the foreshore (separated by East Esplanade Street, Manly) and are largely surrounded by hardstands with some landscaped gardens (East Esplanade Park). Mature Norfolk Island Pines (*Araucaria heterophylla*) lined the landscaped area (Figure 3-1).

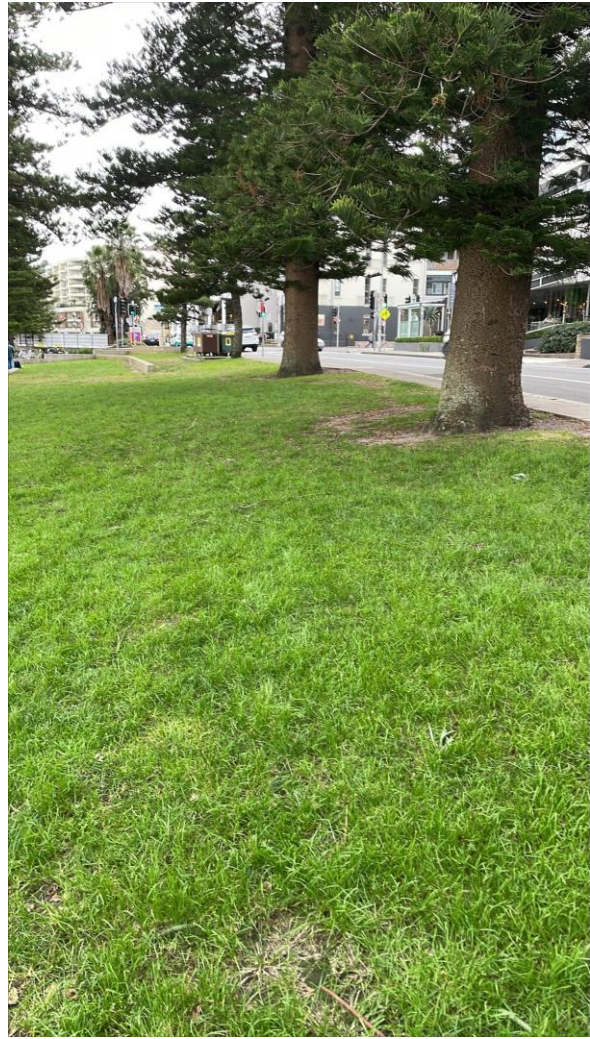


Figure 3-1: Compound area vegetation, photographs taken by GHD

3.6 Terrestrial fauna and habitat

Although the terrestrial vegetation was limited within the study area, the study area provides potential habitat for a number of species. Trees may provide potential foraging habitat for birds and arboreal and aerial mammals. Birds and arboreal mammals may also roost in mature trees although the level of disturbance and lighting may deter roosting and foraging at night. The trees can also provide breeding habitat for birds common to urban areas.

Disturbance-tolerant birds may forage in the vegetated areas and the majority of the study area is considered foraging habitat for microchiropteran bats (microbats). Microbats may also roost in the crevices of the existing wharf structures and commercial structures.

Local and vagrant seabirds may use the foreshores and existing wharf structures as perching or foraging areas. The volume of pedestrian and vessel traffic in the study area is likely to be a deterrent for species that are not adapted to anthropogenic disturbance. The intertidal soft sediment areas at Manly Cove have a high volume of pedestrian traffic. Dogs are not permitted on the sandflats east of the wharf however, many are walked on-leash along the footpath along the shoreline.

A list of fauna species recorded during the aquatic field survey and reviewed photographs supplied by GHD is provided in Appendix A.

3.7 Priority weeds

Review of the GHD supplied photographs did not identify any priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney region. The compound area grass is regularly maintained by the Northern Beaches Council.

3.8 Marine vegetation and habitat

All marine vegetation (seagrass, macroalgae, mangroves and saltmarsh) is protected under the FM Act. The FM Act protects marine vegetation from 'harm' in the form of gathering, cutting, pulling up, destroying, poisoning, digging up, removing, injuring or preventing light from reaching vegetation or any part of it. A permit under Section 205 of the FM Act is required to harm marine vegetation.

A review of the estuarine macrophyte mapping (NSW DPI, 2022a) revealed five marine vegetation communities to occur within the study locality (Figure 3-2):

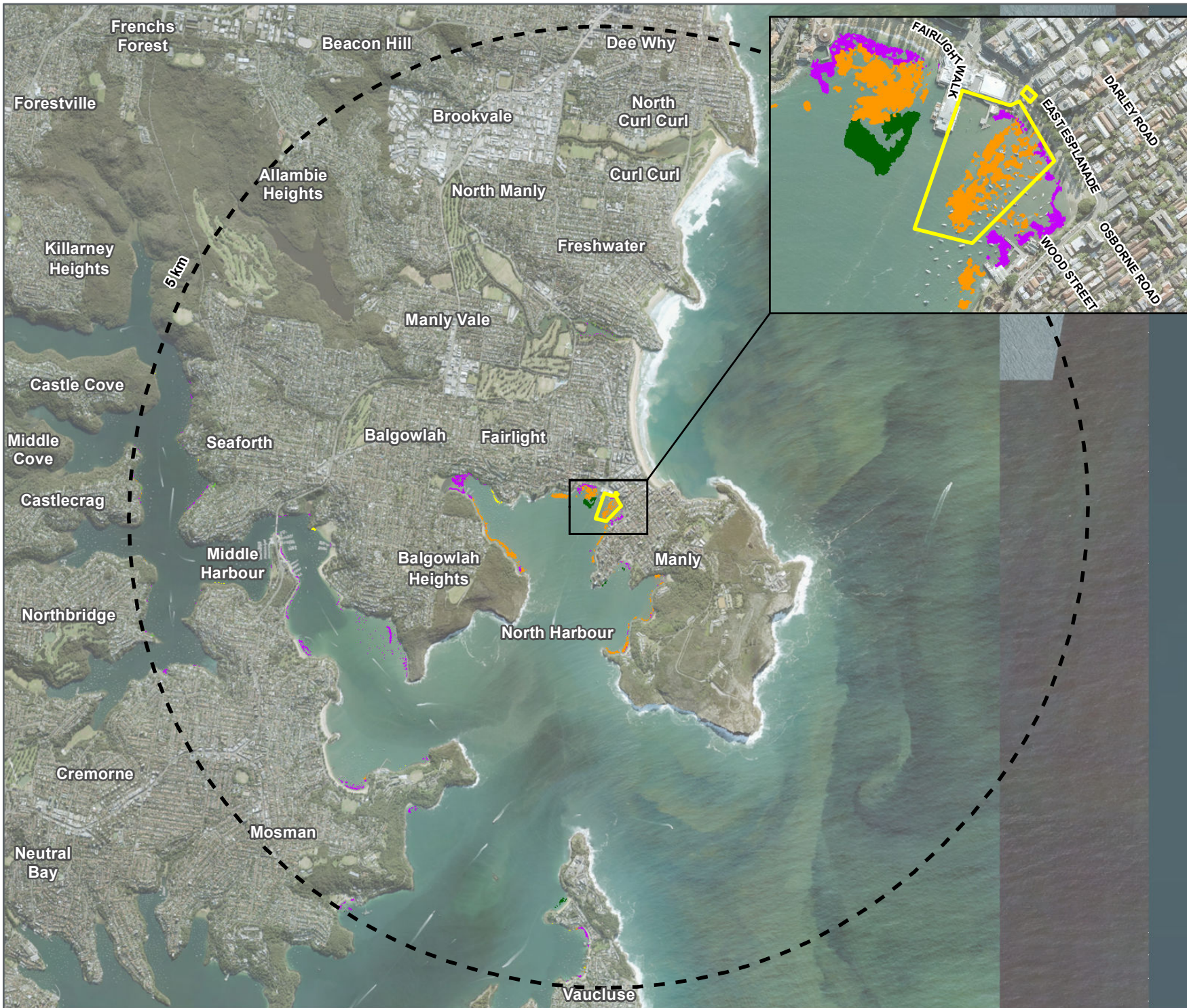
- Posidonia.
- Posidonia/Zostera.
- Zostera.
- Halophila.
- Mangrove.

Communities of seagrasses are the most extensive marine vegetation communities within the study locality and generally occur within embayment's of the harbour (Table 3-2). The nearest community of mangroves is associated with Manly Lagoon, about 1.6 kilometres north of the study area. No mapped saltmarsh occurs within the study locality. The study area is mapped as key fish habitat (KFH) and is estuarine thus, is considered a Class 1 waterway – Major KFH (NSW DPI, 2013; NSW DPI, 2022b).

Table 3-2: Marine vegetation and habitat mapped within the study locality (NSW DPI, 2022a)

Broad marine vegetation and habitat type	Marine vegetation community	Area within the study locality (ha)	Bearing and proximity of the closest occurrence to the study area
Seagrass	Posidonia	0.5	Within study area
Seagrass	Posidonia/Zostera	7.8	Within study area
Seagrass	Zostera	7.8	Within study area
Seagrass	Halophila	1.3	Within study area
Mangrove	Mangrove	0.1	~1.6 kilometre north

Habitat in the dredge area primarily includes soft sediment areas that are either bare or colonised by marine vegetation. Soft sediment areas provide habitat for benthic infaunal assemblages which generally consist of burrowing organisms, such as polychaete worms, amphipod crustaceans, bivalve and gastropod molluscs and other worm-like phyla such as nemerteans and nematodes (which are often abundant). These animals are usually found within the upper 30 centimetres of the sediment. As well as being a source of food for organisms higher up the food web, such as fish, large invertebrates and shorebirds, they also drive nutrient cycling through reworking of the sediments (bioturbation), altering physical and chemical processes, excreting nutrient-rich wastes and feeding on phytoplankton (Penniford & David, 2001). The activity of benthic assemblages in nearshore sediments is linked to pelagic processes and thus influences nutrient exchange processes between coastal and offshore systems (Eyre & Ferguson, 2005; Connell & Gillanders, 2007). Little information is known in regard to the specific infauna associated with the study area however, the macrofauna communities associated with seagrass meadows generally have greater density, biomass and diversity of benthic infauna (Rodil et al. 2021).



Marine Vegetation and Habitat in the Study Locality

MANLY COVE, MANLY

- Legend**
- Study Area
 - Study Locality
 - Marine vegetation (NSW DPI, 2022)**
 - Halophila
 - Mangrove
 - Posidonia
 - Posidonia/Zostera
 - Zostera

FIGURE 3-2
 1:55,000 Scale at A4

Results of the aquatic field survey found the study area was comprised of a mosaic of seagrass, unvegetated soft sediment, sparse rocky rubble colonised by macroalgae (mainly *Ecklonia radiata*) and artificial structures (ie subtidal/intertidal wharf piles and structures) (Figure 3-8). The subtidal and intertidal habitats surveyed within the study area are described below.

The vertical piles of the existing wharf were colonised by species commonly found on subtidal rocky reefs. Subtidal sections of the wharf piles were heavily encrusted with a thick layer of marine growth consisting of various ascidians (mainly *Pyura stolonifera*), macroalgae (mainly *Ecklonia radiata* and *Padina* sp.) and *Corallina* sp. (Figure 3-3). The subtidal portions of the wharf piles were also colonised by soft corals (*Carijoa* sp.).



Figure 3-3: Typical communities and condition of vertical wharf piles in the study area

A large part of the study area consisted of subtidal soft sediment habitat (about 3 hectares) and this was mostly comprised of bare sand and shell grit in the deeper areas (Table 3-3 and Figure 3-4). Some small areas of rock rubble was observed within subtidal soft sediment habitat closest to shore. These consolidated materials provided an attachment surface for macroalgae. These 'reef communities' have potential to mobilise during inclement weather or from vessel wash thus, are considered part of the unconsolidated soft sediment landscape.

No visible epifauna (ie fauna that lives on the surface of the seafloor) was observed during this survey, however, sediment bioturbation indicated the presence of burrowing infauna (Figure 3-4).

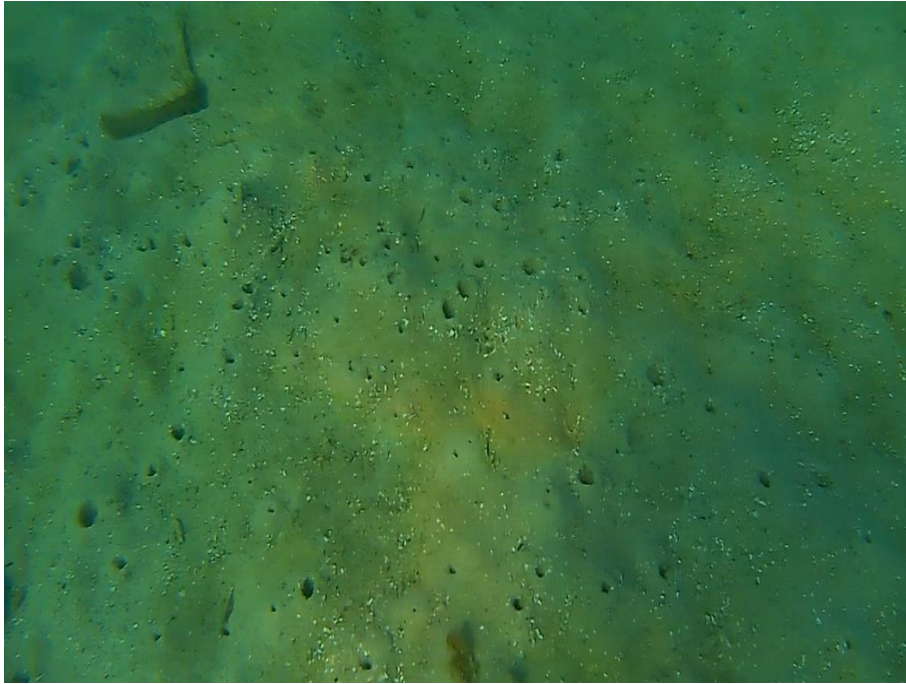


Figure 3-4: Typical soft sediment habitat in the near shore and deeper areas of the study area with evidence of bioturbation

About 1.7 hectares of seagrass was recorded subtidally within the study area. Seagrass was generally observed east and south-east of the wharf which included monospecific patches of *Posidonia*, *Zostera* and *Halophila* as well patches with a mix of these species (Figure 3-8). Sparse *Zostera* and *Halophila* was also observed on the northern slope of the existing Wharf 3 berth pocket. Approximate areas of seagrass and macroalgae mapped during the field survey are presented in Table 3-3. *Halophila* was the dominant seagrass recorded (Table 3-3) and was often found co-occurring with other species (Figure 3-5). The invasive marine alga *Caulerpa taxifolia* (*Caulerpa*) was observed within the study area, often co-occurring with other seagrasses. About 0.01 hectares of macroalgae (mainly *Ecklonia radiata*) was mapped within the study area in proximity to the wharf (not including macroalgae communities attached to wharf piles). These macroalgae were attached to rocky rubble and small boulders, which may mobilise under strong swell conditions.

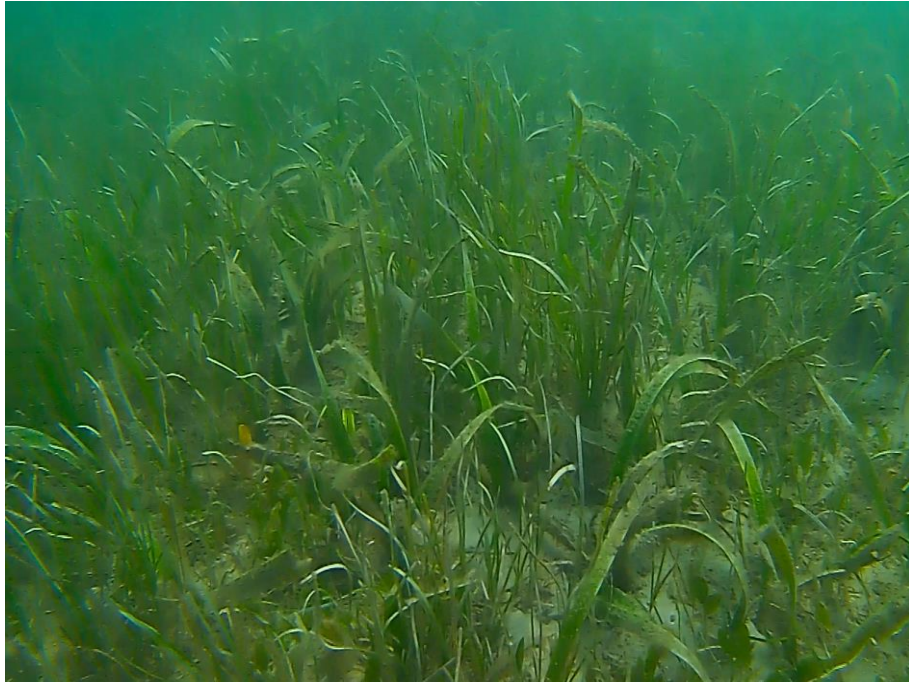


Figure 3-5: Co-occurring medium density Posidonia/Zostera and low density Halophila

The foreshore included subtidal sands near the sandstone seawall which borders the study area (

Figure 3-6); this area amounts to about 3 hectares (Table 3-3). The intertidal habitat present on wharf structures included the upper portions of the wharf pylons which were heavily encrusted by Sydney Rock Oysters (*Saccostrea glomerata*) and barnacles (Figure 3-7).



Figure 3-6: Sandflats and vertical seawall near the study area



Figure 3-7: Typical communities and condition of intertidal timber wharf piles in the study area

Habitat on existing piles is considered Type 2 – Moderately sensitive KFH as they meet the descriptions of estuarine rocky reefs and macroalgae were observed on these structures (NSW DPI, 2013). Intertidal and subtidal soft sediment areas are considered Type 3 – Minimally sensitive KFH as these areas were characterised by unstable or unvegetated sand. All seagrass meadows are considered Type 1 – Highly sensitive KFH attributed to the presence of *Posidonia*, *Zostera* and *Halophila* in areas larger than five square metres. KFH types within the study area are summarised in Figure 3-9.

Table 3-3: Areas of marine vegetation and habitat in the study area

Marine vegetation and habitat	Area in study area (hectares)
Seagrass – Type 1 KFH	1.7 ha Dominant species of seagrass: Posidonia/Zostera – 0.3 ha Posidonia/Halophila – 0.3 ha Posidonia/Zostera/Halophila – 0.1 ha Zostera – 0.1 ha Zostera/Halophila – 0.1 ha Halophila – 0.8 ha
Macroalgae (mapped only) – Type 2 KFH	0.01 ha
Subtidal soft sediment – Type 3 KFH	3 ha
Total	~4.7 ha

The marine vegetation and habitat within the study area is characteristic of many nearshore areas in the harbour. Subtidal and intertidal artificial structures of the existing wharf provide habitat for a number of local and transient fish and other mobile species. The intertidal sand flats can provide habitat for foraging shorebirds. These may include several threatened and migratory species known to occur in Sydney Harbour (see Sections 3.12 and 3.18). No threatened or migratory species were observed during the field survey, however, fish species frequently observed in the harbour were recorded. These included Yellowfin Bream (*Acanthopagrus australis*), Eastern Hulafish (*Trachinops taeniatus*) and Fanbelly Leatherjackets (*Monacanthus chinensis*).

The list of marine fauna species recorded during the field survey is provided in Appendix A.

Marine Habitat in the Study Area

MANLY COVE, NSW

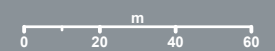
Legend

- Study Area
- Dominant Species of Seagrass**
- Posidonia/Zostera
- Posidonia/Halophila
- Posidonia/Zostera/Halophila
- Zostera
- Zostera/Halophila
- Halophila
- Posidonia Present
- Macroalgae and Soft Sediment**
- Macroalgae
- Subtidal Soft Sediment



FIGURE 3-8

1:2,000 Scale at A4





Key Fish Habitat in the Study Area

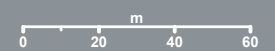
MANLY COVE, NSW

Legend

- Study Area
- Key Fish Habitat**
- Type 1
- Type 2
- Type 3

FIGURE 3-9

1:2,000 Scale at A4



now

Map Produced by Stantec Australia Pty Ltd (WOL)
 Date: 2022-08-05 | Project: NE30165
 Coordinate System: GDA 1994 MGA Zone 56
 Map: NE30165-GS006-MEW-MarineHabitat-KFH.mxd 02
 Aerial imagery supplied by MetroMap (June, 2022)

3.9 Marine pests and diseases

In NSW, introduced marine pests (IMPs) of concern are listed under Schedule 2 of the NSW *Biosecurity Act 2015* as 'prohibited matter' and under Schedule 1, Part 2 of the NSW *Biosecurity Regulation 2017* as 'notifiable matter'. Table 3-4 presents the search of the National Introduced Marine Pest Information System (NIMPIS) (NIMPIS, 2022) and NSW DPI Aquatic Pest Distribution (DPI, 2022c) identified the following species known to occur in proximity to the study area:

Table 3-4: Marine and aquatic pest species known to occur within Sydney Harbour (NIMPIS, 2022, NSW DPI, 2022c)

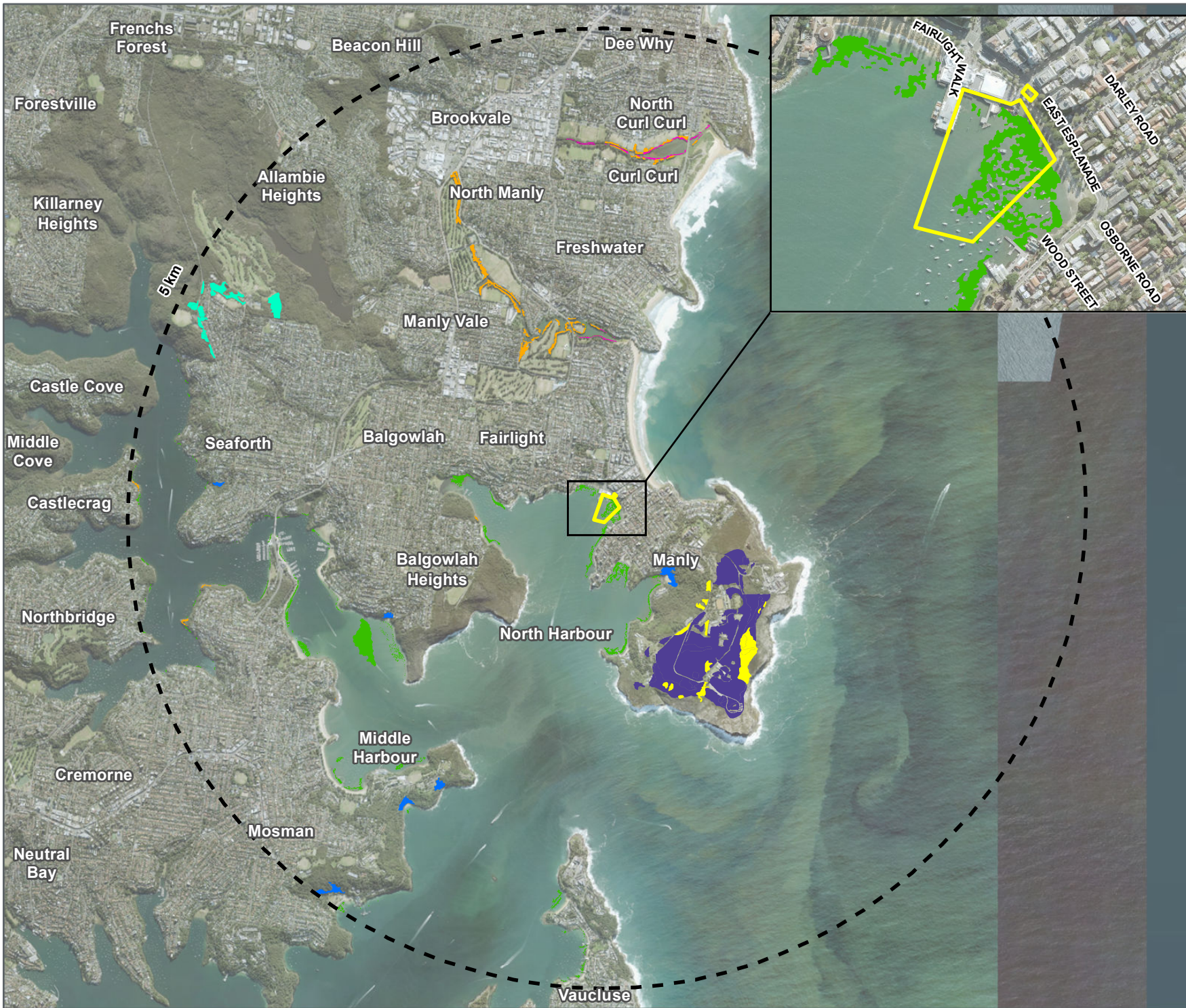
Source: NIMPIS, 2022	Source: NSW DPI, 2022c
Common name/species	Common name/species and disease
Colonial Ascidian (<i>Botrylloides leachii</i>)	Pacific Oyster (<i>Crassostrea gigas</i>)
Solitary Ascidian (<i>Styela plicata</i>)	Eastern Gambusia (<i>Gambusia holbrooki</i>)
Acorn Barnacle (<i>Megabalanus rosa</i>)	Caulerpa (<i>Caulerpa taxifolia</i>)
East Asian Bivalve (<i>Theora lubrica</i>)	Pacific oyster mortality syndrome (POMS)
<i>Bugula neritina</i>	
<i>Bugulina flabellate</i>	
Lace Coral (<i>Schizoporella unicornis</i>)	
<i>Plumularia setacea</i>	
Speckled Pill Bug (<i>Cirolana harfordi</i>)	
Cirolanid Isopod (<i>Eurylana arcuate</i>)	
Sponge Isopod (<i>Paracerceis sculpta</i>)	
Marine Pill Bug (<i>Sphaeroma walker</i>)	
<i>Caulerpa filliformis</i>	
Fanworm (<i>Euchone limnicola</i>)	
Fouling Serpulid (<i>Hydroides elegans</i>)	
Japanese Polydorid (<i>Pseudopolydora paucibranchiata</i>)	

Key: Bold indicates observed within the study area.

Like a great number of other estuaries and waterways, Sydney Harbour is at risk of infestation from the marine pest *Caulerpa* (*Caulerpa taxifolia*) (NSW DPI, 2022d). *Caulerpa* is known to spread via fishing and boating activities as well as natural hydrology and was observed during the field survey often co-occurring with seagrasses in the study area. *Caulerpa* is a fast-growing marine alga native to tropical Australia and the South Pacific (NSW DPI, 2022d). This species is known to alter the physical and chemical environment and can outcompete native seagrasses and seaweeds, forming dense mats. As it can propagate from fragments, it is known to easily spread via fishing and boating activities.

3.10 Threatened ecological communities

No remnant terrestrial vegetation or PCTs occur within the study area. Six threatened ecological communities (TECs) have been mapped in the study locality (Figure 3-10), with one TEC located within the study area. These, and their proximity to the study area, are detailed in Table 3-5.



TECs in the Study Locality

MANLY COVE, NSW

Legend

- Study Area
- Study Locality
- Vegetation - Sydney Metro Area V3 VIS 4489 (OEH, 2016)**
- 664
- 910
- 1234
- 1786
- 1808
- 1809
- 1833
- 1913

FIGURE 3-10

1:55,000 Scale at A4



Table 3-5: Threatened ecological communities (TECs) mapped within the study locality and their proximity to the study area

Plant community type (PCT) and ID	Associated TECs		Area in locality (ha)	Bearing and proximity of the closest occurrence to the study area
	BC Act	EPBC Act		
Lilly Pilly littoral rainforest of the southern Sydney Basin Bioregion and South East Corner Bioregion (PCT ID 910) Lilly Pilly - Cabbage Tree Palm littoral rainforest on escarpment slopes and gullies of the Sydney basin (PCT ID 1833)	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (critically endangered)	Littoral Rainforest and Coastal Vine Thickets	7.4 ha	East, ~787 m
Red Bloodwood - Silvertop Ash - Stringybark open forest on ironstone in the Sydney region (PCT ID 1786)	Duffy's Forest Ecological Community	-	8.8 ha	North-west, ~3.9 km
Banksia heath on aeolian sands of eastern Sydney suburbs, Sydney Basin Bioregion (PCT 664)	Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (critically endangered)	Eastern Banksia Scrub	85.6 ha	East, ~1.2 km
Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (PCT 1234) Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (PCT 1808)	Swamp Oak Floodplain Forest	-	14.7 ha	West, ~1.2 km
Crimson Bottlebrush - Banksia - Melaleuca / Baumea woody sedgeland in dune swales of the Sydney basin (PCT 1809)	Sydney Freshwater Wetlands	-	11.7 ha	East, ~1.3 km

Plant community type (PCT) and ID	Associated TECs		Area in locality (ha)	Bearing and proximity of the closest occurrence to the study area
	BC Act	EPBC Act		
Seagrass meadows (PCT 1913)*	<i>Posidonia australis</i> seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie (endangered population under the FM Act)	<i>Posidonia australis</i> Seagrass Meadows of the Manning-Hawkesbury Ecoregion (endangered)	23.7 ha	In study area

*Marine vegetation discussed in Section 3.8; **Bold** indicates occurs within study area.

Threatened *Posidonia* seagrass was observed within the study area, which could form part of the *Posidonia australis* Seagrass Meadows of the Manning-Hawkesbury Ecoregion TEC. TECs listed under the EPBC Act are identified by key diagnostic characteristics and condition thresholds. These characteristics and conditions assist in identifying endangered ecological communities (EECs) and determining whether the EPBC Act is likely to apply to the community (Department of Environment and Energy, 2018). The condition thresholds assist in distinguishing different meadows of different quality with consideration to various degrees of disturbance and degradation. Condition classes and thresholds provide guidance for when a patch of a TEC retains sufficient conservation values to be considered as a MNES, as defined under the EPBC Act. This means that the referral, assessment and compliance provisions of the EPBC Act are focussed on the most valuable areas of the TEC.

Table 3-6 details the assessment of the occurrence of *Posidonia* within the study area. Although the total area of seagrass in the study area exceeds one hectare, *Posidonia* does not comprise greater than 50 percent coverage of this area and therefore was not considered to meet the condition thresholds for this to be considered part of the EPBC listed endangered population. Therefore, assessment under the EPBC Act for this endangered population is not required for the proposal.

Table 3-6: Key diagnostic characteristics and condition thresholds for *Posidonia australis* seagrass meadows of the Manning-Hawkesbury ecoregion TEC (source: Department of Environment and Energy 2018)

Key diagnostic characteristics	Condition thresholds for small (≥ 0.01 -1 ha) meadows	
	Threshold level	Occurrence within study area
<ul style="list-style-type: none"> • Occurring within the Manning Shelf and Hawkesbury Shelf bioregions from Wallis Lake (32°S) to Port Hacking (34°S); • Occurs in shallow subtidal coastal waters (<10 m) in locations with protection from high wave energy, typically permanently open estuaries; • Consists of seagrass meadows ≥ 0.01 km² (1 ha) and dominated (ie >50% of total seagrass cover) by <i>P. australis</i>; and • Occurs on sand or silty-mud substrate. 	Cover: <ul style="list-style-type: none"> • >50% <i>Posidonia</i> cover of total meadow area <hr/> Shoot density: <ul style="list-style-type: none"> • 100 shoots/m² 	Total seagrass within the study area was estimated to be about 1.7 ha. <i>Posidonia</i> was not observed to be greater than 50% cover of this area. <hr/> Within the occurrence, shoot density was estimated to be less than 100 shoots/ m ²

P. australis seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie of the Sydney and Central Coast Region of NSW present within the study area is an endangered population under the FM Act. Consequently, an AoS under the FM Act was conducted and is provided in Section 4.4 and is further discussed in Section 4.1.2.

3.11 Groundwater dependent ecosystems

There are no aquatic or terrestrial GDEs in the study area (BoM, 2022b). The closest mapped GDE is at associated with Manly Lagoon, about 1.6 kilometres north of the study area.

3.12 Threatened species and populations

A review of the DPIE-EES BioNet database, NSW DPI threatened species list and the DCCEE PMST revealed 133 threatened species including two endangered populations with potential to occur within the study locality. Those with records in the study locality are indicated in Figure 3-11. Of the 133 threatened species, four were amphibians, 33 were flora, two were invertebrates, 56 were birds, four were fish/Syngnathids, 24 were mammals, seven were reptiles and three were sharks. Migratory species listed under the EPBC Act are discussed in Section 3.18.

An assessment of the likelihood of occurrence of all threatened species and populations based on the habitat within the study area, was carried out to determine the potential for these species to occur there. Some of these habitats were not considered optimal/suitable due to the size, condition and level of disturbance. This was a consideration of the likelihood of occurrence assessment. Table 2-1 provides the likelihood of occurrence criteria used in the assessment and Table 3-7 provides a summary of the assessment. The rationale behind the assessment is attached in Appendix B.

Table 3-7: Likelihood of occurrence summary of threatened species

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Amphibians					
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	(PMST)	None.
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	(PMST)	None.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	(PMST)	None.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	-	V	116 (BioNet)	None.
Flora					
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	(PMST)	None.
<i>Acacia terminalis subsp. terminalis</i>	Sunshine Wattle	E	E	(PMST) / 266 (BioNet)	None.
<i>Allocasuarina portuensis</i>	Nielsen Park She-oak	E	E	(PMST) / 8 (BioNet)	None.
<i>Asterolasia elegans</i>	-	E	E	(PMST)	None.
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid	E	V	(PMST)	None.
<i>Callistemon linearifolius</i>	Netted Bottle-brush	V	-	2 (BioNet)	None.
<i>Chamaesyce psammogeton</i>	Sand Spurge	E	-	1 (BioNet)	None.
<i>Cryptostylis hunteriana</i>	Leafless Tongue-Orchid	V	V	(PMST)	None.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	(PMST)	None.
<i>Darwinia biflora</i>	-	V	V	(PMST)	None.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	-	V	-	1 (BioNet)	None.
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	(PMST) / 4 (BioNet)	None.
<i>Eucalyptus nicholii</i>	Narrow-leaved black Peppermint	V	V	3 (BioNet)	None.
<i>Genoplesium baueri</i>	Yellow gnat-Orchid	E	E	(PMST)	None.
<i>Haloragodendron lucasii</i>	Hal	E	E	(PMST)	None.
<i>Lasiopetalum joyceae</i>	-	V	V	(PMST)	None.
<i>Leptospermum deanei</i>	Deane's Tea-Tree	V	V	(PMST)	None.
<i>Macadamia integrifolia</i>	Macadamia Nut	-	V	2 (BioNet)	None.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	(PMST) / 1 (BioNet)	None.
<i>Melaleuca deanei</i>	Deane's Melaleuca	V	V	(PMST)	None.
<i>Microtis angusii</i>	Angus's Onion Orchid	E	E	1 (BioNet)	None.
<i>Persicaria elatior</i>	Knotweed	V	V	(PMST)	None.
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	(PMST) / 1 (BioNet)	None.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	-	V	V	(PMST) / 9 (BioNet)	None.
<i>Prostanthera densa</i>	Villous Mintbush	V	V	(PMST)	None.
<i>Prostanthera junonis</i>	Somersby Mintbush	E	E	(PMST)	None.
<i>Prostanthera marifolia</i>	Seaforth Mintbush	CE	CE	(PMST) / 162 (BioNet)	None.
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	V	E	(PMST)	None.
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	(PMST) / 1 (BioNet)	None.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	(PMST)	None.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	V	(PMST) / 26 (BioNet)	None.
<i>Tetradthea glandulosa</i>	Glandular Pink-bell	V	-	1 (BioNet)	None.
<i>Thesium australe</i>	Austral Toadflax	V	V	(PMST)	None.
Invertebrates					
<i>Dendronephthya australis</i>	Cauliflower Soft Coral	E (FM Act)	E	(PMST)/DPI	Low.
<i>Meridolum maryae</i>	Maroubra Woodland Snail	E	-	(PMST)	None.
Birds					
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	(PMST)	None.
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	V	M (J, R), Ma	(PMST)	Low.
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-	1 (BioNet)	None.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	(PMST) / 1 (BioNet)	Low.
<i>Burhinus grallarius</i>	Bush-stone Curlew	E	-	4 (BioNet)	Low.
<i>Calidris canutus</i>	Red Knot	-	CE, M (B, C, J, R), Ma	(PMST)	Low.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, M (B, C, J, R), Ma	(PMST)	Low.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	(PMST)	None.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V, M (B, C, J, R), Ma	(PMST)	Low.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	1 (BioNet)	None.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	(PMST)	None.
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V, M (B), Ma	(PMST)	Low.
<i>Diomedea antipodensis gibsoni</i>	Gibson's Albatross	V	V	(PMST)	Low.
<i>Diomedea epomophora</i>	Southern Royal Albatross	-	V, M (B), Mi	(PMST)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Diomedea exulans</i>	Wandering Albatross	E	E, M (B), Ma	(PMST) / 2 (BioNet)	Low.
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E	E, M (B), Ma	(PMST)	Low.
<i>Esacus magnirostris</i>	Beach-stone Curlew	CE	Ma	1 (BioNet)	Low.
<i>Eudyptula minor</i>	Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)	EP	-	(DPI) / 30 (BioNet)	High.
<i>Falco hypoleucos</i>	Grey Falcon	E	-	(PMST)	None.
<i>Fregatta grallaria</i>	White-bellied Storm-petrel	V	V, Ma	(PMST)	Low.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	3 (BioNet)	Low.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	(PMST)	None.
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	3 (BioNet)	Low.
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	2 (BioNet)	Low.
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	V	Ma	(PMST) / 12 (BioNet)	Low.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V, M (C, J, R), Ma	(PMST) / 4 (BioNet)	Low.
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	5 (BioNet)	None.
<i>Lathamus discolor</i>	Swift Parrot	E	CE, Ma	(PMST) / 3 (BioNet)	None.
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit (baueri)	-	V	(PMST)	Low.
<i>Limosa</i>	Black-tailed Godwit	V	M (B, C, J, R), Ma	(PMST)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	1 (BioNet)	None.
<i>Macronectes giganteus</i>	Southern giant-Petrel	E	E, M (B), Ma	(PMST)	Low.
<i>Macronectes halli</i>	Northern Giant Petrel	V	V, M (B), Ma	(PMST)	Low.
<i>Ninox connivens</i>	Barking Owl	V	-	1 (BioNet)	None.
<i>Ninox strenua</i>	Powerful Owl	V	-	162 (BioNet)	None.
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE, M (B, C, J, R), Ma	(PMST) / 1 (BioNet)	Low.
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	-	V	(PMST)	Low.
<i>Pandion cristatus</i>	Eastern Osprey	V	M (B), Ma	11 (BioNet)	Low.
<i>Phoebastria fusca</i>	Sooty Albatross	V	V, M (B), Ma	(PMST)	Low.
<i>Pterodroma leucoptera</i>	Gould's Petrel	V	E	(PMST)	Low.
<i>Pterodroma neglecta</i>	Kermadec Petrel (western)	V	V	(PMST)	Low.
<i>Ptilinopus regina</i>	Rose-crowned Fruit Dove	V	-	2 (BioNet)	None.
<i>Ptilinopus superbus</i>	Superb Fruit-dove	V	Ma	1 (BioNet)	None.
<i>Pycnoptilus floccosus</i>	Pilotbird	-	V	(PMST)	None.
<i>Rostratula australis</i>	Australian Painted Snipe	E	E, Ma	(PMST)	None.
<i>Sternula albifrons</i>	Little Tern	E	M (B, C, J, R), Ma	(PMST)	Low.
<i>Sternula nereis</i>	Australian Fairy Tern	-	V	(PMST)	Low.
<i>Thalassarche bulleri</i>	Buller's Albatross	-	V, M (B), Ma	(PMST) / 1 (BioNet)	Low.
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross	-	V, M, Ma	(PMST)	Low.
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	-	V, M (B), Ma	(PMST)	Low.
<i>Thalassarche cauta</i>	Shy Albatross	V	V, M (B), Ma	(PMST) / 3 (BioNet)	Low.
<i>Thalassarche eremita</i>	Chatham Albatross	-	E, M (B), Ma	(PMST)	Low.
<i>Thalassarche impavida</i>	Campbell Albatross	-	E, M (B), Ma	(PMST)	Low.

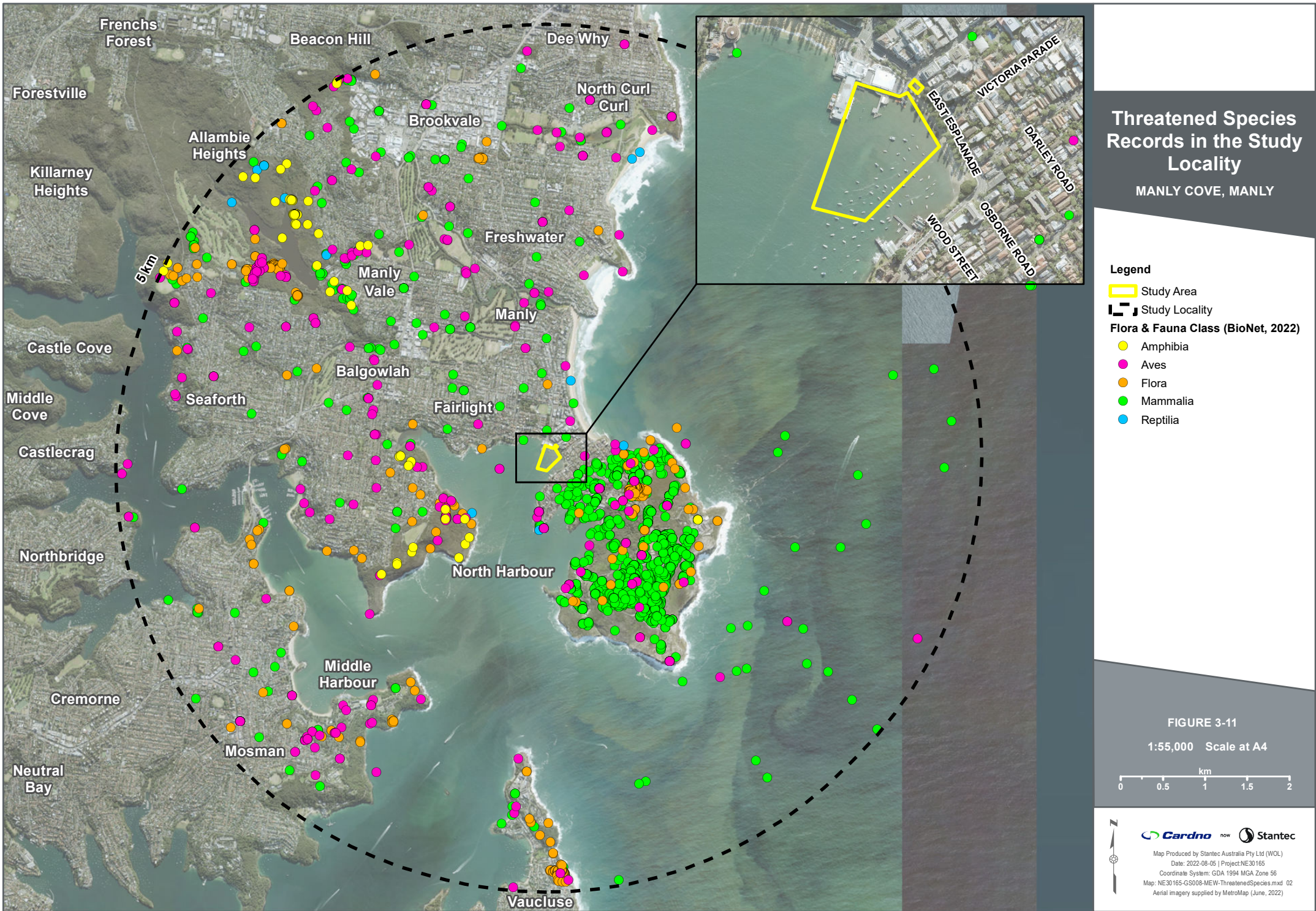
Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V, M (B), Ma	(PMST) / 7 (BioNet)	Low.
<i>Thalassarche salvini</i>	Salvin's Albatross	-	V, M, Ma	(PMST)	Low.
<i>Thalassarche steadi</i>	White-capped Albatross	-	V, M (B), Ma	(PMST)	Low.
Fish and Syngnathids					
<i>Epinephelus daemeli</i>	Black Rockcod	E (FM Act)	V	(PMST)	Moderate.
<i>Hippocampus whitei</i>	White's Seahorse	E (FM Act)	E, Ma	(PMST)	High.
<i>Macquaria australasica</i>	Macquarie Perch	E	E	(PMST)	None.
<i>Prototroctes maraena</i>	Australian Grayling	E (FM Act)	V	(PMST)	Low.
Mammals					
<i>Arctocephalus forsteri</i>	New Zealand Fur Seal	V	Ma	(PMST)	Low.
<i>Arctocephalus pusillus</i>	Australian Fur Seal	V	Ma	(PMST) / 1 (BioNet)	Low.
<i>Balaenoptera borealis</i>	Sei Whale	-	V, M (B)	(PMST)	Low.
<i>Balaenoptera musculus</i>	Blue Whale	E	E, M (B)	(PMST)	Low.
<i>Balaenoptera physalus</i>	Fin Whale	-	V, M	(PMST)	Low.
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	V	-	395 (BioNet)	None.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	(PMST) / 6 (BioNet)	Moderate.
<i>Dasyurus maculatus</i>	Spot-tailed Quoll (southeastern mainland population)	V	E	(PMST)	None.
<i>Dugong dugon</i>	Dugong	E	M, Ma	(PMST)	Low.
<i>Eubalaena australis</i>	Southern Right Whale	E	E, M	(PMST)	Low.
<i>Isodon obesulus</i>	Southern brown Bandicoot (eastern)	E	E	(PMST) / 1 (BioNet)	None.
<i>Megaptera novaeangliae</i>	Humpback Whale	V	V, M (B)	(PMST) / 27 (BioNet)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	10 (BioNet)	Moderate.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	60 (BioNet)	Moderate.
<i>Myotis macropus</i>	Southern Myotis	V	-	18 (BioNet)	Moderate.
<i>Perameles nasuta</i>	Long-nosed Bandicoot (North Head population)	EP	-	2,853 (BioNet)	None.
<i>Petauroides volans</i>	Greater Glider	-	V	(PMST)	Unlikely.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	(PMST)	Unlikely.
<i>Phascolarctos cinereus</i> (combined populations of Qld, NSW and the ACT)	Koala (combined populations of QLD, NSW and the ACT)	E	E	(PMST)	Unlikely.
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	(PMST)	Unlikely.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	(PMST) / 182 (BioNet)	Low.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	2 (BioNet)	Moderate.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	1 (BioNet)	Moderate.
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	1 (BioNet)	Moderate.
Reptiles					
<i>Caretta</i>	Loggerhead Turtle	E	E, M, Ma	(PMST) / 1 (BioNet)	Low.
<i>Chelonia mydas</i>	Green Turtle	V	V, M, Ma	(PMST) / 5 (BioNet)	Low.
<i>Dermochelys coriacea</i>	Leatherback Turtle	E	E, M, Ma	(PMST)	Low.
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	-	V, M, Ma	(PMST) 1 (BioNet)	Low.
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	(PMST)	None.
<i>Natator depressus</i>	Flatback Turtle	-	V, M, Ma	(PMST)	Low.
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	5 (BioNet)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Elasmobranchs					
<i>Carcharias taurus</i>	Grey Nurse Shark (east coast population)	CE (FM Act)	CE	(PMST)	Low.
<i>Carcharodon carcharias</i>	White Shark	V (FM Act)	V, M	(PMST)	Low.
<i>Rhincodon typus</i>	Whale Shark	-	V, M	(PMST)	Low.

*V = vulnerable; E = endangered; CE = critically endangered; M = migratory (EPBC Act) (B = Bonn; C = CAMBA; J = JAMBA; R = ROKAMBA); Ma = marine (EPBC Act)

Moderate or high likelihood of occurrence species are in **bold**.



Threatened Species Records in the Study Locality

MANLY COVE, MANLY

Legend

- Study Area
- Study Locality
- Flora & Fauna Class (BioNet, 2022)**
- Amphibia
- Aves
- Flora
- Mammalia
- Reptilia

FIGURE 3-11

1:55,000 Scale at A4



The likelihood of occurrence assessment found the majority of threatened species were either unlikely to occur or have a low likelihood of occurrence in the study area. The study area provides some potential foraging habitat (ie sandflats) for threatened shore/wading bird species. However, this area is unlikely to be important nesting or foraging habitat for shore/wading birds due to the high level of disturbance from pedestrians and dogs and impacts to these bird species as a result of the proposal are unlikely. As such AoSs were not completed for these species and were not assessed further.

Nine threatened species and two endangered populations were considered to have a moderate to high likelihood of occurrence within the study area. These included:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.
- Black Rockcod (*Epinephelus daemeli*) listed as endangered under the FM Act and vulnerable under the EPBC Act.
- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act and the EPBC Act.
- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed under the FM Act.

Seven microbats listed as vulnerable under the BC Act:

- Large-eared Pied Bat (*Chalinolobus dwyeri*).
- Little Bent-winged Bat (*Miniopterus australis*).
- Large Bent-winged bat (*Miniopterus orianae oceanensis*).
- Southern Myotis (*Myotis macropus*).
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).
- Greater broad-nosed Bat (*Scoteanax rueppellii*).
- Eastern Cave Bat (*Vespadelus troughtoni*).

The Little Penguin in the Manly Point Area endangered population is also listed on the critical habitat register (now Area of Outstanding Biodiversity Value (AOBV under the BC Act)). The registered AOBV (occurs within the study locality, about 500 metres south-east of the study area). No individuals or evidence of nesting was observed during the targeted survey. The species has a large foraging territory and has been known to nest in areas under Manly East Wharf. The Little Penguin population at Manly is the only known breeding population on the mainland of NSW (NSW NPWS, 2003b). Breeding occurs between June to February however, the species is known to use burrows during other times of the year to rest and moult. Adult penguins usually forage in nearby areas (10 to 30 kilometres) with the adults' foraging range known to greatly reduce once young have hatched. Due to the location of the proposal and potential for proposal activities to impact the species and its habitat, an AoS under Part 7.3 of the BC Act has been completed for this species to inform the assessment of impacts (Appendix C) and summarised in Section 4.4.

The main threats to the Manly population of Little Penguins include loss of suitable habitat, predation by foxes, dogs and cats and disturbance of nesting habitat (NSW NPWS, 2002). For example, noise, light and movement from human activities can delay adults accessing burrows to feed chicks and may deter Little Penguins from nesting in nearby, suitable habitat. Stormwater runoff, rubbish dumping and other pollutants have also been known to impact Little Penguins. The targeted field survey carried out by Cardno, now Stantec in March 2022 did not indicate the presence of penguins at any known nesting areas within or

near the study area. In addition, Kristie King (Northern Beaches Council) was consulted in regard to any data indicating penguin usage at the study area. Video footage of penguins in the vicinity of the wharf (below Bavarian Beer Café; outside of the study area) was provided although this was from 2019. Erica Mahon (Department of Infrastructure Planning and Environment) was also consulted and provided historical breeding pair counts for the wharf. Historical data indicated there were up to six breeding pairs in 2007/2008 known to inhabit the wharf. In recent years only one breeding pair has been recorded from the breeding years 2016/2017, 2017/2018, 2018/2019. However as a precautionary approach, given the location of the proposal and potential for proposal activities to impact the species and its habitat, an AoS under Part 7.3 of the BC Act has been completed for this species to inform the assessment of impacts (Appendix C) and summarised in Section 4.4.

The Black Rockcod is listed as vulnerable under the FM Act and the EPBC Act and was considered to have a moderate likelihood of occurrence in the study area due to the presence of suitable habitat and anecdotal evidence of sightings in the wider harbour. This species is known to occur in warm temperate to subtropical waters of the south-western Pacific Ocean (Aquaculture, Conservation and Marine Parks Unit, Port Stephens Fisheries Institute, 2012) and has been recorded along the east coast of Australia from southern Queensland to Kangaroo Island off South Australia and around Lord Howe and Norfolk Islands. The Black Rockcod distribution is centred around the NSW coast and adults are usually found in caves, gutters and beneath bommies on rocky reefs up to 50 metres in depth. Juveniles of this species prefer coastal rock pools while larger juveniles prefer rocky reefs in estuaries. This species has high site fidelity and is territorial. Significant habitat for the species has been identified, of which the intertidal rocky shore within the coastal depth zone between zero and 20 metres of the Hawkesbury Shelf is considered as significant. Although the study area does not extend to the coastal areas of the Hawkesbury Shelf and there was no subtidal rocky reef, the existing wharf structures have potential to provide habitat for juvenile Black Rockcod. Due to the presence of suitable habitat within the study area and the species' characteristic high site fidelity, AoSs under the FM Act and the EPBC Act have been completed for the species (Appendix C) and summarised in Section 4.4.

White's Seahorse is listed as endangered under the FM Act and the EPBC Act and was considered to have a high likelihood of occurrence in the study area due to the presence of suitable habitat (ie artificial structures) and known populations in the harbour. White's Seahorse are endemic to the estuaries and coastal embayments between Hervey Bay in Queensland and Sussex Inlet in NSW (NSW DPI, 2022e). They are usually found in sponge gardens, seagrass meadows and soft corals, as well as artificial habitats such as swimming nets and jetty/wharf piles like those within the study area. Resident populations of White's Seahorse have been reported in the harbour, some of which attract recreational divers. Recent conservation efforts by Sea Life Sydney Aquarium in collaboration with NSW DPI and University of Technology, Sydney released individuals from a breeding program into Clifton Gardens at Mosman. The proposal has potential to present a risk to this species due to the presence of preferred habitat, known populations in the harbour and their limited mobility. Thus, AoSs under the FM Act and the EPBC Act have been prepared to inform the impact assessment (Appendix C) and summarised in Section 4.4.

The FM Act lists *Posidonia* seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie of the Sydney and Central Coast Region of NSW as endangered populations (EP); however, the species occurs from Wallis Lake in the north to Twofold Bay in the south (NSW DPI, 2012). This species is a marine angiosperm (flowering plant) which completes their life cycle in subtidal waters of the temperate and cool-temperate waterways of southeast, southern and south-western Australia. This species has never been observed to establish mature meadows from seedlings which rather suggests rhizomatous growth as the primary mode of reproduction (NSW DPI, 2012). Due to the presence of species within the study area, AoSs under the FM Act has been completed for the species (Appendix C) and summarised in Section 4.4.

Seven microbats, listed under the BC Act, were considered to have a moderate likelihood of occurrence in the study area. There is no known breeding habitat in the study area, however, some of the existing wharf structures have potential to provide roosting habitat and the entire study area forms potential foraging habitat for these seven species, albeit suboptimal. All of these species prefer to roost in caves or tree hollows however, they are known to roost in man-made structures including in/under bridges/wharves and buildings. The Southern Myotis is known to forage over water and can be found roosting in small groups near water (NSW DPIE, 2020a). Although, the study area forms potential roosting habitat for the Little Bent-winged Bat, it is not optimal foraging habitat for the species as this species prefers densely vegetated forests (NSW DPIE, 2020b). As these species are sedentary during the day, have potential to be disturbed during construction and are also difficult to detect, an AoS under the BC Act has been completed for this group of species (Appendix C) and summarised in Section 4.4.

3.13 Protected species

Some species of fish have been formally protected because they are naturally scarce or their numbers have been substantially reduced over recent decades. These species are protected to help prevent them becoming threatened in the future. Twenty-four fish protected under the FM Act have potential to occur within the study locality. Fishing and collecting of these species without a permit would incur a penalty in accordance with Section 19 of the FM Act. An assessment of the likelihood of occurrence of all FM Act protected species, in accordance with the criteria set out in Table 2-1, was carried out to determine the potential for these species to occur within the study area (Appendix B). A summary of the likelihood of occurrence assessment is provided in Table 3-8.

The EPBC Act also provides for the protection of species. These are referred to as 'Marine' listed species. Their listing under the EPBC Act highlights the need for their conservation and management as protecting them from being killed, injured, taken, traded, kept or moved. Similar to the FM Act, all syngnathids (Family: Syngnathidae) are listed as Marine under the EPBC Act. The Protected Matters Search Tool also identified/predicted the occurrence of five bird species listed as Marine under the EPBC Act with potential to occur in the study locality all species were considered to have a low likelihood of occurrence due to the high level of disturbance and wide occurrence of similar habitat in the study locality.

All syngnathids were considered to have a high likelihood of occurrence in the study area. The majority of the remaining 20 species have an affinity to marine vegetation and habitat in estuaries (ie seagrass, macroalgae, rocky reef). These 20 species have a wide distribution and are not unique to the harbour or the habitat within the study area.

A further four fish species were also considered to have a moderate likelihood of occurrence within the study area, including:

- Elegant Wrasse (*Anampses elegans*).
- Estuary Cod (*Epinephelus coioides*).
- Queensland Groper (*Epinephelus lanceolatus*).
- Eastern Blue Devil (*Paraplesiops bleekeri*).

The subtidal areas of the study area form potential habitat for all three species however, these subtidal habitat features are not unique to the study area and are widespread throughout the harbour.

All marine vegetation, including seagrass, saltmarsh, mangroves and macroalgae, are protected under the FM Act. The study area does not encompass saltmarsh or mangroves however, seagrass was present and macroalgae colonised intertidal and subtidal rocky reefs (ie wharf piles (see Section 3.8)). Seagrass and macroalgae are considered as marine

vegetation and Division 4 of the FM Act protects marine vegetation from 'harm' in the form of gathering, cutting, pulling up, destroying, poisoning, digging up, removing, injuring, shading or otherwise harming marine vegetation or any part of it.

Table 3-8: Likelihood of occurrence summary of protected species

Scientific Name	Common Name	FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Birds					
<i>Bubulcus ibis</i>	Cattle Egret	-	Ma	(PMST)	Low.
<i>Merops ornatus</i>	Rainbow Bee-eater	-	Ma	(PMST)	None.
<i>Neophema chrysostoma</i>	Blue-winged Parrot	-	Ma	(PMST)	None.
<i>Pachyptila turtur</i>	Fairy Prion	-	Ma	(PMST)	Low.
<i>Stercorarius skua</i>	Great Skua	-	Ma	(PMST)	Low.
Fish and Syngnathids					
<i>Acentronura tentaculata</i>	Shortpouch Pygmy Pipehorse	P	Ma	(PMST/DPI)	High.
<i>Anampses elegans</i>	Elegant Wrasse	P	-	(DPI)	Moderate.
<i>Epinephelus coioides</i>	Estuary Cod	P	-	(DPI)	Moderate.
<i>Epinephelus lanceolatus</i>	Queensland Groper	P	Ma	(DPI)	Moderate.
<i>Festucalex cinctus</i>	Girdled Pipefish	P	Ma	(PMST/DPI)	High.
<i>Filicampus tigris</i>	Tiger Pipefish	P	Ma	(PMST/DPI)	High.
<i>Heraldia nocturna</i>	Upside-down Pipefish	P	Ma	(PMST/DPI)	High.
<i>Hippichthys penicillus</i>	Beady Pipefish	P	Ma	(PMST/DPI)	High.
<i>Hippocampus abdominalis</i>	Big-belly Seahorse	P	Ma	(PMST/DPI)	High.
<i>Histiogamphelus briggsii</i>	Crested Pipefish	P	Ma	(PMST/DPI)	High.
<i>Lissocampus runa</i>	Javelin Pipefish	P	Ma	(PMST/DPI)	High.
<i>Maroubra perserrata</i>	Sawtooth Pipefish	P	Ma	(PMST/DPI)	High.
<i>Notiocampus ruber</i>	Red Pipefish	P	Ma	(PMST/DPI)	High.
<i>Paraplesiops bleekeri</i>	Eastern Blue Devil	P	-	(DPI)	High.
<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon	P	Ma	(PMST/DPI)	High.
<i>Solegnathus spinosissimus</i>	Spiny Pipehorse	P	Ma	(PMST/DPI)	High.

Scientific Name	Common Name	FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Solenostomus cyanopterus</i>	Robust Ghostpipefish	P	Ma	(PMST/DPI)	High.
<i>Solenostomus paradoxus</i>	Ornate Ghostpipefish	P	Ma	(PMST/DPI)	High.
<i>Stigmatopora argus</i>	Spotted Pipefish	P	Ma	(PMST/DPI)	High.
<i>Stigmatopora nigra</i>	Widebody Pipefish	P	Ma	(PMST/DPI)	High.
<i>Syngnathoides biaculeatus</i>	Double-end Pipehorse	P	Ma	(PMST/DPI)	High.
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish	P	Ma	(PMST/DPI)	High.
<i>Urocampus carinirostris</i>	Hairy Pipefish	P	Ma	(PMST/DPI)	High.
<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	P	Ma	(PMST/DPI)	High.
Reptile					
<i>Pelamis platurus</i>	Yellow-bellied Seasnake	-	Ma	(PMST)	Low.

*P = protected (FM Act); Ma = marine (EPBC Act)

3.14 Commercial and recreational fishing

Drowned valley estuaries are the most productive of all estuary types in terms of commercial and recreational fishing (Roy, et al., 2001). In 1980-81, commercial fish catch was about 108 tonne, while the corresponding recreational fish catch was estimated as 165 tonne. Since then, prawn trawling has been phased out and because of elevated levels of dioxins in fish and crustaceans across Sydney Harbour, including Parramatta River and other connected tidal waterways, a ban was placed on commercial fishing in 2006. Recreational fishing in the harbour has not been banned, but fishers are urged to follow dietary advice on the levels of consumption of seafood from the Sydney Harbour, Parramatta River and other connected tidal waterways. Fishers can also continue to practise catch and release.

Henry (1984) found recreational fishing effort in Sydney Harbour to be generally greater in summer and autumn and on weekends, and estimated over one million fish were caught in 1981. Recreational fishermen took 46 fish species from the estuary during the one-year survey period, with species occurring in a range of benthic, demersal and pelagic habitat. At that time, the top ten species by abundance were Yellowtail (*Trachurus novaezelandiae*), Tailor (*Pomatomus saltatrix*), Yellowfin Bream, Snapper, (*Pagrus auratus*), Silver Trevally (*Caranx georgianus*), Dusky Flathead (*Platycephalus fuscus*), Sweep (*Scorpius lineolatus*), Fanbelly Leatherjacket (*Monacanthus chinensis*), Yellowfin Leatherjacket (*Meuschenia trachylepis*) and Sand whiting (*Sillago ciliata*). More recent anecdotal information indicates Yellowtail Kingfish (*Seriola lalandi*) are now among the top ten common fish caught. Rod fishing and hand lining were the main recreational fishing methods observed during Henry's 1984 survey. Few fishers used traps (crab, lobster, fish), nets (prawn, scissors, dip) or spearfished in the harbour. Fishing from the shoreline, including the shoreline in the study

area, is more popular than from boats. An extensive, convoluted shoreline provides many protected access points to the water's edge, including the wharf structure in the study area.

3.15 Critical habitat and Areas of Outstanding Biodiversity Value

No critical habitats listed under the FM Act or EPBC Act occur within or near the study area. The Little Penguin population in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) is listed as an endangered population under the BC Act. Areas of Outstanding Biodiversity Value (AOBV) (previously Critical Habitat) have been listed for this species and occur within the study locality, about 500 metres south of the study area (Critical habitat A) (Figure 3-12). As discussed in Section 3.12, the Little Penguin was considered to have a high likelihood of occurring within the study area. An AoS under Part 7.3 of the BC Act has been completed for this species to inform the assessment of impacts (Appendix C) and in Section 4.4.



Little Penguin Critical Habitat Map

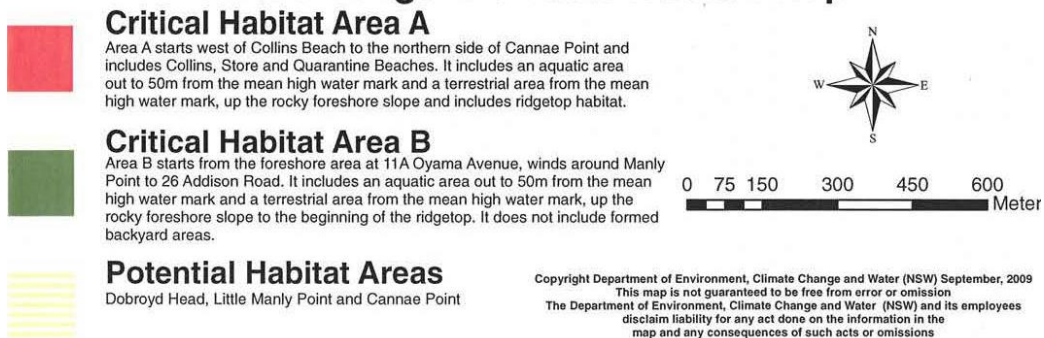


Figure 3-12: Little Penguin AOBV in relation to the study area (white X) (source: Department of Environment, Climate Change and Water (NSW) 2009)

3.16 Wildlife connectivity corridors

Very little vegetation is present within the study area, therefore there are no continuous wildlife corridors. Much of the vegetation in the study area has either been cleared or replanted with landscaped vegetation. This urban landscape comprises a number of open parks and reserves however, there are no continuous wildlife corridors between these areas or riparian corridors.

The waters of Manly Cove forms part of the marine corridor that is Sydney Harbour and is easily accessible for marine and estuarine species.

3.17 State Environmental Planning Policies

There are no Coastal Wetland or Littoral Rainforests, as defined in the Hazards and Resilience SEPP, in the study area. The nearest Coastal Wetland is about 1.6 kilometres north-west located near Addiscombe Road, Manly Vale (Figure 3-13). The nearest Littoral Rainforest is located about 820 metres east of the study area at Collins Beach, Manly (Figure 3-13).

There are no nationally important wetlands or Ramsar Wetlands in the study area or the wider study locality. The nearest nationally important wetland is Towra Point, over 20 kilometres south of the study area (Figure 3-13). Sydney Harbour National Park (Dobroyd Head and North Head) are located about 1.1 kilometres south-west and south-east respectively. Two aquatic reserves are located near the study area. Cabbage Tree Bay and North Harbour are about 500 metres north-east and 705 metres south, respectively (Figure 3-13).

Federation Point is a declared Wildlife Protection Area under the Manly LEP and is a dog exclusion zone in recognition of its importance as a nesting site for Little Penguins.



Conservation Areas in the Study Locality

MANLY COVE, NSW

Legend

- Study Area
- Study Locality
- NSW Marine Protected Area (NSW DPI, 2022)**
- Aquatic Reserve
- Coastal Wetlands
- Proximity Area for Coastal Wetlands
- Littoral Rainforests
- Proximity Area for Littoral Rainforests
- National Park**
- Garigal National Park
- Sydney Harbour National Park

FIGURE 3-13
1:55,000 Scale at A4

3.18 Matters of National Environmental Significance

There are nine types of Matters of National Environmental Significance (MNES) listed under the EPBC Act of which actions that have, or are likely to have, a significant impact on would require approval from the Australian Government Minister for the Environment (Commonwealth Minister). Of the nine types of MNES, four are potentially relevant to the proposal:

- Listed threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.
- Wetlands of international importance.

Threatened species and ecological communities listed under the EPBC Act are considered as MNES and are discussed in Sections 3.10 and 3.12. The location and/or relevance of migratory species, Commonwealth marine areas and wetland of international importance are discussed in the following sections.

3.18.1 Migratory species

Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. Listed migratory species may include any native species identified in an international agreement approved by the Minister. All listed migratory species are MNES under the EPBC Act. An action will require approval if the action has, will have, or is likely to have, a significant impact on a listed migratory species.

The PMST indicated 36 bird species and nine marine mammals/elasmobranchs (cartilaginous fishes, such as sharks and rays), have either been previously recorded or are predicted to occur within the study locality. An assessment of the likelihood of occurrence of all EPBC Act migratory species, in accordance with the criteria set out in Table 2-1, was carried out to determine the potential for these species to occur within the study area (Appendix B). A summary of the likelihood of occurrence assessment is provided in Table 3-9.

All listed migratory species were considered to have a low occurrence in the study area based on the absence of suitable habitat and high level of disturbance from pedestrians and dogs in the area. Impacts to these species as a result of the proposal were also considered unlikely to be significant and were therefore not assessed further.

Table 3-9: Likelihood of occurrence summary of migratory species

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
Birds				
<i>Actitis hypoleucos</i>	Common Sandpiper	M (B, C, J, R), Ma	(PMST) / 2 (BioNet)	Low.
<i>Anous stolidus</i>	Common Noddy	M (C, J), Ma	(PMST)	Low.
<i>Apus pacificus</i>	Fork-tailed Swift	M (C, J, R), Ma	(PMST) / 3 (BioNet)	Low.

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Ardenna grisea</i>	Sooty Shearwater	M (J), Ma	(PMST) / 1 (BioNet)	Low.
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	M (C, J, R), Ma	22 (BioNet)	Low.
<i>Calidris melanotos</i>	Pectoral Sandpiper	M (B, J, R), Ma	(PMST)	Low.
<i>Calonectris leucomelas</i>	Streaked Shearwater	M (C, J, R), Ma	(PMST) / 5 (BioNet)	Low.
<i>Cuculus optatus</i>	Oriental Cuckoo	M (C, J, R)	(PMST)	None.
<i>Fregata ariel</i>	Lesser Frigatebird	M (C, J, R), Ma	(PMST)	Low.
<i>Fregata minor</i>	Greater Frigatebird	M (C, J), Ma	(PMST)	Low.
<i>Gallinago hardwickii</i>	Latham's Snipe	M (B, J, R), Ma	(PMST)	None.
<i>Hydroprogne caspia</i>	Caspian Tern	M (J), Ma	1 (BioNet)	Low.
<i>Limosa lapponica</i>	Bar-tailed Godwit	M (B, C, J, R), Ma	(PMST) / 2 (BioNet)	Low.
<i>Monarcha melanopsis</i>	Black-faced Monarch	M (B), Ma	(PMST)	None.
<i>Motacilla flava</i>	Yellow Wagtail	M (C, J, R), Ma	(PMST)	None.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M (B), Ma	(PMST)	None.
<i>Pandion haliaetus</i>	Osprey	M (B), Ma	(PMST)	Low.
<i>Phaethon lepturus</i>	White-tailed Tropicbird	M (C, J), Ma	(PMST)	Low.
<i>Pluvialis squatarola</i>	Grey Plover	M (C, J, R), Ma	4 (BioNet)	Low.
<i>Rhipidura rufifrons</i>	Rufous Fantail	M (B), Ma	(PMST)	None.
<i>Stercorarius parasiticus</i>	Arctic Jaeger	M (C, J, R), Ma	2 (BioNet)	Low.
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	M (C, J, R), Ma	2 (BioNet)	Low.
<i>Symposiachrus trivirgatus</i>	Spectacled Monarch	M (B), Ma	(PMST)	None.
<i>Thaasseus bergii</i>	Crested Tern	M (J), Ma	24 (BioNet)	Low.

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
<i>Tringa nebularia</i>	Common Greenshank	M (B, C, J, R), Ma	(PMST) / 1 (BioNet)	Low.
Marine Mammals and Elasmobranchs				
<i>Balaenoptera edeni</i>	Bryde's Whale	M (B)	(PMST)	Low.
<i>Caperea marginata</i>	Pygmy Right Whale	M (B)	(PMST)	Low.
<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	M	(PMST)	Low.
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	M (B)	(PMST)	Low.
<i>Lamna nasus</i>	Porbeagle	M	(PMST)	Low.
<i>Mobula alfredi</i>	Reef Manta Ray	M	(PMST)	None.
<i>Mobula birostris</i>	Giant Manta Ray	M	(PMST)	None.
<i>Orcinus orca</i>	Killer Whale	M (B)	(PMST)	Low.
<i>Sousa sahalensis</i>	Australian Humpback Dolphin	M (B)	(PMST)	Low.

* M = migratory (EPBC Act) (B = Bonn; C = CAMBA; J = JAMBA; R = ROKAMBA); Ma = marine (EPBC Act)

3.18.2 Commonwealth marine areas

Commonwealth marine areas extends from three to 200 nautical miles from the coast of Australia. Thus, the study locality and the study area lies outside of any Commonwealth marine areas. However, the coastal waters to the east of the study area resides within the Temperate East Marine Region which covers 383,352 square kilometres and includes eight marine reserves. The study area does not reside within any Commonwealth marine reserves. The closest marine reserves are the Hunter Commonwealth Marine Reserve, about 149 kilometres north of the study area, and the Jervis Commonwealth Marine Reserve, about 135 kilometres south of the study area.

3.18.3 Wetlands of International Importance

Wetlands of international importance are defined by the Ramsar Convention which recognises these areas as being of significant value for their respective countries as well as for humanity as a whole. There are no nationally important wetlands or Ramsar Wetlands in the study area or the wider study locality. The closest Ramsar Wetlands are located at Towra Point Nature Reserve, over 20 kilometres south of the study area.

4 Impact assessment

This section assesses potential impacts to coastal and marine biodiversity in the study area as a result of the construction and operation of the proposal. The main components of the proposal with potential to impact biodiversity are summarised below.

The proposal would be built under TfNSW specifications as managed by the Contractor under a construction environmental management plan (CEMP). The specifications included in the CEMP would cover factors such as environmental performance and management, materials storage and management and erosion and sediment control.

- Construction:
 - Ground disturbance during site establishment.
 - Movement and use of equipment, plant and vessels.
 - Disturbance of the seabed from dredging, vessel traffic, anchoring and piling.
 - Installation and removal of structures.
- Operation:
 - Persistence of the new wharf structures/features.
 - Changes to berthing configuration.
 - Vessel and pedestrian traffic.

This section details the extent and significance of impacts as a result of the proposal including:

- Disturbance of terrestrial groundcover and fauna habitat.
- Removal and disturbance of marine vegetation and habitat.
- Removal/disturbance to threatened, migratory and protected species.
- Mobilisation of soils, sediments and contaminants.
- Surface and underwater noise and vibration.
- Risk of vessel strike.
- Introduction/spread of weeds and/or marine pests and diseases.
- Alterations to hydrology.
- Light disturbance.

4.1 Construction Impacts

4.1.1 Native vegetation and habitat (terrestrial)

The proposal would not require the removal of terrestrial vegetation. A temporary compound will be established to facilitate the proposal. The compound area is located in East Esplanade Park and would utilise the grassed area, no tree clearance would be required. Furthermore, the compound area would be fenced off and tree protection would be used to ensure the nearby trees are not harmed. Impacts to threatened species are discussed below in Section 4.1.4.

4.1.2 Marine vegetation and habitat

The proposal would involve the removal of about 290 cubic metres of material (marine sands) via excavator barge and hopper barge at the Wharf 3 berth pocket area. This would cover an area of about 388 square metres of seabed (Figure 4-1). Dredged material would be transported via barge to a suitable disposal location.

Part of the existing wharf structure and about 54 timber piles of varying decay and seven steel piles all about four metres in length would be removed and a new wharf structure would be installed. Two existing piles positioned between Wharf 2 and Wharf 3 will also be removed.

Removal of existing wharf and structures

The existing wharf structure and piles (63 piles to be removed) within the subtidal and intertidal zone are densely colonised by encrusting and sessile biota (such as ascidians and oysters), macroalgae (including *Ecklonia radiata*) and other small, mobile macroinvertebrates such as gastropod snails and crabs. Although the removal of these structures would result in the loss of these biota, the majority of these species are common in Manly Cove and surrounds and would recolonise piles of the new wharf. This may take months to years before the assemblages reach the same level of diversity as the existing assemblages and will also depend on the material of the new piles and any treatment or coatings that are applied to the piles. The installation of the 76 new piles would otherwise result in an overall increase of submerged artificial surface and available habitat for encrusting and sessile biota to colonise.

Construction of the new wharf/dredging (Direct)

The new structure would require 76 piles (two arrestor piles, 14 mooring and berthing piles, one safety pile, two separator piles and 57 steel support piles) installed by barge mounted pile driving unit via vibration or hammering. The majority of piles installed would be driven into bare, subtidal soft sediment (Type 3 KFH). This would result in the direct removal of infauna from subtidal soft sediment habitats and the area of subtidal soft sediment habitat under the footprint of the piles would be permanently lost.

In summary, marine vegetation that would be directly lost due to dredging and piling is as follows (Figure 4-1):

- 331 square metres of subtidal soft sediment (Type 3 KFH) within the dredge area.
- 48 square metres of macroalgae within the dredge area (Type 2 KFH).
- 17 square metres of low density *Zostera* and *Halophila* overlapping the dredge area (Type 1 KFH).
- 1 square metre of low density *Zostera* and *Halophila* (Type 1 KFH) as a result of one arrestor pile (western pile) driven into a small patch of low density *Zostera* and *Halophila* (about 123 square metres).

Although there would be a net loss of bare, soft sediments and associated benthic infauna, this habitat is characteristic of the majority of subtidal habitat in Manly Cove and similar assemblages are ubiquitous in the study locality. The benthic assemblage will, however recolonise, although the infauna assemblage may differ in composition due to the permanent changes in depth and sediment grain size within the berth pocket. Thus, the impact to this area would not be substantial.

The mapped area of macroalga within the dredge footprint was generally attached to unconsolidated rubble / small boulders and may not therefore be permanently fixed to the seabed which may have moved during inclement weather following the survey. There may also be opportunity to relocate rubble / small boulders with attached macroalgae to un-impacted areas.

Under Section 199 of the FM Act, consultation with NSW DPI (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat*

Conservation and Management (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to dredging and removal and installation of piles. Section 205 of the FM Act states that a permit to 'harm' marine vegetation would be required as per the definition detailed in Section 3.13. Further consultation with NSW DPI (Fisheries) is therefore recommended.

Construction of the new wharf/dredging (Indirect)

Dredging of the berth pocket has potential to indirectly impact adjacent seagrass beds and marine vegetation via the mobilisation of soft sediments, resulting in a temporary increase in turbidity and suspended sediments loads. This may impact on adjacent seagrasses via light attenuation (limiting photosynthesis) or by sedimentation and smothering. Nevertheless, these organisms will be adapted to frequent natural elevations in turbidity and suspended sediments occurring during heavy rainfall, storm and flood events, combined with tides and swell. Short-term changes in turbidity and suspended sediments due to dredging could therefore be expected to be within levels of natural variability within Manly Cove. The risk of mobilisation and sedimentation on adjacent seagrass beds would be further controlled with the use of silt curtains to contain finer sediments.

Disturbance of sediments could also result in the mobilisation of contaminants known to persist in study area (ie TBT). Depending on the conditions, mobilised contaminants may be quickly dispersed and diluted. However, contaminants that persist in the study area have potential to affect sedentary marine organisms if the concentrations remain high enough.

There is potential for coarse debris to be mobilised during removal of existing structures, construction of new structures and vessel movement. Any larger debris would, however, be disposed of offsite and should not cause any impacts to marine biodiversity.

Water-based construction activities would result in the temporary increase in vessel and barge movements in and around the study area. This has potential to mobilise sediments via vessel wash and engine thrust, cause temporary shading of marine vegetation and further scouring of the seabed from anchors. Measures to manage these potential impacts are outlined in Section 5).

4.1.3 Coastal and marine fauna

Coastal and marine fauna including cetaceans, pinnipeds, sirenians, marine reptiles, seabirds, fish and mobile macroinvertebrates have the potential to be affected by construction activities via temporary changes to water quality, temporary increases in vessel movements (ie vessel strike) and temporary impacts from construction noise and vibration, particularly from piling.

In terms of water quality, significant impacts beyond the study area would not be expected with suitable controls in place. The majority of highly mobile marine fauna would also temporarily seek out alternative unaffected habitat within the harbour. Less mobile fauna or those with strong site fidelity and high likelihood of occurrence, such as Syngnathids could be affected by local changes in water quality that may affect breeding, feeding and / or foraging behaviour. This is further addressed in Section 4.1.4.

A temporary increase in vessel and barge activity during construction is associated with an increased risk of vessel strikes with Little Penguins, marine turtles, mammals and diving birds. The study area is, however, considered suboptimal habitat for most marine turtles and mammals and very few individuals, if any, would be likely to occur during construction. Potential risks to Little Penguins foraging or passing through the study area would be at an increased risk of injury or disturbance while barges and vessels facilitate the works. However, it is considered that Little Penguins are fast enough to avoid boat strikes, and as the penguins are already avoiding numerous vessels in the wharf area, there would be no increased risk to injury from the proposal. Speed restrictions of four knots would still apply to

ferries within 200 metres of the wharf, allowing ample time for penguins to avoid interactions. Risk of vessel strike could be further managed by ensuring contracting personnel are made aware of the presence of penguins and other marine fauna and that any sightings are reported. This is addressed in Section 5.

It is expected that a relatively high ambient noise environment already exists in the study area due to the presence of existing vessel movements to and from Manly Wharf. Noise levels would be intermittent and vary depending on the type and the size of the vessel, where ferries could generate ambient noise levels of 141 to 145 dB (re: 1 μ Pa) at distances of 100 metres and 50 metres, respectively (Transport for NSW, 2021). In comparison, ambient underwater noise levels around Australian coastal waters are generally around 100 to 120 dB (re: 1 μ pa) (Government of South Australia, 2012). The additional vessel noise from work barges during construction would be temporary and considered negligible in comparison with the existing underwater noise generated from existing ferry operations.

The main sources of construction related noise would be from:

- Dredging (barge mounted excavator).
- Pile driving (impact or vibratory piling).

While dredging activities are likely to cause a temporary behavioural shift as mobile marine fauna avoid the area immediately in the vicinity of the noise source, the overall risk from this activity is considered to be lower than for pile driving.

The following threatened and protected marine fauna have been identified as having a high likelihood of occurring in the study area and would be potentially at risk from impacts from underwater noise during construction:

- Syngnathids (including White's Seahorse).
- Fish (including the Black Rockcod, Estuary Cod and the Eastern Blue Devil Fish).
- Seabirds, including the Little Penguin.

Other marine fauna that are less likely to enter the study area have been identified as including cetaceans, pinnipeds, sirenians and marine reptiles.

A worst-case scenario has been assessed to determine buffer distances from the works where marine fauna may be affected either by a permanent temporal shift (PTS), temporary temporal shift (TTS) or a behavioural response. A PTS is a permanent reduction in hearing sensitivity caused by irreversible damage to the sensory organs of the ear, a TTS is a temporary reduction in hearing sensitivity as a result of exposure to sound. A behavioural response may include avoidance of preferred foraging locations and potentially increase in foraging effort. Behavioural responses are likely to cease once the underwater noise disturbance has stopped. For marine fauna identified as having a high likelihood of occurrence in the study area, the following buffer distances have been determined:

- Threatened/protected fish and seahorses including White's Seahorse: 12 metres (PTS), 175 metres (TTS) and >1.2 kilometres (behavioural).
- Seabirds, including Little Penguins: 120 metres (PTS) and >1.2 kilometres (behavioural).

The methodology and process for determining these thresholds is outlined in GHD (2022).

An AOBV (formerly critical habitat) has been declared for the Little Penguin breeding ground around 500 metres south of the study area. While the ships and construction activities are likely to deter penguins from swimming through the study area, there is potential for behavioural impacts of piling works affecting penguins within the AOBV.

Mitigation measures have therefore been recommended to reduce the potential for impacts to Little Penguins, other diving birds, Syngnathids and fish that have a high likelihood of occurring within the study area (Section 5).

Land-based construction activities would create noise and vibration in the study area and the responses of terrestrial fauna are likely to be similar to that of mobile marine fauna (ie move away from unfavourable conditions and return once disturbance is removed). With the correct controls, proposal construction is unlikely to cause significant negative impacts to coastal or mobile marine fauna in the study area.

4.1.4 Threatened, migratory and protected species

The proposal is unlikely to significantly impact threatened or protected species and their habitat. Expected impacts would largely be temporary and affect areas considered to be suboptimal and / or proportionally small to that available in the study locality. Details of the AoSs undertaken for species considered to have a high likelihood of occurring in the study area are outlined in Section 4.4.

The removal of existing wharf structures and construction activities has potential to remove and temporarily disturb roosting and foraging habitat for the Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Eastern Cave Bat. However, the area of removal is considered suboptimal and a small proportion of the available habitat for these species and is not expected to reduce species' range, disrupt breeding or reduce population sizes. The new wharf structures are likely to provide new and additional roosting habitat for these species once completed.

Water-based activities have potential to impact habitat for the Little Penguin, Black Rockcod and White's Seahorse. The foraging resource that the study area represents would be made available for these species following the completion of construction thus, impacts of the proposal impacts to potential foraging habitat of these species would be temporary. The impact from the removal of the existing structure is considered minimal for Black Rockcod and White's Seahorse. Some of this habitat would be altered but would not be removed from the areas of occupancy for these species. These are also very small proportions of available habitat in their distribution and the installation of new piles and structures would provide similar, if not the same habitat for these species following operation and recolonization of encrusting biota. Additional controls would be implemented to survey for Black Rockcod, Little Penguin and White's Seahorse at the start of construction so that any individuals that did occur in the area are not harmed and / or can be relocated (see Section 5).

4.1.5 Pests and diseases

The study area is unlikely to be susceptible to any land-based pests and disease as a result of the proposal as land based works will be confined to within the compound area. Proposal activities over water have a small potential to introduce marine pests if vessels, equipment or plant are brought into the study area from other estuaries where marine pests are present. Some of these pests such as Caulerpa are already established within the study area and movements of vessels, plant and equipment could further spread Caulerpa within Manly Cove. Similarly there is a risk that vessels, plant and equipment used within the study area transport fragments to other estuaries outside of the proposal locality. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided (Section 5).

4.1.6 Commercial and recreational fishing

The proposal is unlikely to substantially impact populations of marine species important to recreational fishing as discussed in Section 4.1.3. However, temporary disruption to

recreational fishing in the study area would be experienced during construction and the continuation of recreational fishing from the new structure is likely to be restricted to areas which would not disrupt ongoing ferry operations. These conditions for recreational fishing during operation are unlikely to substantially differ from existing conditions.

4.1.7 Key threatening processes (KTP)

Two Key Threatening Processes (KTPs) have potential to be triggered by the proposal during the construction phase. These are discussed below:

(1) Introduction of Non-indigenous Fish and Marine Vegetation to the Coastal Waters of NSW (FM Act)

Threat abatement actions prioritised in the *Priority Action Statement – Actions for the introduction of non-indigenous fish and marine vegetation to coastal waters of NSW* (Fisheries Scientific Committee, 1994) surrounds community and stakeholder liaison and awareness, legislative development and implementation, eradication and control and research, monitoring and mapping. The proposal is unlikely to interfere with any of these threat abatement actions albeit the potential to introduce/facilitate the spread of non-indigenous fish and marine vegetation. However, as discussed in Section 4.1.5 and Section 5 controls to avoid introducing and / or spread of non-indigenous fish and marine vegetation would be in place thus, proposal activities are unlikely to further exacerbate this KTP.

(2) Installation and Operation of Instream Structures and Other Mechanisms That Alter Natural Flow Regimes of Rivers and Streams (FM Act)

The proposal would remove the existing wharf structures and install 76 piles and associated wharf structures. Due to the relatively small size and seabed footprint of these structures in proportion to Manly Cove, alterations to hydrodynamics are likely to be localised and unlikely to impact any threatened species listed under the FM Act.

The identified threat abatement actions for this KTP include advice to consent authorities, community and stakeholder engagement, research and monitoring and habitat rehabilitation and protection. The proposal is unlikely to interfere with these actions with habitat rehabilitation proposed following proposal completion if required. Thus, the proposal is unlikely to further exacerbate or trigger this KTP.

4.2 Indirect/operational impacts

4.2.1 Marine vegetation and habitat

Potential operational impacts to marine vegetation and subtidal habitat include:

- Indirect, temporary shading from the new pedestrian walkway roof of Wharf 3.
- Relocation of the fast ferry berth area from the old Wharf 3 location (south-east of the new Wharf) to the new Wharf 3 location (within the dredge area west of the new Wharf 3).

Indirect shading

Seagrasses have specific light requirements necessary for photosynthetic performance. Both long-term and short-term light deprivation directly influences seagrass photosynthesis and survival including growth and reproduction (Bité et al. 2007, Longstaff and Dennison 1999, Fitzpatrick and Kirkman 1995). Construction of the boardwalk would result in permanent coverage of a 17 square metre meadow of medium density *Halophila* (Type 1 KFH) which would likely be lost due to shading.

Construction of the Wharf 3 gangway, hydraulic platform and pedestrian walkway and roof will cast shadow over the water on either side of the new Wharf at certain times of day. This would include a significant bed of mixed high density *Halophila* and medium density *Zostera* seagrass immediately east (about 6.5 metres) of the new Wharf. However, given the sun is not directly above the structure for most hours of the day, the seagrass may receive only partial shading during the afternoon. Exposure of seabed within the 6.5 metre gap between the new structure and existing seagrass (due to removal of the old Wharf 3) may also present opportunity for seagrass to recolonise the area that was previously fully shaded. In addition Wharf 4 will be constructed with light penetrable decking which will allow some sunlight to reach the seabed at all time of the day.

Relocation of fast ferry berth

Although operations will not change in terms of frequency of vessel movements, size and types of vessels, there will be a change in the use of wharf berthing areas. Fast ferries previously berthing at the triangular structure at the south east end of the old Wharf 3 will berth alongside the new Wharf 3 (within the new dredge area). Only small recreational and commercial vessels such as water taxis will berth at the proposed new Wharf 4.

This may cause a new zone of scouring between the new Wharf 3 and Wharf 2, potentially impacting about 171 metres squared of low density *Zostera* and *Halophila* seagrass (Type 1 KFH), located to the north west of the dredge area (Figure 4-1). However, significant reduction in scouring and deposition on the eastern side of the wharf (where fast ferries previously berthed), may also provide opportunity for the recolonisation of a significant area of seagrass previously unable to establish due to engine thrust and scour (Figure 4-1). The new Wharves 3 and 4 also extend into deeper water meaning scour effects from vessels will likely be less and would reduce seabed disturbance and impacts to nearby seagrass beds.

4.2.2 Threatened, migratory and protected species

The proposal would require the installation of light poles along the edge of the boardwalk. This may disturb marine fauna such as the Little Penguin returning from day time foraging at dusk / night. However, given the Wharf 3 area is currently highly disturbed with pedestrian activity and well illuminated at night from commercial operations (ie bars and restaurants), these impacts are considered negligible. Furthermore, the Little Penguin is not currently known to nest below the Wharf within the study area. A historical nesting site (not currently being occupied) is below the Bavarian Beer Café (ie under the north-west area of the wharf precinct) near Wharf 1. This area is not expected to be impacted by the proposed lighting.

Table 4-1: Areas of terrestrial and marine vegetation and habitat to be directly impacted and reinstated by the proposal during construction and operation

Vegetation and habitat	Process: Construction and demolition	Construction: Area to be directly impacted/removed (square metres)	Process: Operational impacts	Operational: Area to be directly/indirectly impacted (square metres)	Area to be reinstated (ha)	Net loss/gain	Comment
Landscaped gardens and parks	Compound area establishment	~408 square metres	-	-	~408 square metres	No net loss	-
Microbat roosting habitat	Demolition of existing wharf	~514 square metres	-	-	~1097 square metres	Net gain	-
Seagrass (mixed Halophila and Zostera) (Type 1 KFH)	Piling and dredging	~1 square metre (piling) ~17 square metres (dredging)	Shading	~17 square metres	N/A	Net loss of ~18 square metres (dredging/piling) and ~17 square metres from shading of boardwalk	-
Seagrass (mixed Halophila and Zostera) (Type 1 KFH)	-	-	Indirect effects of ferry scour regime	~171 square metres	N/A	Potential net loss of ~171 square metres	-
Mapped macroalgae (Type 2 KFH)	Dredging	~48 square metres	Shading	~31 square metres	N/A	Net loss of ~48 square metres from dredging and ~31 square metres from shading	Potential for relocation of rock rubble with attached macroalgae

Vegetation and habitat	Process: Construction and demolition	Construction: Area to be directly impacted/removed (square metres)	Process: Operational impacts	Operational: Area to be directly/indirectly impacted (square metres)	Area to be reinstated (ha)	Net loss/gain	Comment
Macroalgae on piles (Type 2 KFH)	Demolition of existing wharf and piles	~63 piles to be removed with macroalgae attached (demolition)	-	-	76 piles to be installed	Net gain of 13 piles for future colonisation	-
Subtidal soft sediment (Type 3 KFH)	Piling and dredging	~75 square metres* (piling) ~331 square metres (dredging)	Shading	-	N/A	Net loss of ~406 square metres from piling/dredging	Subtidal soft sediment habitat will be retained in dredge area, but the seabed will be slightly deeper
Total (square metres)	-	~922 (terrestrial) ~472 (marine)	-	~219 (marine)	~583 (terrestrial)	Net loss: 441 (marine) Net gain: 583 (terrestrial) 15 piles (marine)	-

* Based on an impact area of 1 square metre per pile



Habitat Impacted by the Proposal

MANLY COVE, NSW

Legend

- Study Area
- Dredging Area
- Demolition Area
- Compound Area
- New Wharf Structure
- Potential seagrass habitat for colonisation

80% Pile Arrangement

- Arrestor
- Mooring and Berthing Piles
- Separator Piles
- Steel Support Piles

Dominant species of seagrass

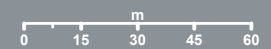
- Posidonia/Zostera
- Posidonia/Halophila
- Posidonia/Zostera/Halophila
- Zostera
- Zostera/Halophila
- Halophila
- Posidonia Present

Marine habitat within dredge area to be directly impacted

- Zostera/Halophila
- Macroalgae
- Subtidal Soft Sediment

FIGURE 4-1

1:2,000 Scale at A4



4.3 Cumulative impacts

Projects within the Northern Beaches LGA and the Sydney Ferries Network have been considered for the purposes of this cumulative impact assessment as per the REF.

Projects identified that could create cumulative impacts with the proposal have been detailed in Table 4-2.

Table 4-2: Past, present and future projects

Project	Biodiversity value impacted	Construction impacts	Operational impacts
<p>Former Manly Sea Life Aquarium TfNSW plans to remove the aquarium building and extend the boardwalk for recreational purposes.</p>	<p>Protected marine vegetation (seagrasses and macroalgae) Threatened/migratory marine species (including Little Penguins and seahorses).</p>	<p>Construction could potentially require the direct removal of marine habitat and marine vegetation and/or indirect effects to water quality impacting on marine vegetation. It is expected, however, that structures would be designed to minimise direct impacts on existing habitat.</p>	<p>Operational impacts will depend on the nature and scale of the final design but may include restaurants and alfresco dining. This has potential for disturbance to habitat and marine species that occur in the area, including from noise, vibration and light. There may, however, be opportunity to enhance artificial habitat for some marine species such as seahorses.</p>
<p>TfNSW Ferry Wharf Upgrade Program. This includes the completed upgrades to 23 ferry wharfs within Sydney Harbour and plans to upgrade a further 7 wharves.</p>	<p>Protected marine vegetation Threatened / migratory marine species</p>	<p>Construction could potentially require the removal of coastal and marine vegetation. However, these areas are generally modified and the proportion of these areas to other similar areas in the harbour is small, even when combined. This is relevant to the removal of vegetation (terrestrial and marine) and potential habitat for native, threatened and/or migratory species.</p>	<p>Operational impacts of all ferry upgrade locations are likely to resemble those discussed in this REF. Most locations would require the removal of existing structures in place of new structures. This is generally a temporary disturbance to coastal and marine vegetation and habitat and ecologically acceptable for coastal and marine species in the harbour.</p>

Project	Biodiversity value impacted	Construction impacts	Operational impacts
<p>Manly Wharf Second level upgrade – completed</p> <p>Manly Independent Assessment Panel approved development plans for the second-level of restaurants in October 2015 in accordance with the original conditions of consent as approved by the Land and Environment Court of NSW in July 2013.</p>	<p>Endangered population of Little Penguins at Manly</p>	<p>Disturbance to penguins nesting under the east wharf during construction.</p>	<p>Increased disturbance from noise, light and human interactions.</p>

4.4 Assessments of significance

Assessments of Significance (AoSs) have been completed for marine and coastal threatened species/populations listed under the BC Act, FM Act and the EPBC Act that were identified as having a moderate to high potential to occur within the study area due to the presence of nearby records and/or the presence of suitable habitat. These species were identified in Section 3.12 and include:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.
- Black Rockcod (*Epinephelus daemeli*) listed as endangered under the FM Act and vulnerable under the EPBC Act.
- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act and the EPBC Act.
- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.
- Seven microbats listed as vulnerable under the BC Act:
 - Large-Eared Pied Bat (*Chalinolobus dwyeri*).
 - Little Bent-winged Bat (*Miniopterus australis*).
 - Large Bent-winged Bat (*Miniopterus orianae oceanensis*).
 - Southern Myotis (*Myotis macropus*).
 - Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).
 - Greater Broad-nosed Bat (*Scoteanax rueppellii*).
 - Eastern Cave Bat (*Vespadelus troughtoni*).

The full AoSs are provided in Appendix C. A summary of results is given in Table 4-3, Table 4-4 and Table 4-5 below:

Table 4-3: Summary table for assessments of significance under the BC Act

Threatened species, or communities	Significance assessment question ¹					Likely significant impact?
	1	2	3	4	5	
Little Penguin (<i>Eudyptula minor</i>) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.	N	X	N	N	X	No.

Significance assessment question ¹						
Threatened species, or communities	1	2	3	4	5	Likely significant impact?
Large-Eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Yellow-bellied Sheath-tail-bat, Greater Broad-nosed Bat and Eastern Cave Bat	N	X	N	X	X	No.

Notes: Y = Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. Section 7.2 of the BC Act

Table 4-4: Summary table for assessments of significance under the FM Act

Significance assessment question ¹								
Threatened species, or communities	1	2	3	4	5	6	7	Likely significant impact?
<i>Posidonia australis</i> seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie	X	N	N	N	X	N	N	No.
White's Seahorse	N	X	X	N	X	N	N	No.
Black Rockcod	N	X	X	N	X	N	N	No.

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact. 1. Section 220ZZ of the FM Act

Table 4-5: Summary table for assessments of significance under the EPBC Act

Significance assessment question ¹										
Threatened species, or communities	a	b	c	d	e	f	g	h	i	Likely significant impact?
White's Seahorse	N	N	N	N	N	N	N	N	N	No.
Black Rockcod	N	N	N	N	N	N	N	N	N	No.

Notes: Y= Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. Matters of National Environmental Significance: Significant Impact Guidelines 1.1

5 Avoidance and minimisation

Under the TfNSW Biodiversity Guidelines: *Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority (RTA), 2011) the management of biodiversity should aim to:

1. Avoid and minimise impacts first.
2. Mitigate impacts where avoidance is not possible.
3. Offset where residual impacts cannot be avoided.

Table 5-1 details measures to avoid, minimise or mitigate proposal impacts. These should be included in the CEMP and any associated sub-plans prior to construction.

Table 5-1: Mitigation measures

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B1	All proposal impacts.	<p>Integrate the management of flora and fauna into the CEMP (either as a standalone flora and fauna management plan or a subplan). This is to include all terrestrial and marine flora and fauna and include but not be limited to such measures as:</p> <ul style="list-style-type: none"> • Documenting and establishing site clearing limits. • Establishment of no go zones. • Implementation of tree protection measures • Pre-clearing surveys, vegetation removal, unexpected finds measures in line with the <i>Biodiversity Guidelines</i> (RTA, 2011). 	Contractor	Pre-construction	Effective	None.
B2	Removal and disturbance to marine vegetation and habitat.	<p>Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the <i>Policy and guidelines for fish habitat conservation and management Update 2013</i> (NSW DPI, 2013).</p>	Contractor	During construction	Effective	Potential localised sediment mobilisation.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B3	Removal and disturbance to marine vegetation and habitat.	<p>Considerations during detailed design to promote colonisation of habitat-forming species could include the installation of structures which provide habitat complexity (ie designs available as part of the Living Seawalls Project).</p> <p>Consideration should be given to the use of perforated materials such as glass reinforced plastic for boardwalks, ramps, gangway and waiting areas to minimise shading impacts on marine vegetation and habitat.</p>	Contractor	Detailed design	Effective	Net loss of artificial habitat from the removal of existing structures, shading of seagrass.
B4	Removal and disturbance to marine vegetation and habitat.	<p>Minimise anchoring where possible and avoid anchoring on any marine vegetation particularly seagrass. This may include establishing 'no-go' zones.</p> <p>Vessels should not remain stationary for an extended period of time over areas of seagrass. All personnel and vessels are to be made aware of the importance of seagrasses and macroalgae and their location in relation to the works.</p>	Contractor	During construction	Effective	None.
B5	Removal and disturbance to marine vegetation and habitat.	Work associated with positioning barges, dredging and pile driving should occur during calm conditions to prevent excessive scouring (from need to use engine thrust) and other impacts.	Contractor	During construction	Effective	None.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
WQ6	Mobilisation of soils, sediments and contaminants.	<p>Prior to commencement of construction activities, sediment control devices (such as sediment booms and curtains) would be installed around the dredge area to contain disturbed sediment from water surface by allowing suspended sediments to settle back to the seabed. The silt boom and curtain would extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work.</p> <p>Installation should be undertaken during high tide from a boat. The device should be designed to rise and fall with the tide to prevent seabed disturbance. Inspection of the device should be undertaken on a daily basis after ebbing tides, with additional inspections carried following storm events. Turbidity inside and outside of the device should be monitored, using a portable turbidity meter. Prior to removing the sediment control device, conditions within the curtain would be assessed visually and with a field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.</p>	Contractor	Pre-construction	Effective	Potential for localised sediment mobilisation/sedimentation.
WQ7	Mobilisation of soils, sediments and contaminants.	Water quality and surface sediments should be tested in the vicinity of the dredge area for contaminants, including TBT during and post-construction to determine whether there has been an increase in contaminant levels (potentially harmful to marine biota) and whether remediation action is required.	Contractor	During and post-construction	Effective	None.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
WQ8	Mobilisation of soils, sediments and contaminants.	<p>A spill management plan will be developed and communicated to all staff working on site.</p> <p>Appropriate land and aquatic spill kits are to be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit must be appropriately sized for the volume of substances at the work site.</p> <p>All workers will be advised of the location of the spill kit and trained in its use.</p>	Contractor	During construction	Effective	None.
B9	Surface and underwater noise and vibration.	<p>Two safety zones would be implemented during impact or vibratory piling that will be applied around each piling location (GHD, 2022):</p> <p>Shut-down zone (PTS): the sighting of marine fauna would trigger piling activities to be ceased as soon as reasonably practical:</p> <ul style="list-style-type: none"> • 12 metres for threatened and/or protected fish and Syngnathids. • 120 metres for threatened and/or migratory seabirds (ie Little Penguin) <p>Observation zone (TTS): the movement zone of marine fauna that may approach the shut-down zone would be monitored to identify any approach to the shut-down zone:</p> <ul style="list-style-type: none"> • 175 metres for threatened and/or protected fish and Syngnathids. • 1 kilometre for threatened and/or migratory seabirds including the Little Penguin (Note: There is no calculated TTS impact distance for diving birds/penguins. A one kilometre 	Contractor	During construction	Effective	Potential for temporary behavioural impacts.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
		observation zone has been adopted for conservatism).				
B10	Surface and underwater noise and vibration.	<p>Standard management and mitigation procedures with respect to piling operations would be adopted as per '<i>Underwater Piling Noise Guidelines</i>' (Government of South Australia, 2012). This would include the following:</p> <ul style="list-style-type: none"> • Use low noise piling methods, instead of impact piling, where possible. • Additional pre-summer and pre-construction inspections for Little Penguins at the historical nesting site (ie under the north-west corner of the wharf precinct, outside of the proposal area). If Little Penguins are observed avoid conducting impact piling activities during times Little Penguins are likely to be breeding within the potential noise impact footprint. • The Little Penguin breeding season this includes the months of June through to February • Use low noise piling methods, instead of impact piling, where possible. • Presence of marine fauna should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the piling procedure. • If no marine fauna are nearby, a soft start piling procedure should be used. This involves gradually increasing the piling impact energy over a 10-minute time period. 	Contractor	During construction	Effective	Potential for temporary behavioural impacts.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
		<ul style="list-style-type: none"> • Visual observations of marine fauna within the exclusion zone should be monitored by trained crew throughout the start period. • If marine fauna are sighted within the observation zone during the soft start of normal operation procedures, the operator of the piling rig should be placed on stand-by to shut down the piling rig. • A record of procedures employed during the operations should be maintained by the piling contractor. 				
B11	Surface and underwater noise and vibration.	<p>Additional underwater noise reduction options should be adopted where possible. This would include:</p> <ul style="list-style-type: none"> • Use of vibro-piling methods instead of impact piling. • If impact piling is needed then pile head cushion blocks, bubble curtains and aerated, damped or dewatered outer pile casings should be used. 	Contractor	During construction	Effective	Unlikely
B12	Risk of vessel strike.	<p>All work boats and barges should adhere to the 4 knot speed limit when operating within the proposal area.</p> <p>Contractors should be made aware of marine fauna that might occur in the area and report any sightings within the observation zone during works and vessel movements. Works should cease until any observed marine fauna move out of the proposal area.</p>	Contractor	During construction	Effective	Potential for temporary behavioural impacts.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B13	Removal/disturbance to threatened, migratory and protected species.	Targeted microbat survey of structures proposed for removal or modification would be undertaken in accordance Guide 1: Pre-clearing process of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) with prior to construction or as soon as feasible prior to disturbance. If threatened microbats are detected, a Microbat Management Plan would be developed in accordance with the TfNSW <i>Microbat Management Guidelines</i> (TfNSW, 2021) and developed as part of the CEMP and implemented by a suitably qualified bat specialist.	Contractor	Pre-construction	Effective	About 0.05 hectares of potential bat roosting habitat will be removed. However, similar habitat would be reinstated with the installation of new structures.
B14	Removal/disturbance to threatened, migratory and protected species.	The unexpected species find procedure would be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the project site.	Contractor	During construction	Proven	Removal of the existing wharf structures and working next to vegetation.
B15	Removal/disturbance to threatened, migratory and protected species.	Fauna would be managed in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	Construction	Effective	None.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B16	Removal/disturbance to threatened, migratory and protected species.	<p>A targeted survey for Black Rockcod, White's Seahorse and Little Penguin, would be completed 24 hours prior to the commencement of water-based construction activities. Black Rockcod would be encouraged to move away from the study area prior to silt curtain installation.</p> <p>White's Seahorse would be collected and relocated to nearby similar habitat (ie Manly Cove Tidal Pool netting, seagrass beds and retained piles) using methods approved by NSW DPI (Fisheries). A White's Seahorse management/relocation plan would be developed in consultation with NSW DPI (Fisheries) to guide this activity. These activities are to be completed by an NSW DPI pre-qualified company.</p>	TfNSW	Pre-construction	Effective	None.
B17	Removal/disturbance to threatened, migratory and protected species.	A Section 37 permit under the FM Act to relocate Syngnathids collected during the targeted pre-clearance survey upon approval of the Syngnathid management/relocation plan.	TfNSW	Pre-construction	Effective	None.
B18	Introduction/spread of weeds and/or marine pests and diseases.	Equipment and vessels must be cleaned and inspected prior to entering and departing from the proposal area.	Contractor	Pre, during and post construction	Effective	None.

No.	Impact/s	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B19	Introduction/sp read of weeds and/or marine pests and diseases.	Weed species would be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	During construction	Effective	None.
B20	Introduction/sp read of weeds and/or marine pests and diseases.	Pathogens would be managed in accordance with Guide 2: Exclusion zones of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA, 2011).	Contractor	During construction	Effective	None.
B21	Introduction/sp read of weeds and/or marine pests and diseases.	Occurrence of any marine pests must be reported to NSW DPI (Fisheries).	Contractor	During construction	Effective	None.
B22	Alteration to hydrology.	The detailed design should aim to avoid/minimise any impact to coastal processes and hydrology.	TfNSW	Detailed design	Effective	Potential localised changes to currents, sediment accretion and scouring.

6 Offset Strategy

The proposal is not expected to clear any terrestrial vegetation (native or otherwise). There may be some minimal impacts to mown lawn during establishment and operation of the compound area.

The proposal is expected to directly impact marine vegetation from dredging and piling activities (Figure 4-1), including:

- 48 square metres hectare of sparse macroalgae (attached to unconsolidated material) within the dredge area (Type 2 KFH) and 61 piles with associated macroalga (Type 2 KFH) and attached encrusting biota.
- 16 square metres of low density *Zostera* and *Halophila* overlapping the dredge area (Type 1 KFH).
- 1 square metre of low density *Zostera* and *Halophila* (Type 1 KFH) as a result of one arrester pile (western pile) driven into a small patch of low density *Zostera* and *Halophila* (about 123 square metres in size).

An additional 16 piles would be available for recolonisation by marine vegetation and other habitat-forming species as part of the new wharf to replace the areas removed during construction. Furthermore, as discussed in Section 4.1.2 there is potential for the macroalga and the loose rocks it is attached to within the dredge area to be relocated to nearby unaffected areas of subtidal soft sediment. This option should be explored as it may avoid the need for offsetting for direct impacts to macroalga within the dredge area. The remaining 17 square metres of seagrass would require off-setting as it exceed the thresholds outlined in the TfNSW *Biodiversity Offset Guidelines*. If macroalgae attached to the substratum is unable to be relocated in the dredge area, the total off-setting of Type 1 and 2 KFH required (inclusive of seagrass) would be 65 metres squared.

The proposal may indirectly impact marine vegetation from changes in vessel scour regimes and shading of structures resulting in a loss of:

- 31 square metres of macroalgae beneath the new Wharf 3 structure.
- 17 square metres of medium density *Halophila* beneath the new boardwalk, near the existing arrester.
- 171 square metres of low density *Zostera* and *Halophila* (Type 1 KFH).

Similarly as above, macroalgae beneath the new wharf structure may also be potentially relocated to nearby unshaded subtidal soft sediment which may avoid the need for offsetting for indirect impacts to macroalga beneath the new wharf structure. The remaining 188 square metres of seagrass that may be indirectly affected as a result of the proposal would require off-setting as these exceed the thresholds outlined in the TfNSW *Biodiversity Offset Guidelines*. If macroalgae attached to the substratum is unable to be relocated beneath the new Wharf 3, the total off-setting of Type 1 and 2 KFH required (inclusive of seagrass) would be 219 metres squared.

The *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013) requires a minimum 2:1 offset for the total area of the three 'Types' of KFH lost (see NSW DPI, 2013 for definitions) to help redress direct and indirect impacts of development. NSW DPI (2013) uses a rate of \$52 per square metre, or \$104 per square metre to meet the 2:1 offsetting requirement. This rate is subject to annual inflation from 1 July each financial year. The rate above is for the 2013–14 financial year and is subject to an annual increase in line with the Consumer Price Index per financial year. NSW DPI (Fisheries) can confirm the current rate through consultation.

7 Conclusion

The proposal forms part of the Ferry Wharf Upgrade Program and the Transport Access Program (TAP) and is focused on the upgrade of Manly Wharf 3 (the proposal). This includes a number of water-based activities and small land based compound area for construction of the new wharf and removal of the existing wharf. The proposal involves upgrade of the existing Wharf 3 and construction of a new Manly Wharf 4 under the TAP.

The biodiversity assessment described the existing environment within the study area and assessed impacts to biodiversity as a result of construction and operation of the proposal. The biodiversity assessment was informed by a review of existing information and data in the study area and the study locality, as well as a field survey of the marine study area.

The proposal is located within the local government authority area (LGA) of Northern Beaches Council. It is also located at the western end of Manly Cove and is part of the greater Manly Wharf Complex which includes a ferry terminal, restaurant and retail section. It also supports transport interchange between water public transport services and buses that service Manly and Northern Beaches suburbs.

The study area is located within a highly modified, urban foreshore, characterised by a low sandstone seawall along the length of the foreshore and surrounded by hardstands with some landscaped gardens (East Esplanade Park) and fringed with mature Norfolk Island Pines. No remnant terrestrial vegetation or PCTs occur within the study area. A significant feature of the subtidal study area were large patches of seagrasses (including mixed and monospecific beds of *Zostera muelleri* subsp. *capricorni*, *Halophila* sp. and *Posidonia australis*) located adjacent to the existing Wharf 3 structure and extending generally south, south-east of the existing Manly Wharf.

Existing timber pilings provided artificial habitat for encrusting invertebrates and macroalgae. The seabed within the study area otherwise consisted of un-vegetated soft sediment (marine sand) and no other marine vegetation such as mangrove or saltmarshes were recorded.

The marine vegetation and habitat in the study area provides potential habitat for a number of urban, disturbance tolerant native species, although features of the study area also provide potential habitat for several threatened fauna species with a moderate to high likelihood of occurrence. These included:

- Seven microbats listed under the *Biodiversity Conservation Act 2016* (BC Act).
- Little Penguin population in the Manly Point Area (*Eudyptula minor*), listed as an endangered population under the BC Act.
- White's Seahorse (*Hippocampus whitei*) listed as endangered under the *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Black Rockcod (*Epinephelus daemeli*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

The proposal is not expected to remove any terrestrial vegetation (trees or shrubs) and any impacts to terrestrial biodiversity would be limited to disturbance of mown lawn or hardstands. Nonetheless, the risks of the spread/introduction of weeds and diseases and the potential for erosion and sediment mobilisation associated with construction activities would be managed in accordance with the relevant Transport for NSW (TfNSW) guidelines.

The proposal would involve the removal of about 290 cubic metres of material (marine sands) from an area of about 388 square metres of seabed (dredge area). This will overlap with a small area of seagrass (low density *Zostera* and *Halophila*) and potentially macroalgae. One arrestor pile would also be driven into a small patch of low density *Zostera* and *Halophila*. Direct shading of the new boardwalk and potentially scouring from the fast

ferry operating out of the new Wharf 3 may also indirectly affect small patches of *Halophila* and low density *Zostera* and *Halophila*. A small residual loss of seagrass would therefore be expected, however, removal of the old Wharf 3 structure and relocation of fast ferry operations alongside the new Wharf 3, may allow recolonisation of seagrass into areas of seabed previously shaded or disturbed by vessel scour.

Under Section 199 of the FM Act, consultation with NSW DPI (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to removal of structures and piling. Section 205 of the FM Act states that a permit to 'harm' marine vegetation would be required.

Offsets for the residual loss of seagrass and macroalgae should be considered in accordance with the *Guideline for Biodiversity Offsets* (NSW Roads and Maritime Services, 2016), *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013) and in consultation with NSW DPI (Fisheries).

Removal of existing timber piles and wharf structure would result in the loss of attached encrusting biota and some macroalgae, however, the majority of these species are common in Manly Cove and surrounds and over time, the new piles would be recolonised. Overall, there would be a net increase in artificial surface for re-colonisation of biota.

Sediment mobilisation from activities that would disturb the seabed and vessel wash/scour were identified as potential impacts. However, the study area is likely to be frequently exposed to elevated levels of sediment, associated with rainfall, sea conditions and vessel traffic in the waters of Manly Cove. Thus, with the appropriate controls, a slight, temporary increase in these impacts is not expected to substantially impact marine biodiversity and likely to be within the level of natural variability.

Construction related noise from dredging and particularly from pile driving has potential to impact marine fauna such as Syngnathids and Little Penguins including an Area of Outstanding Biodiversity Value (AOBV) which is habitat for Little Penguins. Mitigation measures have therefore been recommended to reduce the potential for noise related impacts to these species in particular. This would include pre-construction clearance surveys, deployment of marine fauna observers, timing of piling outside of important breeding seasons and noise reduction measures.

Caulerpa was present within the study area and movements of vessels, plant and equipment could further spread *Caulerpa* (and potentially other marine pests) within Manly Cove and to other unaffected estuaries. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided.

Overall, the proposal is not expected to facilitate any key threatening processes and is unlikely to significantly impact threatened species. Disturbances to potential habitat would largely be temporary and constitute a very small proportion of available habitat. The proposal would not permanently fragment or isolate threatened species or populations or substantially impact any species' lifecycle. Survey for microbats, Black Rockcod, Little Penguin and White's Seahorse prior to the commencement of construction activities is recommended so that individuals in the area are not harmed. Species impact statements (SISs) or referrals are not therefore recommended for the proposal.

Considering the above and assuming recommended mitigation measures are implemented, the proposal is unlikely to significantly impact biodiversity.

8 References

- ANZG, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at: www.waterquality.gov.au/anz-guidelines
- Aquaculture, Conservation and Marine Parks Unit, Port Stephens Fisheries Institute, 2012. *Black Rockcod (Epinephelus daemeli) recovery plan*.
- Australian Museum, 2019. *Seahorses and pipefishes*.
- Berge, J. et al., 2004. *Organotins in marine mammals and seabirds from Norwegian territory*. Journal of Environmental Monitoring, 6(2), 108-112.
- Birch, G., 2006. *A short geological and environmental history of the Sydney estuary, Australia*. Sydney University Press.
- Bité, J. et al., 2007. *Chlorophyll fluorescence measures of seagrasses Halophila ovalis and Zostera capricorni reveal differences in response to experimental shading*. Marine Biology, 152(2), 405-414.
- BoM, 2022a. *Sydney Harbour, New South Wales February 2022 Daily Weather Observations*.
- BoM, 2022b. *Groundwater Dependent Ecosystem Atlas*.
- Browne, M. et al., 2013. *Microplastics Moves Pollutants and Additives to Worms, Reducing Functions Linked to Health and Biodiversity*. Current Biology, Volume 23, pp. 2388-2392.
- Burton, E. D. et al., 2004. Sorption and desorption behavior of tributyltin with natural sediments. Environmental science & technology, 38(24), 6694-6700.
- Cannell, B, 2011. *Potential impacts of the Mangles Bay Marine Based Tourist Precinct in Little Penguins*. Oceanica.
- Connell, S. & Gillanders, B., 2007. *Marine Ecology*. Melbourne, Victoria: Oxford University Press.
- Das, P., Marchesiello, P. & Middleton, J., 2000. Numerical Modelling Of Tide-Induced Residual Circulation In Sydney Harbour. Marine and Freshwater Research, Volume 51, pp. 97-112.
- Department of Environment and Energy, 2018. *Posidonia australis Seagrass Meadows of the Manning Hawkesbury Ecoregion: A Nationally Significant Ecological Community*. Available online: <http://www.environment.gov.au/system/files/resources/b71647bf-6573-4e9a-a886-a4395d5ce2e0/files/posidonia-australis-seagrass-meadows-guide.pdf>
- Department of the Environment, 2013. *Significant Impact Guidelines*.
- DPIE, 2022. *Enterococci data download. Manly Cove, 2021-2022*. Beachwatch Program. Available online: https://www.environment.nsw.gov.au/beachapp/report_enterococci.aspx/
- Dwyer, P. D. & Hamilton-Smith, E., 1965. Breeding caves and maternity colonies of the bent-winged bat in south-eastern Australia. *Helictite*, Volume 4, pp. 3-21
- Eyre, B. & Ferguson, A., 2005. *Benthic metabolism and nitrogen cycling in a subtropical east Australian estuary (Brunswick): temporal variability and controlling factors*. Limnology and Oceanography, Volume 50, pp. 81-96.
- Fisheries Scientific Committee, 2019. *White's seahorse: Hippocampus whitei - Final Determination*.

- Fitzpatrick, J., & Kirkman, H., 1995. *Effects of prolonged shading stress on growth and survival of seagrass Posidonia australis in Jervis Bay, New South Wales, Australia*. Marine Ecology Progress Series, 127, 279-289.
- Gadd, G. & Griffiths, A., 1977. *Microorganisms and heavy metal toxicity*. Microbial Ecology, Volume 4, pp. 303-317.
- GHD, 2021. *Manly Wharf 3 Upgrade – Geotechnical and contamination assessment report*. For Transport for New South Wales. 23 November 2021.
- GHD, 2022. *Manly Wharf 3 Upgrade – Underwater noise impact assessment*. For Transport for New South Wales. 5 September 2022.
- Government of South Australia, 2012. *The South Australian Department of Transport and Infrastructure Underwater Piling Noise Guidelines*.
- Griffiths, S., 2002. *Structure and dynamics of rockpool fish assemblages in Southeastern Australia*, s.l.: University of Wollongong.
- Harasti, D., Glasby, T. M. & Martin-Smith, K. M., 2010. Striking a balance between retaining populations of protected seahorses and maintaining swimming nets. *Aquatic Conservation: Marine and Freshwater Ecosystems*, Volume 20, pp. 159-166.
- Harasti, D., Martin-Smith, K. & Gladstone, W., 2014. Ontogenetic and sex-based differences in habitat preferences and site fidelity of the White's seahorse *Hippocampus whitei*. *Journal of Fish Biology*, Volume 85, pp. 1413-1328.
- Harasti, D., Martin-Smith, K. M. & Gladstone, W., 2012. Population dynamics and life history of a geographically restricted seahorse, *Hippocampus whitei*. *Journal of Fish Biology*, Volume 81, pp. 1297-1314.
- Heemstra, P. C. & Randall, J. E., 1993. *FAO species catalogue. Vol. 16. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date*. s.l.:FAO Fisheries Synopsis.
- Henry, G. W., 1984. *Commercial and recreational fishing in Sydney estuary*, s.l.: NSW Department of Agriculture.
- Johnston, E. et al., 2015. *Sydney Harbour: what we do and do not know about a highly diverse estuary*. Marine and Freshwater Research, Volume 66, pp. 1073-1087.
- King, R.J. & Barclay, J.B., 1986. *Aquatic angiosperms in coastal saline lagoons of New South Wales. III. Quantitative assessment of Zostera capricorni*. Proceedings of the Linnaean Society of NSW 109: 41-50.
- Kuiter, R. H., 2009. *Seahorses and their relatives*. s.l.:Seaford: Aquatic Photographics.
- Longstaff, B. J., & Dennison, W. C., 1999. *Seagrass survival during pulsed turbidity events: the effects of light deprivation on the seagrasses Halodule pinifolia and Halophila ovalis*. Aquatic Botany, 65(1-4), 105-121.
- Manly Council, 2011. *Manly Cove Coastal Zone Management Plan*. Manly Council.
- Manly Council, 2013. *Manly Local Environment Plan*. Manly Council.
- Mitchell, P., 2002. *Descriptions of NSW (Mitchell) Landscapes*.
- Montoya, D., 2015. *Pollution in Sydney Harbour: sewage, toxic chemicals and microplastics*, s.l.: NSW Parliamentary Research Service.
- NIMPIS, 2022. *National Introduced Marine Pest Information System Map*. Australian Government Department of Agriculture, Water and the Environment. Available online: <https://www.marinepests.gov.au/pests/nimpis>

NSW Department of Industry and Investment, 2009. *Black Cod (Epinephelus daemeli) Draft Recovery Plan*, s.l.: Fisheries Conservation and Aquaculture Branch.

NSW DPI, 2008. *Threatened Species Assessment Guidelines: The Assessment of Significance*.

NSW DPI, 2012. *Endangered populations in NSW: Posidonia australis in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie*. Available online: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/635857/Endangered-populations-of-Posidonia-australis.pdf

NSW DPI, 2013. *Policy and Guidelines for Fish Conservation and Management*, Wollongbar, NSW: NSW DPI.

NSW DPI, 2016. *Fish communities and threatened species distributions of NSW*, s.l.: NSW DPI.

NSW DPI, 2022a. *Fisheries Spatial Data Portal. Estuarine Macrophytes*. NSW DPI.

NSW DPI, 2022b. *Fisheries Spatial Data Portal. Key fish habitat*. NSW DPI.

NSW DPI, 2022c. *Aquatic Pests & Disease*. NSW DPI.
Available online: <https://www.dpi.nsw.gov.au/fishing/pests-diseases>

NSW DPI, 2022d. *Caulerpa taxifolia*. NSW DPI. Available online: <http://www.dpi.nsw.gov.au/fishing/pests-diseases/marine-pests/found-in-nsw/caulerpa-taxifolia>

NSW DPI, 2022e. *White's Seahorse (Hippocampus whitei)*. NSW DPI.
Available online: <https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/endangered-species2/whites-seahorse>

NSW DPIE, 2006. *Sydney Harbour and Parramatta River Water Quality Objectives*. NSW DPIE.

NSW DPIE, 2020a. *Southern Myotis - profile*. NSW DPIE. Available online: <https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549>

NSW DPIE, 2020b. *Little Bent-winged Bat - profile*. NSW DPIE. Available online: <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10533>

NSW National Parks and Wildlife Service, 2003. *The Bioregions of New South Wales: their biodiversity, conservation and history*, s.l.: s.n.

NSW NPWS, 2002. *Declaration of critical habitat for the Endangered population of Little Penguins at Manly*.

NSW National Parks and Wildlife Service, 2003a. *The Bioregions of New South Wales: their biodiversity, conservation and history*, s.l.: s.n.

NSW NPWS, 2003b. *Environmental Impact Assessment Guidelines – Endangered Population of Little Penguins (Eudyptula minor) at Manly*.

NSW OEH, 2016. *The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489*. NSW OEH.

NSW OEH, 2017. *Biodiversity Assessment Method*. NSW OEH.

Penniford, M. & David, J., 2001. *Macrofauna and nutrient cycling in the Swan River Estuary, Western Australia: experimental results*. Hydrological Processes, Volume 13, pp. 2537-3553.

Roads and Traffic Authority (RTA), 2011. *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects*, s.l.: Roads and Maritime.

Rodil, I.F., Lohrer, A.M., Attard, K.M., 2021. *Macrofauna communities across a seascape of seagrass meadows: environmental drivers, biodiversity patterns and conservation implications*. *Biodivers Conserv* 30, 3023–3043.

Roy, P. et al., 2001. Structure and Function of South-east Australian Estuaries. *Estuarine, Coastal and Shelf Science*, Volume 53, pp. 351-384.

SCA, 2005. *Metropolitan Water Plan- priority groundwater investigations for contingency drought relief – Area 3: Upper Canal (Appin)*. Sydney Catchment Authority.

Smith, B. S. (1981). Tributyltin compounds induce male characteristics on female mud snails *Nassarius obsoletus*= *Ilyanassa obsoleta*. *Journal of Applied Toxicology*, 1(3), 141-144.

Sydney Institute of Marine Science, 2014. *Sydney Harbour. A systemic review of the science 2014*, s.l.: Sydney Institute of Marine Science.

Transport for New South Wales, 2021. *Microbat Management Guidelines*. Transport for New South Wales.

Appendix A

Species recorded

Recorded fauna

Family	Scientific name	Common name	Native/exotic	Priority weed
Araucariaceae	<i>Araucaria heterophylla</i>	Norfolk Island Pine	Native	N/A
Dictyotaceae	<i>Padina</i> sp.	-	Native	N/A
Hydrocharitaceae	<i>Halophila</i> sp.	Paddleweed	Native	N/A
Lessoniaceae	<i>Ecklonia radiata</i>	Kelp		N/A
Hydrocharitaceae	<i>Halophila</i> sp.	Paddleweed	Native	N/A
Sargassaceae	<i>Sargassum</i> sp.	-	Native	N/A
Zosteraceae	<i>Zostera capricorni</i>	Eelgrass	Native	N/A

Recorded fauna

Family	Scientific name	Common name	Native/exotic
Clavulariidae	<i>Carijoa</i> sp.	-	Exotic
Girellidae	<i>Girella tricuspidata</i>	Luderick	Native
Monacanthidae	<i>Monacanthus chinensis</i>	Fanbelly Leatherjacket	Native
Ostreidae	<i>Saccostrea glomerata</i>	Sydney Rock Oyster	Native
Plesiopidae	<i>Trachinops taeniatus</i>	Eastern Hulafish	Native
Pyuridae	<i>Pyura stolonifera</i>	Cunjevoi	Native
Sparidae	<i>Acanthopagrus australis</i>	Yellowfin Bream	Native
Urolophidae	<i>Trygonoptera testacea</i>	Common Stingray	Native

Appendix B

Habitat assessment table

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (5 kilometre) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (5 kilometre). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.

Threatened species habitat assessment table

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Amphibians						
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and VIC, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, VIC. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 metres from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.	(PMST)	None. No suitable habitat within the study area.
<i>Litoria aurea</i>	Green and Golden Bel Frog	E	V	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). Ephemeral and permanent freshwater wetlands, ponds, dams with an open aspect and fringed by Typha spp. and other aquatics, free from predatory fish.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	Occur along the east coast of Australia from southern QLD to north-eastern VIC. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	(PMST)	None. No suitable habitat within the study area.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	-	V	It has restricted distribution from Pokolbin to Nowra and west to Mt VIC. Occurs in open forests and wet drainage lines below sandstone ridges that often have shale lenses or cappings in the Hawkesbury and Narrabeen Sandstones.	116 (BioNet)	None. No suitable habitat within the study area.
Flora						
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood (<i>Corymbia gummifera</i>), Scribbly Gum (<i>Eucalyptus haemastoma</i>), Drooping Red Gum (<i>E. parramattensis</i>), Old Man Banksia (<i>Banksia serrata</i>) and Small-leaved Apple (<i>Angophora bakeri</i>).	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Acacia terminalis</i> <i>subsp. terminalis</i>	Sunshine Wattle	E	E	Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsley Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated.	(PMST) / 266 (BioNet)	None. No suitable habitat within the study area.
<i>Allocasuarina portuensis</i>	Nielson Park She-oak	E	E	The original known habitat of the Nielson Park She-oak is at Nielson Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielson Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. The original habitat is tall closed woodland. Canopy species include: <i>Ficus rubiginosa</i> , <i>Angophora costata</i> , <i>Elaeocarpus reticulatus</i> and <i>Glochidion ferdinandi</i> with a shrub layer of <i>Pittosporum revolutum</i> , <i>Kunzea ambigua</i> and <i>Monotoca elliptica</i> . The original habitat occurs above a sandstone shelf approximately 20 m above the harbour. The shallow sandy soils are highly siliceous, coarsely textured and devoid of a soil profile. The plantings have occurred on similar soils.	(PMST) / 8 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Asterolasia elegans</i>	-	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>), Smooth-barked Apple (<i>Angophora costata</i>), Sydney Peppermint (<i>Eucalyptus piperita</i>), Forest Oak (<i>Allocasuarina torulosa</i>) and Christmas Bush (<i>Ceratopetalum gummiferum</i>).	(PMST)	None. No suitable habitat within the study area.
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid	E	V	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	(PMST)	None. No suitable habitat within the study area.
<i>Callistemon linearifolius</i>	Netted Bottle-brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Was more widespread across its distribution in the past. Some populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park and Werakata National Park. Grows in dry	2 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				sclerophyll forest on the coast and adjacent ranges.		
<i>Chamaesyce psammogeton</i>	Sand Spurge	E	-	Sand Spurge is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to QLD (and Lord Howe Island). Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>). Flowering recorded in spring and summer.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Cryptostylis hunteriana</i>	Leafless Tongue-Orchid	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into VIC around the coast as far as Orbost. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (<i>Leptospermum laevigatum</i>) – Coastal Banksia (<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>) coastal scrub; Forest Red Gum (<i>Eucalyptus tereticornis</i>) aligned open forest and woodland; Spotted Gum (<i>Corymbia maculata</i>) aligned open forest and woodland; and Bracelet Honeymyrtle (<i>Melaleuca armillaris</i>) scrub to open scrub.	(PMST)	None. No suitable habitat within the study area.
<i>Darwinia biflora</i>	-	V	V	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath.	(PMST)	None. No suitable habitat within the study area.
<i>Epacris purpurascens</i> <i>var. purpurascens</i>	-	V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	1 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of Narrow-leaved Stringybark (<i>Eucalyptus oblonga</i>), Brown Stringybark (<i>E. capitellata</i>) and Scribbly Gum (<i>E. haemastoma</i>).	(PMST) / 4 (BioNet)	None. No suitable habitat within the study area.
<i>Eucalyptus nicholii</i>	Narrow-leaved black Peppermint	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or meta-sedimentary rock.	3 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Genoplesium baueri</i>	Yellow gnat-Orchid	E	E	Recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the several conservation reserves including Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Found in sparse sclerophyll forest and moss gardens over sandstone	(PMST)	None. No suitable habitat within the study area.
<i>Haloragodendron lucasii</i>	Hal	E	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels.	(PMST)	None. No suitable habitat within the study area.
<i>Lasiopetalum joyceae</i>	-	V	V	Restricted on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River between Berrilee and Duffys Forest. Occurs in heath on sandstone.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Leptospermum deanei</i>	Deane's Tea-Tree	V	V	Known from the Hornsby, Warringah, Kuring-gai and Ryde local government areas. Occurs in woodland on lower hill slopes or near creeks, sandy alluvial soil or sand over sandstone, riparian scrub woodland and open forest.	(PMST)	None. No suitable habitat within the study area.
<i>Macadamia integrifolia</i>	Macadamia Nut	-	V	The Macadamia Nut is found in remnant rainforest in northern NSW and south-east QLD. While specimens have been collected from the North Coast of NSW, this species is not known to occur naturally in NSW.	2 (BioNet)	None. No suitable habitat within the study area.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	(PMST) / 1 (BioNet)	None. No suitable habitat within the study area.
<i>Melaleuca deanei</i>	Deane's Melaleuca	V	V	Occurs in two distinct areas, in the Kuring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Microtis angusii</i>	Angus's Onion Orchid	E	E	Currently known from only one site at Ingleside, north of Sydney. It is not easy to define the preferred natural habitat of this orchid as the Ingleside location is highly disturbed. The dominant species occurring on the site are introduced weeds Coolatai grass (<i>Hyparrhenia hirta</i>) and <i>Acacia saligna</i> . The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. These soils support a specific and distinct vegetation type, the Duffys Forest Vegetation Community which is listed as an endangered ecological community under the TSC Act and ranges from open forest to low open forest and rarely woodland.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Persicaria elatior</i>	Knotweed	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	The Hairy Geebung has been recorded in the Sydney coastal area, the Blue Mountains area and the Southern Highlands. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	(PMST) / 1 (BioNet)	None. No suitable habitat within the study area.
<i>Pimelea curviflora</i> <i>var. curviflora</i>	-	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	(PMST) / 9 (BioNet)	None. No suitable habitat within the study area.
<i>Prostanthera densa</i>	Villous Mintbush	V	V	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Hill, Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. Villous Mint-bush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Prostanthera junonis</i>	Somersby Mintbush	E	E	Has a north-south range of approximately 19 km on the Somersby Plateau in the Gosford and Wyong local government areas. The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.	(PMST)	None. No suitable habitat within the study area.
<i>Prostanthera marifolia</i>	Seaforth Mintbush	CE	CE	Seaforth Mintbush is currently only known from the northern Sydney suburb of Seaforth and has a very highly restricted distribution within the Sydney Basin Bioregion. The single population is fragmented by urbanisation into three small sites. All known sites are within an area of 2x2 km. Two of the sites are within the local government area of Manly and one site is in the local government area of Warringah. Occurs in localised patches in or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.	(PMST) / 162 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	V	E	Occurs from south-east QLD to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	(PMST)	None. No suitable habitat within the study area.
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	Shrub or small tree to 25 metres high occurring in coastal districts north from Batemans Bay in NSW approximately 280 kilometres south of Sydney, to areas inland of Bundaberg in QLD. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 metres asl with rainfall of 1,000-1,600 mm. Commonly occurs in all rainforest subforms except cool temperate rainforest.	(PMST) / 1 (BioNet)	None. No suitable habitat within the study area.
<i>Rhodomyrtus psidioides</i>	Native Guava	CE	CE	Occurs from Broken Bay, approximately 90 km north of Sydney, NSW, to Maryborough in QLD. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	(PMST) / 26 (BioNet)	None. No suitable habitat within the study area.
<i>Tetratheca glandulosa</i>	Glandular Pink-bell	V	-	Endemic to NSW, with around about 150 populations from Yengo National Park to Lane Cove National Park. Associates in areas with shale cappings over sandstone. Occurs in heath, scrublands to woodlands and open forest. Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Ericaceae.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Thesium australe</i>	Austral Toadflax	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in TAS and QLD and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>).	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Invertebrates						
<i>Dendronephthya australis</i>	Cauliflower Soft Coral	E (FM Act)	E	Cauliflower Soft Coral is a temperate soft coral species endemic to eastern Australia. The only estuaries where Cauliflower Soft Coral is known to grow in abundance are Port Stephens and the Brisbane Water area of Hawksbury River, NSW. They have been found sporadically in other locations in NSW waters including, Sydney Harbour, Terrigal, Botany Bay and Jervis Bay. The species is predominantly found in estuarine environments in NSW at depths of 1 – 15 m, however, it occasionally occurs offshore down to depths of 30 m. It is generally found in areas of sandy seabed where there is high current flow.	(PMST)/DPI	Low. Potential habitat within the study area, however not recorded in surveys.
<i>Meridolum maryae</i>	Maroubra Woodland Snail	E	-	The Maroubra Woodland Snail is confined to a narrow band of habitat along the coast from the north-eastern corner of the Royal National Park to Palm Beach in Sydney. Records of the species are generally within 1 km of the ocean but occur up to 5 km inland. The species is found in the leaf litter of coastal vegetation communities, most commonly in heathland on foredunes also from areas of podsolised dunes/sand plains that support taller heath communities including Eastern Suburbs Banksia Scrub.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Birds						
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature Eucalypts and Sheoaks.	(PMST)	None. No suitable habitat within the study area.
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	V	M (J, R), Ma	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island (LHI) and New Zealand; the other along the coast of WA. Nest on LHI on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-	Dusky Woodswallows are widespread in eastern, southern and south WA. The species occurs throughout most of NSW, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies	1 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				and pounces under the canopy, primarily over leaf litter and dead timber.		
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	Occurs from south-east QLD to south-east SA, TAS and the south-west of WA. Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats.	(PMST) / 1 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Burhinus grallarius</i>	Bush-stone Curlew	E	-	Occurs in open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	4 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Calidris canutus</i>	Red Knot	-	CE, M (B, C, J, R), Ma	Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE, M (B, C, J, R), Ma	The breeding range of the Curlew Sandpiper is mainly restricted to the Arctic of northern Siberia, including Yamal Peninsula east to Kolyuchiskaya Gulf, Chokotka Peninsula, and also New Siberian Island. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	(PMST)	None. No suitable habitat within the study area.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V, M (B, C, J, R), Ma	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern QLD/northern NSW, Central - Barren Ground Nature Reserve, Budderoo Nature Reserve, Woronora Plateau, Jervis Bay National Park, Booderee National Park and Beecroft Peninsula and Southern - Nadgee Nature Reserve and Croajingalong National Park in the vicinity of the NSW/VIC border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V, M (B), Ma	The Antipodean Albatross is endemic to NZ, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW. It breeds on the NZ islands of Antipodes Island, Campbell Island, Pitt Island and the Auckland Islands. This subspecies nests in open patchy vegetation, such as among tussock grassland or shrubs on ridges, slopes and plateaus. On Antipodes Island, they nest in relatively uniform densities, but avoid areas of tall vegetation on steep coastal slopes, or amongst the tall ferns on poorly drained parts of the peaks near the island's centre.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Diomedea antipodensis gibsoni</i>	Gibson's Albatross	V	V	In Australian territory, Gibson's Albatross has been recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, VIC. Gibson's Albatrosses are rarely observed in the Pacific Ocean or Indian Ocean. The only Australian record of this species is from a recapture off Wollongong, NSW, in September 1997. Gibson's Albatross breeds on Adams Island and Auckland Island, NZ. There are no breeding colonies of Gibson's Albatross in Australian territory. This albatross visits Australian waters while foraging and during the non-breeding season.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Diomedea epomophora</i>	Southern Royal Albatross	-	V, M (B), Ma	During the non-breeding season, the Southern Royal Albatross has a wide and possibly circumpolar distribution, ranging north to about 35°S. The Southern Royal Albatross is moderately common throughout the year in offshore waters of southern Australia, mostly off south-eastern NSW, VIC and TAS. Off SA, they are mostly seen May to September. It breeds on Campbell, Adams, Enderby and Auckland Islands, south of NZ. nests on flat or gently sloping ground on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that the Southern Royal Albatross can take off and land. Its nests are placed among vegetation that is sparse enough for easy access.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Diomedea exulans</i>	Wandering Albatross	E	E, M (B), Ma	The Wandering Albatross breeds on Macquarie Island. Macquarie Island lies in the southwest Pacific Ocean, about half-way between NZ and Antarctica. A single breeding pair has also been recorded on Heard Island. The Territory of Heard Island and McDonald Islands are an Australian external territory and volcanic group of barren Antarctic islands, about two-thirds of the way from Madagascar to Antarctica. It feeds in Australian portions of the Southern Ocean. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and	(PMST) / 2 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.		
<i>Diomedea sanfordi</i>	Northern Royal Albatross	E	E, M (B), Ma	The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. It breeds on Chatham Island and Tairaroa Head on the South Island of NZ. Its habitat includes subantarctic, subtropical, and occasionally Antarctic waters. The Northern Royal Albatross nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Esacus magnirostris</i>	Beach-stone Curlew	CE	Ma	In NSW, the species occurs regularly to about the Manning River, and the small population of north-eastern NSW is at the limit of the normal range of the species in Australia. Found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	1 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Eudyptula minor</i>	Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)	EP	-	Little Penguins are only found in southern Australia and New Zealand. In Australia little penguin colonies are scattered around the coastline from near Perth on the west coast, to Sydney on the east coast, and around TAS. Phillip Island has only one remaining little penguin colony, part of which can be seen at the Penguin Parade which offers up-close views of Little Penguins. On land little penguins live in holes in the ground known as burrows. These burrows provide a place for little penguins to rest, nest and moult. Burrows also provide protection from predators and extreme heat. While on land Little Penguins remain inside their burrows during the day to avoid predators. Little Penguins spend approximately 80% of their lives at sea, returning to land to breed, moult and rest. Researchers use satellite and GPS trackers to record where penguins go at sea. Satellite tracking from Phillip Island Nature Parks shows that Phillip Island's little penguins swim an average 15 to 50 km a day. This includes diving up and down as they look for fish. The deepest Little Penguin dive recorded is 72 m. An average dive in search of fish is between 5 and 20 m.	(DPI) / 30 (BioNet)	High. AOBV located about 360 meters south-east of the study area. Multiple records within the AOBV. May swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Falco hypoleucos</i>	Grey Falcon	E	V	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Fregatta grallaria</i>	White-bellied Storm-petrel	V	V, Ma	A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. The White-bellied Storm-Petrel (Tasman Sea) breeds on small offshore islets and rocks in the Lord Howe Island group, including Roach Island and Balls Pyramid. It nests in crevices between large volcanic rocks, and in burrows excavated in banks. Breeding colonies are often situated along dykes. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in apples (<i>Angophora</i> spp.), paperbarks (<i>Melaleuca</i> spp.) and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants) and urban trees also help sustain viable populations of the species.	3 (BioNet)	Low. However, no suitable habitat within the study area.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, VIC and southern QLD. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels.	3 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	The species is distributed around the entire Australian coastline, although it is most common in coastal TAS and parts of VIC, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	2 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	V	Ma	Distributed along the coastline (including offshore islands) of mainland Australia and TAS. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea).	(PMST) / 12 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V, M (C, J, R), Ma	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	(PMST) / 4 (BioNet)	Low. Exclusively aerial and may fly through the study area, however study area habitat is widely distributed and suboptimal.
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	5 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Lathamus discolor</i>	Swift Parrot	E	CE, Ma	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Red Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>).	(PMST) / 3 (BioNet)	None. No suitable habitat within the study area.
<i>Limosa lapponica baueri</i>	Nunivak Bar-tailed Godwit (baueri)	-	V	The Nunivak bar-tailed godwit is a migratory wader which undertakes the largest non-stop flight of any bird. The trans-Pacific route from its breeding grounds in the Arctic to its non-breeding grounds in the southern hemisphere covers over 11,000 km. It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Limosa</i>	Black-tailed Godwit	V	M (B, C, J, R), Ma	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				bore-overflows. They also use lagoons in sewage farms and saltworks.		
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	E, M (B), Ma	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Macronectes halli</i>	Northern Giant Petrel	V	V, M (B), Ma	The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64°S in open oceans. Their range extends into subtropical waters (to 28°S) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Ninox connivens</i>	Barking Owl	V	-	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	1 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Ninox strenua</i>	Powerful Owl	V	-	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (<i>Syncarpia glomulifera</i>), Black Sheoak (<i>Allocasuarina littoralis</i>), Blackwood (<i>Acacia melanoxylon</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Cherry Ballart (<i>Exocarpus cupressiformis</i>) and a number of Eucalypt species.	196 (BioNet)	None. No suitable habitat within the study area.
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE, M (B, C, J, R), Ma	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including TAS. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	(PMST) / 1 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	-	V	The southern subspecies (subantarctica) of the Fairy Prion was first recorded on Macquarie Island in 1956, with breeding confirmed in 1978. Breeding has also been recorded on two offshore rock stacks at Macquarie Island, one near Langdon Point, the other near Davis Point. A second sub-population was found on Bishop and Clerk Islands in 1993. The species as a whole has been recorded breeding on subantarctic and cool temperate islands. The southern subspecies of the Fairy Prion is a marine bird, found mostly in temperate and subantarctic seas. The species' oceanic distribution is poorly known. The Fairy Prion sometimes forages over continental shelves and the continental slope, but it can come close inshore in rough weather. It may also feed in deep coastal waters. Off Wollongong, NSW, 79% of Fairy Prions were seen in waters over the continental slope while 21% were counted over neritic water (water more than 200 m deep). Data from the south-eastern Australian Seabird Atlas confirm this pattern, with 83% (of 24 505 individuals) seen over the continental slope, 9% over continental shelf and only 8% over open ocean. The southern Fairy Prion is found flying over the ocean where sea surface temperatures are 8.6° to 20.2 °C.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Pandion cristatus</i>	Eastern Osprey	V	M (B), Ma	Total range of this species is from Esperance in WA to NSW and into VIC and TAS. In some states (VIC and TAS and southern NSW) the species is a rare vagrant. The only single historical breeding record in NSW is from the St. Georges Basin. Occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Mostly found in coastal areas but occasionally travel inland along major rivers.	11 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Phoebastria fusca</i>	Sooty Albatross	V	V, M (B), Ma	The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia. The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east QLD, NSW, VIC, TAS and SA. The Sooty Albatross breeds on islands in the southern Indian and Atlantic Oceans, and forages south of 30° S, between southern NSW and Argentina.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Pterodroma leucoptera</i>	Gould's Petrel	V	E	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Principal nesting habitat is located within two gullies which are characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				mats of fallen palm fronds and in cavities among the buttresses of fig trees.		
<i>Pterodroma neglecta</i>	Kermadec Petrel (western)	V	V	Ranges over subtropical and tropical waters of the South Pacific. Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island) are the only known breeding sites in Australian waters. Breeds on islands across the South Pacific. In Australia it breeds on Ball's Pyramid and Phillip Island (near Norfolk Island). Nests in a crevice amongst rocks.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Ptilinopus regina</i>	Rose-crowned Fruit Dove	V	-	Coast and ranges of eastern NSW and QLD, from Newcastle to Cape York. Vagrants are occasionally found further south to VIC. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	2 (BioNet)	None. No suitable habitat within the study area.
<i>Ptilinopus superbus</i>	Superb Fruit-dove	V	Ma	The Superb Fruit-dove occurs principally from north-eastern in QLD to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	1 (BioNet)	None. No suitable habitat within the study area.
<i>Pycnoptilus floccosus</i>	Pilotbird	-	V	The Pilotbird is found from the Wollemi National Park and Blue Mountains National Park in NSW through to the Dandenong Ranges, near Melbourne in VIC. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Rostratula australis</i>	Australian Painted Snipe	E	E, Ma	Most records are from the south-east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in WA. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	(PMST)	None. No suitable habitat within the study area.
<i>Sternula albifrons</i>	Little Tern	E	M (B, C, J, R), Ma	Migrates from eastern Asia, this species is found along the north, east and south-east Australian coasts. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to VIC. It breeds in spring and summer along the entire coast from TAS to northern QLD. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records).	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Sternula nereis</i>	Australian Fairy Tern	-	V	Within Australia, the Fairy Tern occurs along the coasts of VIC, TAS, SA and WA; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from NSW (NSW) in the past, but it is unknown if it persists there. The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayment's of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				beaches at night. Predates small bait-sized fish via shallow dives in shallow water.		
<i>Thalassarche bulleri</i>	Buller's Albatross	-	V, M (B), Ma	Buller's Albatross breed in NZ (Snares, Solander and Chatham Islands), but are regular visitors to Australian waters. They are frequently seen off the coast from Coffs Harbour, south to TAS and west to Eyre Peninsula. In Australia, Buller's Albatross are seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16 °C.	(PMST) / 1 (BioNet)	Low. Has potential to fly through the Study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Thalassarche bulleri platei</i>	Northern Buller's Albatross	-	V, M, Ma	The Northern Buller's Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland. Occurrence within the Australian Fishing Zone is likely, however, the threat from longline injury is considered low. The Northern Buller's Albatross is a marine, pelagic species. It occurs in subtropical and subantarctic waters of the South Pacific Ocean. Habitat preferences are poorly known. In NZ, the species has been observed in association with fishing boats close inshore and over waters of 180–360 m depth although it is not so strongly associated with fishing grounds as are other albatrosses.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Thalassarche carteri</i>	Indian Yellow-nosed Albatross	-	V, M (B), Ma	The Indian Yellow-nosed Albatross forages mostly in the southern Indian Ocean where it is particularly abundant off WA. In the Australasian region, the species occupies inshore and offshore waters, particularly where there are calm seas and light winds.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Thalassarche cauta</i>	Shy Albatross	V	V, M (B), Ma	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and NZ provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in QLD along the entire south coast of the continent to Carnarvon in WA. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park. This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Occasionally the species occurs in continental shelf waters, in bays and harbours. Known breeding locations include Albatross Island off TAS, Auckland Island, Bounty Island and The Snares, off NZ, where nesting colonies of 6-500 nests occur and may contain other species such as the Australian Gannet. Located on sheltered sides of islands, on cliffs and ledges, in crevices and slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks.	(PMST) / 3 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Thalassarche eremita</i>	Chatham Albatross	-	E, M (B), Ma	<p>Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and TAS. The Chatham Albatross is a marine species. It occurs in subantarctic and subtropical waters reaching the tropics in the cool Humboldt Current off South America. It has been noted in shelf-waters around breeding islands, over continental shelves during the non-breeding season, and occurs inshore and offshore. It enters harbours and bays and is scarce in pelagic waters.</p> <p>The Chatham Albatross preference for sea-surface temperatures is poorly known. In Chilean waters it has been observed over waters of 11.5 to 15°C. The species nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks. It is usually in broken terrain with little soil and vegetation.</p>	(PMST)	<p>Low.</p> <p>Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.</p>
<i>Thalassarche impavida</i>	Campbell Albatross	-	E, M (B), Ma	<p>The Campbell Albatross is a non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen foraging over the oceanic continental slopes off TAS, VIC and NSW. They breed only on sub-Antarctic Campbell Island (New Zealand), south of New Zealand. After breeding, birds move north and may enter Australia's temperate shelf waters.</p>	(PMST)	<p>Low.</p> <p>Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.</p>

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Thalassarche melanophris</i>	Black-browed Albatross	V	V, M (B), Ma	The Black-browed Albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park. Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. Can tolerate water temperatures between 0 °C and 24 °C. Spends most of its time at sea, breeding on small isolated islands.	(PMST) / 7 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Thalassarche salvini</i>	Salvin's Albatross	-	V, M, Ma	Salvin's Albatross breeds on Bounty, Snares and Chatham Islands, south of NZ, as well as on Crozet Island in the Indian Ocean. The species forages over most of the southern Pacific Ocean, where it is particularly common in the Humboldt Current, off South America. There are small numbers in the Indian Ocean and sometimes in the South Atlantic Ocean. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Salvin's Albatross is scarce in pelagic waters.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Thalassarche steadi</i>	White-capped Albatross	-	V, M (B), Ma	Breeding colonies occur on islands south of NZ. The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. The White-capped Albatross is probably common off the coast of south-east Australia throughout the year.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Fish and Syngnathids						
<i>Epinephelus daemeli</i>	Black Rockcod	E (FM Act)	V	In Australia, the distribution of Black Rockcod ranges from southern QLD through NSW to northern VIC. However, records from QLD and VIC are rare, and the NSW coastline forms the species' main range, both in Australia and internationally. Adults are usually found in saves, gutters and beneath bommies on rocky reefs from nearshore areas to at least 50 metres depth. Small juveniles are often recorded in coastal rock pools while larger juveniles are found around rocky shores in estuaries. The use of estuaries may be an important part of the ecology of juvenile black cod in NSW waters. The Black Rockcod is territorial and often have a high site fidelity.	(PMST)	Moderate. Known to occur in Sydney Harbour. However, study area does not contain rocky reef.
<i>Hippocampus whitei</i>	White's Seahorse	E, P (FM Act)	E, Ma	Endemic temperate Australian species found only between Forster and Wollongong, NSW. White's seahorse inhabits shallow inshore areas in estuaries, harbours and bays, where it lives on rocky reefs, sponges, seagrass beds, and under piers and jetties to 25 m.	(PMST)	High. Sedentary populations known in the harbour in similar habitats.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Macquaria australasica</i>	Macquarie Perch	E	E	The Murray-Darling form of the Macquarie Perch is still known to exist in waterways of VIC, NSW and the ACT. The eastern form is confined to the Hawkesbury-Nepean and Shoalhaven river systems including a number of Sydney's water supply reservoirs. The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.	(PMST)	None. No suitable habitat within the study area.
<i>Prototroctes maraena</i>	Australian Grayling	E (FM Act)	V	The Australian Grayling occurs in rivers and streams on the eastern and southern flanks of the Great Dividing Range but is diadromous. During the freshwater phase of the life cycle, this species inhabits lower altitude reaches of both large rivers and smaller streams spawning in the tidal freshwater reaches of rivers, presumably among a gravel streambed. Very little is known of the Australian grayling's specific habitat requirements during the estuarine or marine phase of the life cycle.	(PMST)	Low. May occur in the Study area during the marine phase of life-cycle albeit at the end of its range, no records in the Survey Locality and habitat is widespread.
Mammals						
<i>Arctocephalus forsteri</i>	New Zealand Fur Seal	V	Ma	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders.	(PMST)	Low. May swim through the study area, albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Arctocephalus pusillus</i>	Australian Fur Seal	V	Ma	Reported to breed at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand fur-seals where they occur together. The Australian fur-seal prefers to utilise oceanic waters of the continental shelf for foraging and generally does not dive deeper than 150 m.	(PMST) / 1 (BioNet)	Low. May swim through the study area, albeit boat traffic renders the study area suboptimal.
<i>Balaenoptera borealis</i>	Sei Whale	-	V, M (B)	Sei whales have been infrequently recorded in Australian waters. The similarity in appearance of sei whales and Bryde's whales (<i>Balaenoptera edeni</i>) has resulted in confusion about distributional limits and frequency of occurrence, particularly in warmer waters (>20 °C) where Bryde's whales are more common. Sei whales were thought to be the most common whales reported by whalers off Albany, WA while hunting sperm whales (<i>Physeter macrocephalus</i>), however, these may have been misidentified Bryde's whales. There are several reports of presumed sei whale sightings by fishermen around the shelf edge (50 km offshore) off the coast of NSW. The Australian Antarctic waters are important feeding grounds for sei whales, as are temperate, cool waters. Sightings of sei whales feeding in the Bonney Upwelling area indicate that this area is potentially also an important feeding ground. Breeding occurs in tropical and subtropical waters.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Balaenoptera musculus</i>	Blue Whale	E	E, M (B)	Oceanic within Southern Hemisphere between 20° to 70° S including NSW waters. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are only used for migration and opportunistic feeding. The only known areas of significance to the Blue Whale are feeding areas around the southern continental shelf, notably Perth Canyon, in WA and the Bonney Upwelling and adjacent upwelling areas of SA and VIC. Preferring open seas rather than coastal waters. While breeding areas have not yet been identified, it is likely that they occur in tropical areas of high localised biological production, as, unlike the humpback whale (<i>Megaptera novaeangliae</i>) and Southern Right Whale (<i>Eubalaena australis</i>), the Blue Whale has a thin blubber layer, which implies that they cannot fast during the winter season. This is supported by the occurrence of the Blue Whale in tropical upwelling areas in the eastern tropical Pacific Ocean, such as the Costa Rica Dome and the waters west of the Galapagos Islands. Wintering areas, where some blue whale sightings have been reported, include the Indonesian archipelago and the waters adjacent to the Solomon Islands and other island groups of the south-west Pacific (Paton & Gibbs 2003). Satellite tagging has confirmed that the pygmy blue whale feeds off the Perth Canyon and head north in March/April to potential breeding grounds in Indonesian waters by June.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Balaenoptera physalus</i>	Fin Whale	-	V, M	Fin Whales are widely distributed in both hemispheres between latitudes 20–75° S. This species is common in temperate waters, the Arctic Ocean and Southern Ocean. In the Southern Ocean/Subantarctic this species is often found in areas of complex and steep bathymetry, such as deep ravines, where fish and other prey are known to concentrate. Fin Whales have been observed during aerial surveys in SAn waters between November and May. The Australian Antarctic waters are important feeding grounds for Fin Whales. Sightings of fin whales feeding in the Bonney Upwelling area indicate that this area is also a potentially important feeding ground. There are no known mating or calving areas in Australian waters.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	V	-	Found in a broad range of habitats from rainforest through to wet and dry sclerophyll forest and woodland to heath, but in most areas woodlands and heath appear to be preferred.	395 (BioNet)	None. No suitable habitat within the study area.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves.	(PMST) / 6 (BioNet)	Moderate. Potential foraging and roosting habitat present in the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Dasyurus maculatus</i>	Spot-tailed Quoll (south-eastern mainland population)	V	E	Wet and dry sclerophyll forests and rainforests, and adjacent open agricultural areas. Generally associated with large expansive areas of habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	(PMST)	None. No suitable habitat within the study area.
<i>Dugong dugon</i>	Dugong	E	M, Ma	Major concentrations of Dugongs along the QLD coast occur in wide, shallow, protected bays and mangrove channels, and in the inside edge of large inshore islands. These areas coincide with significant seagrass beds. They also use deep-water habitats. Large numbers have been sighted in water more than 10 metres deep in several areas including the Torres Strait, the northern Great Barrier Reef region, and Hervey Bay in southeast QLD. A large proportion of the world's Dugong population is found in northern Australian waters from Moreton Bay in the east to Shark Bay in the west. Dugongs are also occasionally reported much further south in NSW.	(PMST)	Low. Some foraging habitat present in the study area however, is highly disturbed and not considered in core range.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Eubalaena australis</i>	Southern Right Whale	E	E, M	This species occurs in temperate and subpolar waters of the Southern Hemisphere, with a circumpolar distribution between about 20° S and 55° S with some records further south to 63° S. The Southern Right Whale migrates between summer feeding grounds in Antarctica and winter breeding grounds around the coasts of southern Australia, NZ, South Africa and South America. This species feed in the open oceans in summer and move inshore in winter for calving and mating with calving females usually remaining very close to the coast. The southern right whale is not believed to feed in Australian waters at all. The Southern Right Whale is constrained in their ability to colonise unused areas of potentially suitable habitat due to a high degree of site fidelity (individuals returning to the same breeding site each year).	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Isodon obesulus</i>	Southern Brown Bandicoot (eastern)	E	E	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	(PMST) / 1 (BioNet)	None. No suitable habitat within the study area.
<i>Megaptera novaeangliae</i>	Humpback Whale	V	V, M (B)	Occurs in oceanic and coastal waters worldwide. The population of Australia's east coast migrates from summer, cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on the northward migration and October and November, on the southward migration. As with the WA population, the eastern Australian population also tend to migrate further	(PMST) / 27 (BioNet)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				<p>offshore during their northward migration. Three major aggregation areas have been previously identified for the eastern Australian population in QLD around the southern end of the Great Barrier Reef, Hervey Bay and in the Gold Coast region. The southern end of the Great Barrier Reef is a suspected calving area. The breeding area for the eastern population of the humpback whale is presumed to be off the coast between central and northern QLD. Some feeding has been observed in Australia's coastal waters but this is thought to primarily be opportunistic and forms only a small portion of their nutritional requirements. Feeding has been observed close to shore off Eden, NSW, from late September until late November. Feeding behaviour has also been reported off Fraser Island, QLD. Feeding may also occur in northern waters of the Great Barrier Reef, as well as VIC, as sightings of Humpback Whales have been reported in these areas in summer months.</p>		
<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	<p>East coast and ranges of Australia from Cape York in QLD to Wollongong in NSW. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.</p>	10 (BioNet)	<p>Moderate. Potential foraging and roosting habitat present in the study area.</p>
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V	-	<p>Occurs on east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, stormwater tunnels, buildings and other manmade structures.</p>	60 (BioNet)	<p>Moderate. Potential foraging and roosting habitat present in the study area.</p>

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Myotis macropus</i>	Southern Myotis	V	-	Generally, roost in groups close to water in caves, mine shafts, hollow-bearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish	18 (BioNet)	Moderate. Potential foraging and roosting habitat present in the study area.
<i>Perameles nasuta</i>	Long-nosed Bandicoot (North Head population)	EP	-	Restricted to North Head in the Manly Local Government Area. Essentially a solitary animal that occupies a variety of habitats on North Head. Forages mainly at or after dusk, digging for invertebrates, fungi and tubers. The conical holes it leaves in the soil are often seen at the interface of naturally vegetated and areas of open grass around the Quarantine Station, former Defence Lands and Saint Patrick's Estate. Shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris, sometimes hidden with soil and with the entrance closed for greater concealment.	2,853 (BioNet)	None. Generally, the records are located at North Head. No suitable habitat within the Study area.
<i>Petauroides volans</i>	Greater Glider	-	V	The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north QLD through to central VIC (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh Uplands. The broad extent of occurrence is unlikely to have changed appreciably since European settlement. However, the area of occupancy has decreased substantially mostly due to land clearing. This area is probably continuing to decline due to	(PMST)	Unlikely. No suitable habitat within the Study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				further clearing, fragmentation impacts, fire and some forestry activities. An arboreal, nocturnal marsupial largely restricted to Eucalypt forests and woodlands with a diet of eucalypt leaves and occasionally flowers. Found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows although, distribution may be patchy, even in suitable habitat. Favours forests with a diversity of eucalypt species due to seasonal variation. Shelters in tree hollows during the day. Home ranges are typically 1-4 ha.		
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Range extends from south-east QLD to the Grampians in western VIC, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	(PMST)	Unlikely. No suitable habitat within the Study area.
<i>Phascolarctos cinereus</i>	Koala (combined populations of QLD, NSW and the ACT)	E	E	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 Eucalypt species and 30 non-Eucalypt species, but in any one area will select preferred browse species.	(PMST)	Unlikely. No suitable habitat within the Study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	Distribution is fragmented across all eastern states of Australia, where it inhabits open heath lands, open woodlands with heath understorey and vegetated sand dunes.	(PMST)	Unlikely. No suitable habitat within the Study area.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in QLD to Adelaide in SA. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	(PMST) / 182 (BioNet)	Moderate. Potential foraging habitat present in the study area. Roosting camp about 2.5 kilometres north-west of the study area.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V	-	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	2 (BioNet)	Moderate. Potential foraging and roosting habitat present in the study area.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	1 (BioNet)	Moderate. Potential foraging and roosting habitat present in the study area.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	1 (BioNet)	Moderate. Potential foraging and roosting habitat present in the study area.
Reptiles						
<i>Caretta</i>	Loggerhead Turtle	E	E, M, Ma	The Loggerhead Turtle has a worldwide distribution in coastal tropical and subtropical waters. In Australia, Loggerheads occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of QLD, NT, WA and NSW.	(PMST) / 1 (BioNet)	Low. May swim through the Study area albeit not considered core range. Boat traffic renders the study area suboptimal.
<i>Chelonia mydas</i>	Green Turtle	V	V, M, Ma	Green Turtles occur in seaweed-rich coral reefs and coastal seagrass pastures in tropical and subtropical areas of Australia. Usually ocean-dwelling but also occurs in coastal waters on the north or central coast with some straying south of the central coast. Green Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum (a floating marine plant that is also carried by currents). Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae	(PMST) / 5 (BioNet)	Low. May swim through the Study area albeit not considered core range. Boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				mats on which Green Turtles mainly feed. In Australia there are seven separate genetic management units for the green turtle, and three of these occur in QLD. The entire Great Barrier Reef area is an important feeding area for turtles which nest locally, as well as for those which nest in other regions and countries.		
<i>Dermochelys coriacea</i>	Leatherback Turtle	E	E, M, Ma	Throughout the world's tropical and temperate seas and in all coastal waters of Australia. Most sightings are in temperate waters. Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW.	(PMST)	Low. May swim through the Study area albeit not considered core range. Boat traffic renders the study area suboptimal.
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	-	V, M, Ma	Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in WA, and in the northern Great Barrier Reef and Torres Strait, QLD. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. During this pelagic phase, they are often found in association with rafts of Sargassum sp. (floating marine algae that is also carried by currents). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae. They have also been found, though less frequently, within seagrass habitats of coastal waters, as	(PMST) 1 (BioNet)	Low. May swim through the Study area albeit not considered core range. Boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				well as the deeper habitats of trawl fisheries. Hawksbill Turtles have been seen in temperate regions as far south as northern NSW.		
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 metres of escarpments in summer.	(PMST)	None. No suitable habitat within the study area.
<i>Natator depressus</i>	Flatback Turtle	-	V, M, Ma	The Flatback Turtle is only found in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Post-hatchling and juvenile Flatback Turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles. Adults inhabit soft bottom habitat over the continental shelf of northern Australia, extending into Papua New Guinea and Irian Jaya although the extent of their range is not fully known. Hatchling to subadult flatback turtles lack a pelagic life stage and reside in the Australian continental shelf. Flatback Turtles require sandy beaches to nest. Sand temperatures between 25 °C and 33 °C are needed for successful incubation. Beaches free from light pollution are required to prevent disorientation, disturbance, and to allow nesting females to come ashore.		Low. May swim through the Study area albeit not considered core range. Boat traffic renders the study area suboptimal.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in TAS and WA. Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.	5 (BioNet)	
Elasmobranchs						
<i>Carcharias taurus</i>	Grey Nurse Shark (east coast population)	CE (FM Act)	CE	Grey Nurse Sharks are usually found in inshore coastal waters usually less than 40 metres in depth. This species congregates at a number of rocky reef sites with gravel or sand filled gutters, overhangs or caves known as 'aggregate sites' and key aggregate sites refer to those areas occupied by a larger number of grey nurse sharks. Individuals spend most of their time within or in close proximity to aggregate sites but may undertake excursions of varying lengths of time away from site. In NSW, aggregations of grey nurse sharks (east coast population as listed under the EPBC Act) can be found at reefs off the following locations: Byron Bay, Brooms Head, Solitary Islands, South West Rocks, Laurieton, Forster, Seal Rocks, Port Stephens, Sydney, Bateman's Bay, Narooma and Montague Island. Relatively	(PMST)	Low. May swim through the study area albeit widespread. No aggregate sites known in the harbour.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
				little is known about the migratory habits of Grey Nurse Sharks in Australian waters but tagged sharks have been recorded moving over 800 kilometres between sites in relatively short periods of time.		
<i>Carcharodon carcharias</i>	White Shark	V (FM Act)	V, M	In Australia, White Sharks have been recorded from central QLD around the south coast to north-west WA, but may occur further north on both coasts. White Sharks are widely, but not evenly, distributed in Australian waters. This species can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. The majority of recorded White Shark movements occur between the coast and 100 metres in depth but have been recorded to dive to depth of over 1,200 m. Individuals may travel long distances in a relatively short time, but can remain in the same areas for weeks to months. In NSW, the Stockton Beach/Hawks Nest area are identified as primary residency areas for juvenile White Sharks.	(PMST)	Low. May swim through the study area albeit widespread.

Scientific Name	Common Name	BC Act/FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Rhincodon typus</i>	Whale Shark	-	V, M	In Australia, the Whale Shark is known from NSW, QLD, NT, WA and occasionally VIC and SA, but it is most commonly seen in waters off northern WA, NT and QLD. The Whale Shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls. The Whale Shark is generally encountered close to or at the surface, as single individuals or occasionally in schools or aggregations of up to hundreds of sharks. This species is generally found in areas where the surface temperature is 21–25 °C, preferably with cold water of 17 °C or less upwelling into it, and salinity of 34 to 34.5 parts per thousand.	(PMST)	Low. May swim through the study area albeit not considered core range.

* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/>. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

The NSW DPI (Fisheries) Threatened species lists <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/>. and

Australian Government DCCEEW PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

EP = endangered population

CE = critically endangered

E = endangered

V = vulnerable

M = migratory (EPBC Act only); B = Bonn, C = CAMBA, J = JAMBA, R = ROKAMBA

Ma = marine (EPBC Act only)

P = protected (FM Act only)

Migratory species habitat assessment table

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Birds					
<i>Actitis hypoleucos</i>	Common Sandpiper	M (B, C, J, R), Ma	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	(PMST) / 2 (BioNet)	Low. Some foraging habitat present in the study area however, it is highly disturbed and widely distributed.
<i>Anous stolidus</i>	Common Noddy	M (C, J), Ma	Mainly occurs in ocean off the QLD coast. Breeds on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoal or cays or coral or sand. This species feeds main on fish but are known to take squid, molluscs and aquatic insects in offshore areas.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Apus pacificus</i>	Fork-tailed Swift	M (C, J, R), Ma	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	(PMST) / 3 (BioNet)	Low. Almost exclusively aerial so unlikely to land in the study area but may fly through.
<i>Ardenna grisea</i>	Sooty Shearwater	M (J), Ma	In Australia, the Sooty Shearwater breeds on islands off NSW (NSW) and TAS. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The Sooty Shearwater breeds mainly on subtropical and sub-Antarctic islands, as well as on the mainland of NZ. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather.	(PMST) / 1 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	M (C, J, R), Ma	In summer months, the Short-tailed Shearwater is the most common shearwater along the south and south-east coasts of Australia. The Short-tailed Shearwater is found in coastal waters.	22 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Calidris melanotos</i>	Pectoral Sandpiper	M (B, J, R), Ma	In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	(PMST)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Calonectris leucomelas</i>	Streaked Shearwater	M (C, J, R), Ma	Found in the western Pacific, breeding on the coast and on offshore islands of Japan, Russia, and on islands off the coasts of China, North Korea and South Korea. This marine species can be found over both pelagic and inshore waters.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Cuculus optatus</i>	Oriental Cuckoo	M (C, J, R)	Occurs from the coastal region of the NT to the south of NSW coast. This species is very secretive inhabiting forests, occurring in coniferous, deciduous and mixed forest.	(PMST) / 5 (BioNet)	None. No suitable habitat within the study area.
<i>Fregata ariel</i>	Lesser Frigatebird	M (C, J), Ma	Breeding populations are found in the tropical waters of Indian and Pacific Oceans, except in the east Pacific, and the South Atlantic on remote tropical and sub-tropical islands. Mainly feeds on fish but can snatch bird eggs and chicks as well as scavenge.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Fregata minor</i>	Greater Frigatebird	M (C, J, R), Ma	Breeding populations found on small, remote tropical and sub-tropical islands of the Indian and Pacific Oceans and the South Atlantic. Kleptoparasitic behaviour leads to stealing fish and squid from other bird species as well as snatching small chicks.	(PMST)	Low. Some foraging habitat present in the study area however, it is highly disturbed and widely distributed.
<i>Gallinago hardwickii</i>	Latham's Snipe	M (B, J, R), Ma	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern TAS. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Hydroprogne caspia</i>	Caspian Tern	M (J), Ma	Within Australia, the Caspian Tern has a widespread occurrence and can be found in both coastal and inland habitat. The Caspian Tern breeds on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks. Breeding is recorded from the Menindee Lakes. This species usually forages in open wetlands, including lakes and rivers.	(PMST)	None. No suitable habitat within the study area.
<i>Limosa lapponica</i>	Bar-tailed Godwit	M (B, C, J, R), Ma	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	1 (BioNet)	Low. Prefers specific habitat not in the study area however, it may fly through.
<i>Monarcha melanopsis</i>	Black-faced Monarch	M (B), Ma	Widespread in eastern Australia. Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	(PMST) / 2 (BioNet)	None. No suitable habitat within the study area.
<i>Motacilla flava</i>	Yellow Wagtail	M (C, J, R), Ma	Breeds in northern latitudes and travels south before the onset of winter. Occurs in a variety of damp or wet habitats with low vegetation. Outside of the breeding season, it is also found in cultivated areas.	(PMST)	None. No suitable habitat within the study area.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M (B), Ma	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Pandion haliaetus</i>	Osprey	M (B), Ma	In Australia, the subspecies <i>gracillis</i> occurs on much of the west, north and north-east coasts, from south-west WA to south-east QLD, with rare records from north NSW. The Roseate Tern occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. Birds rarely occur in inshore waters or near the mainland, usually venturing into these areas only accidentally, when nesting islands are nearby.	(PMST)	Low. Some foraging habitat present in the study area however, it is highly disturbed and widely distributed.
<i>Phaethon lepturus</i>	White-tailed Tropicbird	M (C, J), Ma	The White-tailed Tropicbird can be found over pelagic waters and the coast of tropical and subtropical seas. It feeds on small fish, especially flying-fish, squid and some crustaceans (especially crabs). Its diet varies locally, for example taking mostly fish in the Seychelles. Most prey is caught by plunging but flying-fish can be taken on the wing. Breeding is seasonal in places but elsewhere can be more or less continuous. It is loosely colonial, nesting in rocky crevices or sheltered scrape on the ground on small-remote islands preferring inaccessible spots on cliffs where take-off is relatively easy.	(PMST)	Low. Some foraging habitat present in the study area however, it is highly disturbed and widely distributed.
<i>Pluvialis squatarola</i>	Grey Plover	M (B, C, J, R), Ma	Non-breeding visitor to Australia, Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They usually roost in sandy areas, such as on unvegetated sandbanks or sand-spits on sheltered beaches or other sheltered environments such as estuaries or lagoons.	(PMST)	None. No suitable habitat within the study area.
<i>Rhipidura rufifrons</i>	Rufous Fantail	M (B), Ma	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (<i>Eucalyptus microcorys</i>), Mountain Grey Gum (<i>E. cypellocarpa</i>), Narrow-leaved Peppermint (<i>E. radiata</i>), Mountain Ash (<i>E. regnans</i>), Alpine Ash (<i>E. delegatensis</i>), Blackbutt (<i>E. pilularis</i>) or Red Mahogany (<i>E. resinifera</i>); usually with a dense shrubby understorey often including ferns.	4 (BioNet)	None. No suitable habitat within the study area.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Stercorarius parasiticus</i>	Arctic Jaeger	M (C, J, R), Ma	The Arctic Jaeger breeds on the northernmost coasts of Eurasia and North America. This marine species is predominately coastal but will migrate over land.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Stercorarius pomarinus</i>	Pomarine Jaeger	M (C, J, R), Ma	The Pomarine Jaeger breeds in the far northern reaches of Europe, Asia and America. In the winter, the pomarine jaeger migrates to areas between the Tropic of Capricorn and the Tropic of Cancer, as well as along the coasts of Argentina and Australia. During the breeding season, the Pomarine Jaeger inhabits areas of tundra. At other times of the year it occurs in coastal habitats.	2 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Symposiachrus trivirgatus</i>	Spectacled Monarch	M (B), Ma	Occurs along the entire east coast of Australia. Breeds in dense scrub in gullies of coastal ranges.	2 (BioNet)	None. No suitable habitat within the study area.
<i>Thaasseus bergii</i>	Crested Tern	M (J), Ma	There are few stretches of the Australian coastline where the Crested Tern cannot be seen. It has been known as both the Bass Straits Tern and the Torres Straits Tern. They breed in colonies on small offshore islands where their nests are so densely packed together that adjacent owners can touch each other's bills. Though the Crested Tern is usually a strictly coastal species, there are occasional records in the arid interior of Australia, where birds were possibly blown by passing tropical cyclones.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
<i>Tringa nebularia</i>	Common Greenshank	M (B, C, J, R), Ma	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia.	24 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Marine Mammals and Elasmobranchs					
<i>Balaenoptera edeni</i>	Bryde's Whale	M (B)	Bryde's whales occur in temperate to tropical waters, both oceanic and inshore, bounded by latitudes 40° N and 40° S, or the 20 °C isotherm. Bryde's whales have been recorded from all Australian states except the NT, including one sighting each in VIC and NSW and 11 reported strandings in TAS (7), NSW (2), VIC (1) and QLD (1). Bryde's whales are found year-round primarily in temperatures exceeding 16.3 °C. The coastal form of Bryde's whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m). Dive times are relatively short, averaging 1.27 minutes but potentially lasting 9 minutes. This suggests that Bryde's whales use the upper layers of the ocean, and can therefore be considered pelagic.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Caperea marginata</i>	Pygmy Right Whale	M (B)	In Australia, dusky dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s. They occur across southern Australia from WA to TAS, with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, TAS, and off TAS, and a recent stranding in the latter State. Given the lack of understanding of the species' distribution in Australian waters, no key localities have yet been identified. Dusky dolphins occur mostly in temperate and subantarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	M	The Oceanic Whitetip Shark is widespread throughout tropical and subtropical pelagic waters of the world (30°N to 35°S). Within Australian waters, it is found in from Cape Leeuwin (WA) through parts of the NT, down the east coast of QLD and NSW to Sydney. It has not been recorded within the Gulf of Carpentaria or the Arafura Sea, preferring pelagic waters. A single specimen has been recorded in TAS.	(PMST)	Low. May swim through the study area, albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	M (B)	In Australia, dusky dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s. They occur across southern Australia from WA to TAS, with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, TAS, and off TAS, and a recent stranding in the latter State. Given the lack of understanding of the species' distribution in Australian waters, no key localities have yet been identified. Dusky dolphins occur mostly in temperate and subantarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times.	(PMST)	Low. May swim through the study area, albeit boat traffic renders the study area suboptimal.
<i>Lamna nasus</i>	Porbeagle	M	The Porbeagle is wide-ranging and inhabits temperate, subarctic and subantarctic waters of the North Atlantic and Southern Hemisphere. The Porbeagle primarily inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle utilises a broad vertical range of the water column and is known to dive to depths exceeding 1300 m. The Porbeagle is thought to be reasonably flexible in the types of habitat used for foraging.	(PMST)	Low. May swim through the study area, albeit boat traffic renders the study area suboptimal.
<i>Mobula alfredi</i>	Reef Manta Ray	M	Distributed in the Indo-West Pacific: Red Sea, South Africa, Thailand to WA; north to Japan (Yaeyama Island), to Solitary Island, Australia as far east as French Polynesia and the Hawaiian Islands. Reported in the Atlantic (Canary and Cape Verde islands) but this species may be restricted more or less to the Indian and Western Pacific only. Adults are commonly sighted inshore, within a few kilometers of land; found around coral and rocky reefs as well as along productive coastlines with consistent upwelling, tropical island groups, atolls and bays.	(PMST)	None. No suitable habitat within the study area.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Mobula birostris</i>	Giant Manta Ray	M	The Giant Manta Ray occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. Commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. Widespread, although relatively uncommon in Australian waters; also Cocos (Keeling) Islands and Christmas Island in the eastern Indian Ocean. Elsewhere the species is circumglobal, usually offshore, often around oceanic islands, sometimes coastal, and most common in tropical waters. Giant Manta Rays aggregate around Ningaloo Reef during autumn and winter.	(PMST)	None. No suitable habitat within the study area.
<i>Orcinus orca</i>	Killer Whale (Orca)	M (B)	In Australia, orcas are recorded from all states, with concentrations reported around TAS. Sightings are also frequent in TAS and VIC. A sighting at Yirrkala in April 1999 provides evidence that they also occur in NT waters. Orcas are frequently seen in the Antarctic south of 60° S and have been recorded from Heard and Macquarie Islands. Macquarie Island appears to be a key locality, with orcas regularly reported there. The preferred habitat of orcas includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters. They may be more common in cold, deep waters, but off Australia, orcas are most often seen along the continental slope and on the shelf, particularly near seal colonies. Orcas have regularly been observed within the Australian territorial waters along the ice edge in summer.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.
<i>Sousa sahalensis</i>	Australian Humpback Dolphin	M (B)	Australian Humpback Dolphins are found in tropical/subtropical waters of the Sahul Shelf from northern Australia to the southern waters of the island of New Guinea. In Australia, Humpback Dolphins are thought to be widely distributed along the northern Australian coastline from approximately the QLD–NSW border to western Shark Bay, WA.	(PMST)	Low. Usually associated with open water, but may swim through the study area albeit boat traffic renders the study area suboptimal.

Scientific Name	Common Name	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
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* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/> and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/> and

Australian Government DCCEEW PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

M = migratory (EPBC Act only); M = migratory (EPBC Act only); B = Bonn, C = CAMBA, J = JAMBA, R = ROKAMBA

Ma = marine (EPBC Act only)

Protected species habitat assessment table

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
Birds						
<i>Bubulcus ibis</i>	Cattle Egret	-	Ma	The Cattle Egret was originally native to Africa, south-west Europe, and Asia. Originally the bird's Asian distribution was from Pakistan, south to Sri Lanka, north to the Himalayas and east to Korea, Japan, and the Philippines. Two major distributions have been located; from north-east WA to the Top End of the NT and around south-east Australia. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare.	(PMST)	Low. Some foraging habitat present in the study area however, is suboptimal and widely distributed.
<i>Merops ornatus</i>	Rainbow Bee-eater	-	Ma	The Rainbow Bee-eater is widely distributed throughout Australia and eastern Indonesia. The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.	(PMST)	None. No suitable habitat within the study area.
<i>Neophema chrysostoma</i>	Blue-winged Parrot	-	Ma	The Blue-winged Parrot occurs in TAS and VIC, with sparse populations in NSW, SA and the NT. The Blue-winged Parrot inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. Throughout their range they favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones.	(PMST)	None. No suitable habitat within the study area.
<i>Pachyptila turtur</i>	Fairy Prion	-	Ma	The Fairy Prion is found throughout oceans and coastal areas in the Southern Hemisphere. This marine species apparently occurs mainly offshore, but may move inshore during stormy weather. Its diet is comprised mostly of crustaceans (especially krill), but occasionally includes some fish and squid.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Stercorarius skua</i>	Great Skua	-	Ma	This species breeds in Iceland, Norway, Svalbard (to Norway), the Faroe Islands (to Denmark), the Scottish islands and a few on mainland Scotland. It is a migratory species, normally wintering off the Atlantic coast of France and the Iberian Peninsulas, but juveniles can reach as far as Cape Verde, the coast of Brazil, areas of the Caribbean and small numbers also winter on the Grand Banks of Newfoundland (Canada). This marine species avoids land during migration and winter, aggregating in winter in areas where it can scavenge from fisheries. It has a hugely varied diet owing to being a highly opportunistic feeder. Individuals regularly show individual specialisations in diet and feeding with some colony-specific learning. Breeding begins in May, and it is loosely colonial but highly territorial, breeding on islands on flat ground with some vegetation cover, usually avoiding human contact. Most birds breed within 1 km of their birth place.	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Fish and Syngnathids						
<i>Acentronura tentaculata</i>	Shortpouch Pygmy Pipehorse	P	Ma	This species is found on tropical inshore reefs. It also occurs in temperate waters associated with shallow sandflats in protected and somewhat silty coastal areas among sparse low plant growth and in algae on rocks. This species inhabits waters of 7-40 metres in depth. Pipefishes feed on small living crustaceans.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Anampses elegans</i>	Elegant Wrasse	P	-	Elegant Wrasse are a widespread but uncommon species found on coral reef and rocky reef habitats at depths from 2 to 35 m. The distribution of elegant wrasse extends from southern QLD to Montague Island on the NSW south coast, particularly around inshore islands. The species is also found at Lord Howe Island, especially in the shallow lagoon habitat, and at nearby Elizabeth and Middleton Reefs, and they have also been recorded from Norfolk Island, the Kermadec Islands, New Zealand and Easter Island. Elegant wrasse are a subtropical, warm-temperate species that are active during the day.	(DPI)	Moderate. Potential habitat occurs within the study area, albeit widespread within the study locality.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Epinephelus coioides</i>	Estuary Cod	P	-	Occurs in tropical and warm temperate marine waters of the Indo-Pacific including the Persian Gulf, India, the Philippines, Singapore, Hong Kong, Taiwan, Fiji and around numerous other islands. In Australia they are most common in QLD, the NT and WA; however, they are known to occur as far southwards as the Sydney area.	(DPI)	Moderate. Potential habitat occurs within the study area, albeit widespread within the study locality.
<i>Epinephelus lanceolatus</i>	QLD Groper	P	Ma	This species has a wide distribution throughout the tropical waters of the Indo-West Pacific. In Australia they occur along all tropical and warm temperate coasts but are rarely found in cooler waters to the south. QLD Gropers occupy a variety of habitats throughout their growth stages including estuaries and coral reefs. This species is usually solitary and inhabit caves and around wrecks and structures. They are ambush predators that swallow prey whole.	(DPI)	Moderate. Potential habitat occurs within the study area, albeit widespread within the study locality.
<i>Festucalex cinctus</i>	Girdled Pipefish	P	Ma	Endemic to tropical and temperate waters of the NT, QLD and NSW. Usually inhabits sheltered coastal bays and estuaries, on patches of rubble, sand or in areas of sparse seagrass, algal and sponge growth. Most specimens were dredged or trawled in depths of 8-31 metres but divers collected some specimens over rubble bottoms in depths of 12 m. In Sydney Harbour it is most common in depths of 10-20 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Filicampus tigris</i>	Tiger Pipefish	P	Ma	The Tiger Pipefish is relatively common in subtropical waters of Australia's east and west coasts. A relic population also occurs in the warmer waters of Spencer Gulf, TAS. Inhabits areas near channels in inshore sheltered bays and estuaries with sandy or muddy bottoms, or along seagrass bed edges at 2-30 m. Feeds on aggregations of mysid shrimps in sheltered bays adjacent to tidal channels.	(PMST/DPI)	High. Potential habitat present within the Study area.
<i>Heraldia nocturna</i>	Upside-down Pipefish	P	Ma	Endemic to temperate waters of southern and south-eastern Australia, from about Hastings, NSW, southwards to VIC, to Port Davey on the west coast of TAS, westwards through TAS to Geographe Bay, WA. Upsidedown Pipefish inhabit sheltered inshore rocky reefs in harbours, bays and coves where they are found under ledges, in holes, crevices and small caves at 2-30 m.	(PMST/DPI)	High. Potential habitat present within the study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Hippichthys penicillus</i>	Beady Pipefish	P	Ma	Widespread in the tropical Indo-west-central Pacific, from the Red Sea and East Africa across the Indian Ocean to north-eastern Australia, north to Taiwan, Japan, Micronesia and east to Samoa and Tonga. This species usually inhabits brackish waters in mangrove estuaries, tidal creeks and sometimes in freshwater reaches in the lower parts of rivers and streams.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Hippocampus abdominalis</i>	Big-belly Seahorse	P	Ma	Known from temperate waters of New Zealand and southern Australia, where it occurs from about South West Rocks, NSW, southwards to the northern Great Australian Bight, TAS, and south to the Derwent Estuary, TAS. Big-belly seahorses live in a range of habitats from low rocky reefs in shallow estuaries, to deep tidal channels and deeper coastal reefs to 100 m. They cling to seagrasses, sponges, macroalgae such as kelp holdfasts and other structures on reefs."	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Histiogamphelus briggsii</i>	Crested Pipefish	P	Ma	Endemic to temperate waters of south-eastern Australia, from NSW, south to VIC and TAS, and westwards to Gulf St Vincent. Crested Pipefish inhabit inshore sandy areas, singly or in small aggregations, often amongst detached seaweed or along the margins of Posidonia seagrass beds and in open sandy areas at 3–20 m; most common in Bass Strait	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Lissocampus runa</i>	Javelin Pipefish	P	Ma	Endemic to temperate waters of southern and eastern Australia; known from southern Qld, southwards to TAS, and across to about Rottnest Island, south-WA. Usually inhabits tidepools and sheltered bays, usually in seagrass and algal beds, and rocky and shelly rubble substratum to about 20 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Maroubra perserrata</i>	Sawtooth Pipefish	P	Ma	Endemic to temperate southern Australian waters from southern QLD to Rottnest Island, WA. The sawtooth pipefish inhabits coastal rocky reefs at 3-25 m, sheltering beneath ledges and in caves during day.	(PMST/DPI)	High. Potential habitat present within the study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Notiocampus ruber</i>	Red Pipefish	P	Ma	Endemic to temperate waters of southern and south-eastern Australia from Sydney Harbour, NSW, south and west to Flinders Island in Bass Strait, TAS, VIC, TAS and the Recherche Archipelago, WA; usually inhabits rocky reefs, often in crevices, in association with sponges and encrusting and filamentous red algae at 5–20 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Paraplesiops bleekeri</i>	Eastern Blue Devil	P	-	Eastern Blue Devil are a shy, secretive fish found in caves, crevices and under ledges on inshore reefs and estuaries. Eastern blue devil fish are distributed from southern QLD to Montague Island on the NSW south coast. They can be found in waters between 3-30 metres and are generally solitary occupying caves, crevices or under ledges.	(DPI)	High. Potential habitat present within the study area.
<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon	P	Ma	Endemic to temperate coastal waters of southern Australia, from about Newcastle (NSW) south to Actaeon Island (TAS) and across southern Australia to about Geraldton (WA). Common seadragons inhabit shallow estuaries to deeper offshore reefs, living seagrass beds and on rocky reefs covered in macroalgae, especially kelp beds, in depths of 1-50 m. Individuals usually remain within a broad home range.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Solegnathus spinosissimus</i>	Spiny Pipehorse	P	Ma	Known from temperate waters of Australia and New Zealand. In Australian waters, Spiny Pipehorses have been recorded from off Caloundra, southern QLD, to southern TAS, throughout Bass Strait to south of Cape Otway, VIC. In the southern part of their range, Spiny Pipehorses inhabit relatively shallow waters. Specimens have been collected from muddy, silty, shelly and rubble substrates, and rocky reefs, and may be washed ashore after storms. Spiny Pipehorses use their prehensile tails to cling to macroalgae and sessile invertebrates on the substrate.	(PMST/DPI)	High. Potential habitat present within the study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Solenostomus cyanopterus</i>	Robust Ghostpipefish	P	Ma	Widespread in the tropical Indo-west Pacific, from East Africa and the Red Sea, eastwards to Fiji and southern Japan, and south to Australia. Known in Australian waters from the Shark Bay region, WA, around the tropical north and southwards to at least Sydney Harbour, NSW. Robust Ghostpipefish live in protected coastal and lagoon reefs, deeper coastal reefs and deep, clear estuaries with seagrass or macro-algae in 15-25 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Solenostomus paradoxus</i>	Ornate Ghostpipefish	P	Ma	Widespread in tropical and warm-temperate regions of the Indo-west Pacific, from East Africa, eastwards to Fiji and Tonga, north to southern Japan, south to Australia and New Caledonia. Ornate ghost pipefish inhabit protected coastal, lagoon and outer reef areas with drop-offs or rock faces, in depths of 3-35 m. They often associate with Crinoids (featherstars), Gorgonians and black corals. Although usually solitary, they may be seen in pairs, or even in small groups.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Stigmatopora argus</i>	Spotted Pipefish	P	Ma	Found from the Hawkesbury River, NSW to Shark Bay, WA in temperate waters. Usually among vegetation in bays and estuaries, but sometimes offshore among floating Sargassum.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Stigmatopora nigra</i>	Widebody Pipefish	P	Ma	Known from temperate waters of southern Australia and New Zealand. The widebody pipefish occurs from about Fraser Island in southern QLD to north of Perth (WA), and around TAS. It is common in sheltered seagrass and algal beds from intertidal depths to 35 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Syngnathoides biaculeatus</i>	Double-end Pipehorse	P	Ma	In Australian waters, known from Geraldton to Shark Bay, and north to Ashmore and Cartier Reefs, WA, and from the Timor Sea, the NT, eastwards to QLD and south to Batemans Bay (NSW). Inhabits shallow, protected waters of bays, lagoons and estuaries including mangrove areas, in association with seagrass beds and macroalgae in depths at 0-10 m. Juveniles sometimes found clinging to floating algae and plant debris including Sargassum sp. rafts.	(PMST/DPI)	High. Potential habitat present within the study area.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish	P	Ma	Widespread in the tropical Indo-west Pacific. Bentstick Pipefish are known in Australian waters from the central coast of WA, northwards throughout the waters of the NT and QLD to central NSW. They live in sheltered coastal lagoon and reef areas on sandy and rubble habitats amongst seagrasses and macroalgae at 1-30 m.	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Urocampus carinirostris</i>	Hairy Pipefish	P	Ma	In Australia, known from the Shoalwater Bay region (QLD) to northern TAS, VIC, and to the Ceduna region of TAS, and in south-WA where it reaches the Perth region. Rare in TAS. Inhabits the lower reaches of rivers, sheltered estuaries and shallow reefs in seagrass and algal beds a 0-6 m. One of the most common estuarine pipefishes in eastern Australia, occurring year-round in seagrass beds in Western Port (VIC), and abundant in seagrass beds in Moreton Bay (QLD).	(PMST/DPI)	High. Potential habitat present within the study area.
<i>Vanacampus margaritifer</i>	Mother-of-pearl Pipefish	P	Ma	Endemic to sub-tropical and temperate Australia, from North Stradbroke island, QLD, southwards to Jurien Bay, WA, absent from TAS. Inhabits shallow estuarine and coastal waters in seagrass beds), macroalgae (Ecklonia spp. and other brown algae), rocky reef, boulder, rubble, sandy and muddy habitats between 2-15 m.	(PMST/DPI)	High. Potential habitat present within the study area.
Reptile						
<i>Pelamis platurus</i>	Yellow-bellied Seasnake	-	Ma	The Yellow-bellied Seasnake is the most widely distributed of all sea snake species. In the beginning of the 21st century, the species was found to range from the east coast of Africa through the Indian and Pacific Oceans to the west coast of the Americas. It was found in most Australian waters with the exception of the colder southern coastline. The greatest density of populations was thought to exist south of the tropics where it was most commonly found on beaches after storms. Populations were also found in tropical seas and the Gulf of Carpentaria. The population living near the central coast of NSW was thought to be permanent and breeding, though no new studies have confirmed this. Most Australian specimens have been washed ashore by a combination of ebbing tides and	(PMST)	Low. Prefers specific habitat not in the Study area however, it may get washed into the harbour.

Scientific Name	Common Name	FM Act	EPBC Act	Habitat requirements*	Number of records (source)+	Likelihood of occurrence
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onshore winds. The Yellow-bellied Seasnake is usually found within a few kilometres of the coast and prefers shallow inshore waters found to be between 11.7–36 °C. Nevertheless, the species is the most pelagic of all known sea snakes, occurring in the open waters well away from coasts and reefs.

* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW <https://www.environment.gov.au/biodiversity/threatened/species>.

NSW DPIE-EES <http://www.environment.nsw.gov.au/threatenedSpeciesApp/> and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities <https://www.dpi.nsw.gov.au/fishing/species-protection/what-current>.

+ Data source includes

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed April 2022) <http://www.bionet.nsw.gov.au/> and

Australian Government DCCEEW PMST <http://www.environment.gov.au/epbc/protected-matters-search-tool>.

Key:

P = protected (FM Act only)

Ma = marine (EPBC Act only)

Appendix C

Assessments of significance

Preamble

The Assessments of Significance (AoSs) have been completed by Jake Ludlow and Kate Reeds ecologists for Cardno, now Stantec, for marine and coastal threatened species listed under the BC Act, FM Act and the EPBC Act that was identified as having a moderate to high potential to occur within the study area due to the presence of nearby records and/or the presence of suitable habitat. These species were identified in Section 3.12 and include:

- *Little Penguin (Eudyptula minor) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.*
- *Black Rockcod (Epinephelus daemeli) listed as endangered under the FM Act and vulnerable under the EPBC Act.*
- *White's Seahorse (Hippocampus whitei) listed as endangered under the FM Act and the EPBC Act.*
- *Posidonia australis seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed under the FM Act.*

Seven microbats listed as vulnerable under the BC Act:

- *Large-eared Pied Bat (Chalinolobus dwyeri).*
- *Little Bent-winged Bat (Miniopterus australis).*
- *Large Bent-winged bat (Miniopterus orianae oceanensis)*
- *Southern Myotis (Myotis macropus).*
- *Yellow-bellied Sheath-tail-bat (Saccolaimus flaviventris).*
- *Greater Broad-nosed Bat (Scoteanax rueppellii).*
- *Eastern Cave Bat (Vespadelus troughtoni).*

No TECs occur within or next to the study area thus, no AoSs for TECs are required for this proposal.

Under the BC Act a 5-part test of significance is applied to determine whether an activity is likely to have a significant impact on listed threatened species, ecological communities, or their habitats, or will be carried out in a declared area of outstanding biodiversity value. The test of significance is set out in section 7.3 of the BC Act.

Part 7A of the FM Act lists threatened species, populations and ecological communities and key threatening processes (KTPs) for species, populations and ecological communities in NSW waters. Section 220ZZ of the FM Act outlines significant impact considerations to threatened species, populations and ecological communities listed under the FM Act. Under the FM Act, a '7-part test' is carried out to assess the likelihood of significant impact upon threat-listed species, populations or ecological communities listed under the FM Act. The document *Threatened Species Assessment Guidelines: The Assessment of Significance* (NSW DPI, 2008) outlines a set of guidelines to help proponents of a development or activity with interpreting and applying the factors of assessment in the 7-part test. The guidance provided by the NSW DPI (*Threatened Species Assessment Guidelines: The Assessment of Significance*, 2008) has been used here in preparing the 7-part test.

For the species listing under the EPBC Act, a significance assessment has been completed in accordance with the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and

upon the intensity, duration, magnitude and geographic extent of the impacts (DoE, 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening. It is sufficient if a significant impact on the environment is a real or not remote chance or possibility (DoE, 2013).

Species listed under the BC Act/FM Act and the EPBC Act have been assessed using the corresponding assessment guidelines separately.

Assessment of significance (BC Act)

Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)

The Little Penguin population at Manly is the only known breeding population on the mainland of NSW (NSW NPWS, 2003b). Breeding occurs between June and February however, the species is known to use burrows during other times of the year to rest and moult.

LITTLE PENGUINS – WHAT THEY'RE DOING AND WHEN*



* Recent monitoring has shown that breeding can begin from June.

Adult penguins usually forage in nearby areas (10-30 km) with the adults' foraging range known to greatly reduce once young have hatched. Young birds (<3 years of age) exhibit philopatry, moulting in their natal colonies. Little Penguins breed from 3-4 years of age. An Area of Outstanding Biodiversity Value (AOBV) has been declared for this species which has known nesting burrows and potential foraging sites at Manly Point and along the eastern shoreline of Spring Cove. Potential Habitat Areas have also been identified to occur at Dobroyd Head, Little Manly Point and Cannae Point (NSW NPWS, 2002). These areas occur outside of the study area albeit, anecdotal evidence suggests the species utilise the area below Manly East Wharf.

Kristie King (Northern Beaches Council) was consulted in regard to any data indicating penguin usage at the study area. Video footage of penguins in the vicinity of the wharf (below Bavarian Beer Café; outside of the study area) was provided although this was from 2019. Erica Mahon (Department of Infrastructure Planning and Environment) was also consulted and provided historical breeding pair counts for the wharf. Historical data indicated there were up to six breeding pairs in 2007/2008 known to inhabit the wharf. In recent years only one breeding pair has been recorded from the breeding years 2016/2017, 2017/2018, 2018/2019. No breeding pairs were recorded after 2018/2019. The targeted field survey carried out by Cardno, now Stantec in March 2022 did not indicate the presence of penguins at any known nesting areas within or near the study area.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species or their habitats are outlined below:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

The proposal construction activities have potential to cause temporary changes to water quality, temporary increases in vessel movements (ie vessel strike) and temporary impacts from construction noise and vibration, particularly from piling which may affect the Little Penguin if the appropriate mitigation measures are not employed.

The Little Penguin is highly mobile and it would be anticipated that individuals if present would temporarily seek unaffected habitat elsewhere in the harbour during construction. Potential risks to Little Penguins foraging or passing through the study area would be an increased risk of injury and disturbance from noise and turbulence while barges and vessels facilitate the works. However, it is considered that Little Penguins are fast enough to avoid

boat strikes, and as the penguins are already avoiding numerous vessels in the wharf area there would be no increased risk to injury from the proposal. The constant presence of vessels has likely deterred foraging Little Penguins from the area as repeated disturbance can result in loss of fitness (Cannell, 2011).

It is expected that a relatively high ambient noise environment already exists in the study area due to the presence of existing vessel movements to and from Manly Wharf, however, there would be additional noise from dredging and pile driving. Noise from pile driving is likely to have the greatest impact on Little Penguins and could result in behavioural changes as far as the Little Penguin AOBV (formerly critical habitat), located around 500 metres south of the study area. While the ships and construction activities are likely to deter penguins from swimming through the proposal area, there is potential for behavioural impacts of piling works affecting penguins within the AOBV. A number of standard controls would be adopted to minimise the effect of piling associated underwater noise. These are listed in Section 5 and include:

- Standard management and mitigation procedures with respect to piling operations would be adopted as per '*Underwater Piling Noise Guidelines*' (Government of South Australia, 2012). This would include the following:
- Avoid conducting piling activities during the Little Penguin breeding season, this includes the months of June through to February.
- Use low noise piling methods, instead of impact piling, where possible.
- Presence of marine fauna should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the piling procedure.
- If no marine fauna are nearby, a soft start piling procedure should be used. This involves gradually increasing the piling impact energy over a 10-minute time period.
- Visual observations of marine fauna within the exclusion zone should be monitored by trained crew throughout the start period.
- If marine fauna are sighted within the observation zone during the soft start of normal operation procedures, the operator of the piling rig should be placed on stand-by to shut down the piling rig.

A record of procedures employed during the operations should be maintained by the piling contractor.

A 120 metre shut-down zone would apply if any penguins are sighted in that area and a 175 metre observation zone would be implemented.

A pre-construction targeted penguin surveys would be carried out to ensure that penguins are not currently nesting beneath the wharf (see item B10 of Table 5-1 mitigation measures).

With these measures in place, the proposal is not likely to have an adverse effect on the life cycle of the species such that the local population of the species is likely to be placed at risk of extinction.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
- (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
 - (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
 - (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*

During construction, dredging activities would result in the direct loss of subtidal soft sediment and a small portion of seagrass, while the operational phase may also lead to a small reduction in seagrass cover due to indirect effects of shading and scouring. The seagrass communities present within the study area provide habitat for fish, the primary food source of the Little Penguin. Thus, the proposal has potential to modify potential foraging habitat for the species. However, as discussed above, the foraging range of the Little Penguin can extend to 30 kilometres and less disturbed foraging areas are extensive outside of the study area.

Land-based habitat for the species would not be affected by the proposal. Hence, the proposal is unlikely to remove, modify, fragment or isolate Little Penguin habitat from other areas of habitat as a result of the proposal. The small area of seagrass potentially modified is unlikely to be important to the long-term survival of the species.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).*

The Little Penguin AOBV is not likely to be removed or modified as a result of the proposal as the study area is more than 500 metres outside of Little Penguin AOBV. Hence, the Little Penguin AOBV will not be directly or indirectly impacted. Indirect impacts from noise would be managed as discussed in item 1.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at present, there are currently 38 listed KTPs under the BC Act. Broadly, the KTPs include threats to threatened species, population and ecological communities as well as causes which result in species, population or ecological communities to become threatened. No KTPs under the BC Act are applicable to Little Penguins and relevant to this assessment.

Conclusion

Provided that all mitigation controls identified are adopted, the proposal is unlikely to have any significant direct or indirect impacts on the Little Penguin population in the Manly Point Area.

Tree and cave-roosting bats Large-eared Pied Bat (*Chalinolobus dwyeri*), Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus* (microbats (Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Southern Myotis (*Myotis macropus*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Eastern Cave Bat (*Vespadelus troughtoni*) - vulnerable (BC Act)

Large-eared Pied Bats are known to forage over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves (NSW DPIE, 2020a). Little Bent wing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats (NSW DPIE, 2020b). Large Bent-winged Bat are known to use caves as the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other manmade structures (NSW DPIE, 2019). Southern Myotis roost in groups close to water in caves, mine shafts, hollow-bearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish (NSW DPIE, 2020c). Yellow-bellied Sheath-tail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Greater Broad-nosed Bats utilise a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings (NSW DPIE, 2022b). Eastern Cave Bats are cave-roosting species that are usually found in dry open forest and woodland, near cliffs or rocky overhangs and have been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals (NSW DPIE, 2017).

All species have potential to forage, and potentially roost in man-made structures including under wharves, which occur within the study area. They may roost in colonies but can also be solitary.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species or their habitats are outlined below:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

The proposal would require the removal of the existing wharf structure. There would be no removal of trees or shrubs. The areas of potential roosting habitat in the study area include existing areas underneath the wharf and in the scuppers. These areas are not considered optimal roosting/breeding habitat for these species as the surrounding vegetation does not form part of the preferred native forests habitat. Their nocturnal foraging times are unlikely to coincide with land-based construction during the day however, any roosting individuals would be removed and relocated as part of pre-construction surveys prior to removal of wharf structures (see item B13 of Table 5-1 mitigation measures). Thus, the proposal is unlikely to adversely affect the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
- (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
 - (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
 - (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*

The proposal would remove the existing wharf structures which forms potential roosting habitat however, additional similar habitat would be reinstated when the new structures are installed. As discussed above, the habitat to be removed is not considered optimal for the roosting or breeding of these species. The proposal is also not going to substantially affect any known foraging habitat for these species during construction. Thus, the proposal is unlikely to modify, fragment or isolate habitat important to the long-term survival of these species in the locality.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).*

There are no Areas of Outstanding Biodiversity Value (AOBVs) listed for these species. This question is not applicable, as no AOBVs have been listed for these species.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

No KTPs under the BC Act are applicable to these species and relevant to this assessment.

Conclusion

While there is potential foraging and roosting habitat for these species in the study area, this habitat is widespread and suboptimal for these species. The proposal would temporarily remove potential roosting habitat for these species however, similar habitat would be reinstated with the installation of new wharf structures. Any individuals roosting in the wharf structures to be removed would be collected and relocated to suitable habitat prior to construction. Provided this is done according to the measures outlined in Section 5 (See item B13 and B15 of Table 5-1 mitigation measures), the proposal is unlikely to significantly impact these species and a SIS or entry into the Biodiversity Offsets Scheme is not required.

7-part test (FM Act)

White's Seahorse (*Hippocampus whitei*) – endangered (FM Act)

White's Seahorse has limited geographical distribution in Australia and is endemic to nine estuaries, coastal lakes and embayments from Wallis Lake in the north to Lake Illawarra in the south, along approximately 300 kilometre of the NSW coast (Harasti, et al., 2014). White's seahorse is known to occur at depths of between one and 15 metres and can be found in a wide range of habitat types (both natural and artificial). Natural habitat for White's Seahorse in estuaries includes marine vegetation (ie seagrass, macroalgae on rocky reef and mangroves) as well as sponges and corals (Australian Museum, 2019; Harasti, et al., 2014; Kuitert, 2009). In Sydney, they are often found associated with artificial structures, particularly protective swimming net enclosures and jetty pylons. Their use of artificial habitats appears to be most common in areas where natural habitat (such as seagrass, sponges and soft corals) has been lost (Fisheries Scientific Committee, 2019). The species is found to prefer habitats with dense epibiotic growth and avoids areas devoid of growth, possibly in relation to the greater availability of shelter and prey in these areas (Harasti, et al., 2010). Densities in artificial habitats such as swimming nets can be as much as one per square metre, but estimates in natural habitat have been around an order of magnitude less (Harasti, et al., 2012).

Data collected on breeding pairs found that White's Seahorse displays life-long monogamy, with three pairs observed remaining bonded over three consecutive breeding years (Harasti, et al., 2012). The breeding season for White's Seahorse extends between October to April (Australian Museum, 2019).

The study area is considered to provide suitable habitat for White's Seahorse in existing piles and wharf structure, seagrass meadows and macroalgae. None were found during targeted surveys of the wharf piles undertaken by Cardno, now Stantec (February 2022), however, being highly cryptic, the species is difficult to detect.

The following questions test whether a proposed development or activity is likely to significantly affect White's Seahorse:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

White's Seahorse has potential to be affected by the proposal in the following ways during the construction process:

- Removal and disturbance of marine vegetation and habitat (including artificial structure and seagrass).
- Surface and underwater noise and vibration.

The precise number of White's Seahorse with potential to be impacted by the proposal, although likely to be small, is uncertain. The loss of individuals from the removal of suitable habitat would be avoided by undertaking dedicated pre-clearance surveys on SCUBA by a suitably experienced specialist (See item B16 of Table 5-1 mitigation measures). Any animals collected would be placed in suitable habitat outside the zone of influence from construction related noise. This should be greater than 175 metres based on the noise assessment (GHD, 2022).

Once installed, the new pilings will provide a net increase in artificial surface potentially suitable for colonisation by White's Seahorse, although it may take several months to years for marine growth and habitat complexity to reach a suitable level for seahorses and other Syngnathids. This may be enhanced through the use of products such as living seawall plates that could be attached to pilings and other structure to encourage marine growth (See item B3 of Table 5-1 mitigation measures). With the mitigation measures discussed in place,

the proposal is unlikely to adversely affect the life cycle of the White's Seahorse such that a viable local population of the species is likely to be placed at risk of extinction.

2. *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable.

3. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable.

4. *In relation to the habitat of a threatened species, population or ecological community:*
 - (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
 - (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
 - (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality*

White's Seahorse may be found in seagrass meadows and artificial structures which are present in the study area. However, it is also likely that the frequent exposure to noise from ferry and other vessel movements / ferry wash may render habitat in the study area suboptimal. Optimal habitat and known populations are found elsewhere in the harbour (ie Clontarf and Manly Cove Tidal Pool).

As indicated above, impacts from the removal of the existing structure is considered minimal for White's Seahorse. Some of this habitat would be altered but would not be removed from the areas of occupancy for these species. These are also very small proportions of available habitat in their distribution and the installation of new piles and structures would provide a net gain in habitat for these species in the long term. Further enhancement of these habitats may also be beneficial.

Dredging activities would directly impact 17 square metres of low density *Zostera* and *Halophila* within the Wharf 3 berthing pocket. The foraging resource that this represents is small in comparison to the extent of similar habitat available in the study area and locality. Changes in the berthing configuration at Manly Wharf 3 due to the proposal may also result in a long term net gain in seagrass within the study area.

Thus, the proposal is not considered to remove habitat important for the long-term survival of the species and replacement habitat of a similar or greater quantity would be reinstated.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

Critical habitat refers to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for White's Seahorse.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

There is no recovery plan or threat abatement plan (TAP) for this species. The Scientific Committee has recommended management actions for White's Seahorse, including:

- Collate and synthesise data collected to quantify the significance of high and moderate risk threat interactions with White's Seahorse (medium priority).
- Reduce the impact of public and private boat moorings that impact on White's Seahorse habitats (high priority).
- Councils to maintain best practice management of protective swimming nets by using the suggested NSW DPI seahorse friendly cleaning methods (high priority).
- Consider information on White's Seahorse distribution, abundance and habitat preferences during development and review of Marine Park Zoning Plans (medium priority).
- Negotiate with relevant authorities to encourage the identification, assessment and modification of natural resource management plans and policies to minimise impacts on White's Seahorse habitats (medium priority).
- Continue to monitor the distribution and abundance of White's Seahorse at important sites (Port Stephens and Sydney Harbour) to inform population status and to assist in determining the effectiveness of recovery actions (high priority).
- Develop and trial artificial habitats to promote recovery of White's Seahorse populations (high priority).
- Implement research using eDNA to investigate the occurrence of White's Seahorse in estuaries and embayments across its range (high priority).
- Implement genetics research to investigate population structure of White's Seahorse across its entire range (NSW and Qld) (medium priority).
- Encourage the reporting of sightings of seahorses along the east coast of Australia to iSeahorse and iNaturalist (medium priority).

The proposal would not interfere with any of the above recommendations. Targeted surveys during pre-construction to capture and relocate individuals could be completed in consultation with NSW DPI (Fisheries) to align with some of the above management recommendations (see Section 5).

7. *Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

The KTP of *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams* (FM Act) is of relevance given instream structures would be placed in or adjacent to White's Seahorse habitat. These structures are unlikely to substantially alter nearshore natural tidal flow and therefore would not be exacerbated by the proposal to significantly impact White's Seahorse.

Conclusion

White's Seahorse are known to occur in the harbour and the study area provides suitable potential habitat for the species in seagrass meadows and existing wharf piles. The proposal would include control measures to collect and relocate individuals prior to water-based construction activities, which would avoid any mortality to individuals in the study area. This should be implemented as part of a syngnathid management plan developed in consultation with NSW DPI (Fisheries). The proposal would also replace suitable habitat proposed to be removed such that there would not be a substantial loss, fragmentation or isolation of White's Seahorse habitat. Thus, the proposal is unlikely to have a significant impact White's Seahorse and a SIS is not required.

Black Rockcod (*Epinephelus daemeli*) – endangered (FM Act)

The following questions test whether a proposed development or activity is likely to significantly affect Black Rockcod:

Black Rockcod, also known as Black Cod or Saddled Rockcod, occurs from southern Queensland to Kangaroo Island in South Australia and are found offshore at Lord Howe Island, Norfolk Island, Kermadec Islands and the North Island of New Zealand (Heemstra & Randall, 1993). New South Wales is the centre of the species distributional range in Australia. They are protogynous hermaphrodites (ie change sex from female to male) and at the time of spawning, males establish a harem within their territory. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.

Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting a cave as core territory. Black Rockcod have been observed by divers or caught by anglers in estuaries, including Sydney Harbour. Although the locations of these occurrences have generally been at the mouths of estuaries and involved juvenile fish, there is anecdotal evidence that Black Rockcod have been caught in embayments of the harbour.

The study area is considered to provide suitable habitat for the Black Rockcod in existing piles and wharf structure. None were found during targeted surveys of the wharf piles undertaken by Cardno now Stantec (February 2022).

- 1. In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

The Black Rockcod has potential to be affected by the proposal in the following ways during the construction process:

- Removal and disturbance and habitat (including artificial structure).
- Surface and underwater noise and vibration.

Although the species may have been prevalent in estuaries in the past (NSW Department of Industry and Investment, 2009), it is unlikely that viable populations of Black Rockcod currently occur in the estuary. The few individuals that occur are more likely to be part of one or many populations in nearby coastal areas (ie Cabbage Tree Bay Aquatic Reserve).

The potential loss of individuals from the removal of suitable habitat would be avoided by undertaking dedicated pre-clearance surveys on SCUBA by a suitably experienced specialist (See item B16 of Table 5-1 mitigation measures). Any animals collected would be placed in suitable habitat outside the zone of influence from construction related noise. This should be greater than 175 metres based on the noise assessment (GHD, 2022). Provided these measures are undertaken, the proposal is not therefore considered likely to lead to a long term decrease in the size of the population.

- 2. In the case of an endangered population, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable.

- 3. In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

- (a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

- (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable.

4. *In relation to the habitat of a threatened species, population or ecological community:*

- (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
- (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
- (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality*

As discussed above, Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting areas of high relief rocky reef, such as a cave, for core territory. Although very few, if any, Black Rockcod may occur in suitable suboptimal habitat (within the study area now, more individuals may have occurred there in the past when the species was more prevalent, as there are past reports of many large individuals being caught in estuaries (NSW Department of Industry and Investment, 2009). In the future, if populations of Black Rockcod were to recover, the artificial structure areas in the study area may again become more commonly occupied.

The proposal would directly remove a small proportion of subtidal soft sediment (about 331 square metres) through dredging activities and remove existing wharf structures (ie 61 piles) colonised by habitat-forming species common to subtidal rocky reef habitat. Subtidal soft sediment is considered transient habitat for the Black Rockcod and similar habitat is abundant across the harbour. Piles would be reinstated as part of the new wharf replacing, resulting in additional surface area. Suitable habitat in the study area would also be temporarily disturbed by changes in water quality, increased vessel/barge traffic, piling noise and vibration and anchoring during construction. However, there are no subtidal rocky reef habitat suitable for Black Rockcod in the study area and this species' occupancy is likely to be restricted to the wharf structures and the nearby submerged structures. Habitat removal and disturbance is not considered to result in the fragmentation or isolation of Black Rockcod habitat and the species is likely to move away and return once construction is complete. Thus, the proposal is unlikely to fragment or isolate habitat important to the long-term survival of the species.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

Critical habitat refers only to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for Black Rockcod.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

State and Commonwealth recovery plans have been developed for the Black Rockcod. The specific objectives of the Commonwealth recovery plan are to:

- Mitigate medium and high risk threats to Black Rockcod.

- Initiate and support scientific research to increase knowledge of the distribution, abundance, reproductive biology, life history, ecology, migratory patterns and genetics of Black Rockcod.
- Monitor fishery management strategies where necessary to reduce potential for interaction with Black Rockcod (either directly or indirectly).
- Establish an on-going monitoring program to document the status of Black Rockcod populations and their habitats and to evaluate the effectiveness of recovery actions.
- Provide enhanced compliance and protection for important Black Rockcod habitats.
- Educate the community about the identification of Black Rockcod, increase awareness of the status of and threats to Black Rockcod populations, and enhance community support for recovery actions.
- Improve understanding of the threats to the survival of Black Rockcod and contribute to management actions to ameliorate identified threats.

The key objectives of the recovery plan are to mitigate medium and high risk threats to Black Rockcod. Included among these risks are the loss or degradation of estuarine and intertidal nursery habitats. As the proposal would temporarily impact a very small proportion of Black Rockcod suboptimal habitat in the harbour, it is not considered a substantial loss or degradation of estuarine habitat. Thus, the proposal is not considered to interfere with any recovery objectives for the Black Rockcod.

7. *Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

The KTP of *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams* (FM Act) is of relevance given instream structures would be placed in or adjacent to Black Rockcod habitat. However, these structures are unlikely to substantially alter nearshore natural tidal flow and therefore would not be exacerbated by the project to impact Black Rockcod.

Conclusion

Black Rockcod is known to occur in estuaries, particularly on medium to high relief rocky reefs. The study area does not include these habitats but does include artificial structures which may be used by the species from time to time. The proposal would remove a very small proportion of transient habitat for the Black Rockcod, removal of subtidal wharf structures and temporarily disturb the study area from changes in water quality, minor increase in vessel/barge traffic, piling noise and vibration and anchoring during construction. However, habitat lost from the removal of wharf structures would be reinstated when new structures are installed. High condition habitat occurs in many areas in the harbour outside of the study area and due to the temporary nature of the disturbance, the proposal is unlikely to significantly impact Black Rockcod and a SIS is not required.

***Posidonia australis* seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie - endangered population under the FM Act**

The following questions test whether a proposed development or activity is likely to significantly affect *Posidonia australis*:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable

2. *In the case of an endangered population, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction*

Posidonia australis (*Posidonia*), along with other seagrasses, is an important driver of fisheries productivity in coastal waters and is crucial to the maintenance of estuarine biodiversity. It provides important feeding and refuge areas for many species of fish, molluscs and crustaceans, many of which are targeted commercially and recreationally. Around 0.7 hectares of mixed *Posidonia* and *Zostera* beds occur within the study area to the east, south east of the existing wharf with the nearest patch is around 35 metres from the existing wharf structure. The proposal would not cause any direct impact to these beds, however, there is potential for indirect impacts via the mobilisation of suspended sediments during the construction phase (ie through dredging, pile driving and movements from work barges/vessels). Suspended sediments could potentially impact *Posidonia* by light attenuation (reducing photosynthesis) and or smothering if sediments settled onto the *Posidonia* beds. However, any risks to seagrass would largely mitigated via sediment control devices such as sediment booms and curtains (See item WQ6 of Table 5-1 mitigation measures). These would be installed around the dredge area to contain disturbed sediment from water surface by allowing suspended sediments to settle back to the seabed and prevent dispersion. Furthermore, changes in the configuration of fast ferry berthing at Wharf 3 may provide opportunity for beds of *Posidonia* on the east side of the new wharf to extend and recolonise into areas previously disturbed by scouring (from fast ferry engine thrust). As the east side of the wharf will only be used by small recreational and commercial vessels, and extend into deeper water, the area of disturbance will be significantly smaller.

Work barges or vessels involved in the construction works will also not be permitted to anchor in any seagrass beds or cause prolonged shading over seagrass beds including *Posidonia* (See item B4 of Table 5-1 mitigation measures). Furthermore, all personnel and vessels are to be made aware of the importance of seagrasses and macroalgae and their location in relation to the works. Risk of pollution via vessel spills would also be mitigated via appropriate controls and impact reduction measures as outlined in WQ8.

3. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
 - (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable.

4. *In relation to the habitat of a threatened species, population or ecological community:*
 - (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

- (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
- (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality*

As discussed in item 2, *Posidonia* will not be removed, modified, fragmented or isolated to the extent that it would affect the long term survival of the population. There is opportunity to increase the area of *Posidonia* as part of the future operation of the proposal.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

Critical habitat refers only to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for *Posidonia*.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

Recovery actions for this species include:

- conducting research into the biology and ecology of *Posidonia australis* including cultivation and rehabilitation techniques.
- promoting the replacement of existing moorings within seagrass beds to environmentally friendly moorings.
- avoiding the establishment of new mooring blocks in proximity to *Posidonia australis* plants.
- educating boat owners to avoid anchoring in or mooring boats over fragile *Posidonia australis* beds.
- improving protection for *Posidonia australis* through land use and coastal zone management planning processes.
- ensuring that structures such as jetties, pontoons, berthing areas, boat ramps and slip rails and their associated use avoid shading or physical damage to *Posidonia australis* beds.
- ensuring that dredging and reclamation activities do not directly or indirectly damage *Posidonia australis* beds.
- preventing sedimentation and poor water quality by improving land management practices, conserving and restoring riparian (river bank) vegetation and using effective erosion control measures.
- educating coastal communities about the ecological importance of *Posidonia australis* and ways to assist with its protection and recovery.
- monitoring and assessing the impact of threatening processes affecting the survival of endangered populations of *Posidonia australis*.
- undertaking compliance action where activities cause unauthorised harm to *Posidonia australis* seagrass.

Providing that the sediment control measures identified are adopted, then it would be ensured that dredging would not directly or indirectly damage *Posidonia* beds. The proposal would not therefore interfere with any of the above recommendations.

7. *Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. There are no KTPs relevant to the proposal that have potential to impact on *Posidonia australis*.

Conclusion

Provided that the mitigation measures outlined above are adopted into the proposal's CEMP and implemented, the proposal is unlikely to significantly impact the endangered population of *Posidonia australis* seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie and a SIS is not required.

Significant impact assessment (EPBC Act)

White's Seahorse (*Hippocampus whitei*) – endangered (EPBC Act)

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

(a) Lead to a long-term decrease in the size of population

White's Seahorse has limited geographical distribution in Australia and is endemic to nine estuaries, coastal lakes and embayments from Wallis Lake in the north to Lake Illawarra in the south, along approximately 300 kilometre of the NSW coast (Harasti, et al., 2014). White's seahorse is known to occur at depths of between one and 15 metres and can be found in a wide range of habitat types (both natural and artificial). Natural habitat for White's Seahorse in estuaries includes marine vegetation (ie seagrass, macroalgae on rocky reef and mangroves) as well as sponges and corals (Australian Museum, 2019; Harasti, et al., 2014; Kuitert, 2009). In Sydney, they are often found associated with artificial structures, particularly protective swimming net enclosures and jetty pylons. Their use of artificial habitats appears to be most common in areas where natural habitat (such as seagrass, sponges and soft corals) has been lost (Fisheries Scientific Committee, 2019). The species is found to prefer habitats with dense epibiotic growth and avoids areas devoid of growth, possibly in relation to the greater availability of shelter and prey in these areas (Harasti, Glasby, & Martin-Smith, Striking a balance between retaining populations of protected seahorses and maintaining swimming nets, 2010). Densities in artificial habitats such as swimming nets can be as much as one per square metre, but estimates in natural habitat have been around an order of magnitude less (Harasti, et al., 2012).

The precise number of White's Seahorse with potential to be impacted by the proposal, although likely to be small, is uncertain. The frequent exposure to noise from ferry and other vessel movements / ferry wash may render habitat in the study area suboptimal. Optimal habitat and known populations are found elsewhere in the harbour (ie Clontarf and Manly Cove Tidal Pool).

The potential loss of individuals from the removal of suitable habitat would be avoided by undertaking dedicated pre-clearance surveys on SCUBA by a suitably experienced specialist (see item B16 of Table 5-1 mitigation measures). Any animals collected would be placed in suitable habitat outside the zone of influence from construction related noise. This should be greater than 175 metres based on the noise assessment (GHD, 2022). Provided these measures are undertaken, the proposal is not therefore considered likely to lead to a long term decrease in the size of the population. This would be carried out in consultation with NSW DPI Fisheries as part of a syngnathid management plan.

(b) Reduce the area of occupancy of the species

As indicated above, White's Seahorse may be found in seagrass meadows and artificial structures which are present in the study area. However, it is also likely that the frequent exposure to noise from ferry and other vessel movements / ferry wash may render habitat in the study area suboptimal. Optimal habitat and known populations are found elsewhere in the harbour (ie Clontarf and Manly Cove Tidal Pool).

Impacts from the removal of the existing structure is considered minimal for White's Seahorse. Some of this habitat would be altered but would not be removed from the areas of occupancy for these species. These are also very small proportions of available habitat in their distribution and the installation of new piles and structures would provide a net gain in habitat for these species in the long term. Further enhancement of these habitats may also be beneficial.

Dredging activities would directly impact 17 square metres of low density *Zostera* and *Halophila* within the Wharf 3 berthing pocket. The foraging resource that this represents is small in comparison to the extent of similar habitat available in the study area and locality.

Changes in the berthing configuration at Manly Wharf 3 due to the proposal may also result in a long term net gain in seagrass within the study area.

Thus, the proposal is not considered to reduce the occupancy of the species and may provide a long term net gain in suitable habitat.

(c) Fragment an existing population into two or more populations

As indicated in (a) and (b), the White's Seahorse habitat occurs in nearshore areas in the harbour. This species exhibits high site fidelity and does not have a pelagic juvenile stage. Young are known to either disperse short distances from or simply settle at the birth site. Although this species could occur in the study area, there are multiple known locations in the harbour where juveniles may disperse from. The proposal is not expected to install any structures or alter ferry operations such that potential dispersal corridors along the foreshore would become fragmented or isolated. Thus, the proposal is unlikely to fragment an existing population of White's Seahorse into two or more populations.

(d) Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of a species refers to areas that are necessary for activities such as:

- *Foraging, breeding, roosting, or dispersal*
- *For the long-term maintenance of the species including the maintenance of other species essential to the survival of the species, such as pollinators*
- *To maintain genetic diversity and long-term evolutionary development, or*
- *For the reintroduction of populations or recovery of the species.*

See (a) and (b). The proposal has potential to alter potential, suboptimal habitat for the species. However, some of the lost habitat would be reinstated (in a greater area than that lost) and the remaining habitat would be altered but still be available and considered a potential area of occupancy. Thus, the proposal is unlikely to adversely affect habitat critical to the survival of the White's Seahorse.

(e) Disrupt the breeding cycle of a population

Research found that White's Seahorse displays life-long monogamy, with three pairs observed remaining bonded over three consecutive breeding years (Harasti, et al., 2012). Thus, the loss of any individuals would disrupt the breeding cycle of White's Seahorse. Any individuals occurring within the study area would be relocated prior to construction by a qualified marine ecologist using researched methods to avoid disruption to their lifecycle. Habitat would be selected by a marine ecologist and individuals would only be relocated to nearby, like-for-like habitat (as per advice from NSW DPI (Fisheries)) as part of a syngnathid management plan. Hence, the proposal is unlikely to disrupt the breeding cycle of a population.

(f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

See (b) and (c). The proposal is unlikely to modify, destroy, remove or isolate or decrease the availability of quality of habitat to the extent that the White's Seahorse is likely to decline.

(g) Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat

Use of equipment and movement of vessels and barges have potential to act as vectors for introduced species. Invasive species that would alter White's Seahorse habitat could be introduced via the aforementioned vectors however, proposal controls would be in place to avoid introducing or spreading invasive species. Thus, the proposal is unlikely to introduce or spread invasive species that are harmful to White's Seahorse.

(h) Introduce disease that may cause the species to decline

As per (g).

(i) Interfere substantially with the recovery of the species

There is currently no recovery plan or recommendations for a recovery plan for the White's Seahorse. When this species was initially nominated for listing under the EPBC Act, the Fisheries Scientific Committee had recommended management actions for the White's Seahorse, including:

- Collate and synthesise data collected to quantify the significance of high and moderate risk threat interactions with White's Seahorse (medium priority).
- Reduce the impact of public and private boat moorings that impact on White's Seahorse habitats (high priority).
- Councils to maintain best practice management of protective swimming nets by using the suggested NSW DPI seahorse friendly cleaning methods (high priority)
- Consider information on White's Seahorse distribution, abundance and habitat preferences during development and review of Marine Park Zoning Plans (medium priority).
- Negotiate with relevant authorities to encourage the identification, assessment and modification of natural resource management plans and policies to minimise impacts on White's Seahorse habitats (medium priority).
- Continue to monitor the distribution and abundance of White's Seahorse at important sites (Port Stephens and Sydney Harbour) to inform population status and to assist in determining the effectiveness of recovery actions (high priority).
- Develop and trial artificial habitats to promote recovery of White's Seahorse populations (high priority).
- Implement research using eDNA to investigate the occurrence of White's Seahorse in estuaries and embayments across its range (high priority).
- Implement genetics research to investigate population structure of White's Seahorse across its entire range (NSW and Qld) (medium priority).
- Encourage the reporting of sightings of seahorses along the east coast of Australia to iSeahorse and iNaturalist (medium priority).

The proposal would not interfere with any of the above recommendations. Targeted surveys during pre-construction to capture and relocate the species could be completed in consultation with NSW DPI (Fisheries) to align with some of the above management recommendations.

Conclusion

White's Seahorse is known to be present in Manly Cove. The study area possesses suboptimal habitat for the species and it is not known to disperse (either as adults or juveniles) great distances from the birth sites. Potential habitat in the study area occurs as the submerged sections of the existing artificial structures and existing seagrass beds. The proposal would temporarily remove artificial habitat and result in a small reduction in seagrass. However, lost potential habitat would be reinstated (in a greater area than that lost) and substantial seagrass habitat would still be available and considered a potential area of occupancy. Provided the mitigation controls identified are adopted, the proposal is unlikely to fragment the population of White's Seahorse in the proposal area, disrupt the breeding cycle of the species, introduce or spread invasive species or disease that may adversely impact the species or interfere with any recovery objectives. Thus, the proposal is unlikely to significantly impact White's Seahorse and a SIS is not required.

Black Rockcod (*Epinephelus daemeli*) – vulnerable (EPBC Act)

Black Rockcod, also known as Black Cod or Saddled Rockcod, occurs from southern Queensland to Kangaroo Island in South Australia and are found offshore at Lord Howe Island, Norfolk Island, Kermadec Islands and the North Island of New Zealand (Heemstra & Randall, 1993). New South Wales is the centre of the species distributional range in Australia. They are protogynous hermaphrodites (ie change sex from female to male) and at the time of spawning, males establish a harem within their territory. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.

Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting a cave as core territory. Black Rockcod have been observed by divers or caught by anglers in estuaries, including Sydney Harbour. Although the locations of these occurrences have generally been at the mouths of estuaries and involved juvenile fish, there is anecdotal evidence that Black Rockcod have been caught in embayments of the harbour.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

(a) Lead to a long-term decrease in the size of an important population of a species

Although the species may have been prevalent in estuaries in the past (NSW Department of Industry and Investment, 2009), it is unlikely that viable populations of Black Rockcod currently occur in the estuary but rather a few individuals that occur would form part of one or many important populations in nearby coastal areas. Any Black Rockcod in the harbour are likely to form a very small proportion of an important population of the species, and appropriate proposal controls to complete targeted surveys for individuals prior to water-based construction activities so that individuals could be encouraged away from the study area, would be implemented. Thus, proposal impacts would unlikely impact the species such that an important population of the species would experience a long-term decrease in size.

Thus, the proposal impacts would unlikely impact the species such that an important population of the species would experience a long-term decrease in size.

(b) Reduce the area of occupancy of an important population

As indicated in (a), Black Rockcod are mostly found in caves and gutters in coastal areas thus, the small number of individuals in the harbour are likely to form part of an important population in nearby coastal areas. There is no subtidal rocky reef habitat in the study area but the artificial structures could form habitat for the species albeit suboptimal. The foraging resource that the study area represents would be made available for these Black Rockcod following the completion of construction thus, impacts of the proposal impacts to potential foraging habitat of these Black Rockcod would be temporary.

The proposal would remove the existing jetty which amounts to <0.01 hectares or marine habitat similar to subtidal rocky reefs and disturbance from vessel/barge movement, piling noise and vibration and anchoring would be experienced during construction. The surface area lost from the removal of the existing wharf would be replaced with new wharf structures. The proposal would also remove a very small proportion of subtidal soft sediment (0.03 hectares) during dredging and piling. However, this impact is considered negligible due to the small proportion of removed habitat compared to the available subtidal soft sediment in the harbour.

These impacts are unlikely to permanently reduce the area of occupancy of an important population as the same area of habitat would be made available to this species and the study area would become available for Black Rockcod upon completion of construction.

(c) Fragment an existing important population into two or more populations

As indicated in (a), the small number of individuals in the harbour are likely to form part of an important population in nearby coastal areas. The occupancy of these individuals in the harbour are likely to mostly surround medium to high relief rocky reef areas, as refuges, and open water as transiting areas. The proposal would not install any structures or remove substantial areas of habitat to fragment important populations of Black Rockcod as connectivity in the study area and the wider harbour would be maintained.

(d) Adversely affect habitat critical to the survival of a species

See (b).

(e) Disrupt the breeding cycle of an important population

Black Rockcod are protogynous hermaphrodites (ie change sex from female to male) and at the time of spawning males establish a harem within their territory. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). As indicated in (a), Black Rockcod individuals in the harbour are likely to form part of an important population in nearby coastal areas, the habitat in the harbour is only a small proportion of habitat occupied by the species in its breeding cycle. Since any Black Rockcod in the harbour are likely to form a very small proportion of a viable population of the species, and with the appropriate proposal controls to complete targeted surveys for individuals prior to water-based construction activities to encourage any individuals in the study areas to vacate, proposal impacts would be negligible and would not disrupt the breeding cycle of an important population.

(f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

See (b) and (c).

(g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Use of equipment and movement of vessels and barges have potential to act as vectors for introduced species. However, there are no known invasive species that could be introduced that could directly cause Black Rockcod to decline. Invasive species that would alter Black Rockcod habitat could be introduced via the aforementioned vectors however, proposal controls would be in place to avoid introductions. Thus, the proposal is unlikely to introduce or spread invasive species that are harmful to Black Rockcod.

(h) Introduce disease that may cause the species to decline

As per (g).

(i) Interfere substantially with the recovery of the species

State and Commonwealth recovery plans have been developed for the Black Rockcod. The specific objectives of the Commonwealth recovery plan are to:

- Mitigate moderate and high risk threats to Black Rockcod.
- Initiate and support scientific research to increase knowledge of the distribution, abundance, reproductive biology, life history, ecology, migratory patterns and genetics of Black Rockcod.
- Monitor fishery management strategies where necessary to reduce potential for interaction with Black Rockcod (either directly or indirectly).
- Establish an on-going monitoring program to document the status of Black Rockcod populations and their habitats and to evaluate the effectiveness of recovery actions.
- Provide enhanced compliance and protection for important Black Rockcod habitats.

- Educate the community about the identification of and ‘best practice’ catch and release methods for Black Rockcod, increase awareness of the status of and threats to Black Rockcod populations, and enhance community support for recovery actions.
- Improve understanding of the threats to the survival of Black Rockcod and contribute to management actions to ameliorate identified threats.

The key objectives of the recovery plan are to mitigate medium and high risk threats to Black Rockcod. Included among these risks are that juvenile Black Rockcod are impacted by the loss or degradation of estuarine and intertidal nursery habitats. As the proposal would permanently remove a portion of transient habitat and potential habitat (to be replaced with the installation of the new wharf) and temporarily impact other habitat in the study area, it is not considered a substantial loss or degradation of estuarine habitat. Thus, the proposal is not considered to interfere with any recovery objectives for the Black Rockcod.

Conclusion

Black Rockcod are known to occur in estuaries, particularly on medium to high relief rocky reefs. The proposal would remove/shade a small proportion of potential habitat and cause some temporary disturbance during construction. However, ambient habitat condition would return following construction completion and high condition habitat occurs in many areas in the harbour and the study area only forms a very small proportion of available habitat for important populations of Black Rockcod. Thus, the proposal is unlikely to significantly impact Black Rockcod and an SIS is not required.

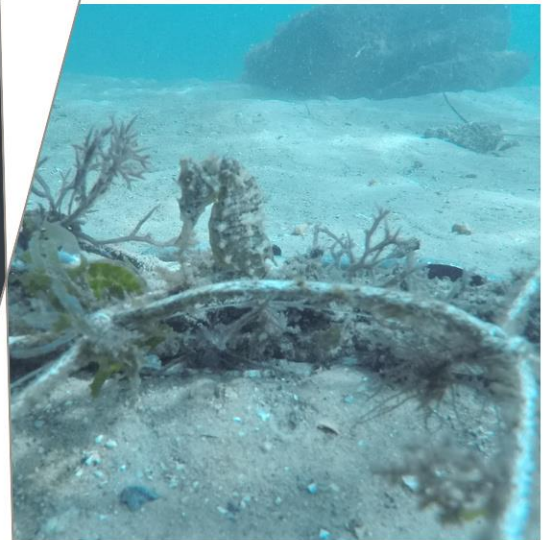
Appendix K

Syngnathid Relocation Plan

Syngnathid Relocation Plan

Manly Wharf 3 Upgrade

NE30165



Prepared for
GHD Pty Ltd on behalf of Transport for New
South Wales

5 September 2022

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Document Information

Prepared for	GHD Pty Ltd on behalf of Transport for New South Wales
Project Name	Manly Wharf 3 Upgrade
File Reference	NE30165_ManlyWharf_SRP _RevB_Final
Job Reference	NE30165
Date	5 September 2022
Version Number	RevB

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Effective Date	5/09/2022
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Date Approved	5/09/2022
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Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
RevA	23/08/2022	Draft for Internal Review	SM/JL	CB
RevB	05/09/2022	Final Report	JL	CB

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Terms

Term	Definition
KFH	Key Fish Habitat
Receiver site	The area selected for all Syngnathid specimens found during the pre-clearance survey to be relocated.
Source site	The area of impact by the proposal where marine vegetation and habitat would be lost or may be indirectly impacted as a result of underwater noise impacts from piling.
Study area	The area of impact by the proposal and the surrounding areas that was investigated as part of the Review of Environmental Factors (GHD, 2022a).

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1 Introduction

Transport for New South Wales (TfNSW) proposes to upgrade Manly Wharf 3 ('the proposal') as part of the Transport Access Program (TAP). TAP is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

1.1 Background

A Review of Environmental Factors (REF) has been prepared to assess the environmental impacts of the proposal under Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) (GHD, 2022a). The REF included the preparation of a Biodiversity Assessment Report (BAR) (Cardno, now Stantec, 2022) which identified and assessed impacts to biodiversity values at Manly Wharf 3 (the study area).

White's Seahorse (*Hippocampus whitei*) and other Syngnathids (Family Syngnathidae) were considered in the BAR to have a high potential to occur in the study area. Suitable habitat such as submerged wharf structures (considered artificial rocky reefs), colonised by macroalgae and invertebrates, and seagrass meadows have been recorded in the study area. Populations of White's Seahorse are known to occur in Sydney Harbour as are other Syngnathids, including various pipefish, seadragons and pipehorses. Syngnathids are cryptic, and difficult to detect and targeted surveys for the BAR using remotely operated vehicle (ROV) undertaken by Cardno, now Stantec in potential habitat (ie piles and seagrass), did not find any individuals. Notwithstanding this, given that habitat is suitable for Syngnathids their presence has been assumed and potential impacts to these species will be managed and minimised accordingly. A Syngnathid Relocation Plan (SRP) is required to mitigate impacts from the proposal to the species and will be included as a chapter in the REF. The removal and installation of wharf structures and an increase in vessel activities, including anchoring, vessel wash and underwater noise from piling during construction were identified as potential impacts to these species in the study area.

1.2 Legislative context

White's Seahorse is listed as endangered under the NSW *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and all other Syngnathids are protected under the same NSW and Commonwealth legislation. The list of Syngnathids and their potential to occur at the study area is included in Appendix A.

1.2.1 Fisheries Management Act 1994

The FM Act contains provisions for the conservation of fish stocks, key fish habitat (KFH), biodiversity, threatened species, populations and ecological communities. The FM Act regulates the conservation of fish, marine vegetation and some aquatic macroinvertebrates and the development and sharing of fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities under Schedules 4, 4A and 5. Schedule 6 lists Key Threatening Processes (KTPs) for species, populations and ecological communities in NSW waters.

The provisions of the FM Act relating to the development approval process (Part 7A) identifies threatened aquatic species, populations and ecological communities and requires a test of significance to determine whether the proposal is expected to have a significant impact on threatened entities. The outcome of the test concluded that no significant impacts to White's Seahorse are expected as a result of the proposal, given the mitigation measures are implemented. Appendix B of the BAR (Cardno, now Stantec, 2022) outlines the tests of significance for the White's Seahorse.

For projects assessed under Division 5.1 of the EP&A Act, the following provisions of the FM Act are relevant to this plan if a public authority (ie Transport for NSW) is the determining authority:

- > Section 199 – the Minister for Primary Industries is to be consulted over any dredging or reclamation works carried out, or proposed to be authorised, by a public authority (other than a local government authority) (i.e. any excavation within, or filling or draining of, water land or the removal of woody debris, snags, rocks or freshwater native aquatic vegetation or the removal of any other material from water land that disturbs, moves or harm these in-stream habitats).

- > A Part 7 permit under the FM Act may be required for the installation of seahorse hotels if impacts to marine vegetation (Section 205) or obstruction of fish passage (Section 219) are expected. However, it is assumed that seahorse relocation would not result in the harm of marine vegetation (Section 205) or the obstruction of free passage of fish (Section 219) thus, permit requirements under these corresponding sections of the FM Act are not required.
- > Section 37 of the FM Act governs any activity that involves taking or possessing fish or marine vegetation that would otherwise be unlawful under the FM Act, including:
 - Science or research collection
 - Aquarium collection.

A permit under Section 37 is required for seahorse relocation unless the proponent is issued a Part 7 permit where NSW Department of Primary Industries (Fisheries) has included requirements for seahorse relocation.

1.2.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES). The significance of impacts on MNES is determined in accordance with the *Significant impact guidelines 1.1 – Matters of National Environmental Significance* (Department of the Environment (DoE), 2013), similar to the test of significance under the FM Act.

The EPBC Act also protects a number of marine-listed species under Section 248. It is an offence to kill, take, trade, keep or move listed species in Commonwealth waters (ie waters beyond the coastal waters of each State). Although a number of Syngnathid species are marine-listed under the EPBC Act, their protection under the Commonwealth legislation does not extent into the study area as it is not located in Commonwealth waters.

Although significant impacts to White's Seahorse as a NSW threatened species and MNES are unlikely and a Species Impact Statement and referral has not been recommended, management measures have been proposed to avoid and minimise potential impacts to these species. The salvage and relocation of Syngnathids prior to the commencement of water-based construction activities was proposed as a management measure. An SRP is required to administer the salvage and relocation of Syngnathids for the proposal.

1.2.3 Relocation guidance

A broader Ferry Wharf Upgrade Seahorse Relocation Plan has been developed in consultation with TfNSW and NSW DPI (Fisheries) in Sydney Harbour. It is noted that best practice for seahorse management in Sydney Harbour is rapidly evolving and relevance of the initial guidance to the proposal below will be discussed with NSW DPI Fisheries.

Initial guidance given for the broader Ferry Wharf Upgrade Seahorse Relocation Plan includes:

- a. For asset maintenance/upgrade activities where the work site contains potential habitat for Syngnathids, an inspection dive must be undertaken within 24 hours of commencing construction or any activities involving habitat disturbance
- b. If any Syngnathids are identified, relocation must be carried out as per Section 3
- c. The relocation site must be a safe distance from the impacts associated with the proposal so that no harm comes to the seahorses during the proposed works
- d. Relocations must occur underwater wherever possible. If Syngnathids require transfer above the surface of the water, NSW DPI Fisheries staff must be consulted
- e. No Syngnathid species are to be harmed during relocation
- f. Syngnathids must be relocated as soon as possible to the release site with minimal handling
- g. Any photography or videography must not delay the relocation of Syngnathids
- h. Syngnathids must not be removed from the water for any reason other than that approved by NSW DPI Fisheries.
- i. Syngnathids must be released directly into the receiving habitat, not into the water column

- j. Seahorse pairs or adjacent groups must be collected in the same bag and transported and released together
- k. Each Syngnathid relocation event must be recorded and reported to NSW DPI Fisheries within two weeks of relocation, including:
 - i. The location of the works
 - ii. The date of the relocation activity
 - iii. The number of Syngnathids collected and relocated
 - iv. The species of Syngnathid, if known
 - v. Where the Syngnathids were moved to, including coordinates
 - vi. The type and condition of the habitat at the relocation site.
- l. Seahorse hotel specifications are:
 - i. Galvanised steel frames of 1x1x0.5 metres
 - ii. Galvanised steel mesh covering with five centimetre apertures
 - iii. Galvanised fixings (avoid using any plastics or cable ties)
 - iv. Two star pickets, two metres long, to secure the seahorse hotels to the seabed
 - v. Rope or netting to provide additional holdfasts for seahorses inside the hotel
 - vi. Rope or brackets to attach seahorse hotels to infrastructure, if required.
- m. The breeding season for White's Seahorse is between September and April. Consultation with DPI Fisheries will be undertaken where construction works occur within this period
- n. If Syngnathids are detected within the work area (ie proposal footprint) during construction, work must cease until a suitably qualified person relocates the Syngnathids to suitable habitat outside the work area.

Table 1-1 Species relocation requirements

Species/ Syngnathid group	Works scenario	Relocation requirements		Stocking density	Habitat in preferential order
		Distance from proposal footprint	Receiver habitat		
White's Seahorse	Tidal pool maintenance or construction of a new asset	Within 100 m	**Posidonia (<i>Posidonia australis</i>) bed or seahorse hotel	<ul style="list-style-type: none"> > 2 seahorses per 1 m2 Posidonia > Maximum 10 seahorses per hotel > Keep mating pairs together 	<ol style="list-style-type: none"> 1. Seahorse hotel 2. **Posidonia
	Asset replacement works (other than tidal pools)	Within 100 m	*Like-for-like or improvement in habitat quality	<ul style="list-style-type: none"> > 2 seahorses per 1 m2 habitat > Keep mating pairs together 	<ol style="list-style-type: none"> 1. **Posidonia 2. Sponges 3. Soft corals 4. <i>Sargassum</i> spp. 5. Kelp 6. <i>Zostera (Zostera muelleri subsp. capricorni)</i>
Other seahorses	Tidal pool maintenance or construction of a new asset	Same embayment	Seahorse hotel if space available following relocation of any White's Seahorses	Maximum 10 seahorses in total per hotel (including all species)	<ol style="list-style-type: none"> 1. Seahorse hotel 2. Sponges 3. Kelp 4. <i>Sargassum</i> spp. 5. Seagrass
	Asset replacement works (other than tidal pools)	Same embayment	*Like-for-like or improvement in habitat quality	Keep mating pairs together	<ol style="list-style-type: none"> 1. Sponges 2. Kelp 3. <i>Sargassum</i> spp. 4. Seagrass
Seadragons	Tidal pool maintenance or construction of a new asset	Same embayment	*Like-for-like or improvement in habitat quality	Keep mating pairs together	<ol style="list-style-type: none"> 1. Sponges 2. Kelp
	Asset replacement works (other than tidal pools)				
Pipefish and pipehorses	Tidal pool maintenance or construction of a new asset	Same embayment	*Like-for-like or improvement in habitat quality	Keep mating pairs together	<ol style="list-style-type: none"> 1. Seagrass 2. Sponges 3. Macroalgae
	Asset replacement works (other than tidal pools)				

1.3 Syngnathid biology and ecology

The family Syngnathidae includes seahorses, seadragons, pipefish and pipehorses. All of these species groups have tiny mouths at the end of a tubular snout and semi-flexible bodies encased in bony rings (Museums Victoria, 2022). Syngnathids lack fin spines and pelvic fins and other fins may be reduced or absent. Colour pattern and body ornamentation vary between species but most species are cryptically coloured to match their surroundings with some adorned with appendages to enhance their camouflage. Species in this family range in size from less than 10 millimetres to over 65 centimetres, although most species are relatively small. Seahorses differ from other species groups in having a head at a 90 degree angle to the body axis and a distinctly prehensile tail.

Syngnathids are carnivores and mostly feed on small benthic and pelagic crustaceans (Museums Victoria, 2022). Many seahorses and pipefishes form monogamous pairs and perform daily greeting rituals during the breeding season. The unique reproductive strategy involves the female depositing eggs into an abdominal brood pouch/modified body part of the male where the eggs are incubated and nourished until hatching. Syngnathid larvae resemble miniature adults and are planktonic.

Over 340 species of this family have been identified across the world belonging to 50 genera (Museums Victoria, 2022). Forty genera are recognised in Australian waters and found in marine tropical to temperate waters, mostly at depths above 50 metres. Some species have been recorded in freshwater and estuarine waters and deeper shelf and upper slope waters. Syngnathids are mostly benthic and occur on macroalgae and coral reefs, seagrass beds, sandy and rubble substrates, artificial structures and, on the rare occasion, on macroalgae rafts offshore.

1.3.1 White's Seahorse biology and ecology

The appearance of White's Seahorse can vary between a pale brown to almost black with pale spots/striations often at the first, fourth and eight trunk rings and on tail rings where spines are enlarged (Museums Victoria, 2022). This species can also appear as entirely yellow. It possesses a dorsal, anal and pectoral fin and, like other Syngnathid species, bony rings. It can grow up to 20 centimetres (nose and tail). Males and females form monogamous pairs and breed from spring to autumn (September to April (Harasti, et al., 2010)). Males can 'birth' up to 150 independent larvae, usually at night, following a three week gestation period. Males may receive a new batch of eggs the following day and carry up to seven broods during the mating season. Larvae are not pelagic and generally settle in nearby areas (Harasti, et al., 2012).

This species occurs from north of Mackay in Queensland to Sussex Inlet in NSW although juveniles have been recognised in more southerly areas in association with macroalgae rafts (Museums Victoria, 2022). White's Seahorse inhabits estuaries, bays and harbours, in seagrass meadows, macroalgae, soft corals, gorgonians, sponges growing on reefs, piers, jetties and seaside pool netting. Individuals live in small overlapping ranges. The average range of an individual is about 8.3 m although some have been recorded to move up to 60 m (Harasti, et al., 2010).

2 Source and receiver sites

A description of the study area, source sites and the receiver sites for the proposal are included in this section.

Two receiver sites have been identified and listed in order of preference to provide the flexibility for avoiding undesirable stocking densities and should conditions change from that recorded during the most recent survey. The identification of receiver sites is based on habitat available in the study locality. DPI Fisheries have been consulted in reference to potential receiver sites, upon guidance the receiver sites may change.

The description of the study area was extracted from the BAR prepared for the proposal.

2.1 Study area

An overview of the wharf upgrade work, marine vegetation and habitat in the study area are shown in Figure 2-1 to Figure 2-6.

The study area was comprised of a mosaic of seagrass, unvegetated soft sediment, sparse rocky rubble colonised by macroalgae (mainly *Ecklonia radiata*) and artificial structures (ie subtidal/intertidal wharf piles and structures) (Figures 2-1 to 2-6). The subtidal and intertidal habitats surveyed within the study area are described below.

The vertical piles of the existing wharf were colonised by species commonly found on subtidal rocky reefs. Subtidal sections of the wharf piles were heavily encrusted with a thick layer of marine growth consisting of various ascidians (mainly *Pyura stolonifera*), macroalgae (mainly *Ecklonia radiata* and *Padina* sp.) and *Corallina* sp. (Figure 2-1). The subtidal portions of the wharf piles were also colonised by soft corals (*Carijoa* sp.). Given the subtidal areas on piles and structures in the study area are considered suitable Syngnathid habitat it is considered a source site for collections.



Figure 2-1 Typical communities and condition of vertical wharf piles in the study area

Subtidal soft sediment habitat occupied that largest area in the study area (about 3 hectares) and mostly comprised of bare sand and shell grit in the deeper areas (Table 2-1 and Figure 2-6). Rock rubble that had settled on the sandy seabed were observed in this habitat closest to shore. These consolidated materials provided an attachment surface for macroalgae. These 'reef communities' have potential to mobilise during inclement weather or from vessel wash thus, are considered part of the unconsolidated soft sediment landscape.

No visible epifauna (ie fauna that lives on the surface of the seafloor) were observed during this survey, however, sediment bioturbation indicated the presence of burrowing infauna (Figure 2-6). Unvegetated soft sediment habitats are not considered optimal Syngnathid habitat although there are some patches of marine vegetation growing within these that have been included as source sites in this plan for completeness (see Figure 2-6.).

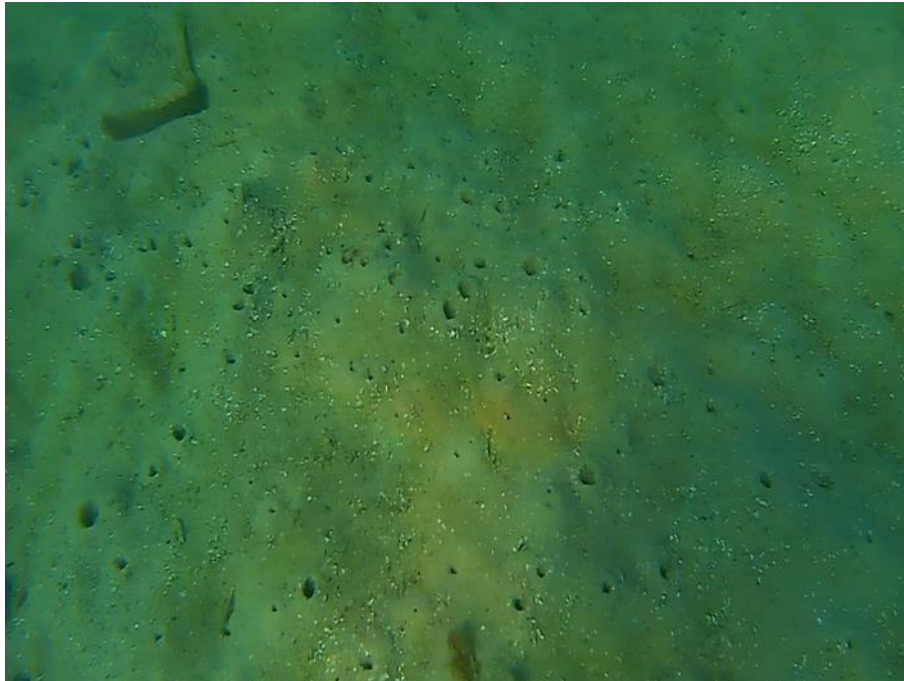


Figure 2-2 Typical soft sediment habitat in the near shore and deeper areas of the study area, with evidence of bioturbation

About 1.7 hectares of seagrass was recorded subtidally within the study area. Seagrass was generally observed east and south-east of the wharf which included monospecific patches of *Posidonia*, *Zostera* and *Halophila* as well patches with a mix of these species (Figure 2-3). Sparse *Zostera* and *Halophila* was also observed on the northern slope of the existing Wharf 3 berth pocket. Approximate areas of seagrass and macroalgae mapped during the field survey are presented in Table 2-1. *Halophila* was the dominant seagrass recorded (Table 2-1) and was often found co-occurring with other species (Figure 2-3). The invasive marine alga *Caulerpa taxifolia* (*Caulerpa*) was observed within the study area, often co-occurring with other seagrasses. About 0.01 hectares of macroalgae (mainly *Ecklonia radiata*) was mapped within the study area in proximity to the wharf (not including macroalgae communities attached to wharf piles). These macroalgae were attached to rocky rubble and small boulders, which may mobilise under strong swell conditions.



Figure 2-3 Co-occurring medium density Posidonia/Zostera and low density Halophila

The foreshore included subtidal sands below the sandstone seawall which borders the study area (Figure 2-4) and amounts to about 3 hectares (Table 2-1). The intertidal habitat present on wharf structures included the upper portions of the wharf pylons which were heavily encrusted by Sydney Rock Oysters (*Saccostrea glomerata*) and barnacles (Figure 2-5). The intertidal areas on piles and structures in the study area is not considered suitable Syngnathid habitat however, individuals may be found in these areas when inundated and have been included as a source site for completeness (in the event these areas are inundated during the inspection dive).



Figure 2-4 Sandflats and vertical seawall near the study area



Figure 2-5 Typical communities and condition of intertidal timber wharf piles in the study area

Habitat on existing piles are considered Type 2 – Moderately sensitive KFH as they meet the descriptions of estuarine rocky reefs and macroalgae were observed on these structures (NSW DPI, 2013). Intertidal and subtidal soft sediment areas are considered Type 3 – Minimally sensitive KFH as these areas were characterised by unstable or unvegetated sand. All seagrass meadows are considered Type 1 – Highly sensitive KFH attributed to the presence of Posidonia, Zostera and Halophila in areas larger than five square metres. KFH types within the study area are summarised in Figure 2-7.

Table 2-1 Areas of marine vegetation and habitat in the study area

Marine vegetation and habitat	Area in the study area (hectares)
Seagrass – Type 1 KFH	1.7 ha Dominant species of seagrass: Posidonia/Zostera – 0.3 ha Posidonia/Halophila – 0.3 ha Posidonia/Zostera/Halophila – 0.1 ha Zostera – 0.1 ha Zostera/Halophila – 0.1 ha Halophila – 0.8 ha
Macroalgae* (mapped only) – Type 2 KFH	0.01 ha
Subtidal soft sediment – Type 3 KFH	3 ha
Total	~4.7 ha

*Not inclusive of marine vegetation attached to piles



Marine Habitat in the Study Area

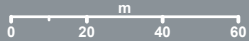
MANLY COVE, NSW

Legend

- Study Area
- Dominant Species of Seagrass**
- Posidonia/Zostera
- Posidonia/Halophila
- Posidonia/Zostera/Halophila
- Zostera
- Zostera/Halophila
- Halophila
- Posidonia Present
- Macroalgae and Soft Sediment**
- Macroalgae
- Subtidal Soft Sediment

FIGURE 2-6

1:2,000 Scale at A4





Key Fish Habitat in the Study Area

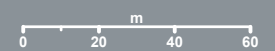
MANLY COVE, NSW

Legend

- Study Area
- Key Fish Habitat**
- Type 1
- Type 2
- Type 3

FIGURE 2-7

1:2,000 Scale at A4



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Map Produced by Stantec Australia Pty Ltd (WOL)
 Date: 2022-08-05 | Project: NE30165
 Coordinate System: GDA 1994 MGA Zone 56
 Map: NE30165-GS006-MEW-MarineHabitat-KFH.mxd 02
 Aerial imagery supplied by MetroMap (June, 2022)

2.2 Source sites

The areas illustrated in Figure 2-8 are considered potential source sites and would be directly impacted as a result of proposal activities. This would include the demolition area including around 61 subtidal piles and associated wharf structures and the macroalgae and soft sediment within the dredge area. In addition to this, retained subtidal piles beneath the Manly Wharf 3 outdoor bar and dining area and retained fender piles would also be included in the pre-construction inspection if this area is inundated at the time of inspection due to the proximity to potential permanent temporal shifts (PTS) effects (GHD, 2022b) during piling (either vibratory or impact piling).

It should also be noted that if low impact piling is utilised, further consultation with NSW DPI Fisheries on source and receiver sites should be undertaken.

Estimated total areas (where calculated) of expected direct impact on subtidal habitat are presented in Table 2-2.

Table 2-2 Areas of marine vegetation and habitat to be impacted by the proposal

Impact (direct/indirect)	Marine vegetation and habitat	Area to be impacted/removed (square metres)
Direct	Demolition area: vertical submerged marine vegetation/habitat	61 piles containing marine vegetation (~512 square metres of structures to be removed, above seabed area)
Direct	Dredge area: mapped macroalgae attached to the rubble/rocks and subtidal soft sediment	~48 square metres (macroalgae) and ~331 square metres of subtidal soft sediment



Potential Source Sites

MANLY COVE, NSW

Legend

- Study Area
- Dredging Area
- Demolition Area
- Compound Area
- New Wharf Structure
- 80% Pile Arrangement**
 - Arrestor
 - Mooring and Berthing Piles
 - Separator Piles
 - Steel Support Piles
- Dominant Species of Seagrass**
 - Posidonia/Zostera
 - Posidonia/Halophila
 - Posidonia/Zostera/Halophila
 - Zostera
 - Zostera/Halophila
 - Halophila
 - Posidonia Present
- Macroalgae and Soft Sediment**
 - Macroalgae
 - Subtidal Soft Sediment

FIGURE 2-8

1:2,000 Scale at A4



2.3 Receiver sites

As per Table 1-1, potential receiver sites within 100 metres would include retained eastern piles below the Manly Wharf 3 outdoor bar and dining area (>12 metres from piling and the source of underwater noise), various beds medium density Posidonia south-east of the current Wharf structure (all mapped Posidonia beds are more than 12 metres from the nearest proposed pile location). Another potential receiver site considered would be the Manly Cove Tidal Pool netting, about 85 metres from the western proposal's western edge. Potential receiver sites are presented in Figure 2-9.

Receiver sites will be subject to the outcome of consultation with NSW DPI Fisheries.



Potential Receiver Sites

MANLY COVE, NSW

- Legend**
- Study Area
 - Dredging Area
 - Demolition Area
 - Compound Area
 - New Wharf Structure
 - Potential Receiver Site
- 80% Pile Arrangement**
- Arrestor
 - Mooring and Berthing Piles
 - Separator Piles
 - Steel Support Piles
- Dominant Species of Seagrass**
- Posidonia/Zostera
 - Posidonia/Halophila
 - Posidonia/Zostera/Halophila
 - Zostera
 - Zostera/Halophila
 - Halophila
 - Posidonia Present
- Macroalgae and Soft Sediment**
- Macroalgae
 - Subtidal Soft Sediment

FIGURE 2-9
1:2,500 Scale at A4

3 Relocation methodology

The methodology and relocation specifics presented in this section apply to all locations. The methodology is focused on the salvage and relocation of White’s Seahorse however, it is also applicable to all other species of Syngnathids.

3.1 Reporting

As per the relocation guidance (see Section 1.2.3), each Syngnathid relocation event must be recorded and reported to NSW DPI Fisheries within two weeks of relocation, including:

- > The location of the works
- > The date of the relocation activity
- > The number of Syngnathids collected and relocated
- > The species of Syngnathid, if known
- > Where the Syngnathids were moved to, including coordinates
- > The type and condition of the habitat at the relocation site.

A reporting proforma template has been included in Appendix B.

Records of the threatened White’s Seahorse must also be registered in the NSW DPI Fisheries ‘Report a threatened species’ database (<https://www.dpi.nsw.gov.au/fishing/threatened-species/report-it>) within the same timeframe as the above reporting requirements.

3.2 Relocation methods

Table 3-1 presents the two Syngnathid relocation methods in order of preference.

Table 3-1 Syngnathid salvage and relocation methods

Method	Prepare	Salvage	Release
In-situ Relocation Method	<ul style="list-style-type: none"> > Zip-lock bags 20x19 centimetres or larger for storing individuals or pairs of Syngnathids. > Catch bags for storing zip-lock bags. > Waterproof paper/tags to label size of individuals and location/habitat where they were salvaged from. > Underwater pencil and slate. 	<ul style="list-style-type: none"> > Two divers search all potential Syngnathid habitat identified as source sites in Section 2. Divers are to wear gloves when salvaging Syngnathids. > Syngnathids located will be captured by hand and placed in an extended catch bag or similar so that individuals are not injured from crushing or abrasion (e.g. storing individuals in zip lock bags filled with water and then placed in the catch bag). > Pairs or nearby groups of individuals are not to be separated and are to be placed in the same bag. 	<ul style="list-style-type: none"> > Salvage divers are to take note of habitat and habitat condition where Syngnathids are found so that individuals can be relocated to like-for-like habitat at receiver sites. > Individuals must be carefully placed in the receiving habitat as close to the seafloor or structure as possible and observed to be responsive to stimulus or have attached to benthic habitat features.

Method	Prepare	Salvage	Release
Alternative Relocation Method (for when Syngnathids cannot be safely relocated underwater by divers)	<ul style="list-style-type: none"> > Zip-lock bags 20x19 centimetres or larger for storing individuals of pairs of Syngnathids. > Catch bags for storing zip-lock bags. > Waterproof paper/tags to label size of individuals and location/habitat where they were salvaged from. > Underwater pencil and slate. > Large buckets (≥20 litres; receiving tanks) filled with water and macroalgae from the source site will be prepared in anticipation of salvaged Syngnathids. > The amount of macroalgae in the receiving tanks should occupy about 25 per cent of the volume of the tank. > Receiving tanks should be aerated and fitted with a digital thermometer. The aerator should not create turbulence in the water. > A dive supervisor on land/onboard will monitor the tanks and complete a water change (from the source location) if water temperatures fluctuate more than one degree Celsius. 	<ul style="list-style-type: none"> > Two divers search all potential Syngnathid habitat identified as source sites in Section 2. Divers are to wear gloves when salvaging Syngnathids. > Syngnathids located will be captured by hand and placed in an extended catch bag or similar so that individuals are not injured from crushing or abrasion (e.g. storing individuals in zip lock bags filled with water and then placed in the catch bag). > Pairs or nearby groups of individuals are not to be separated and are to be placed in the same bag. > At the end of each dive, salvaged Syngnathids are to be transferred to receiving tanks, taking care to keep them inundated at all times and handled as less as possible. > The maximum density of one receiving tank is 10 individuals. > If multiple dives are required to salvage Syngnathids, then a second dive team should be deployed to relocate individuals where possible. This is aimed to reduce stress on individuals in the receiving tanks. > The dive supervisor onshore will monitor the captured seahorses for signs of stress and complete a water change if stress is detected or water temperatures fluctuate more than one degree Celsius. Water changes should be done with care and not disturb captured Syngnathids. 	<ul style="list-style-type: none"> > Salvage divers are to take note of habitat and habitat condition where Syngnathids are found so that individuals can be relocated to like-for-like habitat at receiver sites. > Individuals must be carefully placed in the receiving habitat as close to the seafloor or structure as possible and observed to be responsive to stimulus or have attached to benthic habitat features. > If salvaged Syngnathids need to be transported by a vessel or vehicle to the receiver site, this should be done as soon as practicable (e.g. deploy a second dive team to release individuals). Care must also be taken during transit to create as little disturbance to the receiving tanks as possible. Receiving tanks are to be covered by perforated lids during transit and remain aerated.

3.3 Equipment and personnel

Syngnathid relocation must be completed by a pre-qualified section 37 permit-holder company. The relocation should be completed by a marine ecologist or biologist certified as a scientific diver or commercial diver with extensive experience in subtidal habitat surveys and animal handling.

The equipment requirements for Syngnathid relocation include:

- > Buckets (≥20 litres)
- > Aerators
- > Digital thermometers
- > SCUBA dive equipment
- > Sanitised dive gloves
- > Catch bags and zip lock bags
- > Underwater slate and pencil
- > Relocation records
- > Dive camera (optional)
- > Vessel/vehicle (if required).

3.4 Timing

Inspection dives to salvage Syngnathids are to be completed within 24 hours of the commencement of water-based construction activities. The timing of construction activities will be discussed with NSW DPI Fisheries.

Installation of silt curtains (if require to protect receiver sites) must take place immediately after the inspection dive to salvage and relocate Syngnathids. Relocation of Syngnathids should be completed immediately before or after the installation of silt curtains around the proposal footprint, if proposed. This would prevent any Syngnathids located outside the proposal footprint from dispersing to the proposal footprint during construction activities. This assumes silt curtain installation would not impact (e.g. scour) any marine vegetation outside of the defined proposal footprint.

3.5 Adaptive management

Syngnathid relocation is best carried out during clear skies and water and calm seas. It is not recommended to complete relocation in poor visibility or during inclement weather, upon which relocation activities should be delayed until more suitable conditions arise.

All Syngnathid injury or mortality must be reported to NSW DPI Fisheries. Any injured Syngnathids should be taken to SEA LIFE Sydney Aquarium. It is recommended to alert the staff at SEA LIFE Sydney Aquarium of the arrival of injured Syngnathids to avoid delays in treating injuries. Injured individuals should be handled and transported as per the methods in Section 3.2.

Updates to this plan must be clearly differentiated in the appropriate sections and approved by Transport for NSW and NSW DPI Fisheries.

3.6 Additional requirements

Exclusion areas are to be established to demarcate all receiver sites that Syngnathids have been relocated to (e.g. use of silt curtains or booms, or mapped on sensitive area plans) prior to commencement of water-based construction activities.

The installation of seahorse hotels, if required, require (water) landowners consent. However, in the case of installing on Transport for NSW (water) land, a licence to occupy is not required if the seahorse hotel is attached to an existing structure within an existing lease. This assumes the installation and persistence of the structure would not impact (e.g. scour) any marine vegetation (particularly seagrass).

3.7 Occupational health and safety requirements

Inspection divers must hold a scientific diving or commercial diving licence as a minimum.

Only serviced and fully-operational SCUBA equipment is to be used. All other equipment listed in Section 3.3 are to be cleaned and sanitised before each relocation event. Cleaning agents used must be aquarium-grade and safe to use for Syngnathids.

All field work would be undertaken under an appropriate Safe Work Method Statement in accordance with Transport for NSW's health, safety and environment requirements. No divers are to enter the water if ferries are still operational at the proposal footprint.

4 References

- Cardno, now Stantec. (2022). Manly Wharf 3 Upgrade – Biodiversity Assessment Report. Prepared for GHD Pty Ltd.
- Connell, S., & Gillanders, B. (2007). *Marine Ecology*. Melbourne, Victoria: Oxford University Press.
- Department of the Environment (DoE). (2013). *Significant impact guidelines 1.1 – Matters of National Environmental Significance*.
- Eyre, B., & Ferguson, A. (2005). Benthic metabolism and nitrogen cycling in a subtropical east Australian estuary (Brunwick): temporal variability and controlling factors. *Limnology and Oceanography*, 50, 81-96.
- Gadd, G., & Griffiths, A. (1977). Microorganisms and heavy metal toxicity. *Microbial Ecology*, 4, 303-317.
- GHD. (2022a). Manly Wharf 3 Upgrade – Review of Environmental Factors. Prepared for Transport for New South Wales.
- GHD. (2022b). Manly Wharf 3 Upgrade – Underwater noise impact assessment. Prepared for Transport for New South Wales.
- Harasti, D., Glasby, T., & Martin-Smith, K. (2010). Striking a balance between retaining populations of protected seahorses and maintaining swimming nets. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20, 159-166.
- Harasti, D., Martin-Smith, K., & Gladstone, W. (2012). Population dynamics and life history of a geographically restricted seahorse, *Hippocampus whitei*. *Journal of Fish Biology*, 81, 1297-1314.
- Ivesa, L., Chapman, M., Underwood, A., & Murphy, R. (2010). Differential patterns of distribution of limpets on intertidal seawalla: experimental investigation of the roles of recruitment, survival and competition. *Marine Ecology Progress Series*, 407, 55-69.
- Museums Victoria. (2022). *Fishes of Australia*. Retrieved 2022, from <http://fishesofaustralia.net.au>
- NSW DPI. (2013). *Policy and Guidelines for Fish Conservation and Management*. Wollongbar, NSW: NSW DPI.

APPENDIX

A

SYNGNATHID SPECIES



now



Scientific Name	Common Name	Habitat requirements	Potential to occur
<i>Acentronura tentaculata</i>	Shortpouch Pygmy Pipehorse	This species is found on tropical inshore reefs. It also occurs in temperate waters associated with shallow sandflats in protected and somewhat silty coastal areas among sparse low plant growth and in algae on rocks. This species inhabits waters of 7-40 metres in depth. Pipefishes feed on small living crustaceans.	✓
<i>Festucalex cinctus</i>	Girdled Pipefish	Endemic to tropical and temperate waters of the Northern Territory, Queensland and New South Wales. Usually inhabits sheltered coastal bays and estuaries, on patches of rubble, sand or in areas of sparse seagrass, algal and sponge growth. Most specimens were dredged or trawled in depths of 8-31 metres but divers collected some specimens over rubble bottoms in depths of 12 m. In Sydney Harbour it is most common in depths of 10-20 m.	✓
<i>Filicampus tigris</i>	Tiger Pipefish	The tiger pipefish is relatively common in subtropical waters of Australia's east and west coasts. A relic population also occurs in the warmer waters of Spencer Gulf, South Australia. Inhabits areas near channels in inshore sheltered bays and estuaries with sandy or muddy bottoms, or along seagrass bed edges at 2-30 m. Feeds on aggregations of mysid shrimps in sheltered bays adjacent to tidal channels.	✓
<i>Heraldia nocturna</i>	Upside-down Pipefish	Endemic to temperate waters of southern and south-eastern Australia, from about Hastings, New South Wales, southwards to Victoria, to Port Davey on the west coast of Tasmania, westwards through South Australia to Geographe Bay, Western Australia. Upside-down Pipefish inhabit sheltered inshore rocky reefs in harbours, bays and coves where they are found under ledges, in holes, crevices and small caves at 2-30 m.	✓
<i>Hippichthys penicillus</i>	Beady Pipefish	Widespread in the tropical Indo-west-central Pacific, from the Red Sea and East Africa across the Indian Ocean to north-eastern Australia, north to Taiwan, Japan, Micronesia and east to Samoa and Tonga. This species usually inhabits brackish waters in mangrove estuaries, tidal creeks and sometimes in freshwater reaches in the lower parts of rivers and streams.	✓
<i>Hippocampus abdominalis</i>	Big-belly Seahorse	Known from temperate waters of New Zealand and southern Australia, where it occurs from about South West Rocks, New South Wales, southwards to the northern Great Australian Bight, South Australia, and south to the Derwent Estuary, Tasmania. Big-belly Seahorses live in a range of habitats from low rocky reefs in shallow estuaries, to deep tidal channels and deeper coastal reefs to 100 m. They cling to seagrasses, sponges, macroalgae such as kelp holdfasts and other structures on reefs.	✓
<i>Hippocampus whitei</i>	White's Seahorse	Endemic temperate Australian species found only between Forster and Wollongong, NSW. White's seahorse inhabits shallow inshore areas in estuaries, harbours and bays, where it lives on rocky reefs, sponges, seagrass beds, and under piers and jetties to 25 m. This species is listed as endangered under the FM and EPBC Acts.	✓

Scientific Name	Common Name	Habitat requirements	Potential to occur
<i>Histiogamphelus briggsii</i>	Crested Pipefish	<p>Endemic to temperate waters of south-eastern Australia, from New South Wales, south to Victoria and Tasmania, and westwards to Gulf St Vincent.</p> <p>Crested pipefish inhabit inshore sandy areas, singly or in small aggregations, often amongst detached seaweed or along the margins of Posidonia seagrass beds and in open sandy areas at 3–20 m; most common in Bass Strait.</p>	✓
<i>Lissocampus runa</i>	Javelin Pipefish	<p>Endemic to temperate waters of southern and eastern Australia; known from southern Qld, southwards to Tasmania, and across to about Rottnest Island, south-western Australia. Usually inhabits tidepools and sheltered bays, usually in seagrass and algal beds, and rocky and shelly rubble substratum to about 20 m.</p>	✓
<i>Maroubra perserrata</i>	Sawtooth Pipefish	<p>Endemic to temperate southern Australian waters from southern Queensland to Rottnest Island, Western Australia. The sawtooth pipefish inhabits coastal rocky reefs at 3-25 m, sheltering beneath ledges and in caves during day.</p>	✓
<i>Notiocampus ruber</i>	Red Pipefish	<p>Endemic to temperate waters of southern and south-eastern Australia from Sydney Harbour, New South Wales, south and west to Flinders Island in Bass Strait, Tasmania, Victoria, South Australia and the Recherche Archipelago, Western Australia; usually inhabits rocky reefs, often in crevices, in association with sponges and encrusting and filamentous red algae at 5–20 m.</p>	✓
<i>Phyllopteryx taeniolatus</i>	Weedy Seadragon	<p>Endemic to temperate coastal waters of southern Australia, from about Newcastle (New South Wales) south to Actaeon Island (Tasmania) and across southern Australia to about Geraldton (Western Australia).</p> <p>Common seadragons inhabit shallow estuaries to deeper offshore reefs, living seagrass beds and on rocky reefs covered in macroalgae, especially kelp beds, in depths of 1-50 m. Individuals usually remain within a broad home range.</p>	✓
<i>Solegnathus spinosissimus</i>	Spiny Pipefish	<p>Known from temperate waters of Australia and New Zealand. In Australian waters, spiny pipefishes have been recorded from off Caloundra, southern Queensland, to southern Tasmania, throughout Bass Strait to south of Cape Otway, Victoria. In the southern part of their range, Spiny Pipefishes inhabit relatively shallow waters. Specimens have been collected from muddy, silty, shelly and rubble substrates, and rocky reefs, and may be washed ashore after storms. Spiny Pipefishes use their prehensile tails to cling to macroalgae and sessile invertebrates on the substrate.</p>	✓
<i>Solenostomus cyanopterus</i>	Robust Ghost Pipefish	<p>Widespread in the tropical Indo-west Pacific, from East Africa and the Red Sea, eastwards to Fiji and southern Japan, and south to Australia. Known in Australian waters from the Shark Bay region, Western Australia, around the tropical north and southwards to at least Sydney Harbour, New South Wales. Robust Ghost Pipefish live in protected coastal and lagoon reefs, deeper coastal reefs and deep, clear estuaries with seagrass or macro-algae in 15-25 m.</p>	✓

Scientific Name	Common Name	Habitat requirements	Potential to occur
<i>Solenostomus paradoxus</i>	Ornate Ghost Pipefish	Widespread in tropical and warm-temperate regions of the Indo-west Pacific, from East Africa, eastwards to Fiji and Tonga, north to southern Japan, south to Australia and New Caledonia. Ornate ghost pipefish inhabit protected coastal, lagoon and outer reef areas with drop-offs or rock faces, in depths of 3-35 m. They often associate with Crinoids (featherstars), Gorgonians and black corals. Although usually solitary, they may be seen in pairs, or even in small groups.	✓
<i>Stigmatopora argus</i>	Spotted Pipefish	Found from the Hawkesbury River, NSW to Shark Bay, WA in temperate waters. Usually among vegetation in bays and estuaries, but sometimes offshore among floating Sargassum.	✓
<i>Stigmatopora nigra</i>	Widebody Pipefish	Known from temperate waters of southern Australia and New Zealand. The Widebody Pipefish occurs from about Fraser Island in southern Queensland to north of Perth (Western Australia), and around Tasmania. It is common in sheltered seagrass and algal beds from intertidal depths to 35 m.	✓
<i>Syngnathoides biaculeatus</i>	Double-end Pipefish	In Australian waters, known from Geraldton to Shark Bay, and north to Ashmore and Cartier Reefs, Western Australia, and from the Timor Sea, the Northern Territory, eastwards to Queensland and south to Batemans Bay (NSW). Inhabits shallow, protected waters of bays, lagoons and estuaries including mangrove areas, in association with seagrass beds and macroalgae in depths at 0-10 m. Juveniles sometimes found clinging to floating algae and plant debris including Sargassum sp. rafts.	✓
<i>Trachyrhamphus bicoarctatus</i>	Bentstick Pipefish	Widespread in the tropical Indo-west Pacific. Bentstick Pipefish are known in Australian waters from the central coast of Western Australia, northwards throughout the waters of the Northern Territory and Queensland to central New South Wales. They live in sheltered coastal lagoon and reef areas on sandy and rubble habitats amongst seagrasses and macroalgae at 1-30 m.	✓
<i>Urocampus carinirostris</i>	Hairy Pipefish	In Australia, known from the Shoalwater Bay region (Queensland) to northern Tasmania, Victoria, and to the Ceduna region of South Australia, and in south-western Australia where it reaches the Perth region. Rare in South Australia. Inhabits the lower reaches of rivers, sheltered estuaries and shallow reefs in seagrass and algal beds a 0-6 m. One of the most common estuarine pipefishes in eastern Australia, occurring year-round in seagrass beds in Western Port (Victoria), and abundant in seagrass beds in Moreton Bay (Queensland).	✓
<i>Vanacampus margaritifer</i>	Mother-of-Pearl Pipefish	Endemic to sub-tropical and temperate Australia, from North Stradbroke island, Queensland, southwards to Jurien Bay, Western Australia, absent from Tasmania. Inhabits shallow estuarine and coastal waters in seagrass beds), macroalgae (Ecklonia spp. and other brown algae), rocky reef, boulder, rubble, sandy and muddy habitats between 2-15 m.	✓

APPENDIX

B

RELOCATION RECORD PROFORMA



now



FWUP location (select)	Manly Wharf
Salvage sites	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>

	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
Receiver sites	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>

	<p>Name:</p> <p>Easting:</p> <p>Northing:</p> <p>Description:</p>
Salvage and release team	<p>Diver 1:</p> <p>Diver 2:</p> <p>Diver 3:</p> <p>Diver 4:</p>
Date	
Weather and sea conditions	
Syngnathid records	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>
Syngnathid records	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>

Syngnathid records	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>
	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>
	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>
	<p>Identifier:</p> <p>Species:</p> <p>Salvage area name:</p> <p># of individuals:</p> <p>Release area name:</p> <p>Notes:</p>