



Transport
for NSW

Barangaroo Ferry Hub

Submissions Report



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Abbreviations and definitions

BCA requirements	Building Code of Australia requirements
BDA	Barangaroo Delivery Authority
CBD	Central Business District
CEMP	Construction Environmental Management Plan
City of Sydney	City of Sydney Council
CLP	Community Liaison Plan
CNS	Construction Noise Strategy
CNVMP	Construction Noise and Vibration Management Plan
CTMP	Construction Traffic Management Plan
DDA	Disability Discrimination Act 1992
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	Environmental Protection and Assessment Act 1979
ICNG	Interim Construction Noise Guideline
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
LEP	Local Environment Plan
LTTMP	NSW Long Term Transport Master Plan
NCA	Noise catchment area
NSW 2021	NSW 2021: A Plan to Make NSW No 1
OEH	Office of Environment and Heritage
RMS	Roads and Maritime Services
SCCAS	Sydney City Centre Access Strategy
SEARs	Secretary environmental assessment requirements
SHFA	Sydney Harbour Foreshore Authority
SSI	State significant infrastructure
Sydney Water	Sydney Water Corporation
TfNSW	Transport for NSW

Executive Summary

The Barangaroo Ferry Hub proposal comprises the construction and operation of three new ferry wharves and ancillary landside facilities. The proposal is located immediately north of King Street Wharf on the harbour side boundary of Barangaroo South (formerly known as East Darling Harbour) in Sydney's CBD.

The Barangaroo Ferry Hub proposal includes the following key features:

- Establishment of a construction work area and a temporary construction compound
- Construction of three new ferry wharves (two wharves would be constructed initially with the third wharf being constructed when demand necessitates) and ancillary landside facilities
- Potential demolition of the King Street Wharf wave baffle
- Site clean-up and opening of the new wharves
- Operation of three wharves including ferry layover, pump-out facilities and minor maintenance activities

- Decommissioning and removal of the public transport elements of King Street Ferry Wharf such as ticket vending machines and signage
- Landside ancillary facilities included as part of the proposal would comprise wayfinding signage and ticketing including Opal card facilities.

Transport for NSW (TfNSW) is the proponent for the Barangaroo Ferry Hub proposal, delivering the planning, concept design and construction of the Barangaroo Ferry Hub.

Ownership and maintenance of the ferry hub asset would be the responsibility of NSW Roads and Maritime Services (RMS), while ferry operations would be delivered by Sydney Ferries.

Planning approvals process

The Barangaroo Ferry Hub proposal is a State significant infrastructure (SSI) project. The proposal is SSI as defined under the State Environmental Planning Policy (State and Regional Development) 2011, as it proposes 'wharf or boating facilities' with a capital investment value over \$30 million. Part 5.1 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) establishes an assessment and approval regime for SSI.

The Secretary's Environmental Assessment Requirements (SEARs) for the proposal were issued on 10 November 2014.

An Environmental Impact Statement (EIS) for the Barangaroo Ferry Hub was commissioned, lodged with the NSW Department of Planning and Environment (DP&E) for assessment and publicly exhibited between 11 December 2014 and 9 February 2015. During this period, government agencies, interested groups and the community were invited to make written submissions on the Barangaroo Ferry Hub proposal to DP&E. As part of the exhibition of the EIS, TfNSW undertook consultation with the community and stakeholders. This included a staffed public display office throughout the duration of the exhibition period and a community information session. Meetings were also held with key stakeholders, including businesses, on request. Chapter 2 provides detail of the consultation undertaken.

Following the conclusion of the public exhibition period, TfNSW has prepared a Submissions Report incorporating a Preferred Infrastructure Report (this document) to address the issues raised in community and stakeholder submissions, and to document proposed design changes and additional investigations undertaken since exhibition of the EIS.

The Minister for Planning will subsequently decide whether to grant approval, or to refuse the proposal, under Section 115ZB of the EP&A Act. Approval from the Minister for Planning is required before TfNSW can proceed with the construction and operation of the Barangaroo Ferry Hub proposal.

Purpose of this report

This Submissions Report (incorporating a Preferred Infrastructure Report) outlines and provides responses to submissions received in response to the EIS. The Submissions Report also provides an overview of:

- the EIS document
- consultation activities undertaken during development of the EIS and during public exhibition
- consultation activities proposed during the pre-construction, construction and commissioning phases
- details on design changes and additional investigations that have been undertaken since exhibition of the EIS
- clarifications on the information provided in the EIS (in response to issues raised in submissions).

Overview of submissions

A total of 31 submissions were received during the period of exhibition. These included:

- 14 submissions from individual community members.
- 8 submissions from organisation stakeholders (Lend Lease, Brookfield, Sealink, Jones Lang LaSalle, BIKE Sydney, Bicycle NSW, Sandell Consulting, Pyrmont Action Inc).

- 9 submissions from local government and/or agencies (Leichhardt Council, Environment Protection Authority, Office of Environment and Heritage, Department of Primary Industries, Barangaroo Delivery Authority, City of Sydney Council, Sydney Water Corporation, Transport for NSW (Land Use and Integrated Transport), Office of Environment and Heritage – Heritage Division).

Preferred Infrastructure Report

The Preferred Infrastructure Report in Chapter 6 documents refinements that have been made to the design since the exhibition of the Barangaroo Ferry Hub EIS and clarifications to the proposal scope. The design refinements and scope clarifications which are outlined in the Preferred Infrastructure Report cumulatively will minimise impacts and address issues raised in submissions and include:

- The northern two wharves would be constructed initially, with the southern wharf to be constructed when demand necessitates
- Installation of additional piles on each wharf
- Installation of customer information totems to improve wayfinding and customer information

- Adjustment to customer information and ticketing pod locations
- Installation of temporary queuing provisions on the link structure and the foreshore.

Conclusion and next steps

This Submissions Report (and accompanying Preferred Infrastructure Report) has documented and considered the issues raised in community and stakeholder submissions on the Barangaroo Ferry Hub proposal, as well as TfNSW's response to these issues. It is proposed that the Barangaroo Ferry Hub proposal, as described in Chapter 4 of the EIS, and as amended by this Submissions Report, should be submitted for determination by the Minister for Planning.

The Minister for Planning will subsequently decide whether to grant approval, or to refuse the proposal, under Section 115ZB of the EP&A Act. Should the proposal be approved by the Minister, TfNSW would continue to consult with community members, government agencies and other stakeholders during the pre-construction, construction and commissioning phases (refer Section 2 of this report for further details).

1 Introduction and overview

The Barangaroo Ferry Hub proposal comprises the construction and operation of three new ferry wharves and ancillary landside facilities. The proposal is located immediately north of King Street Wharf on the harbour side boundary of Barangaroo South in Sydney's CBD.

Transport for NSW (TfNSW) is the proponent for the Barangaroo Ferry Hub proposal, delivering the planning, concept design and construction of the Barangaroo Ferry Hub.

Ownership and maintenance of the ferry hub asset would be the responsibility of NSW Roads and Maritime Services (RMS), while ferry operations would be delivered by Sydney Ferries.

1.1 Background

An Environmental Impact Statement (EIS) for the Barangaroo Ferry Hub proposal was placed on public exhibition between 11 December 2014 and 9 February 2015. An electronic copy of the EIS is available on the NSW Department of Planning and Environment (DP&E) website, www.majorprojects.planning.nsw.gov.au. During this period, government agencies, interested stakeholders and the community were invited to make written submissions on the Barangaroo Ferry Hub proposal to DP&E.

The determination process for the Barangaroo Ferry Hub is summarised in Figure 1, which also identifies the current status of the proposal in relation to the determination process.

1.2 Purpose of this report

This document comprises the Submissions Report (and accompanying Preferred Infrastructure Report) for the Barangaroo Ferry Hub proposal, which has been prepared in accordance with the requirements for State significant infrastructure (SSI) under Part 5.1 and section 115Z(6) of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

The proposed changes to the Barangaroo Ferry Hub proposal that comprise the Preferred Infrastructure Report are described in Chapter 6 of this Submissions Report.

This Submissions Report outlines and provides responses to submissions received in response to the EIS. The Submissions Report also provides an overview of the EIS; consultation activities undertaken prior to, and during the public exhibition of the EIS, as well as activities proposed during the pre-construction, construction and commissioning phases; details on design changes (the Preferred Infrastructure Report) and additional investigations that have been undertaken since exhibition of the EIS; as well as clarifications on the information provided in the EIS (in response to issues raised in submissions).

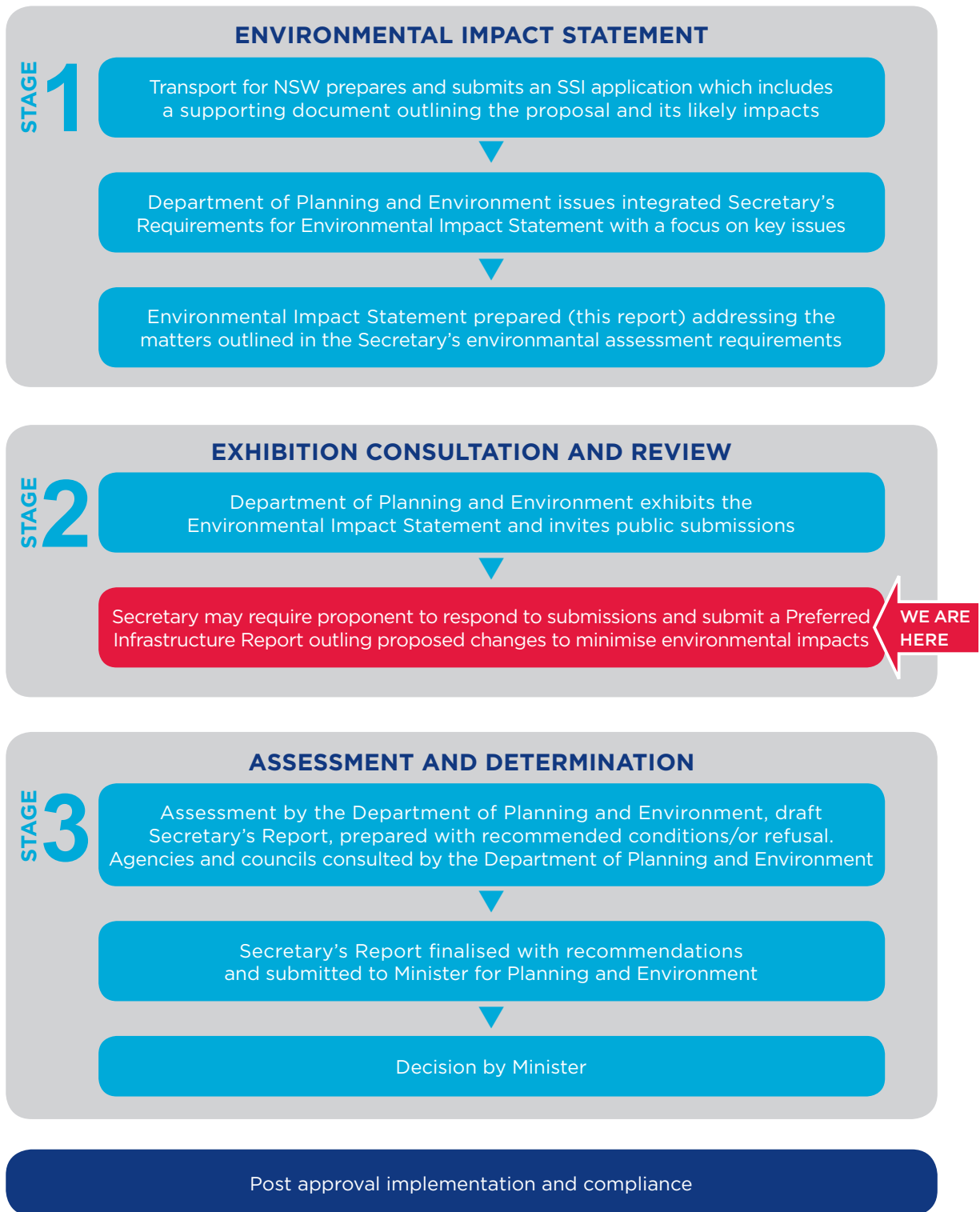


Figure 1 - Flowchart of planning process

1.3 Overview of the proposal

1.3.1 Key features of the EIS proposal

The key features of the proposal include:

- Establishment of a construction work area and a temporary construction compound
- Construction of three new ferry wharves (two wharves would be constructed initially with the third wharf being constructed when demand necessitates) and ancillary landside facilities
- Potential demolition of the King Street Wharf wave baffle
- Site clean-up and opening of the new wharves
- Operation of three wharves including ferry layover, pump-out facilities and minor maintenance activities
- Eventual decommissioning and removal of the public transport elements of King Street Ferry Wharf such as ticket vending machines and signage
- Landside ancillary facilities included as part of the proposal would comprise wayfinding signage and ticketing including Opal card facilities.

1.3.2 Strategic framework

The context of and need for the Barangaroo Ferry Hub proposal in relation to the overall Barangaroo precinct was outlined in Chapters 1 and 2 of the EIS. The proposal was assessed in the context of key government strategies including NSW 2021: A Plan to Make NSW No 1 (NSW 2021) (NSW Government, 2011), the draft *Metropolitan Strategy for Sydney to 2031* (NSW Government, 2013), and the *NSW Long Term Transport Master Plan* (LTTMP) (NSW Government, 2012).

The need for a ferry service at Barangaroo was identified in the NSW LTTMP. Further detail on the outline provided in the NSW LTTMP was provided in the following documents:

- *Sydney's Ferry Future* (TfNSW, 2013b)
- *Sydney City Centre Access Strategy* (TfNSW, 2013a)
- *Barangaroo Integrated Transport Plan* (TfNSW, 2012a).

The Barangaroo Ferry Hub proposal responds to the overarching strategic aim of growth in ferry patronage by facilitating convenient access to the western and central parts of the CBD for ferry passengers, as well as relieving congestion pressure at Circular Quay and meeting expected future demand for public transport at Barangaroo.

The proposal was assessed against each of the relevant strategies in Section 3.1 of the EIS.

1.3.3 Need for the proposal

The need for the proposal was outlined in Chapter 3 of the EIS, with additional context provided in Chapters 1 and 2. In summary the Barangaroo Ferry Hub proposal would address the unique transport needs of the Barangaroo precinct and provide a move forward in ferry transport capability and capacity. The Barangaroo Ferry Hub proposal is designed to address key transport challenges facing the Barangaroo precinct and Sydney CBD, including predicted growth and increasing demand for public transport options.

Barangaroo is a 22 hectare site along the Sydney Harbour foreshore, between King Street Wharf and Walsh Bay. The Barangaroo precinct is expected to accommodate up to 23,000 office workers, include a residential community of about 2,500 people and attract up to 33,000 visitors per day when complete. The need for the proposal is based on the anticipated demand for transport services to the precinct.

Growth in employment across Sydney is also anticipated, with the NSW LTTMP projecting around 43,500 additional jobs within the northern Sydney CBD by 2031 (including Barangaroo). Forecast high employment and residential growth along the Parramatta River corridor also gives rise to the need for additional transport options.

The Barangaroo Ferry Hub proposal addresses a number of the transport challenges for Barangaroo and the Sydney CBD and would be a significant contribution in the delivery of an integrated and modern transport system for both areas.

1.3.4 Anticipated benefits

The proposal has been developed to meet the strategic need for a ferry solution at Barangaroo, effectively service the public service demand arising from surrounding development growth, and improve customer experience. Specific benefits that would result from the proposal include:

- Accessibility benefits – improvements in access for passengers with a disability as well as direct access to the Barangaroo precinct and connection to the western and central parts of the CBD.
- Customer benefits – improved and more reliable journeys for public transport users, including through the provision of new facilities with better wayfinding signage, customer information screens and ticketing. The proposal would more than double the capacity for services when compared with King Street Ferry Wharf.
- Operating benefits – improving the resilience of ferry services for special events or maintenance activities through creating additional network capacity.

1.4 Key findings of the EIS

The positive and adverse impacts of the Barangaroo Ferry Hub proposal were outlined in the Executive Summary of the EIS and described in detail in Chapter 6 of the EIS. The key benefits (positive impacts) of the proposed are outlined above in Sections 1.3.3 and 1.3.4.

1.4.1 Key impacts during construction

The key impacts of the proposal during construction include:

- Noise and vibration – Construction activities, such as pile installation, crane lifts, demolition and landside construction, are expected to cause some exceedances of noise management levels for sensitive receivers. Some activities such as piling require calm water conditions and may need to be done at night or early morning. Vibration impacts associated with construction of the proposal are anticipated to be negligible.
- Traffic and transport – The majority of the construction materials would be transported to the site by water. A 130 metre wide navigation channel would be kept clear for water traffic but there may be temporary restrictions for short periods of time. There would also be some materials transported by road (which may create a small increase in traffic).

- Pedestrian access – During construction, pedestrian access to the foreshore would be temporarily restricted due to the landside construction compound. The working area of the site would also be enclosed for safety reasons and pedestrians would be directed around it.
- Ecology – An aquatic ecology dive survey was undertaken as part of investigations and no threatened or protected aquatic species were found at the site. Potential impacts during construction include disturbance of the seabed or sediments. These impacts would be managed through measures integrated into a construction environmental management plan.
- Visual impact – During construction the temporary site compound would be established and there would be construction barges, machinery and workers would result in a temporary adverse visual impact. TfNSW would enhance the visual amenity of the construction site where possible, for example by using hoardings to support wayfinding, display key messages and improve the look and feel of the site.

1.4.2 Key impacts during operation

The key impacts of the proposal during operation include:

- **Noise and vibration** – The proposal would introduce an additional noise source to the area. Operational noise levels were predicted at sensitive receiver locations around the proposed Barangaroo Ferry Hub, which generally complied with the noise criteria. However modelling indicated some potential for sleep disturbance due to maximum noise levels (e.g. horn usage and cleaning activities). There is not anticipated to be any vibration impacts associated with operation of the proposal.
- **Traffic and transport** – Customers would benefit from the ferry hub with increased ferry services and improved travel times. Private and commercial vessel operators would also benefit from released capacity at King Street Wharf. The proposal would result in an increase to vessel movements on the harbour. A small increase in vehicle traffic on the local road network associated with local residents and taxi circulation is anticipated.
- **Pedestrian and cycle access** – Pedestrian activity is expected to increase as a result of the proposal and would be accommodated by a series of new walkways and promenades at Barangaroo and the new Wynyard Walk pedestrian walkway (under construction). In addition, bicycle parking would be provided for ferry customers.
- **Visual impact** – The Barangaroo Ferry Hub architecture would have a similar character to the design of the new wharves delivered as part of the Ferry Wharf Upgrade Program. The proposed wharves are characterised by a low profile, steel framed structure with a curved roof, grey panels and glass.

A visual impact assessment was undertaken, which identified that there would be changes to views from King Street Wharf resulting in moderate adverse visual impact. However, the proposal when viewed from across the harbour would be largely absorbed into the urban background of Barangaroo and Sydney's CBD. The proposal would be operational during day and night, when it would be lit to accommodate safe public use of the facility. The lighting would be compatible with Australian Standards and was not considered to have a significant impact given the context of a brightly lit urban environment.

- **Socio-economic impact** - Once construction is complete, Sydney Ferries services at King Street Ferry Wharf would be moved to the new Barangaroo Ferry Hub. This would enable potential use of the facility by private and commercial vessel operators (not the subject of this application). The timing of this change will be determined as part of the operational plan for ferry services. The relocation of the ferry wharves from King Street Wharf to Barangaroo may result in minor impacts to businesses which currently benefit from passing trade from ferry passengers.

Increased frequency and use of public transport services is generally expected to benefit local businesses, especially during peak hour and weekend operations.

1.5 Structure of this report

The structure of this report is as follows:

- **Chapter 1 – Introduction:** Provides background to the Barangaroo Ferry Hub project and an overview of the key features and benefits; a summary of the assessment and approval process and EIS public exhibition; and the structure and purpose of this Submissions Report.
- **Chapter 2 – Consultation:** Provides an overview of consultation activities undertaken prior to, and during, the public exhibition of the Barangaroo Ferry Hub EIS. Also includes a summary of ongoing and proposed consultations and communications.
- **Chapter 3 – Overview of submissions:** Provides an overview of the process that was used to analyse the issues raised in submissions, as well as an overview of the key issues raised by the community and government agencies.
- **Chapter 4 – Government agency submissions:** Summarises the issues raised in government agency submissions and TfNSW's response to these issues.
- **Chapter 5 – Community and stakeholder submissions:** Details the key issues raised in community and stakeholder submissions and TfNSW's response to these issues.
- **Chapter 6 – Preferred infrastructure report:** Documents and assesses proposed changes that have been made to the proposal since the exhibition of the EIS, as well as any additional environmental management measures that TfNSW proposes to implement to manage any newly identified adverse impacts.
- **Chapter 7 – Additional investigations:** Documents any additional investigations that have been undertaken since the exhibition of the EIS.
- **Chapter 8 – Environmental management:** Provides the revised set of environmental management measures for the proposal, which have been amended in response to the proposed changes to the proposal, additional investigations undertaken since the public exhibition of the EIS, and issues raised in submissions received during the public exhibition period.
- **Chapter 9 – Conclusion:** Concludes the Submissions Report and requests determination by the Minister for Planning.

2 Consultation

2.1 Pre-EIS consultation

Prior to the preparation of the EIS, the NSW Government consulted with stakeholders during the development of the NSW LTTMP, which identified building a new ferry hub at Barangaroo as a key action to expand the ferry network.

Following the announcement of the proposal by the NSW Minister for Transport, consultation was undertaken with a range of key government and stakeholder representatives during the development of the project and the EIS.

A detailed overview of the consultation activities undertaken by TfNSW for the Barangaroo Ferry Hub proposal both before and during the preparation of the EIS was provided in Chapter 5 of the EIS. This included an overview of the key issues raised by stakeholders and, where relevant, how these concerns have been addressed through the design of the Barangaroo Ferry Hub proposal and/or addressed in the EIS.

A summary of the consultation activities undertaken with key project stakeholders and the community is provided in sections 2.1.1 and 2.1.2 below, respectively.

2.2 Stakeholder engagement plan

A Stakeholder and Community Engagement Strategy consistent with TfNSW's Community Engagement Policy was prepared for the proposal. The objectives of the stakeholder and community engagement strategy are to:

- Identify and engage a wide range of stakeholders and interested parties.
- Increase community and stakeholder understanding of the project, its objectives and benefits.
- Keep people informed about the project phases and ensure that project information is communicated to the community and stakeholders in an effective and timely manner.
- Provide the community and stakeholders with an opportunity to participate in the development of the project through feedback and input.
- Record, review, comment on and record project responses to feedback.
- Identify concerns and address them where practical and appropriate.
- Ensure that community and stakeholder enquiries regarding the project are managed and resolved effectively

The Stakeholder and Community Engagement Strategy provides for consultation to be undertaken in three stages:

- During EIS preparation.
- During the public exhibition of the EIS.
- During construction and commissioning.

An overview of the activities proposed for each stage of consultation is provided in the following sections.

2.3 Consultation during EIS preparation

Consultation with stakeholders and the community has been undertaken progressively throughout the development of the proposal. The consultation approach was designed to inform key stakeholders about the proposal and facilitate stakeholder input into the EIS. It allowed the development of the proposal to benefit from stakeholder knowledge and understanding of specific issues.

As described in Section 5.3 of the EIS, consultation prior to the exhibition of the EIS included:

- Government agency consultation – Government agencies and authorities were consulted one-on-one throughout the preparation of the EIS. As the approval authority for the proposal, DP&E coordinated input on issues raised by government agencies and authorities through the development of the SEARs for the EIS.
- Barangaroo community and business construction liaison groups – Barangaroo Community Construction Liaison Group and Barangaroo Business Construction Liaison Group representatives were provided briefings during August and October 2014.
- Stakeholder briefings – Comprehensive stakeholder briefings and presentations regarding the proposal were held between August and November 2014. Stakeholders briefed through this period are detailed in Table 5-1 of the EIS. These briefing sessions allowed stakeholders to discuss areas of interest, ask detailed questions and helped the project team understand views about the proposal.
- Proposal contact mechanisms – The TfNSW information line number (1800 684 490) and email address (projects@transport.nsw.gov.au) were provided to enable all stakeholders to provide feedback on the proposal and ask questions of the project team.
- Proposal website – Information about the proposal has been available on the transport projects pages of the TfNSW website (<http://www.transport.nsw.gov.au/projects>) since August 2014.
- Door knocking – Door knocking of businesses along King Street Wharf was undertaken in September 2014 to provide information about early geotechnical investigations and introduce the proposal.

2.4 Consultation during public exhibition of the EIS

The EIS was publicly exhibited by DP&E between 11 December 2014 and 9 February 2015. During the exhibition period, government agencies, interest groups and organisations, stakeholders and the community were invited to make written submissions. Details regarding the consultation during public exhibition of the EIS are provided in Section 5.4 of the EIS. A summary of the engagement activities and tools used to encourage community and stakeholder participation during the public exhibition period is outlined below.

- EIS display locations – The EIS was publically displayed at the following locations:
 - Department of Planning & Environment: Information Centre, 23–33 Bridge Street, Sydney
 - City of Sydney Council: One Stop Shop, Town Hall House, Level 3, 456 Kent Street, Sydney
 - Transport for NSW: Community Information Centre, 388 George Street (corner King and George Streets), Sydney
 - Transport for NSW Transport Projects, Level 5, Tower A Zenith Centre, 821 Pacific Highway Chatswood
- EIS public exhibition promotion – Opportunity for public comment on the EIS was advertised in mX, Central Sydney and Inner West Courier newspapers during December 2014 and January 2015 inviting stakeholders to provide feedback and attend the community information session.
- Community update newsletter, December 2014 – A community update brochure was distributed in December 2014 to residents and businesses within close proximity to the proposed Barangaroo Ferry Hub. Over 3000 brochures were delivered.
- Community information session, January 2015 – A drop-in community information session was held on 29 January 2015. The information session provided an opportunity for members of the community to find out more about the project before making a formal submission.

2.5 Proposed future engagement

Community and stakeholder engagement activities would continue prior to and throughout construction and commissioning of the Barangaroo Ferry Hub. Stakeholders would be provided with project updates through a variety of means including:

- project newsletters
- notification of construction works (including targeted letterbox drops)
- regular updates to the project website
- clear signage at construction sites
- doorknocks where required
- community contact facilities (24-hour project information phone line, email and post)
- project email list (subscription based)
- complaints management process
- ongoing stakeholder meetings and consultation.

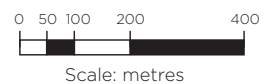
Figure 2 - Community notification area, below identifies the proposed notification area and key stakeholders. Following consultation during the public exhibition period, this figure has been updated to reflect a larger distribution area.



KEY

- Commercial
- Residential
- Tourist attraction
- Hotel
- Proposed development
- Parks and reserves

F Ferry



3 Overview of submissions

This chapter provides an overview of the process that was used to analyse the issues raised in submissions received for the proposal during the public exhibition of the Barangaroo Ferry Hub EIS. This chapter also identifies the key issues raised in government agency and community submissions.

3.1 Analysis process

3.1.1 Receipt of submissions

Submissions from government agencies, special interest groups and the community were received by the DP&E. Submissions were received up until 27 February 2015. A total of 32 submissions were received. Of these submissions, nine were responses from government agencies including:

- Sydney Water Corporation
- Barangaroo Delivery Authority
- Office of Environment and Heritage
- Office of Environment and Heritage – Heritage Division
- Environmental Protection Authority
- Department of Primary Industries
- Leichhardt Council
- City of Sydney
- Transport for NSW (Land Use and Integrated Transport)

A total of 22 submissions were received from the community, special interest groups and businesses. Of the community submissions, two submissions were received from special interest groups and one submission from a community action group. The special interest groups and community action group consisted of the following organisations:

Special interest groups

- BIKESydney
- Bicycle NSW

Community action group

- Pyrmont Action Inc

3.1.2 Handling and responses to submissions

Both formal submissions and email enquiries were considered for the purpose of compiling all community feedback during the exhibition period.

Government agency submissions

Government agency submissions were addressed individually (rather than with community submissions). Responses to issues raised by government agencies have been provided to each individual submission. These are presented in Chapter 4 of this Submissions Report.

Of the nine government submissions received, three indicated support for the proposals, six were neither in support or opposition to the proposal and no submissions indicated they were opposed to the proposal.

Community submissions

Community submissions, including special interest groups, peak bodies, community action groups and the business community, were considered separately to government agency submissions. Each submission was assigned an individual number. The content of each community submission was reviewed and categorised according to the key issues (e.g. noise and vibration) and sub-issues (e.g. construction noise) raised. It is noted that no formal form letters were received as submissions during the exhibition period. Some submissions presented shared text; these respondents have been treated as individual submissions.

A full list submission numbers and references to TfNSW responses is provided in Appendix A.

To avoid redundancy in this report, issues raised in community submissions were grouped together based on their assigned key and sub-issue categories with responses provided to these grouped issues. Each issue is presented as a summary of the specific issues raised by individual submissions, meaning that, while the exact wording of a particular submission may not be presented in the summary of the issue, the intent of each individual issue raised has been captured. A tailored response has been provided to each grouped issue in Chapter 5 of this Submissions Report.

3.1.3 Analysis of community submissions

A summary of the key issues raised in community submissions is provided in Table 3-1 below.

Table 3-1: Key issues raised in community submissions

Key issue	No. of submissions raising issue	Percentage
Proposal description and scope	19	86%
Traffic, transport and access	16	73%
Project need and alternatives	15	68%
Community and stakeholder consultation	9	41%
Property and land use	4	18%
Planning and assessment process	4	18%
Issues external to the proposal	3	14%
Noise and vibration	2	9%
Visual amenity and urban character	2	9%
Socio-economic impacts	2	9%
Ecologically sustainable development	1	5%
Water quality and hydrology	1	5%

Of the 22 community submissions received, 11 indicated support for the proposals, 11 were neither in support or opposition to the proposal and no submissions indicated they were opposed to the proposal.

The key issues raised in community submissions included:

- Proposal description and scope – 86% of submissions raised this issue including queries regarding the design of the proposal; submissions on landside facilities including cycling provisions and wayfinding; and comments on the use of Barangaroo Ferry Hub.
- Traffic, transport and access – 73% of submissions raised this issue including management of navigational, traffic, pedestrian and cyclist safety during construction; queries and comments regarding operation of the proposal including integration of transport modes, navigation, traffic and pedestrian impacts; recommendations on landside cycling facilities; and queries and comments on the future ferry network.
- Project need and alternatives – 68% of submissions raised this issue including queries and comments regarding the project need, options assessment and strategic context of the proposal.

4 Government agency submissions

This chapter includes a summary of the submissions received from government agencies, local councils and state owned corporations regarding the proposal. Responses to government agencies and local councils have been provided in tabular format addressing comments raised by each.

4.1 Barangaroo Delivery Authority

The Barangaroo Delivery Authority (BDA) provided a submission regarding the proposal, dated 15 February 2015, raising a number of issues regarding the proposal including:

- the need for integration with Barangaroo South and collaboration with BDA regarding the design and treatment of the waterfront promenade
- recommended consultation with BDA for all items that impact on landside elements.

The issues raised by BDA and TfNSW's responses to these issues are detailed in Table 4-1 below.

4.2 City of Sydney

The City of Sydney Council (City of Sydney) provided a submission regarding the proposal, dated 23 February 2015, raising a number of issues regarding the proposal including:

- urban design considerations during detailed design
- location of ticket machines and amount of signage
- the need for coordination with Lend Lease during construction.

The issues raised by City of Sydney and TfNSW's responses to these issues are detailed in Table 4-2 below.

4.3 Department of Primary Industries

The Department of Primary Industries (DPI) provided a submission regarding the proposal, dated 12 February 2015 raising a number of issues regarding the proposal including:

- the importance of mitigation measures to protect the aquatic habitat
- methodology and requirements to manage groundwater, should it be intercepted.

The issues raised by DPI and TfNSW's responses to these issues are detailed in Table 4-3 below.

4.4 Environment Protection Authority

The Environment Protection Authority (EPA) provided a submission regarding the proposal, dated 12 February 2015 raising a number of issues regarding the proposal including:

- construction and construction-related noise and vibration impacts (including recommended standard construction hours and intra-day respite periods for highly intrusive noise generating work) construction phase dust control and management, including controls for works over harbour waters construction phase runoff and sediment control and management of a harbour side work site

- construction related waste handling and management, particularly concrete waste and rinse water
- construction phase chemical handling and storage
- construction phase air quality impacts
- operational noise and vibration impacts, including vessel 'overnighting' and maintenance
- operational fuel storage and handling, effluent storage and discharge, and energy efficiency.

The issues raised by EPA and TfNSW's responses to these issues are detailed in Table 4-4 below.

4.5 Leichhardt Council

Leichhardt Council provided a submission regarding the proposal, dated 13 February 2015 raising a number of issues regarding the proposal including:

- the opportunity for Barangaroo Ferry Hub to service the Balmain peninsula and Bays precinct
- recommended ongoing consultation with the Balmain East community during construction
- the investigation of opportunities for new inner Sydney Harbour ferry services
- discussion and collaboration with the NSW

The issues raised by Leichhardt Council and TfNSW's responses to these issues are detailed in Table 4-5 below.

4.6 Office of Environment and Heritage

The Office of Environment and Heritage (OEH) provided a submission regarding the proposal, dated 15 December 2015 advising that they did not intend to review the proposal documents or make comment regarding Barangaroo Ferry Hub.

This response is noted by TfNSW.

4.7 Office of Environment and Heritage - Heritage Division

The Office of Environment and Heritage - Heritage Division (Heritage Division) provided a submission regarding the proposal, dated 6 February 2015 raising a number of issues regarding the proposal including:

- there are no State Heritage Register Items within the development site but there are items in the vicinity of the proposal
- recommendations for management of unexpected archaeological finds and staff heritage inductions.

The issues raised by the Heritage Division and TfNSW's responses to these issues are detailed in Table 4-6 below.

4.8 Sydney Water Corporation

Sydney Water Corporation (Sydney Water) provided a submission regarding the proposal, dated 12 January 2015 raising a number of issues regarding the proposal including:

- water and wastewater requirements
- building adjacent to existing stormwater channels

The issues raised by Sydney Water and TfNSW's responses to these issues are detailed in Table 4-7 below.

4.9 Transport for NSW (Land Use and Integrated Transport)

Transport for NSW (Land Use and Integrated Transport) provided an undated submission regarding the proposal. This submission did not raise any issues regarding the proposal but confirmed that there are no concerns with the proposed development in relation to the CBD Metro corridor, and no additional conditions for consent are required.

This response is noted by TfNSW.

Table 4-1: Issues raised by Barangaroo Delivery Authority

Item	Summary of issue	Response
Proposal description and scope – proposal design		
4.1a	<p>Recommends that TfNSW be required to consult with and obtain approval from BDA for all items which impact on landside elements as a result of the proposal, including:</p> <ul style="list-style-type: none"> • Design of all elements that interface with the promenade such as handrails, finishes and any adjustments to the proposed Stage 1A Public Domain. • Design and location of wayfinding signage; • Design and location of ticket machines; • Service access arrangements; • Special event management, including pedestrian circulation and queue management; • Interface with heat rejection system; • Location and design of bicycle racks; • Emergency access and congregation points; • Location and extent of temporary construction compound. 	<p>TfNSW has coordinated ongoing Landside Working Group meetings since May 2014 to work collaboratively regarding these elements. The Landside Working Group was established to provide an interface forum for the coordination, resolution and agreement of interface issues between the landside works by BDA/Lend Lease and the Barangaroo Ferry Hub proposal being delivered by TfNSW. In addition to the central Landside Working Group coordination committee, specialist working groups have been convened to deal with specific issues including:</p> <ul style="list-style-type: none"> • Electrical services • Services • Hydraulics • Urban design <p>A total of 32 Landside Working Group meetings (including specialist working groups) have been convened between May 2014 and April 2015. The location and design of all of the listed elements has been tabled at these regular meetings. TfNSW has considered the concerns and comments of BDA and Lend Lease in relation to the listed elements and has proposed alternative solutions through the working group.</p> <p>TfNSW intends to continue to consult with BDA and Lend Lease regarding items which impact on landside elements as a result of the proposal and additional safeguards have been proposed as outlined in Section 8.1 to this effect.</p>
4.1b	<p>BDA is responsible for creating an opportunity for design excellence in architecture and public domain design of the precinct. BDA is therefore obligated to ensure the integration and coordination of Barangaroo Ferry Hub with the design and treatment of the landside waterfront promenade area.</p>	<p>The Barangaroo Ferry Hub team has maintained constant and regular engagement with BDA throughout the design process to ensure that they have been consulted and their concerns addressed as the design has developed. The aim of this process has been to ensure the integration and coordination of the proposal with the design and treatment of the landside waterfront promenade area.</p> <p>TfNSW intends to continue to consult with BDA and Lend Lease regarding design.</p>

Table 4-2: Issues raised by City of Sydney

Item	Summary of issue	Response
Needs and alternatives – project need		
4.2a	The City is supportive of the development. The SSI application follows years of long term planning for this essential transport infrastructure.	Noted.
Proposal description and scope – landside facilities		
4.2b	<p>The City provided feedback on the indicative wayfinding plan including:</p> <ul style="list-style-type: none"> • Consider rationalising the number of ferry mode identifiers. Suggests deletion of two particular signs. • Consider locating ticket booths either within the zone of the wharves or on the opposite side of the boardwalk, in alignment with the trees, to minimise conflict with the path of pedestrian travel. 	<p>The TfNSW wayfinding strategy for Barangaroo Ferry Hub, including the location of ticketing devices, is undergoing design and development. This feedback from City of Sydney will be considered by TfNSW as part of this process.</p> <p>TfNSW have proposed three customer information and ticketing pods in alignment with the trees as shown in Figure 3. However, the exact location of the customer information and ticketing pods is subject to negotiation with BDA and Lend Lease as the owner and developer of Barangaroo South.</p>
Traffic, transport and access – construction		
4.2c	Construction from the land side of the project opens up potential conflicts between users of the early development in Barangaroo South and other development sites under construction. Coordination and consultation with Lend Lease is essential, including regarding the Construction Environmental Management Plan.	<p>See Item 4.1a regarding details of ongoing consultation through the Landside Working Group convened by TfNSW.</p> <p>TfNSW intends to continue to consult with BDA and Lend Lease regarding items which impact on Barangaroo South landside elements as a result of the proposal.</p>

Item	Summary of issue	Response
Visual amenity and urban character – operation		
4.2d	<p>Encourages designers to keep the space between the ferry concourse and roofline as clear as possible to enable views through the structures (when there are no ferries idling) from the water’s edge and view lines from the Barangaroo internal street layout.</p> <p>Recommends considering rationalising signage and notification structures at the detailed design phase to achieve this.</p>	<p>Enabling views through the structures to the water is a key design principle for the Barangaroo Ferry Hub. The proposed detail design has a clear line of sight from the landside through to the water that has been achieved by limiting structural columns on each wharf to just four, providing clear glazed screens and balustrades and limiting structures on the pontoon to the minimum required for safe operations.</p> <p>The detailed design proposes that any signage suspended from the pontoon ceiling would be limited to what can be accommodated within a pair of parallel services channels.</p>
4.2e	<p>Supports proposed zinc roofing material, including the standing seam design, to ensure an appropriate non-reflective, textured, finish is achieved.</p> <p>Recommends adjusting the design to include a simple upturn at the short ends of the roofs to limit gutters to falling edges only. The proposed detailed design incorporates a standing seam zinc roof as has been used for the Sydney Wharf Upgrade Program. The zinc material proposed in the detailed design is dull with a matte finish. Over time this material develops an oxide layer, which would further reduce reflectivity.</p>	<p>Roof drainage is currently being reviewed to ensure simplicity.</p>

Table 4-3: Issues raised by the Department of Primary Industries

Item	Summary of issue	Response
Ecology – construction		
4.3a	DPI (Fisheries) is of the opinion that provided the mitigation measures under the ‘Ecology’ and ‘Water Quality’ sections of Table 7-1 are implemented, potential impacts to the aquatic habitat should be mitigated.	Noted. These mitigation measures are intended to be implemented as identified in the EIS.
4.3b	Recommends a sediment curtain should be used during both demolition and construction works to mitigate turbidity impacts (as per mitigation measures).	As outlined in Section 6.9 of the EIS and the relevant mitigation measures it is proposed that a silt curtain be used prior to commencement of demolition of King Street Wharf wave baffle, and prior to commencement of piling activities. This is considered to cover all relevant activities likely to cause turbidity impacts through disturbance to the sea bed.
4.3c	Recommends all demolished material from the existing wharf should be deposited appropriately on land above the highest astronomical tide.	If demolition of the King Street Wharf wave baffle is required, it is anticipated that the demolished material would be placed on a barge and then transported to the off-site facility for waste processing. Any landside storage space is expected to be limited, and it would likely not be appropriate to store demolished material on land. The particular demolition methodology would be determined during detailed construction planning.
4.3d	Recommends that the CEMP outlines the methodology to manage any groundwater intercepted by the construction work. If groundwater dewatering is required, the applicant should contact the Office of Water as depending on volumes a temporary dewatering license under the Water Act 1912 may be required.	Construction of ancillary landside facilities included as part of the proposal would not involve disturbance of sub surface materials and therefore would not intercept groundwater along the foreshore area (estimated to between 1.5 metres and three metres below ground level). There would be no dewatering activities involved with the proposal therefore it is not anticipated that any license would be required. Should groundwater dewatering be anticipated based on the detailed construction methodology, Office of Water would be contacted to determine whether any licences or approvals are required.

Table 4-4: Issues raised by the Environmental Protection Authority

Item	Summary of issue	Response
General		
4.4a	<p>The EPA considers that the project comprises distinct phases of construction and operation and has set out its comments on that basis.</p> <p>The EPA notes the proximity of surrounding residences and tourist accommodation on both sides of Darling Harbour, including residences nearing completion at Barangaroo and likely to become occupied during the course of construction.</p> <p>The EPA emphasises that it does not review or endorse environmental management plans or the like for reasons of maintaining regulatory ‘arms length’. And, has not reviewed the environmental management plans forming part of or referred to in the EIS.</p>	Noted.

Item	Summary of issue	Response
Noise and vibration – construction		
4.4b	<p>The project is likely to generate significant noise and vibration impacts on surrounding residences and other noise sensitive land uses during construction.</p>	<p>It is recognised that certain construction activities associated with the proposal involve high noise levels, and most activities associated with the proposal would involve some audible noise for sensitive receivers. The high levels are a direct result of the source type and relatively close proximity of sensitive receivers to the works.</p> <p>The noisiest construction activities (associated with piling) are expected to result in noise levels greater than 75 dBA, or 'highly noise affected', at some receivers. As identified in the EPA's Interim Construction Noise Guideline (ICNG) construction activities at these levels may result in a strong community reaction to noise. Accordingly the Guideline and TfNSW's Construction Noise Strategy recommend consideration of feasible and reasonable ways to reduce this noise level. Where no quieter work method is feasible and reasonable then communicating with impacted residences is recommended by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.</p> <p>TfNSW is committed to minimising or avoiding noisy activities outside of standard working hours (particularly at night) where feasible and reasonable.</p>

Construction hours

4.4c	<p>The EPA has an expectation that 'out of hours' work (especially night work) be kept to an absolute minimum and then only when fully justified on grounds other than production.</p> <p>Concern that the assessed extension of construction hours does not have adequate justification.</p> <p>Recommends imposition of conditions on the proposal construction including:</p> <ul style="list-style-type: none"> • respite periods (detailed in the letter) • undertake as much piling work as possible from land or jack-up barge to reduce wave/wind condition issues • only undertake impact piling during standard hours. 	<p>The nature of the project is such that it may not be possible to undertake all activities during standard daytime construction hours. As identified in the EIS a number of the proposed activities require still water for safety and accuracy of construction. These activities are:</p> <ul style="list-style-type: none"> • Pitching, vibrating and drilling piles into sediment and rock • Hammering piles to refusal. <p>The proposal area has unobstructed open water for over 2 km to the north, but is more protected to the east, west and south. Winds may create an unsuitable environment for piling works (small waves and chop). The waterway is usually calmer during the night time and early morning periods with wind and wind chop increasing throughout the day at this location.</p>
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Item	Summary of issue	Response
Construction hours		
4.4c		<p>Vessel wash may also impact barge stability in the busy Darling Harbour waterway, and there are higher levels of boating activity during the day and early evening, in particular after 7 am with the commencement of the morning peak period. Accordingly, the conditions required for piling usually occur during the night and early morning periods.</p> <p>TfNSW have collected wave data in Darling Harbour since April 2014 and this process is ongoing. However, until the specific details of the construction equipment and construction methodology are known, it cannot be confirmed what wave height and wave frequency would require the stoppage of piling works.</p> <p>As such, the proposal may require night works over about two to three months to complete the installation of piles. This timeframe provides some allowance for construction to be programmed to minimise the number of consecutive nights that impact on the same receptors and unfavourable conditions from weather, seas, swell, wind, and boat wash.</p> <p>Once the construction contractor is engaged by TfNSW it would be possible to consider the detailed construction methodology proposed and potential noise impacts in a greater level of detail, as would be required in the Construction Noise and Vibration Impact Statement (CNVIS) that would form part of the assessment and mitigation process. This would include consideration of alternative construction methodology such as a jack-up barge which would provide a stable work platform thereby enabling piling activities to be undertaken during standard working hours (see also response to Item 4.4d). The use of the jack up barge does not reduce noise levels but enables piling activities to be conducted during the less sensitive standard construction hours.</p> <p>If out-of-hours work is necessary (for example, if no jack-up barge is available and adverse weather precludes piling work during the day), more detailed supporting information would be available to provide the necessary justification, together with recommendations in respect of noise impacts and how these can be managed.</p>

Item	Summary of issue	Response
Construction hours		
4.4c		<p>Transport for NSW (TfNSW) and its contractor would work closely to communicate this information to the community/sensitive receivers and develop appropriate mitigation measures.</p> <p>Construction noise and vibration from the project is proposed to be managed in accordance with the TfNSW Construction Noise Strategy. This would include the following elements:</p> <ul style="list-style-type: none"> • Following the appointment of a construction contractor for the project a CNVIS would be prepared. The statement would update the indicative methodology outlined in the EIS with the actual construction methodology and equipment to be used by the contractor. The CNVIS would therefore more accurately predict noise levels at receivers, based on actual construction techniques and equipment. In accordance with the Construction Noise Strategy where exceedances are identified mitigation measures would be considered and these would feed into the Construction Noise and Vibration Management Plan (CNVMP). • A CNVMP would be produced, based on the CNVIS. The CNVMP would update the indicative methodology outlined in the EIS with the actual construction methodology and equipment to be used by the contractor. • The CNVMP would include the standard mitigation measures, and additional mitigation measures described in the Construction Noise Strategy. The additional mitigation measures are important for this project, as they are applicable to works that may be required outside standard construction hours. The Construction Noise Strategy recognises that where out of hours work is required exceedances of the project's noise objectives is likely and a pro-active engagement with affected sensitive receivers is required. Accordingly additional mitigation measures include, but are not limited to notifications, letter box drops, noise monitoring, and respite periods. The active engagement with affected sensitive receivers would include consideration of the trade-off between the duration of construction vs. the relative noise impact.

Item	Summary of issue	Response
Methodology		
4.4d	<p>Concern that alternate work methods which may avoid the need for night works have not been investigated.</p> <p>Use of a jack-up barge would provide a stable work platform above the influence of wave action and may avoid the need for night works.</p> <p>Use of a land-based piling rig should be investigated for piles close to shore (including crash barrier piles).</p>	<p>A jack-up barge would provide a stable work platform which would allow piling activities to be undertaken during standard working hours independent of any adverse weather or sea conditions. Use of a jack up barge is the preferred method of construction given the construction benefits it offers including reduced noise impacts and potential reduction in the construction period. The use of a jack up barge is expected to reduce exceedances at the nearest sensitive receivers from up to 37 dB during night-time to up to 26 dB during daytime due to the difference in night-time and daytime noise management levels. Further, the use of a jack-up barge would avoid the exceedance of the sleep disturbance screening level (as no works during night-time would occur).</p> <p>However, TfNSW is unable to commit to the use of a jack up barge until the construction contractor is appointed and it is confirmed whether a jack-up barge is available (i.e. this is subject to the procurement of the construction contractor and the availability of this type of equipment within the time frame within which the project is to be delivered). TfNSW therefore proposes to commit to an additional mitigation measure to investigate the potential use of a jack-up barge for construction works where possible, subject to other project requirements and commitments also being met.</p> <p>Use of a land-based piling rig is not possible for this project as the caisson wall and foreshore surface have a limited load-rating which is not sufficient to support a piling rig.</p>

Item	Summary of issue	Response
Respite periods		
4.4e	<p>If night works are undertaken respite nights should be provided.</p> <p>The EPA recommends the following in relation to construction hours and respite periods including:</p> <p>(a) comply with the standard construction hours as recommended in Table 1 Chapter 2 of the Interim Construction Noise Guideline, July 2009 except where any deviation from those hours is -</p> <p style="padding-left: 40px;">(i) fully justified in consultation with surrounding residents, and</p> <p style="padding-left: 40px;">(ii) limited to specific high noise impact works subject to an explicitly limited duration in the context of the justification referred to in (i) above;</p> <p>(b) undertake night-time work on not more than 2 nights during any single week and then only to undertake such work as is unable to be undertaken during standard hours due to wind and sea conditions;</p> <p>(c) not undertake night work on a Sunday night/Monday morning or during a public holiday;</p> <p>(d) provide respite of not less than 3 nights between the last night of work during one week and the first night of work during the week immediately following;</p> <p>(d) undertake as much of the piling work as is practicable from the land and or a jack-up barge so as to avoid the limitations wind and sea conditions would impose on piling rigs mounted on barges; and</p> <p>(e) only undertake impact or hammer piling during standard hours and under no circumstances during night-time.</p>	<p>Comments on recommended respite periods and conditions follow:</p> <p>(a) As indicated above, TfNSW is committed to investigating the potential use of a jack-up barge for construction works where possible, subject to other project requirements and commitments also being met.</p> <p>If it is possible for the Contractor to obtain a jack-up barge for works requiring calm conditions then piling within standard hours would be possible. However, TfNSW cannot commit to working within standard construction hours until a Contractor has been appointed for the project, and the availability of a jack up barge has been confirmed for the project. TfNSW notes that the standard hours adopted for the Barangaroo precinct are 7am – 6pm Mon – Fri, 7am – 5pm Sat (rather than ICNG standard hours). This could be considered further relative to TfNSW’s proposal. Justification in consultation with residences and business to determine the detailed methodology relating specifically to high noise impact works would be available at a later stage when the contractor has been appointed and the CNVIS and CNVMP prepared. This work would be conducted in accordance with the TfNSW Construction Noise Strategy and consider the different requirements of residences and businesses. It is noted that work required outside standard hours, such as the delivery of large components if required under Road Occupancy Licences or Harbour Master Approval, would be subject to the standard exemptions.</p> <p>(b) The suggested respite periods have the potential to substantially extend the Barangaroo Ferry Hub construction period. This would be incompatible with the timing of Barangaroo precinct operations. The provision of transport solutions to support the occupation of the precinct was promised by the State Government in the Sydney City Centre Access Strategy. It is noted that occupation of residential buildings within the Barangaroo precinct is currently planned for about September 2015, and imposition of the suggested respite periods would extend the duration of impact of piling activities for sensitive receivers both within Barangaroo and in nearby precincts.</p>

Item	Summary of issue	Response
Respite periods		
4.4e		<p>TfNSW proposes to manage the impacts associated with noisy activities proposed out of hours in consultation with sensitive receivers and in accordance with the TfNSW Construction Noise Strategy. The TfNSW Construction Noise Strategy requires that “No more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven day period”. This should be considered in the context of short duration of high-noise activities (e.g. pile hammering) involved in piling, and the longer duration of lower noise activities (e.g. pitching, drilling etc which are unlikely to be as intrusive). Consistent with this approach high noise and/or vibration generating works may only be undertaken for 4 consecutive nights in any 7 day period.</p> <p>(c) It is proposed no night work would be undertaken on a Sunday night/Monday morning or during a public holiday.</p> <p>(d) If it is possible for the Contractor to obtain a jack-up barge for works requiring calm conditions then piling works could be undertaken within standard hours. In relation to conducting piling works from the land, the land based structure at the wharf sea wall is not capable of supporting a piling rig, hence piling activities are required to be conducted from a barge or jack up barge.</p> <p>(e) As outlined in the response to Item 4.4c above the requirement to restrict impact or hammer piling to standard construction hours is not feasible as calm water conditions are required. It is noted the Balmain East wharf is similarly exposed and affected by waves and chop during the daytime and the upgrade currently being undertaken requires piling to be undertaken outside standard construction hours from 5am to 7am. Similarly community announcements for upgrades at Pyrmont Bay Wharf, Cremorne Point Wharf and Mosman Bay Wharf indicated early morning or night works may be required when the water is at its calmest. TfNSW will continue to engage with RMS on lessons learnt from these projects, particularly in relation to community consultation and feedback, if received, to assist in developing a construction methodology and measures which minimise impacts on sensitive receivers.</p>

Item	Summary of issue	Response
Intra-day respite periods		
4.4f	<p>Recommends adopting a regime of intra-day respite periods for activities generating noise with annoying or intrusive characteristics as identified in the ICNG. The recommendation was for at least one hour respite every three hours of continuous noise.</p>	<p>Intra-day respite periods of '3 hours on and 1 hour off' are proposed for high noise activities undertaken during the following hours:</p> <ul style="list-style-type: none"> • 8.00 am and 5.00 pm Monday to Friday; and • 8.00 am and 12.00 pm Saturdays <p>The proposed project respite period of 3 hours on and 1 hour off for high noise activities is consistent with the EPA recommendations, and the TfNSW Construction Noise Strategy.</p>
Queuing and idling construction vehicles and vessels		
4.4g	<p>Recommends ensuring construction vehicles and vessels do not arrive at the project site or in surrounding residential precincts outside approved construction hours.</p>	<p>The EIS identified that the number of construction vehicles likely to be generated during construction landside would be in the order of 10 concrete trucks per day (during concrete pours), and a small number of light vehicles and occasional heavy vehicles throughout the construction period. The majority of construction plant, equipment, personnel and materials would access the site via boat or barge.</p> <p>TfNSW proposes to minimise the number of construction vehicles and vessels arriving at the project site or in surrounding residential precincts outside approved construction hours. It is noted the approved construction hours may include night-time and the 5am to 7am early morning period. The detail of construction vehicle and vessel numbers and arrival and departure times would be identified in the project specific Construction Traffic Management Plan (CTMP), the CNVMP and would take into account any requirements of the Barangaroo Integrated Transport Plan Working Group and the Harbour Master in minimising traffic and pedestrian impacts associated with the proposal.</p>

Item	Summary of issue	Response
Demolition of existing wave baffle		
4.4h	<p>Recommends use of the least noisy feasible and reasonable method for pile removal (e.g. using divers to cut off piles at sea bed).</p>	<p>The demolition of the King Street Wharf wave baffle would be undertaken at a later stage of the proposal, if required, when the third wharf of the Barangaroo Ferry Hub is constructed.</p> <p>Prior to demolition it is proposed that TfNSW would undertake an assessment of the noise and vibration from the works. Where the potential noise and vibration exceeds the relevant criteria, less noisy feasible and reasonable methods for pile removal would be considered for the project. This procedure would form part of the CNVIS developed for that stage of the project.</p>
Noise and vibration - operation		
4.4i	<p>Query regarding the definition of 'extended layover' (during which vessels would run on shore power).</p>	<p>The following information is provided as an indicative guide:</p> <ul style="list-style-type: none"> • Vessels moored overnight would shut down engines and connect to shore supply. • Vessels moored for shift change, crib breaks and in between peak timetables (usually up to 3 hours) would shut down engines but not connect to shore power. • Vessels picking up and dropping off with short turnaround time (usually less than 10 minutes) would leave engines running. <p>The specific details of ferry operations at Barangaroo Ferry Hub would be outlined in an Operational Environmental Management Plan (OEMP).</p>

Item	Summary of issue	Response
4.4j	<p>Recommends TfNSW facilitates the logging of noise complaints during operation and provides an active and timely response to any such complaints.</p> <p>Recommends TfNSW develop and implement an effective community consultation and communication strategy (including a complaints management process).</p>	<p>Recommends TfNSW develop and implement an effective community consultation and communication strategy (including a complaints management process). Once constructed the Barangaroo Ferry Hub would be owned by Roads and Maritime Services (RMS) and operated by Sydney Ferries. It is not a standard TfNSW practice to prepare a consultation and communication strategy for operation of an asset. At the time of commissioning a new asset, an operational readiness communications plan would be prepared. This plan would outline community consultation on the future operation of the new hub to be undertaken during commissioning. Consultation would involve communication tools such as stakeholder briefings, project notifications and website updates to let the community know about the operation of the hub and set expectations for future use and engagement.</p> <p>TfNSW would work closely with the owner and operator of the Barangaroo Ferry Hub to ensure a smooth transition from construction to operation.</p> <p>Currently, to register a compliment or complaint about a Sydney Ferries service customers are encouraged to contact Transport Information at http://www.transportnsw.info/ or telephone 131 500. It is anticipated that Barangaroo Ferry Hub would be dealt with using the same mechanism during operation. TfNSW have well-established practices for dealing with complaints in line with the TfNSW Customer Complaints and Feedback Policy.</p> <p>Sydney Ferries operator Harbour City Ferries (HCF) has a complaints management framework which follows the principles outlined in the TfNSW policy. This includes timely response times, commitments to investigate complaints and customer follow up. More information regarding HCF's complaints management is located on their website http://harbourcityferries.com.au/service-centre.</p>

Item	Summary of issue	Response
4.4k	<p>Recommends a noise monitoring program be undertaken to 'ground truth' noise impact predictions at set periods following commencement of operation. Results of monitoring should be used to guide improved noise mitigation and management measures.</p>	<p>TfNSW proposes to conduct post construction noise monitoring to validate the prediction of operational noise levels. The monitored noise levels would be used with concurrent vessel movements to confirm the accuracy of the noise modelling. As part of this process should significant variations in the predicted noise levels at the nearest sensitive receivers be identified, then noise mitigation measures and/or changes to operational practices can be considered. This approach is similar to post construction noise studies that are conducted for road and rail projects.</p>
4.4l	<p>Deliveries and waste collection</p> <p>Recommends deliveries and waste collection are restricted to 'daytime hours' (7am-6pm Mon-Sat, 8am-6pm Sundays).</p>	<p>Barangaroo Ferry Hub will be located on one of the busiest routes within the Barangaroo South precinct (based on Barangaroo South Stage 1A public domain documentation which identifies this as a primary pedestrian corridor). It is considered that daytime collection of waste would potentially cause safety concerns, and a reduction in public enjoyment of the space, during the busiest periods. Daytime deliveries and waste collection may therefore not be suitable for the environment at this location.</p> <p>TfNSW is investigating opportunities to use the same service provider for waste collection as for the Barangaroo South foreshore to minimise cumulative impacts.</p> <p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan.</p>
4.4m	<p>Leaf blowers, blower vacuums and the like</p> <p>Recommends avoiding the use of leaf blowers, blower vacuums and the like to clean and maintain the wharves and surrounding area.</p>	<p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan. Note there is no proposal to use leaf blowers or vacuums (though high-pressure water cleaner use is proposed).</p>

Item	Summary of issue	Response
4.4n	<p>Public address system</p> <p>Recommends design of public address system should consider noise impacts. A well-designed system would typically comprise:</p> <ul style="list-style-type: none"> • maximum 30 watt amplifier • more lower power speakers rather than fewer high power speakers • provision for zoned announcements • well-located speakers pointed in the appropriate direction • speakers inclined downwards at a 45 degree angle. <p>Recommends the proposal's public address system should be designed and operated to minimise noise impacts on surrounding residents, particularly during evening and night-time.</p>	<p>Recommendations to address and control noise from the public address system will be considered at the detailed design stage. Indicative arrangements include:</p> <ul style="list-style-type: none"> • Each wharf would have public address speakers where each speaker is individually adjusted and controlled, therefore allowing for zoned announcements. • Around 12 speakers are expected to be installed on each wharf which would allow for lower volume announcements. • A hearing loop would be provided for customers with hearing impairment. <p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan.</p>

Water quality and hydrology – construction

4.4o	<p>Notes that construction would occur in immediate proximity to harbour waters. Notes excavation is likely to be of a minor nature.</p> <p>Recommends daily inspection of erosion and sediment controls.</p> <p>Recommends material storage (whether on-shore or on a vessel) should not be in a position where it is likely to enter the harbour.</p>	<p>Prior to construction an erosion and sediment control management plan for all land construction activities would be developed in accordance with Managing Urban Stormwater: Soils and Construction (The Blue Book) and included in the CEMP. The plan would require all erosion and sediment controls to be installed prior to any land works commencing. The controls would be maintained throughout construction, with regular inspections, and removed only once all disturbed areas have been reinstated.</p> <p>The CEMP would include measures to ensure that no material storage (including on-vessel and on-land storage) should occur in a position where it is likely to enter the harbour.</p> <p>It is further noted that recommended mitigation measures from the EIS include:</p> <ul style="list-style-type: none"> • Equipment barges (carrying plant, machinery, fuels or chemicals) will be banded to contain any accidental chemical spills or leaks. <p>Any chemicals or fuels stored at the temporary construction compound will be within double banded areas.</p>
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Item	Summary of issue	Response
4.4p	Notes risk of construction materials being introduced in or onto harbour waters. Recommends a dedicated self-propelled boat is available on the proposal site throughout construction to provide a timely response to contain and clean up any spills or leaks in or onto harbour waters.	<p>The recommendation for a dedicated self-propelled work boat is not consistent with other construction projects around the harbour or with the level of risk associated with the proposal.</p> <p>Equipment barges (carrying plant, machinery, fuels or chemicals) would be banded to contain any accidental chemical spills or leaks. Any chemicals or fuels stored at the temporary construction compound would also be within appropriately banded areas. Spill kits would be kept at certain accessible points around the site including on relevant barge/s and in the site compound throughout the works.</p> <p>Potential impacts on water quality would be minimised through the installation of booms fitted with turbidity curtains around water-based works for spill and sediment containment during construction of the project.</p>

Water quality and hydrology – operation

4.4q	Notes it is an offence to pollute waters. Raises concerns about particular activities which may pose a risk of water quality impacts during operation including sewage pump-out, fuel and oil spills, and cleaning and maintenance of wharves.	Noted.
4.4r	<p>Fuelling</p> <p>Recommends that vessel refuelling be undertaken at the ferry fleet base and not at Barangaroo Ferry Hub.</p>	No fuelling of ferries is proposed to be undertaken at the Barangaroo Ferry Hub during operation.
4.4s	<p>Maintenance</p> <p>Recommends that heavy maintenance be undertaken at the ferry fleet base and not at Barangaroo Ferry Hub.</p>	Ferry maintenance at Barangaroo Ferry Hub would only be internal to the vessel (e.g. within soundproofed engine rooms, or changing light bulbs etc.). No noisy maintenance works on vessels are anticipated. No heavy maintenance is proposed to be undertaken at Barangaroo Ferry Hub.

Item	Summary of issue	Response
4.4t	<p>Spill management</p> <p>Recommends installing appropriate pollution control measures and implementing procedures to prevent spills and leaks into and onto harbour waters.</p> <p>Recommends adopting and implementing contingency measures in the event of plant or equipment breakdown to minimise the impact of spills and leaks.</p> <p>Recommends the provision of a dedicated self-propelled work boat, floating boom, spill kits and other equipment for containment and clean-up of spills or leaks which may cause pollution of harbour waters.</p> <p>Recommends training ferry and wharf personnel in spill containment and clean up procedures and their reporting obligations concerning spills and leaks that are not of a trivial nature.</p>	<p>The risk of spills would be relatively limited at Barangaroo Ferry Hub. No refuelling is proposed to occur at Barangaroo Ferry Hub during operation therefore there is no risk of fuel spills during refuelling. Other spill risks associated with ferry use have been identified as:</p> <ul style="list-style-type: none"> • Collision and rupture of a vessel fuel tank. This is considered to be unlikely, and the design of Barangaroo Ferry Hub has considered minimisation of collision risk (for example, inclusion of fender piles and channel piles). • Minor release of sewage during vessel pump out. This is considered unlikely, as there is no history of such spills occurring and the system works on a vacuum (see below for further information). • The sewer system components have been designed to minimise the possibility of sewerage spills to the environment. There are two key components to the system: <ul style="list-style-type: none"> • A vacuum system has been designed between the vessel and the link structure. Any damage to the vacuum system (e.g. a hose puncture) would cause depressurisation and pumping would stop immediately as a result. • A positive pressure system for approximately 8.5 metres between the link structure and landside sewerage connection. A discrepancy alarm would be installed to immediately and automatically stop the pump in the event of pipe leak. The pipe would be visible and would be inspected during periodic maintenance checks. • Therefore contingency is built into the sewer system design for the proposal. • Circular Quay, a busier ferry interchange than the future Barangaroo Ferry Hub, does not have a dedicated spill boat. However, ferries do carry spill containment kits on board to handle minor spills, and wharves also have similar spill containment kits.

Item	Summary of issue	Response
4.4t		<p>The protocol for managing spills is as follows:</p> <ul style="list-style-type: none"> • Port Authority of New South Wales provides a 24 hour emergency response for port related marine incidents for both Sydney Harbour and Botany Bay. Any port related emergency is to be reported immediately by phone to Triple Zero (000) or by radio on VHF Ch 12 (Botany) or VHF Ch 13 (Sydney). • Incidents requiring a non-urgent response can be reported by phone on 9296 4000 or email to enquiries@portauthoritynsw.com.au <p>Vessel and wharf staff are aware of their responsibilities regarding spill management and the above protocol.</p> <p>For the above reasons it is considered disproportionate to have a self-propelled work boat available during operation of the Barangaroo Ferry Hub for the purpose of spill containment or clean up.</p> <p>The process for managing potential spills during operation would be outlined in an OEMP. It is anticipated that this would include having spill kits on vessels and wharves, and outlining the protocol for spill management including training of staff if necessary.</p>

Soils, geology and contamination – construction

4.4u	<p>Any excavation or disturbance of potential acid sulfate soils as part of the proposal must be managed in accordance with the Waste Classification Guidelines Part 4: Acid Sulfate Soils. Recommends also considering the 1998 Acid Sulfate Soils Manual.</p> <p>If Acid Sulfate Soils or Potential Acid Sulfate Soils are to be removed from the site for disposal there is only one landfill currently licensed to accept such waste.</p>	<p>It is not anticipated that soils would be excavated as part of the proposal. The probability of encountering acid sulfate soils and/or groundwater as a result of landside works is therefore low. However, if during detailed construction planning it is identified that excavation of soils would be required, relevant management requirements would be incorporated into the CEMP.</p> <p>Mitigation measures outlined in the EIS included:</p> <ul style="list-style-type: none"> • The CEMP will include a contamination plan outlining the methodology (in accordance with Waste Management Guidelines) to manage any potential contamination should small amounts of material be recovered (e.g. during pile removal). This plan would also include an unexpected finds protocol. <p>It is noted that there is only one landfill currently licensed to accept acid sulfate waste.</p>
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Item	Summary of issue	Response
Ecologically Sustainable Development – operation		
4.4v	<p>Energy and water conservation are essential components of ecologically sustainable development. The design should consider energy efficiency, water conservation (through stormwater collection, treatment and reuse for non-potable purposes) and water efficiency.</p> <p>The EPA acknowledges the initiatives in 6.13.1 of the EIS in relation to sustainability in design.</p>	<p>Noted. Numerous sustainability initiatives have been outlined in the EIS.</p> <p>It is noted that the glazed skylights in each roof would provide benefits in terms of energy performance and daylight benefits for customers.</p> <p>There is no proposed stormwater system as part of the Barangaroo Ferry Hub, therefore those particular recommendations would not apply to the proposal. However, water use during operation is anticipated to be limited.</p>
Waste and resource use – construction		
4.4w	<p>Waste generated during the project must be properly assessed, classified and managed in accordance with the EPA Waste Classification Guidelines.</p>	<p>Agreed. This is captured appropriately in the mitigation measures outlined in the EIS at Section 6.15.2.</p>
4.4x	<p>Concern that concrete deliveries and pumping are likely to generate significant volumes of concrete waste and rinse water. Concrete waste and rinse water are not be disposed of on the construction site.</p> <p>Recommends, regarding the management of concrete waste and rinse water, that:</p> <ul style="list-style-type: none"> • waste concrete is returned to the supplier (in the agitator trucks) or directed to a dedicated watertight skip • concrete rinse water is directed to a dedicated watertight skip or suitable water treatment plant. 	<p>The CEMP would include provisions to ensure that concrete waste and rinse water is appropriately managed.</p> <p>Both contractor and environmental representative inspections would be undertaken on a regular basis to ensure appropriate concrete management procedures as outlined in the approved CEMP are being adhered to on site.</p>
4.4y	<p>Recommends any vehicle or vessel used to transport waste is covered before leaving the premises to prevent the spill of any dust, waste or spoil.</p> <p>Recommends measures to minimise the chance of mud-tracking or other emissions from construction vehicles leaving the site, including clean-down prior to exit.</p>	<p>This is a standard management measure. The CEMP would include provisions to ensure that the transport of waste is managed to avoid spills.</p> <p>It is noted that all areas, including the landside compound, would be expected to be on hardstand areas. Therefore there would be minimal chance of mud-tracking. However the CEMP would include provisions to ensure construction vehicles are managed to minimise the chance of mud-tracking or other emissions.</p>

Table 4-5: Issues raised by Leichhardt Council

Item	Summary of issue	Response
Assessment and approval process		
4.5a	<p>Council recommends that TfNSW avoid inclusion images of the proposed Barangaroo hotel/casino in documents until that project has been formally approved by the DP&E.</p>	<p>TfNSW acknowledges that the proposed Barangaroo hotel/casino development is subject to assessment and determination by DP&E. However, to provide an indication of the visual appearance of the proposed Barangaroo Ferry Hub within the Barangaroo Precinct, TfNSW has relied upon images provided by BDA/Lend Lease.</p>
Community and stakeholder notification		
4.5b	<p>Recommends a community consultation meeting be convened to establish communication between Balmain East residents and TfNSW regarding construction of the proposal.</p> <p>Requests that Balmain East residents be informed:</p> <ul style="list-style-type: none"> • of construction hours and anticipated noise and visual impacts • of the operation of Barangaroo Ferry Hub once completed • in advance about construction works which may involve out-of-hours noise impacts. <p>Recommends that TfNSW:</p> <ul style="list-style-type: none"> • provide a detailed schedule of works to be made publicly available prior to construction commencing • implement a complaints management procedure • establish a community reference group facilitated by TfNSW • initiate community consultation, including notification in advance of out-of hours work • expand the proposed community consultation area to include residents of Balmain East. 	<p>TfNSW is committed to community and stakeholder engagement throughout construction and commissioning of the Barangaroo Ferry Hub.</p> <p>A Community Liaison Plan (CLP) would be prepared for the project to ensure stakeholders and the community are provided with timely and effective information about activities associated with the project, and opportunities to provide feedback, where appropriate. Community notification and consultation, including notification regarding out-of-hours and/or high noise generating works, would be undertaken in accordance with the TfNSW Construction Noise Strategy (CNS). Stakeholders potentially impacted by out of hours and/or high noise generating work would receive targeted notification no later than seven days ahead of new construction activities. The notification area would be expanded to include Balmain East residents, where required.</p> <p>Stakeholders would receive monthly construction updates on the progress of the project and upcoming activities. These would be distributed via letterbox drops and the Barangaroo Ferry Hub email database.</p> <p>Up to date information on the project and construction would also be available on the project website www.transport.nsw.gov.au/projects.</p> <p>Complaints during construction would be managed in accordance with TfNSW's Community Engagement Policy. A construction response line (1800 775 645) is available for all TfNSW projects and is a 24 hour contact point for complaints and urgent enquiries regarding construction works.</p> <p>Balmain East residents would be included in the letterbox drop area.</p>

Item	Summary of issue	Response
Noise – construction		
4.5c	<p>Recommends high-noise activities including piling works and demolition of the existing wave baffle, proposed for the 5am-7am shoulder period, be scheduled so that noisy works would be conducted as late in the shoulder period as possible.</p>	<p>Refer to Items 4.4b and 4.4c above regarding the management of noisy activities.</p> <p>If out-of-hours work is necessary (for example, if no jack-up barge is available and adverse weather precludes piling work during the day), TfNSW and its contractor would work closely to communicate with the community/sensitive receivers and develop appropriate mitigation measures.</p>
Traffic, transport and access – transport network		
4.5d	<p>Recommends the inclusion of White Bay and the western (Rozelle/Lilyfield) area of the Bays Precinct in the future ferry network.</p> <p>Encourages TfNSW to investigate opportunities for new Inner Sydney ferry services including to White Bay, Rozelle Bay, Pyrmont, Glebe and the Fish Markets.</p> <p>Recommends consideration of shuttle services between Balmain peninsula and Barangaroo.</p>	<p>The proposed servicing strategy provides a high frequency connection between Barangaroo Ferry Hub and Balmain East wharf as part of the regular ferry network.</p> <p>Parramatta River and Darling Harbour services would use the Barangaroo Ferry Hub once operational. Once introduced, the Cross Harbour route would also stop at Barangaroo Ferry Hub. The Cross Harbour route would link the Bays Precinct with Barangaroo, Lower North Shore and the Eastern Suburbs.</p> <p>As part of Sydney’s Ferry Future a number of locations were investigated for potential new wharves as indicated on page 13 of the strategy. This investigation included potential wharves at White Bay, Rozelle Bay, Pyrmont, Glebe and the Fish Markets. The requirements for additional ferry wharves within the Bays Precinct would be investigated as part of the urban renewal program.</p>
4.5e	<p>Council expresses its interest in further discussion and collaboration with the NSW Government in attracting tourists from Barangaroo to the Balmain Peninsula.</p>	<p>Noted.</p> <p>This comment relates to matters which are outside the scope of this proposal.</p>

Table 4-6: Issues raised by the Office of Environment and Heritage - Heritage Division

Item	Summary of issue	Response
Built and non-Indigenous heritage		
4.6a	Noted that there are no State Heritage Register items within the development site, however there are State Heritage Register items within the vicinity.	Noted. This is identified in the EIS in Section 6.5 and would be captured in the CEMP.
4.6b	Recommended that a suitably qualified and experienced heritage practitioner should oversee the heritage induction of staff and contractors.	No heritage items have been identified within the area of the proposal. It is proposed that all relevant staff and contractors would be trained regarding their statutory obligations and responsibilities under the Heritage Act 1977 and best practice outlined in The Burra Charter 2013, through the site induction and toolbox talks. Given the above it is not considered proportionate to require heritage practitioner to attend site to provide this component of the induction.
4.6c	If unexpected historic marine infrastructure and associated relics and/or historic ship wrecks are uncovered, the Heritage Council of NSW must be notified in writing in accordance with Section 148 of the Heritage Act 1977. Work must cease in the affected area(s) and a suitable qualified and experienced maritime archaeologist must be contacted to assess the archaeological material. Additional assessment and approval may be required prior to works continuing in the affected area(s) based on the nature of the discovery.	This is acknowledged and it is noted that such a procedure for unexpected finds was outlined in Section 6.5.3 of the EIS in the mitigation measures. This requirement would also be captured in the CEMP.

Table 4-7: Issues raised by Sydney Water Corporation

Item	Summary of issue	Response
Planning and assessment process – additional approvals and permits		
4.7a	<p>Extensions of the water and wastewater mains will be required to service the project. These will need to be managed in consultation with Sydney Water Corporation through the Section 73 certificate process under the Sydney Water Act.</p>	<p>It is anticipated that Lend Lease will be constructing the water mains, and these would be delivered to the edge of the Barangaroo foreshore under the public domain works for Barangaroo South. The proposal would connect to utilities at that point. It is understood that Lend Lease has received approval from Sydney Water Corporation for the extension of water mains to the foreshore. TfNSW will continue to work with Sydney Water Corporation, BDA and Lend Lease to obtain any necessary approvals to cover the water connection to the wharves.</p> <p>There would be no wastewater provision for the proposal as it is not required.</p> <p>However, it is noted that the sewerage connection for the proposal would be to the Barangaroo South plant.</p>
Utilities and services – stormwater		
4.7b	<p>The southernmost wharf may impact a stormwater channel outlet at this location. Structures should not be built within 1 metre of the outlet or over the stormwater structures. Further information should be provided to Sydney Water Corporation regarding the proposed structures to consider any impacts.</p>	<p>TfNSW has determined that for safety, time and cost reasons the northern two wharves would be constructed first. Therefore the third (southernmost) wharf would be constructed at a later date when demand necessitates it, and the first stage of construction is not expected to impact the stormwater channel.</p> <p>TfNSW is continuing to liaise with Sydney Water Corporation to clarify the limitations on construction around the stormwater channel and develop an engineering solution to this issue. This would be resolved through the detailed design of the southernmost wharf at a future stage.</p>

5 Community and stakeholder submissions

This chapter details the issues raised in submissions received during the public exhibition of the Barangaroo Ferry Hub EIS from the community and organisations, and TfNSW's response to these issues.

The order of the issues in this chapter is generally designed to reflect the order of information and assessment issues as presented the EIS, and does not reflect the number of times a particular issue was raised. For each issue (or sub-issue) raised, a summary of the issue is presented, followed by a list of the relevant submission numbers and then TfNSW's response.

5.1 Planning and assessment process

Item	Summary of issue	Sub No.	Response
Assessment and approval process			
5.1a	<p>Requested that TfNSW explicitly address the Secretary's Environmental Assessment Requirements in relation to:</p> <ul style="list-style-type: none"> • <i>"...assessment and modelling of ...bicycle parking requirements"</i> and • <i>"...assessment of ...impacts on cyclist and pedestrian access and safety, including consideration of opportunities to integrate cycling and pedestrian elements with the public domain"</i> 	8, 14, 15	<p>(1) TfNSW has considered the demand for bicycle parking in planning the proposal. Barangaroo Ferry Hub is expected to function as a transfer hub for cyclists for the most part rather than an ultimate end point. Those customers working at Barangaroo would have separate cycling facilities provided as part of their employment within the buildings and workers beyond Barangaroo would most likely take their bicycles with them to reach their final destinations. The commercial and residential buildings within Barangaroo South have provided for basement bicycle parking for tenants and residents. The specifics of these planning applications and approvals can be found on the DP&E webpage: http://majorprojects.planning.nsw.gov.au</p> <p>Twenty bicycle parking spaces are proposed for the Barangaroo Ferry Hub. These would be provided in a visible location close to Barangaroo Ferry Hub, subject to negotiation with BDA as landowner and Lend Lease as developer of Barangaroo South.</p> <p>(2) Barangaroo Ferry Hub is not anticipated to have any negative impact upon cyclist and pedestrian access and safety.</p> <p>Barangaroo Ferry Hub would provide improved accessibility and DDA compliance compared with King Street Ferry Wharf. This would benefit all users including passengers with a disability.</p> <p>The waterfront interface of the proposal with Barangaroo South influenced the link structure design, including the apron sizing. Key considerations included accessibility in accordance with DDA and other requirements, improving customer circulation and queuing, compatibility with Barangaroo South design and reducing special event queuing on Barangaroo South land.</p>

5.1 Planning and assessment process

Item	Summary of issue	Sub No.	Response
Assessment and approval process			
5.1a		8, 14, 15	<p>Landside elements of the proposal, including customer information and ticketing pods, are being designed in consultation with BDA and Lend Lease. TfNSW has recommended locations for customer information and ticketing pods to minimise impact on public open space (e.g. in line with trees), however exact locations are yet to be confirmed. Chapter 6 identifies the proposed change in wayfinding locations from that identified in the EIS.</p> <p>The public domain space is the responsibility of BDA and Lend Lease. Barangaroo Ferry Hub has been designed to be compatible with Barangaroo South public domain.</p>
5.1b	<p>Does not believe there is approval under their Barangaroo South planning applications for installation of services to facilitate connection to Barangaroo Ferry Hub.</p> <p>Recommends TfNSW seek planning approval for landside services and connection points</p>	29	<p>A review of the Stage 1A Public Domain application and approval for Barangaroo South (SSD 6303) indicates that provision has been made for the services for the Barangaroo Ferry Hub proposal to connect into. The intent expressed in documentation (including the EIS and response to submissions) suggests that Lend Lease would provide necessary service/utility connections to the Barangaroo Ferry Hub.</p> <p>Lend Lease's original Stage 1 Public Domain application stated the following in respect of provision of utilities and services:</p> <ul style="list-style-type: none"> • Section 3.11 of Stage 1A Public Domain Barangaroo South Environment Impact Statement (JBA, May 2014): Services for power and water supply will extend to the harbour edge to provide for future connections to any future ferry wharves. A maximum power demand allowance of 100kVA has been made in the project infrastructure for the ferry wharfs.

Item	Summary of issue	Sub No.	Response
5.1b		29	<ul style="list-style-type: none"> Section 4.3.3 Access and Connectivity – Maritime Infrastructure and Access: The Waterfront Promenade has been designed in consultation with Transport for NSW to ensure that it can accommodate the future potential ferry wharves adjacent to Barangaroo South. As the location and design of the ferry wharves is still yet to be determined, no wharf infrastructure, access easements or the alike have been included in this application , with the exception of utility services to facilitate future connection to the wharves. Future applications for those buildings will include these elements. Section 10.6 of Stormwater Management and Civil Infrastructure Assessment Project Application – Barangaroo South Public Domain (Cardno, May 2014) – Ferry Wharves: Services connections for power and water supply will be provided to the harbour edge of the ferry wharves. A maximum power demand allowance of 100kVA has been made in the project infrastructure for the ferry wharfs. If required additional connections to other services for the ferry wharves will be provided, subject to relevant conditions of consent. <p>In response to exhibition of the Stage 1A Public Domain application TfNSW sought confirmation of provision of utilities and services with termination at the wharves including power, communications, data, water and sewerage.</p> <p>Lend Lease provided the following response to the issue raised by Transport for NSW:</p> <p>TfNSW’s requests are noted and adequately accommodated in the Stage 1A Public Domain scheme at this stage. No further action is required as part of the Stage 1A application in relation to these items. Lend Lease has held numerous meetings and communications with TfNSW Barangaroo Ferry Hub project team in relation to the land side services throughout 2014 (refer to item 3 above).</p>

Item	Summary of issue	Sub No.	Response
Assessment and approval process			
5.1b		29	<p>The Determination of the Stage 1 Public Domain application which was issued 5 March 2015 includes the following Conditions relevant to the provision of utilities and services:</p> <p>Condition 1: Development Description subject of the approval, includes: The provision of all ground treatment and finishes, landscaping, furniture and fixtures, public domain structures, lighting, utility services, and civil and stormwater services.</p> <p>Condition B15: Prior to the issue of a Construction Certificate, the applicant is to liaise with TfNSW to ensure that suitable provision has been made to accommodate and co-ordinate the servicing requirements (electricity, communications, sewer etc) for the Barangaroo Ferry Hub. Details are to be submitted to the satisfaction of the PCA.</p> <p>In this regard, TfNSW is of the view that planning approval for services and utility provisions to support the Barangaroo Ferry Hub are provided under the abovementioned application. Notwithstanding this, planning approval is being sought under this SSI application for the construction and operation of the proposed Barangaroo Ferry Hub, which would include the necessary infrastructure such as services and utilities to support its operation. As indicated in the EIS and earlier in this report, TfNSW will continue to liaise with BDA/Lend Lease with a view to reaching agreement on the physical construction of required utility services to support the Barangaroo Ferry Hub.</p>

5.2 Proposal description and scope

Item	Summary of issue	Sub No.	Response
Design and justification			
5.2a	<p>Query size of waiting areas and whether this is sufficient to service crowds during busy periods. Raises safety and comfort concerns for waiting patrons, for example in the instance that two ferries are simultaneously arriving at the north and south berth of the same wharf.</p> <p>Notes Barangaroo Ferry Hub design has wider pontoons than Circular Quay wharves, however is concerned the waiting areas (approximately 200 square metres for each pontoon) do not appear to be large enough. Notes that seating effectively reduces waiting space.</p>	4	<p>The waiting and circulation areas of the pontoons have been designed to accommodate peak hour and normal Sunday crowds at a pedestrian level of service C which is in line with current standards for rail stations. This level of service is comfortable and safe for waiting customers.</p> <p>The provision of some customer seating is considered appropriate as this is a DDA requirement.</p>
5.2b	<p>Query regarding design of gangways. Suggests this proposal is an opportunity to modernise gangway technology to speed up passenger loading and unloading. Query whether it is possible to design a better vessel/ pontoon interface which allows 400 passengers to quickly disembark and 400 others to quickly board.</p>	4	<p>The investigation of redesigning of gangways to speed up loading and unloading of passengers is beyond the scope of this proposal.</p> <p>In Sydney's Ferry Future, the NSW Government announced it will modernise the ferry fleet and improve services as the network expands and the number of passengers increases. Gangway design will be investigated as part of the modernisation of the ferry fleet.</p>
5.2c	<p>Recommends ensuring all wharves are fully and easily accessible for prams, bicycles (including cargo bikes) and wheelchairs.</p> <p>Design should consider user safety, including those travelling with children, due to the danger posed by the water.</p>	19	<p>The design has been considered against the provisions of DDA, Disability Standards for Accessible Public Transport, Disability (Access to Premises – Buildings) Standards, BCA requirements and Australian Standards. The detailed design is to consider minor issues raised to maximise compliance with DDA and other relevant requirements.</p>

Item	Summary of issue	Sub No.	Response
5.2c		19	<p>The proposed design generally provides appropriate access paths, manoeuvring areas, passing places, waiting and rest areas, ramps and handrails. Further compliance details such as hearing loops, appropriate signage and tactiles will be considered in detailed design.</p> <p>Each gangway has to be designed to comply with relevant DDA gradient standards but there would be times when gangway gradients exceed the standard due to extreme tidal variance (e.g. during spring and king tides). This would be the case less than 20 per cent of the time.</p> <p>Glazed balustrades and sliding metal boarding gates (operated by Sydney Ferries staff) provide protection around the pontoon, gangway and link structure.</p>

Landside facilities (cycling)

5.2d	<p>Requests that TfNSW provide ample, convenient, secure bike parking.</p> <p>The quantum of bike parking provided should be increased later if required.</p> <p>Recommended the ferry hub provide end of trip facilities including covered bicycle parking.</p>	6, 8, 11, 12, 14, 15, 16, 17, 20, 21	<p>In Sydney's Cycling Future the NSW Government committed to providing bicycle parking at all transport interchanges to encourage cycling trips. Twenty bicycle parking spaces are proposed for the Barangaroo Ferry Hub.</p> <p>One of the key constraints for TfNSW in providing bicycle parking, is that it does not own land adjacent to the proposal area. In this regard, the bicycle parking spaces would be provided in a visible location close to Barangaroo Ferry Hub, subject to negotiation with BDA as landowner and Lend Lease as developer of Barangaroo South.</p> <p>Barangaroo Ferry Hub is expected to function as a transfer hub for cyclists for the most part rather than an ultimate end point. Those customers working at Barangaroo would have separate cycling facilities provided as part of their employment within the buildings and workers beyond Barangaroo would most likely take their bicycles with them to reach their final destinations. The commercial and residential buildings within Barangaroo South have provided for basement bicycle parking for tenants and residents. The specifics of these planning applications and approvals can be found on the DP&E webpage http://majorprojects.planning.nsw.gov.au</p>
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Item	Summary of issue	Sub No.	Response
5.2d		6, 8, 11, 12, 14, 15, 16, 17, 20, 21	<p>It is noted that the Barangaroo South project has identified public bicycle parking provisions as part of their Stage 1A public domain application (SSD6303). That EIS indicated “84 bicycle parking spaces (42 bike racks) for visitors to the commercial buildings and public domain will be provided in various locations across the public domain.” Condition B13 issued by DP&E required an increase to bicycle parking to 25 spaces for visitors to the commercial building and 120 spaces for visitors to the public domain.</p> <p>One submission requested covered bicycle parking. The Barangaroo South foreshore is an area of public open space which would not be a suitable location for a bike cage or covered bicycle parking due to the potential impact on pedestrians, visual impact and the lack of available land. No covered bicycle parking is proposed.</p>
5.2e	Recommends that TfNSW provide services such as an air pump.	15	This is beyond the scope of the proposal. There are no facilities for providing compressed air on or near the Barangaroo Ferry Hub.
5.2f	<p>Provide signalised cycling crossings at road intersections into/out of Barangaroo.</p> <p>Provide clearly signalised cycle crossings to control and make safe bicycle and pedestrian activity.</p>	8, 11, 14, 15, 16, 17, 21	<p>Cyclists accessing the proposed Barangaroo Ferry Hub from the Hickson Road and Napoleon Street cycleways would benefit from the new traffic signals proposed for installation as part of Barangaroo South at the Hickson Road/Napoleon Street intersection.</p> <p>The internal cycle provisions within Barangaroo are the responsibility of BDA/Lend Lease and future developers in the case of Central Barangaroo and Headland Park. Cycle provisions at road intersections are the responsibility of BDA/Lend Lease and RMS.</p> <p>These crossings and signals are outside of the scope of the proposal area assessed in the EIS.</p>

Item	Summary of issue	Sub No.	Response
5.2g	<p>Ensure the foreshore path is rideable without conflict.</p> <p>Provide cycling facilities along the entire foreshore.</p> <p>Provide safe, connected cycling links to the Barangaroo Ferry Hub that eliminate conflict with pedestrians and motorised traffic.</p> <p>Recommends providing direct connections to existing cycleways, including routes north along Hickson Road, south along Sussex St to Pyrmont Bridge and east to the Kent St cycleway.</p> <p>Requests cycle links are provided to meet Austroads guidelines, and in accordance with Long Term Transport Master Plan and Sydney City Centre Access Strategy.</p> <p>Requested the proposal provide internal cycling links to the Barangaroo Ferry Hub delivered as part of the first tranche of the Barangaroo transport network.</p> <p>Recommends providing high quality and clearly defined cycling infrastructure within Barangaroo and to the Ferry Hub to increase the safety of all users.</p>	<p>8, 11, 14, 15, 16, 21</p> <p>6, 7, 8, 9, 11, 14, 15, 16, 17, 20, 21</p>	<p>The strategic cycle network for the city area is outlined at page 45 of the Sydney City Centre Access Strategy (SCCAS). Barangaroo Integrated Transport Plan provided an outline of possible pedestrian and cycle access to Barangaroo including a shared foreshore path.</p> <p>The scope of Barangaroo Ferry Hub proposal is predominantly limited to waterside works (i.e. three wharves). Landside cycle facilities are beyond the scope of the proposal. Barangaroo land, including the foreshore area adjacent to the proposed Barangaroo Ferry Hub is owned by BDA.</p> <p>The Barangaroo foreshore is being developed in three sections. Barangaroo South is being developed by Lend Lease. Headland Park (now known as Barangaroo Point) is being developed by Baulderstone. The developer for Central Barangaroo is yet to be announced.</p> <p>BDA and the relevant developers are responsible for delivering transport connections, including cycle facilities, within the Barangaroo development area including the foreshore. The design and timing of those connections are not within the control of TfNSW.</p> <p>The DP&E has determined an application for Barangaroo South Stage 1A Public Domain (SSD 6303) which addresses cycle connections. That application is available at the DP&E webpage http://majorprojects.planning.nsw.gov.au</p> <p>The majority of cycling demand is expected to be commuter due to the commercial development at Barangaroo South. Cyclists are expected to access Barangaroo South via a number of routes including ferry services and Hickson Road.</p>

Item	Summary of issue	Sub No.	Response
Landside facilities (wayfinding)			
5.2h	<p>Support for wayfinding and directional signage which directs people to destinations further south as well as Barangaroo locations. A wayfinding strategy should be provided with this application.</p> <p>Notes King Street Wharf is a substantial trip generator, particularly for visitors, and the role of the Darling Harbour Precinct should be considered.</p> <p>Recommends wayfinding and directional signage to the following destinations:</p> <ul style="list-style-type: none"> • Commercial offices in Barangaroo South • Commercial towers within Shelley Street Waterfront Promenade restaurants and activities • Wynyard Station/CBD via Transport Place • King Street Wharf/Darling Harbour • Sydney Aquarium and Sydney Visitor Centre. <p>Wayfinding plan should consider arrivals at the site from properties to the south, as well as from Barangaroo.</p>	22, 27	<p>The TfNSW wayfinding strategy for Barangaroo Ferry Hub is being refined and would be determined in detailed design. In terms of maps and signage this strategy would incorporate identification of local area ‘points of interest’, but no final decisions have been made at this time as to details of this design package.</p> <p>TfNSW note however that the responsibility for wayfinding and signage unrelated to wharves and other transport infrastructure lies within the remit and responsibility of other organisations including:</p> <ul style="list-style-type: none"> • BDA within Barangaroo area • Infrastructure NSW in relation to the International Convention Centre • City of Sydney in remaining landside areas. <p>Ferry wharf identification would consider arrivals from the south, east (e.g. Transport Place) and the north. The spread of wayfinding and customer information and ticketing pods proposed by TfNSW to BDA and Lend Lease has considered arrivals from all three directions.</p>

Item	Summary of issue	Sub No.	Response
Waterside facilities (wharf use)			
5.2i	<p>Barangaroo Ferry Hub should be a dedicated public transport only terminal. Other jetties, marinas, moorings and launch points in the inner harbour cater for private and commercial vessels.</p> <p>The Barangaroo Ferry Hub should serve public transport needs and not serve party boats or tour boats. King Street Wharf would better serve these other vessels.</p>	5, 18	<p>The Barangaroo Ferry Hub is designed to serve public transport services. As part of the TfNSW Wharf Access Policy public transport services would have priority for access to the Barangaroo Ferry Hub. However if there was additional available capacity that may be allocated to other operators, such as commercial operators of public ferry services.</p> <p>The future use of King Street Wharf is out of scope for the Barangaroo Ferry Hub project and would be further investigated in the future.</p> <p>There is potential for King Street Ferry Wharf to be refurbished and converted to a leased wharf for charter operators in line with the other King Street wharves.</p>
5.2j	<p>Recommends that Barangaroo Ferry Hub be used for commercial vessels (particularly party boats) as well as ferries, in order to spread the impact of the party boat industry (including noise, anti-social behaviour).</p>	23	<p>The Barangaroo Ferry Hub is designed to serve public transport services. As part of the TfNSW Wharf Access Policy public transport services would have priority for access to the Barangaroo Ferry Hub, however if there was additional available capacity that may be allocated to other operators (for example, private ferry services). Use of the Barangaroo Ferry Hub facilities by late night party boats is not part of the current proposal.</p> <p>The impact of the party boat industry is beyond the scope of this environmental impact assessment.</p>
5.2k	<p>Support for extended operating hours for Barangaroo Ferry Hub compared with the existing King Street Ferry Wharf.</p> <p>Increased operating hours, noting the proximity to King Street Wharf, are supported.</p>	22	<p>Noted.</p> <p>Operating hours would typically be between 5 am and 12 am Monday to Friday and between 7 am and 12 am Saturday, Sunday and public holidays.</p>

5.3 Needs and alternatives

Item	Summary of issue	Sub No.	Response
Project need			
5.3a	<p>Supports the proposed ferry hub in this location to provide a western city link to a major public transport mode.</p> <p>Happy to learn of the inclusion of a new ferry hub in the Barangaroo area, as this is an underutilised area of Sydney.</p> <p>Supports provision of more public ferry services, and notes that ferries are a pleasant and healthy mode of transport.</p> <p>Notes role of public ferry transport in reducing traffic congestion and utilising the asset of Sydney Harbour.</p>	12, 16, 18	<p>Noted.</p> <p>The Barangaroo Ferry Hub would initially double the current ferry capacity within the Darling Harbour precinct by providing two extra berthing faces. A third wharf would be installed when demand necessitates. The two wharves built initially would allow additional services to the Darling Harbour precinct from the Parramatta River and Lower North Shore via the Parramatta River and Darling Harbour routes. The Cross Harbour route would provide services from the Eastern Suburbs once introduced.</p> <p>The proposal would assist in meeting the ferry mode share target outlined in the Barangaroo Integrated Transport Plan.</p>
5.3b	<p>Queries demand forecasts presented in EIS, particularly growth in patronage anticipated from current (King Street Ferry Wharf) numbers to Barangaroo Ferry Hub 2016 forecasts. Queries what proportion of passengers who would continue to Circular Quay rather than disembarking at Barangaroo.</p> <p>Queries growth in ferry patronage from locations on Parramatta River (including increased proportion of ferry mode share) and ferry patronage growth network wide presented in EIS (8% per year through to 2026).</p>	4	<p>The patronage and growth forecasts provided in the EIS are considered to be an accurate projection. Patronage forecasts were developed based on the Sydney Strategic Transport Model which is a tour-based multi-segmented disaggregate model. The model estimates the future patronage based on land use and employment forecasts. The model assigns trips to modes based on travel time and cost. This means mode shares are derived from the model.</p> <p>The annual growth of the ferry network is based on the increased land use and employment within the wharf catchments, and the network improvements of the ferry network.</p>

Item	Summary of issue	Sub No.	Response
Options assessment			
5.3c	<p>Requests that Option B is further considered.</p> <p>King Street Ferry Wharf should be retained for future public use, rather than the construction of the northern wharf at Barangaroo Ferry Hub.</p> <p>Queries why Option C selected (building two new wharves) when King Street Ferry Wharf is available. Challenges value selection of Option C (preferred option).</p> <p>If Barangaroo Ferry Hub is built then recommends using Aquarium Wharf for commuter ferries to serve the Darling Harbour East / Cockle Bay area.</p>	3, 22	<p>The options identification and assessment which identified Option C as the preferred option is outlined at Section 3.3.3 of the EIS.</p> <p>Business case analysis determined that Option C provided the greatest benefits and best value for money. The analysis considered construction costs, operating costs along with various benefits including travel time savings across all of the options.</p> <p>Option C aligns most favourably with the key findings of the strategic assessment, in particular Sydney's Ferry Future in which the NSW Government has committed to provide a ferry hub at Barangaroo, to service the Barangaroo precinct, improve services to central and western parts of the CBD and relieve capacity constraints at Circular Quay. This option would also enable Sydney's ferry services to respond to predicted growth over time (by including future provision of a third wharf as demand necessitates), while giving operators improved flexibility with regard to scheduling of ferry services and managing wider network constraints.</p> <p>Option C would enhance the customer experience by offering new ferry services to and from Barangaroo (and hence central and western parts of the CBD), a new facility with improved amenity including greater ticketing convenience, improved wayfinding and accessibility, direct access via Wynyard Walk to Wynyard Station and city buses and the opportunity for integrated timetabling across these modes (ferries, trains and buses).</p> <p>Option B was not the preferred option. Capacity limitations, the lack of suitable disabled access and the need for ongoing maintenance given the age of the wharf, mean future reliance on King Street Ferry Wharf for public ferry services is undesirable.</p> <p>Aquarium Wharf does not currently serve Sydney Ferries services. However certain private ferry services may use Aquarium Wharf. These services are not run or controlled by TfNSW.</p> <p>Item 5.3f provides further information regarding the construction of the northernmost wharf.</p>

Item	Summary of issue	Sub No.	Response
5.3d	<p>Queries why pump-out facilities are being provided when ferry depot is 300 metres away.</p> <p>Queries need for repairs to be done at Barangaroo Ferry Hub.</p>	3	<p>The statement that there is a ferry depot 300 metres away is incorrect. The Balmain Shipyard is the nearest ferry depot to Barangaroo Ferry Hub. The commercial pump out facilities at King Street Wharf 6 are not a Sydney Ferries facility and not suitable for this use.</p> <p>Alternative pump-out locations considered during the planning process included Baileys Wharf at White Bay and the ferry depot at Balmain Shipyard. The use of either facility would result in up to one hour “dead running” time, reducing operational inefficiencies.</p> <p>Pump out facilities are provided at Barangaroo Ferry Hub to provide operational flexibility as some vessels require pump out multiple times a day during peak running periods. If vessels are required to pump out in alternate locations there is a potential need for these vessels to be taken out of service potentially leading to customer delays. Section 3.3.4 of the EIS provides further information on the need for these facilities.</p> <p>Minor maintenance of ferries would take place at the Barangaroo Ferry Hub on a daily basis, similar to the maintenance activities that currently occur at Circular Quay. This would be limited to ferries that layover and would include activities such as minor repairs, pump-out of sewage, cleaning of vessels and updating passenger information displays. Ferries would only be cleaned with low pressure hoses to remove salt. Ferry maintenance at the wharf would only be internal to the vessel (e.g. within soundproofed engine rooms, or changing light bulbs etc.). No noisy maintenance works on vessels are anticipated.</p> <p>Major scheduled maintenance would take place at Balmain Shipyard.</p> <p>There is significant operating time and cost associated with requiring vessels to be moved between Balmain Shipyard and Barangaroo Ferry Hub for pump out, minor maintenance and other cleaning functions. Undertaking these low impact activities at Barangaroo Ferry Hub would provide network and operational flexibility.</p>

Item	Summary of issue	Sub No.	Response
5.3e	Proposes that King Street Ferry Wharf should be retained, at least in part, for public transport infrastructure.	22	<p>The development of Barangaroo Ferry Hub would expand ferry infrastructure in eastern Darling Harbour. Barangaroo Ferry Hub would more than double the capacity of the existing King Street Ferry Wharf and would provide much better facilities in terms of ticketing facilities, wayfinding signage and access for disabled passengers. The proposal would also enable Sydney's ferry services to respond to predicted growth over time (by including future provision of a third wharf as demand necessitates).</p> <p>The option of retaining King Street Ferry Wharf for public transport infrastructure would not offer the full integration of the ferry hub with the Wynyard precinct development, nor would it address the deficiencies of the existing King Street Ferry Wharf, particularly the lack of suitable disabled access. Once Barangaroo Ferry Hub is operational, future reliance on King Street Ferry Wharf for public ferry services is unlikely to be required.</p>
5.3f	<p>Query which of the three wharves will be constructed first.</p> <p>Each submission made a recommendation for building the two southern wharves first. Their reasons included:</p> <ul style="list-style-type: none"> • reduce visual impact on Barangaroo South residences • reduce noise impact on Barangaroo South residences during construction and operation • provide the best connectivity to the CBD via Transport Place and Wynyard Walk • cluster wharf activity around existing and planned maritime uses to help promote ferry modal shift and reduce impacts • accessibility to King Street Wharf, Darling Harbour and Cockle Bay precincts • to provide in a larger walking catchment to existing (southern) employment and visitor destinations when compared to the northern wharf. 	22, 27, 29	<p>TfNSW has determined that for safety, time and cost reasons the northern two wharves would be constructed first.</p> <p>The key reason for this decision related to navigational safety. TfNSW convened a workshop with the Maritime Management Centre, various divisions of TfNSW, Roads and Maritime Services, Harbour City Ferries, Captain Cook Cruises, the Commercial Vessels Associations, BlueLine Cruises and Port Authority NSW to consider the Barangaroo Ferry Hub. On the basis of navigation safety all attendees agreed it was preferable to construct the two most northerly wharves first for the following reasons:</p> <ul style="list-style-type: none"> • this option moves ferry activities further to the north, away from the pinch point between Pyrmont Point (also known as Wharf 10, Pyrmont) and Barangaroo; • this option moves ferry activities further away from the congestion at King Street wharves; • ferry activities would be concentrated in a wider waterway and therefore the resultant impact from ferry wash would be reduced; • no need to remove wave baffle between Barangaroo Ferry Hub and King Street wharves during the first stage of construction.

Item	Summary of issue	Sub No.	Response
5.3f	Noted that Cockle Bay Wharf, Darling Park, Darling Harbour and King Street Wharf are existing high demand destinations and employment generators and are experiencing growth.	22, 27, 29	<p>When the third (southern) wharf is constructed, vessels using Darling Harbour would be familiar with Barangaroo Ferry Hub. Further, establishing the northern two wharves first would provide an opportunity to establish navigational procedures and make any necessary adjustments in the wider area of Darling Harbour. This would reduce navigation risks at the “pinch point” between Pyrmont Point and Barangaroo once the southern wharf is constructed.</p> <p>In the long term, all three wharves are expected to be operational at Barangaroo Ferry Hub. Thus the long term visual, noise and accessibility impacts are anticipated to be identical once the third wharf is operational.</p> <p>The issue of walking catchments and connectivity is dealt with in greater detail in Section 5.6, particularly Items 5.6u and 5.6v.</p>
5.3g	5.3g Requests Transport for NSW oversee a future upgrade of King Street Ferry Wharf to ensure it can meet disability access requirements.	22	<p>The use of the King Street Ferry Wharf following the decommissioning of ferry services is currently being considered by TfNSW in consultation with relevant stakeholders.</p> <p>There is potential for King Street Ferry Wharf to be converted to a leased wharf for charter operators in line with the other King Street Wharf facilities. If necessary, this would be subject to a separate approval.</p>

Strategic context

5.3h	<p>Query how does the proposal encourage cycling as a transport option and help achieve NSW 2021's goal of doubling cycling mode share?</p> <p>Requested an outline on strategies that the proposal will adopt to encourage cycling as a transport and commuter option.</p>	8, 11, 14, 15, 17, 21	<p>The goal of doubling the cycling mode share is predominantly supported by other (cycle-focused) transport projects. However this proposal would link to those projects as outlined in SCCAS via the Barangaroo South area which is owned by BDA.</p> <p>The Barangaroo Ferry Hub proposal would encourage cycling by providing additional ferry services (which are bicycle accessible) to the western CBD. Barangaroo Ferry Hub would expand on an existing access point (currently King Street Ferry Wharf) and provide improved accessibility.</p> <p>The internal cycle connections within Barangaroo are the responsibility of BDA / Lend Lease and future developers in the case of Central Barangaroo and Headland Park.</p>
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Item	Summary of issue	Sub No.	Response
5.3h		8, 11, 14, 15, 17, 21	<p>The Department of Planning and Environment has determined an application for Barangaroo South Stage 1A Public Domain (SSD 6303) which addresses cycle connections for Barangaroo South as well as bicycle parking and facilities. That application is available at the Department's webpage http://majorprojects.planning.nsw.gov.au</p> <p>Bicycle parking would be provided nearby the Barangaroo Ferry Hub as outlined further at Item 5.2d.</p>
5.3i	<p>Recommends the proposal is amended to include cycling links and bicycle parking as mandated in the Long Term Transport Master Plan and Sydney City Centre Access Strategy.</p> <p>Requests cycling provisions along the foreshore are shown in line with Sydney Regional Environment Plan 2005 and Sharing Sydney Harbour Access Plan.</p>	8, 14, 15	<p>As identified above at Items 5.2f and 5.2g the provision of landside cycling links is beyond the scope of the proposal. The foreshore area adjacent to the proposed Barangaroo Ferry Hub is owned by BDA, therefore this would be the responsibility of BDA and the relevant developers for each of the three areas of Barangaroo development.</p> <p>Bicycle parking is discussed at Items 5.1a and 5.2d.</p> <p>However the SCCAS outlines a strategic cycleway network for the Sydney city centre with indicative links connecting Barangaroo from the north and south. TfNSW is currently undertaking further planning investigations on bicycle links to Barangaroo.</p> <p>It is understood that a separated cycleway is to be provided along Hickson Road (north of Napoleon Street) by Lend Lease / BDA as part of the Barangaroo development. There is potential for a separated cycle facility linking the Hickson Road cycleway to the existing King Street cycleway along Sussex Street, which would provide cycle access from the west (Pyrmont Bridge), south (Kent Street) and east (King Street). Several options are under consideration for an improved link from the north (Sydney Harbour Bridge).</p>

5.4 Community and stakeholder consultation

Item	Summary of issue	Sub No.	Response
Ongoing consultation			
5.4a	<p>Requests that Bicycle NSW, BIKESydney and other cycling representative groups are consulted during detailed design and when planning bike paths and cycling infrastructure.</p> <p>Requested ongoing consultation advocacy groups including Bicycle NSW and BIKESydney.</p>	6, 7, 11, 14, 15, 16 17, 21	<p>BDA and Lend Lease are responsible for delivering transport connections, including cycle facilities, within the Barangaroo South development area adjacent to the proposal. The design and timing of those connections are not within the control of TfNSW and therefore TfNSW is not responsible for consultation on these facilities.</p> <p>A Community Liaison Plan (CLP) would be prepared for the Barangaroo Ferry Hub project to ensure stakeholders and the community are provided with timely and effective information about activities associated with the project, and opportunities to provide feedback, where appropriate.</p> <p>Bicycle advocacy groups, including Bicycle NSW and BIKESydney would be engaged throughout construction and commissioning of the Barangaroo Ferry Hub via monthly construction updates and project newsletters.</p>
5.4b	Offered assistance during design to assist with solutions to improve cyclist access and amenities.	15	<p>TfNSW notes the offer of assistance during detailed design of cyclist access and amenities.</p> <p>TfNSW is proposing to provide a minimum of 20 bicycle rack spaces (10 Urails) near the interchange entrance for ferry customers. Final bicycle rack numbers, design and location are subject to discussions with BDA and Lend Lease given the need to position them on BDA owned land.</p>
5.4c	<p>Request preparation of a community liaison plan in relation to the decommissioning of King Street Ferry Wharf. This should include ongoing liaison with Brookfield.</p> <p>Consultation with key stakeholders should be undertaken in relation to future use of King Street Ferry Wharf (if decommissioned).</p>	22	<p>A Community Liaison Plan (CLP) would be prepared for the project to ensure stakeholders and the community are provided with timely and effective information about activities associated with the proposal (including decommissioning of King Street Ferry Wharf), and opportunities to provide feedback, where appropriate. The CLP would ensure:</p> <ul style="list-style-type: none"> Stakeholders and the community have a high level of awareness of all processes and activities associated with the project including the decommissioning of King Street Wharf.

Item	Summary of issue	Sub No.	Response
5.4c		22	<ul style="list-style-type: none"> • Accurate information is made available in an effective and timely manner. • A timely response is given to feedback, enquiries and complaints received from stakeholders and the community. <p>Once the proposal is complete, all public transport ferry trips from King Street Ferry Wharf would be transferred to the new Barangaroo Ferry Hub. This change would provide an opportunity to release capacity at the King Street Ferry Wharf in the future for private and commercial operations. The timing of this change and confirmation of proposed future use, would be determined as part of the operational plan for ferry services.</p>
5.4d	<p>Concern regarding timing of preparation of the Construction Environmental Management Plan (CEMP).</p> <p>Proposes that stakeholders should have an opportunity to comment on the proposed construction methodology and mitigation measures.</p>	22	<p>During public exhibition of the EIS, stakeholders were provided the opportunity to comment on proposed mitigation measures for the Barangaroo Ferry Hub project (Table 7-1) and a detailed overview of the proposed construction methodology (Chapter 4).</p> <p>Feedback received during public exhibition of the EIS has been considered in this Submissions Report and would be considered during development of the CEMP. TfNSW would consult with stakeholders throughout construction to implement additional mitigation measures for any unexpected impacts, should they occur.</p>
Consultation undertaken to date			
5.4e	Stated the Bicycle NSW and BIKESydney were not consulted during the development of the EIS.	14	Cyclist needs were considered in the development of the ferry hub design with the inclusion of bicycle parking racks. Most landside transport connections including cycling facilities are outside the scope of the project as detailed in Section 5.2.

5.5 Noise and vibration

Item	Summary of issue	Sub No.	Response
Construction			
5.5a	Noted that King Street Wharf noise catchment area is not expected to experience substantial noise impacts during construction. Any further design changes should meet those noise levels anticipated the EIS.	22	<p>Design changes are identified in Chapter 6 of this Submissions Report, in the Preferred Infrastructure Report section.</p> <p>It is noted that design refinements have led to an increased number of piles to be installed, with approximately 46 per wharf rather than the 30 per wharf originally considered in the EIS. The increase in the number of piles will result in an overall duration of the piling element of the works. However the methodology as detailed in the EIS involving construction of one pile at a time remains the same. In this regard, it is not expected that there would be a change in the noise levels predicted in the EIS.</p>
5.5b	Noted substantial noise exceedances (including sleep disturbance levels) anticipated during construction for future Barangaroo noise catchment area, Pyrmont and Jones Bay Wharf (NCA-01, 03, 04).	22	<p>The issue of substantial noise exceedances during construction has been addressed in detail in the response to Items 4.4b and 4.4c. It is acknowledged that the noisiest construction activities (impact piling) are expected to result in noise levels greater than 75 dBA, or 'highly noise affected', at some receivers. It is noted the noise levels predicted in the EIS are representative of the worst case or most intensive operation of equipment in any given scenario, and in general lower noise levels will be expected.</p> <p>As exceedances of noise management levels are anticipated, these would be managed through the preparation of a CNVIS and CNVMP to provide an appropriate response to manage these impacts.</p> <p>If out-of-hours work is necessary (for example, if no jack-up barge is available and adverse weather precludes piling work during the day), TfNSW and its contractor would work closely to communicate with the community/sensitive receivers and develop appropriate mitigation measures.</p>

Item	Summary of issue	Sub No.	Response
5.5c	<p>Barangaroo South residences (Buildings R8 and R9) will be occupied from September 2015. Recommends piling should be carried out prior to this if possible.</p> <p>Recommends restriction to standard working hours after the occupation of Barangaroo South residences.</p> <p>Requested CNVMP mitigation measures are provided in the response to submissions.</p>	29	<p>It is noted that residents at R8 and R9 are not the only sensitive receivers which would potentially be impacted by Barangaroo Ferry Hub construction. The CNVIS and would consider all impacted sensitive receivers and the CNVMP would provide an appropriate response to manage these impacts.</p> <p>As detailed in the responses to Item 4.4c above, the particulars of construction timing and methodology cannot be committed to at this stage until a construction contractor is engaged. Once the construction contractor is engaged it would be possible to consider the methodology, timing and likely noise impacts in greater detail in the CNVIS. As outlined above it may not be possible to construct the proposal entirely within standard working hours if a jack-up barge is not available, and any restriction to standard working hours would extend the duration of construction.</p> <p>The CNVMP would be prepared once the construction contractor is engaged and in line with the conditions of approval. The CNVMP would include the standard mitigation measures, and additional mitigation measures described in the TfNSW Construction Noise Strategy. The additional mitigation measures are important for this project, as they are applicable to works that may be required outside standard construction hours. The Construction Noise Strategy recognises that where out of hours work is required exceedances of the project's noise objectives is likely and a pro-active engagement with affected sensitive receivers is required. The additional mitigation measures include, but are not limited to notifications, letter box drops, noise monitoring, and respite periods. The pro-active engagement with affected sensitive receivers would include consideration of the trade-off between the duration of construction verses the relative noise impact.</p>
5.5d	<p>Queries distance from Noise Catchment Area 01 to the area of proposed works (suggests figure used was incorrect). Recommends reviewing the noise calculations for NCA-01.</p>	29	<p>Table 6 of Report 610.14047 specifies a distance of 60 m to NCA-01 receivers. The table footnote specifies this distance as being from the 'centre of the Barangaroo Ferry Hub project (i.e. the centre of wharf 2)'. Calculations to receivers were based on the nearest distance from construction and operational noise sources to the receivers, rather than the 'indicative' distance specified in Table 6. The predicted noise levels presented in the EIS are therefore accurate and do not need to be reviewed.</p>

Item	Summary of issue	Sub No.	Response
Operation			
5.5e	Noted that King Street Wharf noise catchment area is not expected to experience substantial noise impacts during operation. Any further design changes should meet those noise levels anticipated the EIS.	22	Design changes are identified in Chapter 6 of this Submissions Report, in the Preferred Infrastructure Report section. There are no proposed changes which would result in a change in noise levels during operation predicted in the EIS.
5.5f	Noted noise exceedances (including sleep disturbance levels) anticipated during operation for future Barangaroo noise catchment area, Pyrmont and Jones Bay Wharf (NCA-01, 03, 04). There are not substantial mitigation measures proposed for operational noise impacts.	22	Some exceedances of operational noise objectives are anticipated at NCA-01, NCA-03 and NCA-04, including sleep disturbance criteria and night-time (NCA-01 only). These exceedances are likely due to the proposed use of high pressure water cleaning equipment and ferry warning horns. Currently no ferry timetable is available for the proposed Barangaroo Ferry Hub. The peak period scenario presented in the EIS was derived based on the forecast operation of the terminal as a worst case (during peak hours with all three wharves in used within a one hour period). It would be appropriate to consider operational noise mitigation when the proposed timetable and operational procedures for the proposed Barangaroo Ferry Hub are developed. TfNSW will continue to work with RMS and Sydney Ferries in relation to these matters. Potential operational noise mitigation measures would be included the Operational Environmental Management Plan/Operational Noise Management Plan.
5.5g	Recommends larger vessels should not be moored (layover) at Barangaroo Ferry Hub to minimise noise impacts associated with out-of-hours maintenance.	29	Minor maintenance of ferries would take place at the Barangaroo Ferry Hub on a daily basis, similar to the maintenance activities that currently occur at Circular Quay. This would be limited to ferries that layover and would include activities such as minor repairs, pump-out of sewage, cleaning of vessels and updating passenger information displays. Ferries would only be cleaned with low pressure hoses to remove salt. Ferry maintenance at the wharf would only be internal to the vessel (e.g. within engine rooms, or changing light bulbs etc.). No noisy maintenance works on vessels are anticipated. Noise levels associated with at-wharf maintenance are not expected to be any higher for larger vessels than smaller vessels, and are not anticipated to exceed noise management levels.

Item	Summary of issue	Sub No.	Response
5.5g		29	<p>Major scheduled maintenance would take place at Balmain Shipyard.</p> <p>There is substantial operating time and cost associated with requiring vessels to be moved between Balmain Shipyard and Barangaroo Ferry Hub for pump out, minor maintenance and other cleaning functions. Undertaking these low impact activities at Barangaroo Ferry Hub would provide network and operational flexibility.</p>

5.6 Traffic, transport and access

Item	Summary of issue	Sub No.	Response
Construction – Navigation			
5.6a	The EIS identifies the potential for occasional disturbance to the 130 metre wide navigation channel. Requests prior notification and consultation if any temporary encroachment on the navigation channel would restrict access to the private wharves at Cockle Bay Wharf.	27	<p>The 130 metre wide navigation channel would be maintained throughout the construction period wherever possible to minimise disturbance to vessel movements and safety of vessels travelling to and from Darling Harbour during construction.</p> <p>Construction would be planned to minimise impact on the navigation channel – a Construction Traffic Management Plan (CTMP) would be prepared before the commencement of work. The CTMP would include event management during construction, including avoiding events taking place in the harbour such as the Sydney International Boat Show.</p> <p>Movement in and out of the construction site is not anticipated to block navigation into Darling Harbour.</p> <p>Approval from the Sydney Harbour Master would be required in relation to the configuration of the site boundary. If any particular delivery events necessitated temporary disruption of the use of the waterway this would be managed through the CTMP procedures including Harbour Master approval and notification procedures. The Harbour Master would also provide notification to vessel users of any planned disruption to normal navigational procedures.</p>

Item	Summary of issue	Sub No.	Response
Construction – Pedestrian			
5.6b	Request that should temporary closure of any pedestrian routes be required key stakeholders are consulted prior.	22	It is not anticipated that closure of pedestrian routes would be required. However, should this be identified during detailed construction planning key stakeholders would be consulted prior. This would be identified in the CLP.
5.6c	Concerned that the calculation of public access space along the Waterfront Promenade would be restricted by the construction compound and Barangaroo South construction hoardings. States that the clear width will be 5 metres, rather than 12 metres. Recommends pedestrian modelling is revisited for a narrower (5 metre) clear width.	29	<p>The calculation of public access space adjacent to the construction compound was done on the basis of information provided by Lend Lease regarding staging and hoardings within the vicinity. That information was current at the time the EIS was prepared. In February 2015 Lend Lease updated TfNSW with changed staging arrangements. It is acknowledged that this would result in a narrower space between the proposed construction compound and the Barangaroo South construction hoardings.</p> <p>It is noted that a reduced clear width would be expected to apply for a limited time, until September 2015.</p> <p>A five metre clear width would allow space for two wheelchair users to pass in opposite directions. TfNSW is also exploring options to use a narrower construction compound to provide a wider public space in this area. This is being done in consultation with BDA and Lend Lease.</p> <p>It is considered that this issue can be adequately managed during detailed construction planning, preparation of the CTMP and in consultation with BDA and Lend Lease.</p>
Construction – Traffic			
5.5d	Requested inclusion of mitigation measures to address impact of construction vehicles on cyclists, particularly along Hickson Road as shown in Figures 6-5 and 6-6 of the EIS.	8, 11, 14, 15, 16, 17, 21	A CTMP would be prepared before the commencement of work, which would include a Traffic Control Plan in accordance with the RMS Traffic Control at Work Sites Manual and Australian Standard 1742.3. This plan would manage construction vehicle movements including movements along Hickson Road in the vicinity of the site. The estimated number of construction vehicle movements is expected to be easily accommodated by the surrounding road network which has ample capacity, and is thus not anticipated to have a significant impact on cyclists.

Item	Summary of issue	Sub No.	Response
5.6e	<p>Inbound and outbound construction traffic routes which are adjacent to King Street Wharf and Shelley Street may impact these receivers.</p> <p>Request CTMP is provided to key stakeholders for comment prior to construction commencing.</p>	22	<p>Construction of the proposal would require a small number of light and heavy vehicles to transport materials to and from the construction compound located on the foreshore. The majority of construction plant, equipment, materials and personnel would access the construction site via Sydney Harbour, travelling by boat and/or barge from the construction contractor's off-site facility to the proposal area, which would reduce traffic impacts.</p> <p>It is anticipated that the busiest period for land based vehicle access would be for concrete pours associated with the link structures after piling has been completed. Up to ten concrete trucks per day (about one vehicle per hour) would access the site via land during concrete pours, for example construction of the link structure. The expected traffic impact is considered to be minimal in the context of existing and expected traffic volumes on Lime Street during the construction period.</p> <p>The CLP would include ongoing liaison with key stakeholders, including in relation to construction traffic.</p>
5.6f	<p>Notes landside heavy vehicle access may be restricted as there is potential for damage to paving materials on the Waterfront Promenade.</p> <p>Recommends concrete pumping is done from Lime Street to avoid damage to the Waterfront Promenade.</p>	29	<p>Noted. TfNSW have been made aware of the loading limitations of the Waterfront Promenade through regular meetings with BDA and Lend Lease.</p> <p>Identification of the exact construction methodology would take place during detailed construction planning. However, indicative information has been provided to respond to the issues identified.</p> <p>The intention is to transport concrete for piles on water by barge. This would reduce the number of land based concrete deliveries. However, for the construction of the concrete link structure the intention is to transport concrete by land.</p> <p>A compound on land would assist in facilitating concrete pumping from Lime Street.</p>
5.5g	<p>Recommends material should be transported by water and stored on a barge.</p>	29	<p>The majority of construction plant, equipment, materials and personnel would access the construction site via Sydney Harbour, travelling by boat and/or barge from the construction contractor's off-site facility to the proposal area.</p> <p>A limited number of deliveries and activities are proposed to be undertaken on land. If no landside compound was available, this would extend the construction program.</p>

Item	Summary of issue	Sub No.	Response
Operation – Modal integration			
5.6h	<p>Barangaroo Ferry Hub should be a multimodal hub specifically connecting the ferry network to the cycle network.</p> <p>The EIS addresses multi-modal transport in a disconnected way.</p> <p>Integration of the cycle network into the design would assist in encouraging use by cyclists.</p> <p>Requested that the ferry hub be connected with other modes of transport including pedestrian networks, cycling networks and bus networks.</p> <p>Noted other global cities have effective cycle networks, and stated Sydney’s cycle network does not meet the same standards.</p>	12, 17	<p>Section 6.2.2 of the EIS outlines the modal connections between ferry services and the pedestrian, cycle, train, bus and road networks. The construction of the Barangaroo Ferry Hub would assist in creating a public transport spine between Wynyard Station and ferry services via Wynyard Walk.</p> <p>The proposal would be well served by a number of existing and future pedestrian connections. Transport Place, a new pedestrian plaza at the western end of Wynyard Walk, would provide a safe and accessible connection to the proposed Barangaroo Ferry Hub (delivered by TfNSW and BDA/Lend Lease). Pedestrian connections south along the foreshore and north via Barangaroo would also serve ferry customers.</p> <p>Following the introduction of Wynyard Walk, pedestrians travelling between George Street, Wynyard Station and the proposed Barangaroo Ferry Hub would be able to bypass on-street delays, travelling to the Barangaroo foreshore in about six to eight minutes. This would facilitate connection to train and bus networks centred in Wynyard precinct. Additional bus services and routes in the area of Barangaroo Ferry Hub are considered in the SCCAS.</p> <p>The SCCAS and Sydney’s Cycling Future outline opportunities to improve Sydney’s cycle network.</p> <p>The future cycle network in the precinct would provide ample capacity to support bicycle movements to and from the proposed Barangaroo Ferry Hub. BDA/Lend Lease are responsible for delivering transport connections, including cycle facilities, within the Barangaroo South development area adjacent to the Barangaroo Ferry Hub. Access for cyclists to the proposed Barangaroo Ferry Hub would be improved with the public domain improvements occurring throughout the Barangaroo precinct and there is unlikely to be a potential impact from the proposal. In future key connections to the Kent Street bi-directional cycleway, and Hickson Road and Napoleon Street cycleways, are expected to be facilitated by the Barangaroo South works.</p>

Item	Summary of issue	Sub No.	Response
Operation – Cycle			
5.6i	<p>Include an assessment of internal and external (to Barangaroo) cycling catchments and ‘desire lines’.</p> <p>Stated Barangaroo will generate a significant number of commuter cycling trips irrespective of the cycling provisioning provided.</p> <p>Explicitly identify cycling links to the Ferry Hub within and external to Barangaroo.</p> <p>Recommends identifying clear cycling routes from Barangaroo Ferry Hub into the city, Darling Harbour, Ultimo and Pyrmont.</p>	8, 11, 14, 15, 16, 17, 19, 21	<p>The SCCAS outlines a strategic cycleway network for the city. This network was developed based on key cycling gateways to the city centre from the north, south, east and west. These gateways include the Sydney Harbour Bridge cycleway to the north, Central Station / Prince Alfred Park to the south, Anzac Parade to the east and the Anzac Bridge and Pyrmont Bridge to the west. The strategic cycleway network links these gateways directly via separated cycling facilities.</p> <p>High level analysis of Journey to Work data shows that commuters cycling to the Northern CBD (currently most accurate proxy for Barangaroo) are travelling into the city centre at all directions from inner city locations. On-going cycle counts at key gateways to the city centre and on the existing King Street and Kent Street separated cycleways support these findings.</p> <p>BDA/Lend Lease are responsible for delivering transport connections, including cycle facilities, within the Barangaroo South development area adjacent to the Barangaroo Ferry Hub.</p> <p>Refer to Item 5.2g above for further information on cycle links from Barangaroo Ferry Hub.</p>
5.6j	<p>Include an assessment of the demand for bicycle parking.</p>	8, 11, 14, 15, 16, 17, 21	<p>TfNSW has considered the demand for bicycle parking in planning the proposal. Twenty bicycle parking spaces are proposed as outlined in Item 5.1a and 5.2d. The details of bicycle parking are subject to negotiation with BDA as landowner and Lend Lease.</p> <p>Barangaroo Ferry Hub is expected to function as a transfer hub for cyclists for the most part rather than an ultimate end point.</p>
5.6k	<p>Specifically address the cycling desire line between the Harbour Bridge cycleway and the northern entrance to Barangaroo via Watson Rd, Argyle Pl and Dalgety Rd (this route is likely be favoured by many riders).</p>	8, 11, 14, 15, 17, 21	<p>Several options are under consideration for an improved cycle link connecting Barangaroo from the northern gateway (Sydney Harbour Bridge). An on-road cycle lane and mixed traffic facility is currently being implemented for improved cycle access via Watson Road, Argyle Place and Dalgety Road.</p> <p>This is the subject of a separate project and approval and is beyond the scope of the proposal.</p>

Item	Summary of issue	Sub No.	Response
Operation – Navigation			
5.6l	<p>Recommends that 3 wharves / 6 berths are required initially to service Parramatta River, Darling Harbour, Hunters Hill and Manly Fast ferries.</p> <p>Concerned there may be flow on delays if the berths provided are insufficient.</p>	3	<p>Barangaroo Ferry Hub has been designed to cater to passenger and vessel demand through 2026. The initial construction of two wharves ensures spare capacity for vessel berthing is provided. The space reservation for the third wharf ensures that it can be built when demand for services necessitates its construction.</p> <p>As the proposal has been designed to cater sufficiently for demand, delays are not anticipated.</p>
5.6m	<p>Concerned that opening of Barangaroo Ferry Hub, and the addition of extra services, may add to congestion at Circular Quay. Notes the number of ferry lines terminating at Circular Quay is as per existing.</p>	4	<p>The operational modelling for the long-term ferry network has taken into account the available capacity at Circular Quay, and future capacity at Barangaroo Ferry Hub. The increase in services over time can be accommodated at both facilities.</p>
5.6n	<p>Queries how many ferry services per hour are proposed when Barangaroo Ferry Hub is completed?</p>	3	<p>At the year of opening (2016) of the first two wharves, the Barangaroo Ferry Hub is expected to have patronage of up to 11 vessels per hour during weekday AM peak period and up to 14 vessels per hour Saturday and Sunday. Patronage is expected to increase to 15 vessels per hour for the weekday AM peak period by 2026.</p>
5.6o	<p>Requests confirmation that the proposal will not adversely restrict existing and potential future expansion of private ferry and commercial vessel operators within the southern precinct of Darling Harbour and Cockle Bay.</p> <p>Requests that consideration be given to the potential expansion or increased demand of private and commercial vessels entering Darling Harbour and Cockle Bay when developing the vessel traffic management plan.</p>	27	<p>The proposed Barangaroo Ferry Hub would initially include two operating ferry wharves catering for most vessel classes, and a third wharf to be constructed when demand necessitates. The wharves have been designed at a northwest angle and configured to minimise the projection of the structures into the Darling Harbour channel, which ensures that the 130 metre wide navigation channel is maintained.</p> <p>In consideration of navigational impact of the Barangaroo Ferry Hub a formal risk assessment for the Darling Harbour waterway, including the Barangaroo Ferry Hub proposal, was conducted by TfNSW. This risk assessment was undertaken with input from various divisions of TfNSW, Roads and Maritime Services, Harbour City Ferries, Captain Cook Cruises, the Commercial Vessels Associations, BlueLine Cruises and Port Authority NSW.</p>

Item	Summary of issue	Sub No.	Response
5.6o	<p>Notes the planned and anticipated growth of southern Darling Harbour associated with the proposed upgrade of the existing waterside structures at Cockle Bay, Darling Harbour Live and a potential redevelopment of Harbourside Shopping Centre.</p> <p>The proposal should not reduce the capacity for private or commercial vessels to operate in Darling Harbour and Cockle Bay.</p>	27	<p>The risk assessment informed the development of a draft Vessel Traffic Management Plan which would be finalised and implemented prior to commencement of operations at the Barangaroo Ferry Hub. The general trend towards more and larger recreational vessels in Sydney Harbour, including Darling Harbour, has been considered in these documents.</p>
5.6p	<p>Barangaroo Concept Plan MOD 7 includes a pier to the north of Barangaroo Ferry Hub proposal area. Barangaroo Concept Plan MOD 8 proposes to modify this plan including moving the pier southwards.</p> <p>Requests that the relationship between the approved (MOD 7) and proposed (MOD 8) piers and the Barangaroo Ferry Hub proposal be examined to consider operational safety.</p>	29	<p>The Barangaroo Ferry Hub would be located between the existing King Street wharves to the south and the proposed Barangaroo pier to the north.</p> <p>The design of Barangaroo Ferry Hub considered the State Environmental Planning Policy (Major Development) Amendment (Barangaroo) 2010 site boundary (as per MOD 7), including the pier design. The distance between the MOD 7 Barangaroo site boundary and the northern Barangaroo Ferry Hub wharf would allow for safe use of the northernmost berthing face at Barangaroo Ferry Hub.</p> <p>TfNSW has requested CAD drawings from Lend Lease for the Barangaroo South public pier design but has not yet received drawings which would allow an exact measurement of the distance to the northernmost berthing face. Navigational safety workshops have considered safe berthing spaces. For safe navigation a minimum of 17.5 metres clear berthing navigation area must be provided to the north of the northernmost berthing face. This has been communicated to both BDA and Lend Lease, and TfNSW has provided CAD drawings to BDA and Lend Lease detailing this requirement.</p>

Item	Summary of issue	Sub No.	Response
5.6p		29	<p>Based on the approved Barangaroo Site Boundary (as per MOD 7) and the proposed Barangaroo South Concept Plan MOD 8 site boundary shown on Lend Lease drawing B10_AMP_08_0022.dgn, TfNSW has calculated the approximate distance from the northernmost berthing face of the proposal to the Barangaroo public pier measured perpendicular from the berthing face to accurately gauge navigation space.. This calculation was based on the actual location of the proposed wharves, as the Lend Lease plan shows the wharves incorrectly located. Given these calculations are based on PDF drawings and no set out points have been provided, an approximation has been made based on static landmarks including roads and approved buildings R8 and R9. The following approximate distances are:</p> <ul style="list-style-type: none"> • The approved State Environmental Planning Policy (Major Development) Amendment (Barangaroo) 2010 site boundary (as per MOD 7) would provide a distance of around 26 metres to the northernmost berthing face. • The modified site boundary proposed in MOD 8 would provide a distance of around 17.7 metres to the northernmost berthing face. <p>The State Significant Development application for MOD 8 was on public exhibition until 1 May 2015. MOD 8 has not received planning approval. Therefore it is not considered appropriate to design the Barangaroo Ferry Hub based on MOD 8.</p>

Operation – Ferry Network

5.6q	<p>Suggestions for Barangaroo Ferry Hub to be the hub for all ferries coming from the west, including Woolwich and Parramatta lines.</p> <p>Recommends that the future ferry network include a Barangaroo stop in the proposed future Cross Harbour route shown in Sydney's Ferry Future.</p> <p>Recommends that the following services/wharves be established:</p> <ul style="list-style-type: none"> • Jacksons Landing/Bays Precinct route 	4, 5, 18	<p>Parramatta River and Darling Harbour services would use the Barangaroo Ferry Hub once operational.</p> <p>Once introduced, the Cross Harbour route would also stop at Barangaroo Ferry Hub. The Cross Harbour route would link the Bays Precinct with Barangaroo, Lower North Shore and the Eastern Suburbs.</p> <p>Changes to the ferry network and new ferry wharves are beyond the scope of this proposal. However it is noted that as part of Sydney's Ferry Future a number of locations were investigated for potential new wharves as indicated on page 13 of the strategy. This investigation included potential wharves at White Bay, Rozelle Bay, Pyrmont, Glebe and the Fish Markets.</p>
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Item	Summary of issue	Sub No.	Response
5.6q	<ul style="list-style-type: none"> Bays Precinct route White Bay service including a new public ferry wharf near Booth Street, Balmain. <p>Concern regarding poor public transport for the Bays Precinct (including White Bay Domestic Cruise Passenger Terminal, Pyrmont and Sydney Fish Markets).</p> <p>Notes urban renewal of Bays Precinct will increase demand due to new residents and businesses in the area.</p>	4, 5, 18	<p>Sydney's Ferry Future indicates new wharves will be investigated at Johnstons Bay and Glebe Point and, if warranted, will be introduced in the longer term as an extension to the Darling Harbour route.</p> <p>Other wharf options may be revisited in the future if there are significant changes in land use. The requirements for additional ferry wharves within the Bays Precinct would be investigated as part of the urban renewal program.</p>
5.6r	<p>Presents an alternative to the Sydney's Ferry Future plan, with a diagram and text identifying regular interval timetabling principles, four proposed new ferry wharves and changes to existing routes. This also includes a bridge or tunnel connection to Pyrmont Bay rather than ferry connection.</p> <p>Recommends that connecting lines should provide convenient ferry to ferry connections (approximately 4-10 minutes wait time).</p>	4	<p>The recommended changes to the ferry network and ferry timetable are beyond the scope of this proposal.</p> <p>Please see Item 5.6q regarding proposed routes and new wharves.</p>
Operation – Traffic			
5.6s	<p>Query whether the operation of a third ferry wharf has been considered in assessing operational traffic impacts. This environmental assessment should consider the proposal at full operation (i.e. all three wharves operating).</p>	22	<p>Section 6.2 of the EIS assessed the operation of the proposal for all three wharves. As outlined in the EIS the proposal is not expected to have an impact on vehicular traffic. The vast majority of users are expected to arrive using the enhanced pedestrian network as previously discussed. However there may be small numbers who are dropped off or picked up in the vicinity of the wharves, and a small number of vehicles accessing the site for routine maintenance activities.</p>

Item	Summary of issue	Sub No.	Response
Operation – Pedestrian			
5.6t	<p>Transport Place would connect best with the two southern wharves. This would provide the best connection to Wynyard Walk via Transport Place (within Barangaroo South development).</p>	22	<p>The proposal includes eventual construction of all three wharves. In the long term, all three wharves would be in operation.</p> <p>The additional distance to Transport Place from the northern wharf, compared with either the middle or southern wharves, would be around 65 metres (less than one minute walk for most pedestrians). This is not considered to substantially hinder the connection with Wynyard Walk via Transport Place.</p> <p>Item 5.3f identifies the reason for constructing the northern two wharves first.</p>
5.6u	<p>Walking catchments from the existing King Street Ferry Wharf allow access to locations further south and west (via Pyrmont Bridge) than from Barangaroo Ferry Hub.</p> <p>Pedestrian catchment maps were provided as part of the submission. Stated these maps show the areas that are currently located within 10 minute and 5 minute walking catchments at the existing King Street Ferry Wharf would be outside of these catchments for the proposed Barangaroo Ferry Hub. This includes impacts to the 10 minute walking catchment of the Maritime Museum, Harbourside, and a greater eastern span of the CBD.</p> <p>Stated that substantial redevelopment opportunities and trip generators are located at the southern and eastern area of Darling Harbour.</p>	22	<p>The middle of the three Barangaroo Ferry Hub wharves is around 185 metres north of the King Street Ferry Wharf. Therefore moving ferry services to Barangaroo Ferry Hub would on average add 185 metres to the journey of pedestrians accessing areas south of the proposal, and a maximum of 250 metres for services to the northernmost wharf.</p> <p>The location of Barangaroo Ferry Hub would optimise the connection with Transport Place, creating a public transport spine between Wynyard precinct and the CBD and ferry services via Wynyard Walk.</p> <p>The pedestrian catchment maps provided are not considered to accurately represent the pedestrian catchment of the King Street Ferry Wharf or the Barangaroo Ferry Hub. In any pedestrian catchment mapping the distance change between two central points for comparison (in this case King Street Ferry Wharf and the Barangaroo Ferry Hub) should be equivalent to the represented change in catchment.</p> <p>Figure 6-7 in the EIS represents the 400 metre and 800 metre walking isochromes from Barangaroo Ferry Hub.</p> <p>Once the proposal is operational the southern and eastern areas of Darling Harbour precinct could be accessed via Barangaroo Ferry Hub and Pyrmont Bay Wharf.</p>

Item	Summary of issue	Sub No.	Response
5.6v	<p>The shift from the existing King Street Ferry Wharf to the Barangaroo Ferry Hub location reduces accessibility to southern destinations.</p> <p>The Cockle Bay Wharf Precinct is outside of the 800m/10 minute walking catchment from Barangaroo Ferry Hub (shown in EIS Figure 6-7).</p> <p>Cockle Bay Wharf and surrounds is also accessible by private ferry, water taxi and other water transport by way of Darling Harbour Pier 26, and the Darling Harbour Aquarium Wharf which are each within a 3 minute walk.</p> <p>Challenges whether the EIS is accurate in stating “the proposal would ensure accessibility to Darling Harbour and surrounding foreshores”.</p>	22	<p>The proposal would improve accessibility to Darling Harbour, servicing a greater number of ferry services than the existing King Street Ferry Wharf. By introducing an accessible transport mode to the area, the proposal would serve a significant proportion of commuters and visitors to the Barangaroo precinct. It would also attract customers from existing modes of travel by providing improved access to the western and central parts of the CBD, including for passengers with a disability.</p> <p>The construction of the Barangaroo Ferry Hub would create a public transport spine between Wynyard precinct and ferry services via Wynyard Walk. The shift from King Street Ferry Wharf is not considered significant in light of the improved accessibility the proposal would provide. Figure 6-7 in the EIS represents walking distances from Barangaroo Ferry Hub. Cockle Bay Wharf Precinct is slightly south of the 800 metre walking catchment from Barangaroo Ferry Hub. Sydney Ferries services would serve the Darling Harbour precinct via Barangaroo Ferry Hub and Pyrmont Bay Wharf.</p> <p>As stated in the submission, this Cockle Bay Wharf area is also accessible by private ferry, water taxi and other water transport by way of Darling Harbour Pier 26 and the Darling Harbour Aquarium Wharf.</p>

5.7 Visual amenity and urban character

Item	Summary of issue	Sub No.	Response
Operation			
5.7a	<p>Concern regarding the impact of the proposal on visual amenity, landscape character and outlook for the existing retail and restaurant district at King Street Wharf.</p>	22	<p>The Barangaroo Ferry Hub would sit to the north of the King Street Wharf retail and restaurant district. Views from tenancies at King Street Wharf tend to be directly west to the water, framed by the side walls of the individual tenancy. The proposal would not impact on these views. The proposal may potentially be visible obliquely from the promenade, but this view is already restricted by the existing King Street Ferry Wharf and layover/berthing for tourist vessels along the frontage of the King Street Wharf retail and restaurant district.</p>

Item	Summary of issue	Sub No.	Response
5.7a	<p>Concern that mitigation measures (including use of transparent materials, minimisation of scale of elements and reduction of visual clutter) will not be adequately considered during detailed design. Request mitigation measures to reduce visual impact of the proposal on the promenade and King Street Wharf area are outlined.</p> <p>The visual impact of the proposal and mitigation measures should not be deferred to detailed design.</p>	22	<p>The visual impact of the Barangaroo Ferry Hub has been mitigated by minimising the height and articulating the roof structure whilst also ensuring views through the structure are available from the landside to the water. The proposed detailed design has a clear line of sight from the landside through to the water that has been achieved by limiting structural columns to just four, providing clear glazed screens and balustrades and limiting structures on the pontoon to the minimum required for safe operations.</p> <p>The visual impact of Barangaroo Ferry Hub has been considered at the concept design stage with mitigation measures being incorporated into the development of the detailed design. These mitigation measures would reduce the overall visual impact of the proposed wharves including the impact on the promenade and King Street Wharf area. This was outlined in Section 6.4 of the EIS, with mitigation measures outlined in Section 6.4.4.</p>
5.7b	<p>States that the visual impact of Barangaroo Ferry Hub on the Barangaroo South residences has not been sufficiently assessed.</p> <p>Query on how the design has considered minimisation of visual impact.</p> <p>Query on how roofs will be treated and maintained.</p>	29	<p>The visual and landscape character assessment did consider views from Barangaroo south, including retail and residential land uses. While Barangaroo South is currently a construction site, the Landscape and Visual Impact Assessment was based on the area as completed, as a “landmark high-end commercial, residential and recreational precinct”. Viewpoint 10 considered future views from the Barangaroo South promenade, adjacent retail and residential areas Refer to Section 6.4 and Appendix H of the EIS for further information.</p> <p>The visual impact of the Barangaroo Ferry Hub has been mitigated by minimising the height and articulating the roof structure whilst also ensuring views through the structure are available from the landside to the water. The proposed detail design has a clear line of sight from the landside through to the water that has been achieved by limiting structural columns to just four, providing clear glazed screens and balustrades and limiting structures on the pontoon to the minimum required for safe operations.</p>

Item	Summary of issue	Sub No.	Response
5.7b		29	<p>The lighting system and luminaires have been designed and selected to minimise glare and comply with AS4284 (Testing of building facades) and AS1680.5 (Interior lighting).</p> <p>The zinc roofing is anticipated to be durable and require minimal maintenance over its 50 year design life. No regular treatment is expected to be required. Basic inspections would be undertaken at regular intervals and after events such as storms as required. There are not anticipated to be any substantial impacts on sensitive receivers in relation to roofs.</p>
5.7c	<p>Recommends a reflectivity study be completed to consider the impact on surrounding building occupants.</p>	29	<p>The Barangaroo Ferry Hub proposes very low scale single storey structures that are largely open. The opportunities for reflectivity are therefore limited to the roof, stainless steel clad pods and glazed screens. The roof is proposed to be a standing seam zinc roof which has very limited reflectivity and has been used on other wharves in Sydney Harbour during the Wharf Upgrade Program. Glazed screens on the pontoon are shaded by the roof which would limit their reflectivity. Any reflectivity from the roof or other components would be moderated as the structure ages due to the impact of the marine environment.</p> <p>Given the above it is not considered necessary to undertake a reflectivity study.</p>
5.7d	<p>Recommends larger vessels should not be moored (layover) at Barangaroo Ferry Hub to minimise visual impacts.</p>	29	<p>The wharf design and space limitations at Barangaroo Ferry Hub would limit the vessel size which may potentially use the layover space.</p> <p>The largest class of vessels in the Sydney Ferries fleet, the Freshwater Class, would not use Barangaroo Ferry Hub. The largest displacement and longest vessel which may potentially use the Barangaroo Ferry Hub is the Lady Class vessel at around 44 metres. However most vessels are 35 metres or less in length.</p> <p>Layover is likely to occur for longer periods during the night, which would have limited visual impact. However it may also occur during the day depending on timetabling.</p> <p>The existing ferry layover facilities at Circular Quay and Balmain do not have sufficient capacity to effectively accommodate future fleet numbers given Sydney's Ferry Future plans for modernisation and expansion of the ferry fleet. There are significant operating cost associated with requiring vessels to be moved between ferry facilities for the purpose of layover, thus use of the Barangaroo Ferry Hub for this purpose would also assist to avoid unnecessary inefficiency.</p>

5.8 Property and land use

Item	Summary of issue	Sub No.	Response
Construction			
5.8a	Raised concerns regarding removal of the King Street Wharf wave baffle and potential impact on leased berths at King Street Wharf. Requested consultation and information to assist with managing any associated impacts.	13	Due to the proximity of the proposal to King Street Wharves, a management plan with appropriate measures would be prepared to manage vessel manoeuvring during construction work. TfNSW would consult with relevant stakeholders to manage any impacts associated with removal of the wave baffle.
5.8b	Recommends that the majority of the site facilities for the construction workers should be provided on water (i.e. barge), as the majority of works are waterside works.	29	<p>The majority of construction plant, equipment, materials and personnel would access the construction site via Sydney Harbour, travelling by boat and/or barge from the construction contractor's off-site facility to the proposal area. Many components would be transported and temporarily stored on barges (rather than on land), such as piles. Detailed construction planning would be undertaken by the construction contractor once engaged.</p> <p>The waterside site is constricted by the busy Darling Harbour channel and there is likely to be a limit on the water borne plant that may access the site.</p> <p>A landside compound is proposed to include relocatable site sheds, temporary toilets and bunding to prevent accidental spills entering the waterway. Construction equipment (e.g. construction materials and tool boxes) would be stored within the compound.</p> <p>A landside compound would be beneficial to the construction process, providing a greater degree of flexibility and a land based access point for relevant works. If no landside compound is available this would extend the duration of construction. For example, a compound on land would assist in facilitating concrete pumping from Lime Street for the link structure, which would be more efficient than constructing the link structure from barges.</p>

Item	Summary of issue	Sub No.	Response
5.8b		29	<p>Landside access would be required in case of emergencies and/or extraordinary events, and for TfNSW inspections (such as safety and environmental inspections).</p> <p>TfNSW has been made aware of the loading limitations of the Waterfront Promenade through regular meetings with BDA and Lend Lease. The proposed landside compound elements would comply with these loading limitations, and any vehicle access would be restricted to comply with loading limitations. The compound area would be returned to its previous condition once construction was complete.</p>
Operation			
5.8c	<p>The future use of King Street Ferry Wharf for private or commercial vessels is not clear. Further information should be provided.</p> <p>Interest in future use of King Street Ferry Wharf for potential tourism and commuter services on Sydney Harbour.</p> <p>Requested consultation in process determining the future use of King Street Ferry Wharf.</p>	13, 27	The proposal includes the decommissioning of King Street Ferry Wharf for public transport use after Barangaroo Ferry Hub becomes operational. However, the future use of King Street Ferry Wharf is not assessed as part of this proposal.
5.8d	<p>The future use of King Street Ferry Wharf has not been adequately identified in the EIS and should be clarified.</p> <p>Potential future use of King Street Ferry Wharf by private and commercial operations is noted in the EIS, however there is no assessment of the feasibility of this use.</p>	22	The future use of King Street Ferry Wharf has not been decided and is not being assessed as part of the Barangaroo Ferry Hub proposal. This would be subject to further investigation and a separate environmental impact assessment (if required) in the future.
5.8e	<p>Recommends the design and location of landside ticket machines and signage be subject to approval by Lend Lease and BDA.</p>	29	TfNSW has proposed three ticketing facilities in alignment with the trees as shown in Figure 3. However, the exact location of the ticketing facilities is subject to negotiation with BDA and Lend Lease as the owner and developer of Barangaroo South. This has been an ongoing process as part of the Landside Working Group.

5.9 Water quality and hydrology

Item	Summary of issue	Sub No.	Response
Operation			
5.9a	<p>The potential for the Barangaroo Ferry Hub to affect temperature dispersion from the Harbour Heat Rejection System should be addressed and mitigated (if required).</p> <p>Recommends that a study be completed to further consider the impact of the pontoons and other infrastructure on the Harbour Heat Rejection System, including near-field and far-field modelling. A proposal was provided by Worley Parsons providing an outline of recommended studies.</p>	29	<p>Section 6.9 of the Barangaroo Ferry Hub EIS assessed the potential impacts to the water flow and temperature as a result of interactions between the Harbour Heat Rejection System and the proposed Barangaroo Ferry Hub. This assessment was based on Appendix G of the Barangaroo Precinct Modification MP 10_0023 which assumed a 30 metre separation between the discharge point and the berthed vessels. The EIS acknowledged that the previous studies assumed a 30 metre separation and that the Barangaroo Ferry Hub would encroach upon this distance, with no layover of vessels within 8 metres of the seawall. As a result, the EIS identified that the interface with the heat rejection system would be considered during detailed design and in collaboration with BDA and Lend Lease. Given issues raised in the submissions, Worley Parsons was commissioned to complete an assessment of potential impacts arising from interactions between the Barangaroo Ferry Hub and the Harbour Heat Rejection System. The report was based on the proposal by TfNSW to construct three wharves in front of the Heat Rejection System Outfall as well as the associated operational infrastructure and vessel layovers.</p> <p>Near-field modelling was undertaken by Worley Parsons. The modelling results show that the Heat Rejection System Outfall, operating within the worst case scenario, would comply with ANZECC guidelines. The 80th percentile values for the seasonal pre-development temperature form the risk trigger level within the ANZECC guidelines. All maximum temperatures modelled at the near field boundary fall below this value and therefore the proposed development does not trigger the risk levels.</p>

Item	Summary of issue	Sub No.	Response
5.9a	<p>The potential for the Barangaroo Ferry Hub to affect temperature dispersion from the Harbour Heat Rejection System should be addressed and mitigated (if required).</p> <p>Recommends that a study be completed to further consider the impact of the pontoons and other infrastructure on the Harbour Heat Rejection System, including near-field and far-field modelling. A proposal was provided by Worley Parsons providing an outline of recommended studies.</p>	29	<p>Whilst significant interactions between the outfall flow and the proposed Barangaroo Ferry Hub were found during two seasonal flow cases, it was concluded that this interaction creates turbulence that assists the mixing of the discharge from the outfall and that the flow was not inhibited. Therefore there are no significant impacts to the outfall flows as a result of the proposed Barangaroo Ferry Hub operations.</p> <p>Given the results of the near-field modelling which show little impact on flow caused by the ferries and layover pontoons, and that the Heat Rejection System Outfall would continue to comply with ANZECC guidelines with the proposed Barangaroo Ferry Hub in place, Worley Parsons concluded that further far-field modelling is not required. The pontoons of the proposed Barangaroo Ferry Hub would not be expected to affect the general pattern of heat build-up within Darling Harbour. Worley Parsons also concluded that based on the modelling results, the operation of the Barangaroo Ferry Hub would not cause short-circuiting of the outfall discharges back to the intake.</p> <p>Further information is included in Section 7.1 and Appendix B of this report.</p>

5.10 Socio-economic

Item	Summary of issue	Sub No.	Response
Operation			
5.10a	<p>Concern regarding the future impact on Darling Harbour and King Street Wharf due to the relocation of the proposed Barangaroo Ferry Hub away from these destinations.</p> <p>States the decommissioning of King Street Ferry Wharf has not been sufficiently assessed in the EIS (including Section 4.2.2 of the EIS). Requests that the impact of decommissioning is further considered in the Preferred Infrastructure Report.</p> <p>States that the potential reduction in passing trade in combination with reduced visual amenity is considered to result in a significant impact on King Street Wharf businesses.</p>	22	<p>The potential impact of the decommissioning of King Street Ferry Wharf was considered further in the EIS at Section 6.11.2. It was noted that there could be a minor impact on King Street Wharf businesses who could expect some reduction in passing trade due to the change in location of the ferry wharves.</p> <p>The removal of public transport elements from the existing King Street Ferry Wharf would make available additional wharf infrastructure which may potentially be used for commercial opportunities. Further, the Barangaroo Ferry Hub is anticipated to provide additional services, and to cater for a substantial increase in patronage in comparison with the King Street Ferry Wharf. These factors are anticipated to provide some offset for the loss of passing trade for businesses at King Street Wharf.</p> <p>The King Street Wharf viewpoint was considered in the Landscape and Visual Impact Assessment – the assessment concluded the proposal was likely to have a moderate adverse daytime impact, and a negligible night-time impact.</p> <p>It is not expected that there would be a significant impact on King Street Wharf businesses as a result of the proposal.</p>
5.10b	Concern that the EIS does not sufficiently consider the potential impacts on southern Darling Harbour and Cockle Bay precinct.	27	<p>It is not expected that there would be a significant impact on southern Darling Harbour or Cockle Bay precinct.</p> <p>In terms of transport and accessibility impacts this has been considered above in Items 5.6o, 5.6u and 5.6v. In terms of visual and landscape character impact the impact was assessed to be negligible as outlined in Section 6.4 of the EIS.</p>
5.10c	Sydney's Ferry Future and Barangaroo Integrated Transport Plan do not consider the impact of relocation of wharf facilities.	22	Sydney's Ferry Future and the Barangaroo Integrated Transport Plan are strategic level documents and would not usually include impact assessment. These documents included a strategic level consideration of the servicing requirements of the precinct and potential future growth.

Item	Summary of issue	Sub No.	Response
5.10d	Concern that the proposal is not as much in the interests of the wider Darling Harbour precinct and is too focused on the Barangaroo development. Notes growth in employment density also anticipated south of Barangaroo (between Darling Harbour, Barangaroo South, western Sussex Street and Druitt Street).	22	<p>Chapter 3 of the EIS outlined the project need and strategic context of the Barangaroo Ferry Hub proposal. It is expected that the Barangaroo precinct would add to the CBD's existing congestion and capacity constraints by accommodating up to 23,000 office workers, 2,500 residents and around 33,000 visitors per day when complete. The need for the proposal is based on the consequent expected demand for transport services to the precinct with a focus on employment and attractions within the walking catchment of the Barangaroo precinct. The growth in the Barangaroo precinct outstrips the general rate of growth in the Sydney CBD, which was acknowledged and outlined in the EIS.</p> <p>The Barangaroo Integrated Transport Plan recommended 28 short and long term actions to provide accessibility between Barangaroo and the City Centre and to the other foreshore attractions located between Circular Quay and Darling Harbour. The delivery of the proposed Barangaroo Ferry Hub is one component of that plan.</p> <p>Once the proposal is complete the Darling Harbour precinct would be accessible via Barangaroo Ferry Hub, Pyrmont Bay Wharf and other transport services including train and bus. By introducing an accessible transport mode to the area, the proposal would serve a significant proportion of commuters and visitors to the Barangaroo precinct and surrounding areas. It would also attract customers from existing modes of travel by providing improved access to the western and central parts of the CBD including for passengers with a disability.</p> <p>The wider Darling Harbour precinct would benefit from the introduction of an accessible transport mode and increased number of ferry services to east Darling Harbour, as would Barangaroo precinct.</p>

5.11 Ecologically sustainable development

Item	Summary of issue	Sub No.	Response
Operation			
5.11a	Recommends considering photovoltaic cells on the roof of each wharf to offset greenhouse gas emissions from the operation of Barangaroo Ferry Hub.	29	The Landside Working Group has had a number of discussions regarding the potential to use wharf roof space for photovoltaic cells. Through that forum, TfNSW indicated that to ensure a suitable urban design solution and minimise the visual impacts of the proposal, it would not be suitable to have roof mounted photovoltaic panels. Roof mounted photovoltaic panels would increase the visual impact of the proposal on views from a variety of viewpoints, including the nearby outdoor dining and residential development, by introducing additional clutter and adding unnecessary complexity to the roof forms.

5.12 Issues external to the proposal

Item	Summary of issue	Sub No.	Response
Barangaroo precinct			
5.12a	There should be a substantial increase in public recreation and gathering space adjacent to Barangaroo Ferry Hub and along the waterfront. The proposed large high-roller casino building should be refused in favour of more public open space. The casino development would degrade and devalue our harbour due to its size and location.	18	This issue is beyond the scope of the proposal. Information regarding planning applications and approvals for the Barangaroo development, and the opportunity to comment on applications on public exhibition, is available at http://www.majorprojects.planning.nsw.gov.au

Item	Summary of issue	Sub No.	Response
5.12b	Requested that the Barangaroo precinct does not rely on cars as a mode of transport.	17	<p>This issue is beyond the scope of the proposal. However, the provision of the proposed Barangaroo Ferry Hub provides an alternative method of transport to Barangaroo.</p> <p>Information regarding planning applications and approvals for the Barangaroo development, and the opportunity to comment on applications on public exhibition, is available at http://www.majorprojects.planning.nsw.gov.au/</p>

Broader Sydney transport network

5.12c	Requests a new light rail service be built to White Bay, utilising a rail easement and disused tracks from Lilyfield to White Bay, to connect with a suggested new ferry wharf at White Bay.	18	This issue is beyond the scope of the proposal.
5.12d	Requests that the Glebe Island Bridge be re-opened to provide pedestrian and cycle access to Barangaroo.	18	This issue is beyond the scope of the proposal.

Party boats

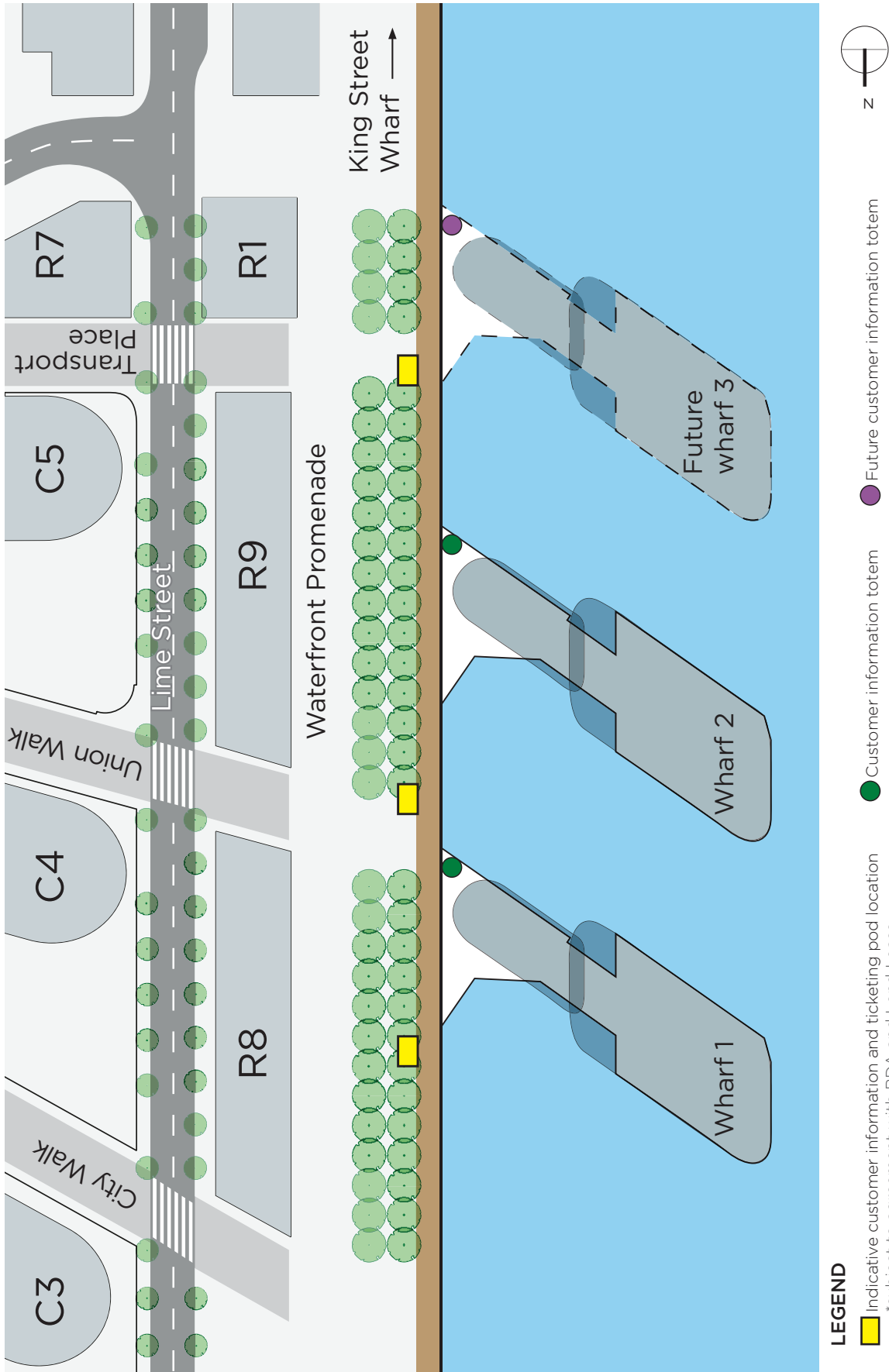
5.12e	<p>Concern regarding the noise impact of party boats on residents, customers and visitors to the harbour.</p> <p>Concern regarding the noise impact of party boats on King Street Wharf area (particularly residents) for extended periods while the boats are loading and unloading.</p> <p>Suggests moving party boats away from King Street Wharf / Barangaroo precinct.</p>	23	<p>The Barangaroo Ferry Hub is designed to serve public transport services. As part of the TfNSW Wharf Access Policy public transport services would have priority for access to the Barangaroo Ferry Hub, however if there was additional available capacity that may be allocated to other operators (for example, private ferry services). Use of the Barangaroo Ferry Hub facilities by late night party boats is not part of the current proposal.</p> <p>The impact of the party boat industry is beyond the scope of this environmental impact assessment.</p>
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6 Preferred Infrastructure Report

This chapter documents refinements that have been made to the design since the exhibition of the Barangaroo Ferry Hub EIS. Section 115Z(6) of the EP&A Act enables the preparation of a Preferred Infrastructure Report (PIR) that outlines any proposed changes to the SSI to minimise its environmental impact or to deal with any other issue raised during the assessment of the application concerned. Further consideration was provided to certain components of the proposed design following feedback from public exhibition and design development. Generally, changes proposed in this PIR have been incorporated into the design for the purpose of further minimising environmental impacts or in response to submissions. The proposed design changes and scope clarifications that are assessed include:

- The northern two wharves would be constructed initially, with the southern wharf to be constructed when demand necessitates
- Installation of additional piles on each wharf
- Installation of customer information totems to improve wayfinding and customer information
- Adjustment to customer information and ticketing pod locations
- Installation of temporary queuing provisions on the link structure and the foreshore.

Figure 3 on the following page identifies the northern wharves, the customer information totem locations and the customer information and ticketing pod locations.



Please note, the design of Barangaroo South is based on the Stage 1A Location Plan (Barangaroo South Public Domain Stage 1A Development Application, Aspect Oculus 2014).

Figure 3 - Indicative wharf and landside layout

6.1 Northern two wharves built first

6.1.1 Description of the EIS design

The EIS sought approval for three new ferry wharves. It was identified that two wharves would be constructed initially, and the third wharf would be constructed in the future when the demand for ferry services necessitates. However, it was not known at the time of the EIS which two wharves would be built first.

6.1.2 Description of the proposed design change

Following the exhibition of the EIS, ongoing design refinements and consultation regarding navigational safety, it was determined the two most northern wharves would be constructed first. The third (southern) wharf would be built when demand necessitates. As outlined in Item 5.3f it was considered preferable to construct the two most northerly wharves first as:

- this option moves ferry activities further to the north, away from the pinch point between Pyrmont Point (also known as Wharf 10, Pyrmont) and Barangaroo;
- this option moves ferry activities further away from the congestion at King Street wharves, and when the third (southern) wharf is constructed, vessels using Darling Harbour would be familiar with Barangaroo Ferry Hub and its operations;
- ferry activities would be concentrated in a wider waterway and therefore the resultant impact from ferry wash would be reduced;
- there would be no need to remove wave baffle between Barangaroo Ferry Hub and King Street wharves during the first stage of construction;
- this option is more efficient in terms of program and cost.

6.1.3 Change in impact

The EIS assessed initial construction of two wharves, with the third constructed when demand necessitates. Thus in the long term, once the third wharf is constructed and operational, the impact of the proposal is anticipated to be the same regardless of which wharves were constructed first. This is a design refinement that provides greater clarity at this stage as to which two wharves will be constructed first.

In terms of navigational safety establishing the northern two wharves first would provide an opportunity to establish navigational procedures and make any necessary adjustments in the wider area of Darling Harbour. This would reduce navigation risks at the “pinch point” between Pyrmont Point and Barangaroo once the southern wharf is constructed.

The Sydney Water Corporation stormwater channel discussed at Item 4.7b aligned with the southern wharf would not be impacted as part of the initial construction program. Any impact would be managed in preparation to build the third (southern) wharf.

6.1.4 Additional or changed mitigation measures

Construction and operation of all three wharves was assessed in the EIS. Therefore the existing management and mitigation measures as detailed in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

One additional mitigation measure is proposed in relation to the stormwater channel:

- Prior to construction of the third (southern) wharf TfNSW would consult with Sydney Water Corporation to manage any impact on the stormwater channel.

6.2 Additional piles

6.2.1 Description of the EIS design

Chapter 4 of the EIS identified that about 30 piles (including steel pontoon restraint piles, steel support piles, crash barrier piles and fender piles) would be installed into bedrock for each wharf.

6.2.2 Description of the proposed design change

Following the public exhibition of the EIS, ongoing design refinements of the proposal as well as further navigational safety work identified a need for additional piles to be installed for each wharf, bringing the total number of piles for each wharf to 46. The increase in the number of piles for each wharf can be attributed mainly to additional channel and berth piles, layover piles and link structure support piles.

6.2.3 Change in impact

Each pile is anticipated to take around one shift to install, in accordance with the timeframes outlined in Section 4.2 of the EIS. Piles are to be installed one after another, rather than concurrently.

SLR considered this change in design in their letter report of April 2015. In relation to noise impacts SLR concluded that:

The main impact of the increase in the number of piles is an increased duration for construction, however the methodology as detailed in the EIS involving construction of one pile at a time remains the same. In this regard, it is not expected that there would be a change in the noise levels predicted in the EIS.

The navigational safety impact of installing additional piles would be positive as these would provide protection from passing vessels (channel), better delineate berths and safer mooring in layover.

The impact would be generally consistent with the assessment detailed in the EIS, however the duration of piling impacts would increase by approximately one month. The overall program of works may also be extended by up to one month potentially taking the total construction period to 15 months.

6.2.4 Additional or changed mitigation measures

The existing management and mitigation measures in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.3 Customer information totems

6.3.1 Description of the EIS design

Chapter 4 of the EIS indicated that passenger information would be provided on each pontoon including screens showing ferry service information and up-to-date information on transport related matters, and audio announcements via the public address system. Appendix D of the EIS indicated that the landside ticketing and wayfinding facilities would also include real-time information displays showing the next ferry service from each wharf.

6.3.2 Description of the proposed design change

Chapter 4 of the EIS indicated that passenger information would be provided on each pontoon including screens showing ferry service information and up-to-date information on transport related matters, and audio announcements via the public address system. Appendix D of the EIS indicated that the landside ticketing and wayfinding facilities would also include real-time information displays showing the next ferry service from each wharf.

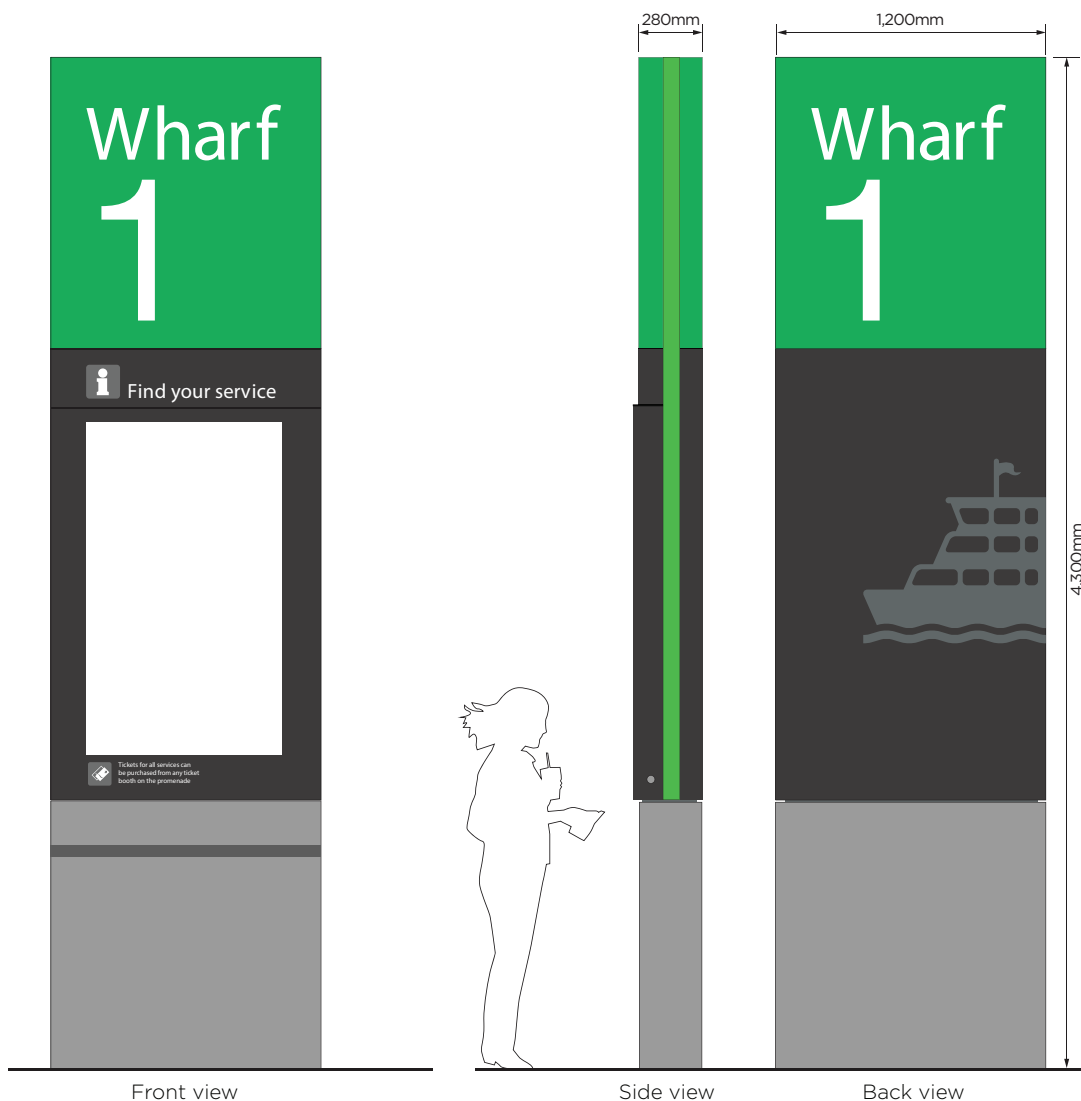


Figure 4 - Indicative customer information totem design

6.3.3 Change in impact

There would be a visual impact due to the introduction of this new element, however the totems were designed to be compatible with the proposed wharf design and use wayfinding colours and font. By combining wharf identifiers with the customer information screen, the totems consolidate the number of vertical elements proposed to be installed. To give an impression of the wayfinding signage and customer information package for the proposal, an indicative plan has been included in Figure 5.

Each customer information totem would provide passengers with clear, appropriately located service information leading to improved customer service.

6.3.4 Additional or changed mitigation measures

It is considered that the visual amenity and urban design mitigation measures would appropriately cover this new design element. Therefore the existing management and mitigation measures in Chapter 8 of this Submissions Report are considered to be sufficient to manage the potential impacts of the revised design change.

6.4 Customer information and ticketing pod locations

6.4.1 Description of the EIS design

Chapter 4 of the EIS indicated that landside ancillary facilities included as part of the proposal would comprise wayfinding signage and ticketing including Opal card facilities. Appendix D of the EIS showed preferred locations for three customer information and ticketing pods. The locations were indicative and subject to further design as well as negotiations with BDA and Lend Lease as owner and developer of Barangaroo South.

6.4.2 Description of the proposed design change

Following exhibition of the EIS, ongoing design refinement of the proposal has identified that the two northern wharves would be built first. This has necessitated design refinement in relation to the location of customer information and ticketing pods. Three customer information and ticketing pods would be provided on the foreshore. Figure 3 gives an indication of their proposed locations.

The location of the most northern customer information and ticketing pod is subject to negotiations with BDA and Lend Lease as owner and developer of Barangaroo South.

6.4.3 Change in impact

The relocation of one customer information and ticketing pod is considered to be consistent with the impact assessed in the EIS. The pod would be within a similar proximity to the wharves, and located in line with the trees and thus outside of the main pedestrian path of the foreshore.

6.4.4 Additional or changed mitigation measures

One additional mitigation measure is proposed in relation to the customer information and ticketing pods:

- The final location of the customer information and ticketing pods would be decided in consultation with BDA and Lend Lease, and would be selected to minimise the impact on the foreshore thoroughfare and visual amenity of the foreshore.

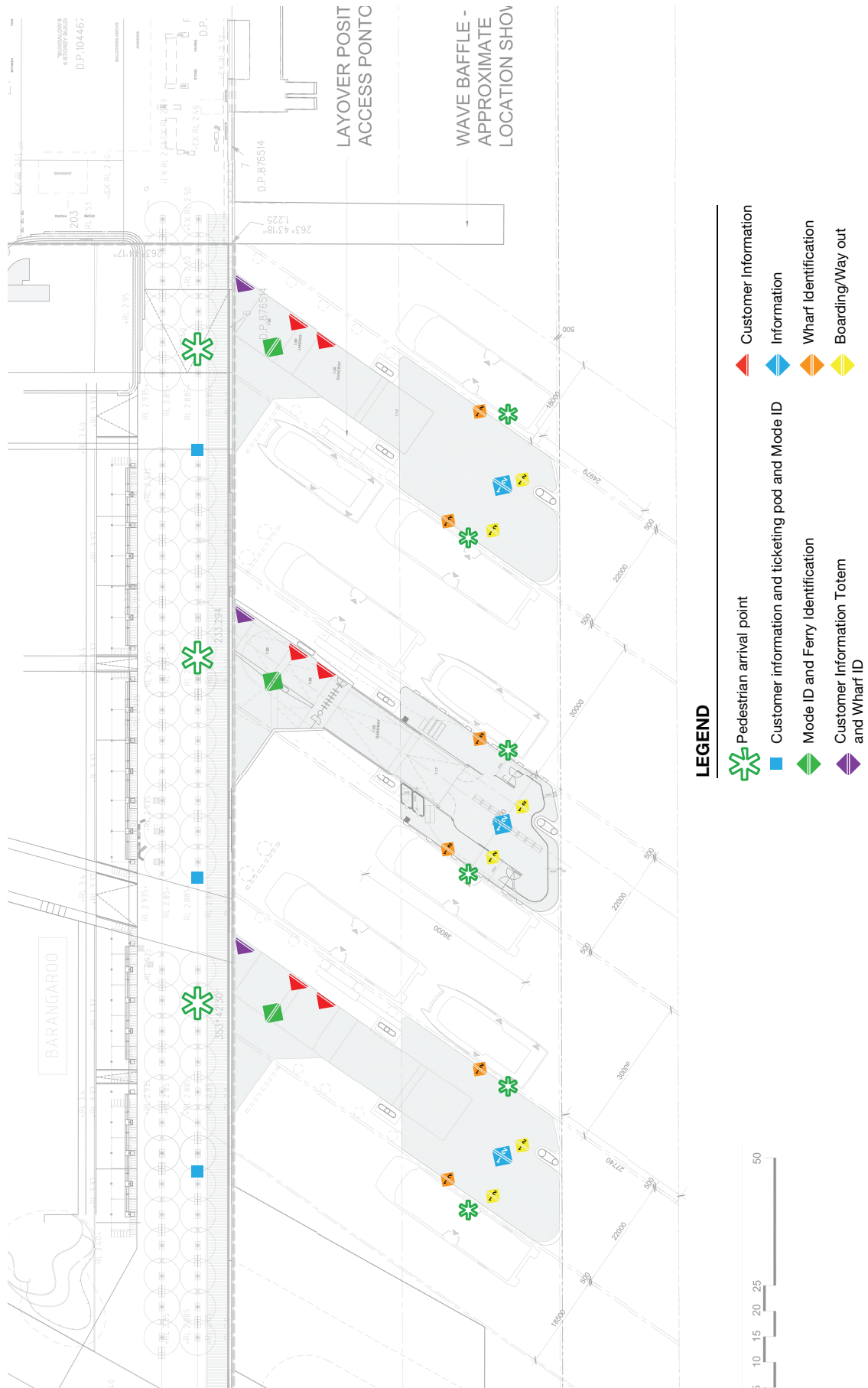


Figure 5 - Indicative wayfinding signage plan

6.5 Temporary queuing provisions

6.5.1 Description of the EIS design

Chapter 4 of the EIS indicated that during special events such as New Year's Eve, Vivid and Australia Day, temporary queuing provisions would be used to ensure the safety and efficient movement of the larger than normal number of passengers. This was expected to include the erection of temporary marshalling infrastructure such as:

- removable bollards,
- permanent provision for removable queue management systems, and
- temporary fencing or barriers along the water's edge in a special event queuing area to prevent falls into the harbour, if required in addition to permanent barriers.

6.5.2 Description of the proposed design change

Following the public exhibition of the EIS, ongoing design development has further considered the need for temporary queuing provisions during special events. It is proposed to install a permanent bollard socket to which a temporary bollard system could be fixed during use. These would be located on the link structure and on Barangaroo South land to provide sufficient queuing space and prevent falls into the harbour. The locations, design and protocols for use of these bollard sockets (where located on land) are subject to negotiations with BDA and Lend Lease as owner and developer of Barangaroo South.

6.5.3 Change in impact

Temporary queuing provisions and the need for special event queuing were considered in the EIS. The temporary bollard system is expected to provide a simple, effective queuing system consistent with the impacts assessed in the EIS.

The bollard socket design is being negotiated with BDA and Lend Lease to ensure a suitable visual outcome which is compatible with the design of Barangaroo South foreshore. The recessed sockets would have a minor visual impact on the foreshore and link structure surface.

During special events, the temporary bollards are expected to have a lower visual impact compared with alternative barrier systems such as water-filled plastic barriers.

6.5.4 Additional or changed mitigation measures

One additional mitigation measure is proposed in relation to the queuing provisions:

- The final design of the temporary queuing provisions would be decided in consultation with BDA and Lend Lease, and would be selected to minimise the impact on the visual amenity of the foreshore.

7 Additional investigations

7.1 Harbour Heat Rejection System

The Barangaroo Ferry Hub EIS assessed the potential impacts on the water flow and temperature in Section 6.9. This assessment was based on information provided in Appendix G of the Barangaroo Precinct Modification MP 10_0023 which assumed a 30 metre separation between the discharge point and the berthed vessels. The EIS acknowledged that the previous studies assumed a 30 metre separation and that the proposed Barangaroo Ferry Hub would encroach upon this distance, with no layover of vessels within 8 metres of the seawall. As a result, the EIS identified that the interface with the heat rejection system would be considered during detailed design and in collaboration with BDA and Lend Lease.

Given further issues were raised in submissions, Worley Parsons was commissioned to complete an assessment of potential impacts arising from any interactions between the Barangaroo Ferry Hub and the Harbour Heat Rejection System. The report was based on the proposal by TfNSW to construct three wharves in front of the Heat Rejection System Outfall as well as the associated operational infrastructure and vessel layovers.

Near-field modelling was undertaken by Worley Parsons to assess the interaction between the ferry operations and the discharge from the Heat Rejection System Outfall.

Previous modelling for the outfall was carried out using a Lagrangian buoyant jet model, however due to limitations in predictions outputs, the near field modelling for this assessment was carried out using the CFD software modelling FLOW 3-D.

Four different seasonal flow cases were analysed for the Heat Rejection System Outfall. The approximate steady state near field heat distribution was extracted for the Heat Rejection System Outfall for each of the flow cases. The heat distributions were compared to the ANZECC guidelines to determine the impact of the proposed Barangaroo Ferry Hub on the compliance of the outfall.

The median and 80th percentile temperature for the receiving water was determined for each of the flow cases from long-term temperature data measured at the proposed development site. The discharge from the Heat Rejection System Outfall was assigned a temperature 7°C greater than the receiving water for each for the flow cases. This is the expected discharge temperature from the outfall when the Heat Rejection System is operating at peak efficiency. The modelling was carried out using the worst case scenario as inputs including maximum seasonal flow rates, lowest astronomical tide, minimum turbulent mixing and all layover positions occupied by ferries.

The modelling results show that the Heat Rejection System Outfall, operating within the worst case scenario, would comply with ANZECC guidelines. The 80th percentile values for the seasonal pre-development temperature form the risk trigger level within the ANZECC guidelines. All maximum temperatures modelled at the near field boundary fall below this value and therefore the proposed development does not trigger the risk levels.

Whilst significant interactions between the outfall flow and the proposed ferry hub were found during two seasonal flow cases (Summer and Autumn), it was concluded that this interaction creates turbulence that assists the mixing of the discharge from the outfall and that the flow was not inhibited. Therefore there are no significant impacts to the outfall flows as a result of the ferry hub operations.

Given the results of the near-field modelling which show little impact on flow caused by the ferries and layover pontoons, and that the Heat Rejection System Outfall would continue to comply with ANZECC guidelines with the proposed Barangaroo Ferry Hub in place, Worley Parsons concluded that further far-field modelling is not required. The pontoons of the proposed Barangaroo Ferry Hub would not be expected to affect the general pattern of heat build-up within Darling Harbour. Worley Parsons also concluded that based on the modelling results, the operation of the Barangaroo Ferry Hub would not cause short-circuiting of the outfall discharges back to the intake.

Further information can be found in the the Worley Parsons report, attached as Appendix B.

7.2 Noise and Vibration

SLR Consulting Pty Limited (SLR) undertook a full assessment of noise and vibration impacts associated with construction and operation of the proposal to support the preparation of the EIS. This was considered in Section 6.1 and attached in full at Appendix E of the EIS.

SLR were engaged by TfNSW to assist in responding to issues relating to noise and vibration which were raised in submissions. To support this Submissions Report a letter report was prepared by SLR in consultation with TfNSW. SLR's findings and recommendations have been captured in Chapters 4 and 5 of the Submissions Report in responding to submissions. Recommended amendments to mitigation measures have been adopted in Chapter 8.

The SLR report is based on the indicative methodology and scope of works presented in the EIS and the noise and vibration technical paper, which presented a worst case scenario for noise impacts.

The SLR report is attached as Appendix C.

7.3 Visual impact assessment

A single figure illustrating the location of the project, the location of viewpoints and landscape character assessment areas and highlighting key land uses has been prepared to assist DP&E in its assessment. Refer to Figure 6 below.



KEY

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| <ul style="list-style-type: none"> Viewpoint from: 1 Illoura Reserve, Balmain East 2 Ferry travelling between Balmain East and King Street Ferry Wharf 3 Ferry approaching the proposal 4 Ballarat Park, Pyrmont 5 Pier 10, next to the heritage fleet, Pyrmont | <ul style="list-style-type: none"> 6 Pyrmont Bay Ferry Wharf, Pyrmont 7 Pyrmont Bridge, Cockle Bay 8 Restaurants at King Street Wharf, Darling Harbour 9 Footpath adjacent to the Sussex Hotel, Sussex Street 10 Foreshore south along the harbour, Barangaroo South Barangaroo Ferry Hub | <ul style="list-style-type: none"> Central Barangaroo and Headland Park Barangaroo South King Street Wharf Balmain East to Millers Point White Bay to Barangaroo Darling Harbour to Cockle Bay |
|--|--|--|

Figure 6 - Visual impact assessment map

8 Environmental management

8.1 Mitigation and management measures

Chapter 7 of the EIS documented a range of environmental management measures that would be implemented to reduce the identified environmental and social impacts associated with the construction and operational phases of the Barangaroo Ferry Hub.

The management and mitigation commitments documented in Table 7-1 of the EIS have been considered and revised (where necessary) in response to the submissions received during the public exhibition of the EIS. New measures that are proposed have been denoted in Table 8.1 with underlined text, while any environmental management measure proposed to be removed (or have text deleted from the measure) has been shown with strikethrough text.

Table 8-1: Revised environmental management measures for the Barangaroo Ferry Hub proposal

Environmental issue	ID	Environmental management measure	Responsibility	Timing
General environmental management				
General environmental management	G1	<p>A Construction Environmental Management Plan (CEMP) will be prepared and implemented to ensure appropriate environmental management measures are followed during project delivery. The CEMP will provide a framework for environmental management during construction and will:</p> <ul style="list-style-type: none"> • Outline all environmental management practices and procedures to be followed during construction and demolition works associated with the project • Describe all activities to be undertaken on the site during construction of the project • Detail how the environmental performance of the construction works will be monitored • Detail what corrective actions will be taken to address identified adverse environmental impacts • Describe the roles and responsibilities for all relevant employees involved in the project • Include relevant sub-plans: <ul style="list-style-type: none"> - Construction Noise and Vibration Management Plan - Construction Traffic Management Plan - Erosion and Sediment Control Management Plan - Waste Management Plan <p>The CEMP will be developed in accordance with Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources, 2004).</p>	TfNSW Construction contractor	Pre-construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Environmental awareness training	G2	<p>Environmental awareness training will be provided, by the contractor, to all field personnel and subcontractors. The environmental induction will include:</p> <ul style="list-style-type: none"> • Construction noise and vibration management • Traffic (road and maritime) management • Marine ecology • Non-Indigenous heritage • Air quality • Indigenous heritage • Ecologically Sustainable Development • Hazards and risks 	Construction contractor	Pre-construction and during construction as required

Noise and vibration

Construction Noise and Vibration Management Plan	N1	<p>A Construction Noise and Vibration Management Plan (CNVMP) will be included in the CEMP to provide the framework and mechanisms for the management and mitigation of all potential noise and vibration impacts from the construction works.</p> <p>A CNVMP will be prepared and all work will be undertaken in accordance with the TfNSW Construction Noise Strategy (CNS) and Interim Construction Noise Guidelines where practicable.</p> <p>The CNVMP will as a minimum include:</p> <ul style="list-style-type: none"> • Identification of nearby residences and sensitive land uses. • Determination of Noise Management Levels (NMLs) and the prediction of noise levels. 	Construction contractor	Construction
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Environmental issue	ID	Environmental management measure	Responsibility	Timing
	N1	<ul style="list-style-type: none"> • Details of construction activities, <u>examination of alternate methods (including investigation of using a jack-up barge)</u> and a schedule for construction works. • Description of approved hours of work and <u>justification for any activities to be undertaken outside these approved hours.</u> • An out of hours works protocol. • Restrictions on the hours of construction for specific works. • Details of work practices and measures that will be implemented to minimise noise impacts, <u>including any additional measures as negotiated with affected residents and other sensitive receivers.</u> • <u>Community consultation and notification process.</u> • Description of the complaints handling process. • Details of monitoring that is required. 	Construction contractor	Construction
Construction hours	N2	<p>Construction and demolition activities, including heavy vehicle movements will generally be restricted to the standard construction hours of:</p> <ul style="list-style-type: none"> • Monday to Friday 7:00 am to 6:00 pm. • Saturday 8:00 am to 1:00 pm. • No work on Sundays or public holidays. <p>The installation of piles and intricate lifting works will require specific weather conditions, such as calmer water. Therefore works may be required in the evening or night-time period, or during the night-time/ daytime shoulder period</p> <p>(e.g. 5:00 am to 7:00 am), for safety of workers, businesses, residents and pedestrians.</p>	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Out of hours work	N3	<p>All works will be undertaken in accordance with the construction hours detailed above, except for the following works, as outlined in the TfNSW Construction Noise Strategy (CNS), which will be permitted outside of these hours:</p> <ul style="list-style-type: none"> • Any works which do not cause noise emissions to be more than 5dBA higher than RBL (background) noise levels at any nearby residential property and/or other noise sensitive receiver. • The delivery of plant, equipment and materials which is required outside these hours as requested by police or other authorities for safety reasons and with suitable notification to the community as agreed by the TfNSW Principal Manager Environmental Management. • Emergency work to avoid the loss of lives, property and/or to prevent environmental harm. • Any other work in accordance with TfNSW's Out-of-Hours Work (OOHW) Procedure and considered essential to the project. <p>Where OOHW is proposed which has not been assessed in the EIS and CNVMP, activity and site specific Construction Noise Impact Statements (CNISs) will be developed to support an OOHW Application. The CNISs will provide a detailed assessment of potential noise levels and site specific measures to control potential noise impacts and minimise the potential for disturbance at affected receptors.</p> <p>Night works will be programmed to minimise the number of consecutive nights work impacting the same receptors, as per the TfNSW CNS.</p>	Construction contractor	Construction
Respite periods	N4	<p>The proponent and construction contractor(s) will schedule work to provide respite periods from the noisiest activities, and communicate with the impacted residents by clearly explaining the duration and noise level of the works, as per the TfNSW CNS.</p>	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Community consultation	N5	<p>Community notification and consultation, including notification regarding noisy works, will be undertaken in accordance with the TfNSW CNS. This would typically include:</p> <ul style="list-style-type: none"> • Periodic and targeted notifications distributed to stakeholders prior to work commencing. • The project website would be updated to provide information on upcoming noisy works. • Construction Response Line, 1800 775 465 – providing a dedicated 24 hour contact point for any complaints regarding construction works. • Project Infoline, 1800 684 490 – providing a dedicated contact point for any project enquiries. <p>If noisy works are required to be done outside of standard construction hours additional notification activities would be undertaken. Additional measures which may be considered include:</p> <ul style="list-style-type: none"> • Individual briefings to inform stakeholders of the impacts of high noise activities and the mitigation measures that will be implemented • Specific letter drops to affected sensitive receivers to inform the upcoming noisy works. <p>Email distribution lists will be used to disseminate project information to interested stakeholders. Advanced warning of noisy activities can assist to reduce the impact of projects experienced by the community.</p>	TfNSW	Construction
Avoid noisy works	N6	<p>Broadband audible or non-tonal alarms will be used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work, as per the TfNSW CNS.</p> <p>The use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers will be avoided or limited where feasible and practicable.</p>	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Switch off noisy equipment	N7	Equipment which is used intermittently will be shut down or throttled down to a minimum when not in use. Plant items such as barge(s), concrete trucks will be turned off when parked or otherwise not in use.	Construction contractor	Construction
Compliance checks on equipment	N8	Regular compliance checks on the noise emissions of all plant and machinery used for the proposal will be undertaken to indicate whether noise emissions from plant items are higher than predicted and whether any silencing equipment on items of plant is defective.	Construction contractor	Construction
Environmental awareness	N9	Environmental awareness training will be provided, by the contractor, to all field personnel and subcontractors. <ul style="list-style-type: none"> Regular reinforcement (such as at toolbox talks) of the need to minimise noise will be undertaken. 	Construction contractor	Construction
Specific Notifications	N10	Specific notifications will be letterbox dropped or hand distributed to nearby stakeholders and other sensitive receivers no later than seven days ahead of new construction activities and construction activities that are to be undertaken out-of-hours or are considered high noise generating. This form of communication is used to support periodic notifications.	Construction contractor TfNSW	Construction
Monitoring	N11	Noise monitoring at sensitive receivers will be used during construction to assist in managing high noise OOHW activities and in response to complaints. All noise monitoring will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	Construction contractor	Construction
<u>Construction Noise and Vibration Impact Statement</u>	<u>N12</u>	<u>A Construction Noise and Vibration Impact Statement (CNVIS) will be prepared prior to the Construction Noise and Vibration Management Plan.</u> <u>The CNVIS will be prepared in accordance with the TfNSW Construction Noise Strategy and as a minimum will include:</u> <ul style="list-style-type: none"> <u>Determination of noise and vibration objectives.</u> 	<u>Construction contractor</u>	<u>Pre-construction</u>

Environmental issue	ID	Environmental management measure	Responsibility	Timing
<u>Construction Noise and Vibration Impact Statement</u>	<u>N12</u>	<ul style="list-style-type: none"> • <u>An assessment of construction scenarios including noise from construction vehicles and vessels.</u> • <u>All reasonable and feasible measures including adopting the least noisy available construction methods, systems and equipment.</u> • <u>Description and commitment to work practices which limit noise and vibration:</u> • <u>Description of specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency;</u> • <u>Justification for any activities to be undertaken outside the specified construction hours;</u> • <u>Additional noise and vibration mitigation measures which include:</u> <ul style="list-style-type: none"> - <u>Community consultation and notification.</u> - <u>Negotiated specific mitigation with affected residents and other sensitive receivers.</u> 	<u>Construction contractor</u>	<u>Pre-construction</u>
<u>Construction methodology</u>	<u>N13</u>	<u>Construction methodologies which reduce noise impacts, including the use of a jack-up barge, will be investigated and implemented where reasonable and feasible. The CNVMP and the Community Liaison Plan will be tailored to the construction methodology to ensure an appropriate response to the level of noise impact.</u>	<u>TfNSW</u> <u>Construction contractor</u>	<u>Pre-construction</u>
Traffic and transport				
Consultation	T1	Consultation will be undertaken with the Barangaroo Integrated Transport Plan Working Group to co-ordinate management measures for cumulative transport impact during construction.	TfNSW	Detailed design

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Traffic management plan	T2	<p>A Construction Traffic Management Plan will be prepared before the commencement of work. The plan will include:</p> <ul style="list-style-type: none"> • Ongoing consultation with key stakeholders including Port Authority of NSW, Roads and Maritime Services and Harbour City Ferries. • Specific mitigation measures to minimise impact of the works on the road and maritime networks during construction. • A Traffic Control Plan in accordance with the Roads and Maritime Traffic Control at Work Sites Manual and Australian Standard 1742.3. • Event management during construction including avoiding events taking place in the harbour, such as the Sydney International Boat Show. 	TfNSW Construction contractor	Pre-construction
Pedestrian routes	T3	<p>Should the temporary closure of any pedestrian routes be required consultation will be undertaken with key stakeholders (including BDA and Lend Lease).</p> <p>Alternative pedestrian routes will be identified and communicated through the provision of appropriate information and signage at key locations.</p>	Construction contractor	Pre-construction Construction
Navigation	T4	The movement of construction barges in the harbour will follow the standard navigational procedures to limit impact on other vessels.	Construction contractor	Construction
Operational vessel management	T5	A Vessel Traffic Management Plan will be prepared and implemented prior to commencement of operations at the Barangaroo Ferry Hub. This will be supported by a risk assessment for the Darling Harbour waterway which includes the Barangaroo Ferry Hub proposal.	Ferry operator <u>TfNSW</u> <u>RMS</u>	Operation
Event management during operation	T6	A tailored event management plan will be implemented during event periods or when a dramatic increase in pedestrians is expected, such as New Year's Eve.	Ferry operator	Operation

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Ecology				
Marine ecology	E1	The project CEMP will include mitigation measures to avoid impacts to marine ecology. This will include information about the risk of spills and leaks, as well as the threat posed to marine biota (fishing birds, marine mammals and fish) of ingestion and throttling from discarded garbage and in particular from plastic wrapping materials and plastic off cuts (such as hosing, jetty fenders, electrical wiring).	Construction contractor	Pre-construction
Environmental awareness	E2	Environmental awareness training will be provided, by the contractor, to all field personnel and subcontractors. Regular reinforcement (such as at toolbox talks) covering ecology impacts will be undertaken.	Construction contractor	Pre-construction and during construction as required
Spills during operations	E3	Operational procedures and policies will include mitigation measures to avoid the risk of spillages of liquids and solids from pump-out and maintenance. This will be managed by a combination of normal best-practice, and policies and procedures. Information about the threat posed to marine biota (fishing birds, marine mammals and fish) of ingestion and throttling from discarded garbage and in particular from plastic wrapping materials and plastic offcuts (such as hosing, jetty fenders, electrical wiring) will also be included.	Ferry operator	Operation
Visual amenity and urban design				
Visual amenity	V1	<p>The following visual amenity design considerations will be investigated during detailed design:</p> <ul style="list-style-type: none"> • The use of glass or similar material to create transparency and reduce the obstruction of views to the water. • Integrate and minimise the scale of elements such as the pump-out facility, gateline 'kiosk', and any pontoon facilities as much as possible to reduce visual obstruction to water views. 	TfNSW	Detailed design

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Visual amenity	V1	<ul style="list-style-type: none"> Minimise the use of railings and structures that obstruct views to the water and create visual clutter. Integrate elements of the structure to create a unified and coherent character to the architecture of the Barangaroo Ferry Hub. Given the visually congested context of the future Barangaroo precinct, the design of Barangaroo Ferry Hub should create a simple, low scaled ferry hub that maximises views to the water and which relates to the architectural language of the existing Ferry Wharf Upgrade Program. Selection of finishes to be visually compatible with the adjacent Barangaroo South development. 	TfNSW	Detailed design
Visual amenity	V2	Where feasible, the elements within the construction sites will be located to minimise visual impact, where feasible and reasonable.	Construction contractor	Construction
Lighting	V3	Lighting in line with AS/NZ 1158 Set:2010: Lighting for roads and public spaces will be used to ensure glare and light spill are minimised while meeting safety and amenity requirements.	Construction contractor	Construction
Construction hoardings	V4	Hoarding treatments will be designed to support wayfinding, display key messages, improve the look and feel of the construction site and document project progress. Regular maintenance of site hoarding and perimeter site areas will be undertaken, including the prompt removal of graffiti.	Construction contractor	Construction
Built and non-Indigenous heritage				
Heritage awareness	H1	All relevant staff and contractors will be trained regarding their statutory obligations and responsibilities under the Heritage Act 1977 and best practice outlined in The Burra Charter 2013, through the site induction and toolbox talks.	Construction contractor	Pre-construction and during construction as required

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Heritage items uncovered	H2	<p>The CEMP for the proposal will include that provisions for unexpected finds. If, during the course of construction of the proposal, suspected historic cultural heritage material is uncovered:</p> <ul style="list-style-type: none"> • Work will cease in that area immediately and the area will be cordoned off. • TfNSW environment staff and a suitably qualified archaeologist will be contacted. <p>Should the finds constitute non-Indigenous heritage then the Heritage Division, Office of Environment & Heritage will be notified.</p>	Construction contractor	Construction

Climate change

Design for climate change	CC1	<p>The following climate change design considerations will be investigated during detailed design:</p> <ul style="list-style-type: none"> • The design of the fixed link structure, in particular the allowance for sea level rise. The potential for adaptation or upgrading of the deck at a future date (when there is greater certainty regarding sea level rises and projections) to cater for potential sea level rise beyond the design life will be considered. • Materials selection to minimise accelerated degradation of infrastructure. • Shading for user comfort in extreme heat. 	TfNSW	Detailed design
Inspection of infrastructure	CC2	<p>Regular inspections of the infrastructure will be undertaken. Should excessive deterioration be identified, more regular or more substantial maintenance activities may be required within the design life of the project.</p> <ul style="list-style-type: none"> • Inspection of infrastructure after storm events will be undertaken to determine damage and appropriate maintenance requirements. 	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Air quality				
Air quality awareness	AQ1	Methods for management of emissions will be incorporated into the CEMP and included in project inductions, training and pre-start talks.	Construction contractor	Construction
Dust management	AQ2	Dust will be visually monitored and where necessary the following measures implemented: <ul style="list-style-type: none"> • Loads on vessels and trucks transporting material to and from the construction work area will be appropriately covered. • Tailgates of road transport trucks will be securely fixed prior to loading and after unloading. 	Construction contractor	Construction
Vehicle emissions	AQ3	Plant and machinery will be regularly checked and maintained in a proper and efficient condition. <ul style="list-style-type: none"> • All site vehicles and machinery will be switched off or throttled down to a minimum when not in use. 	Construction contractor	Construction
Vessel emissions	AQ4	During operation, vessel engines will be switched off during overnight layover. The operator will develop procedures to manage vessel idling at the wharves.	Ferry operator	Operation
Pump-out facility	AQ5	The detailed design of pump-out facilities will consider air quality impacts, in particular the need to avoid odour release from the pump out system.	TfNSW	Detailed design
Pump-out facility	AQ6	The operator will develop procedures to manage pump-out facilities at the wharves. These procedures are to consider the operation and maintenance of the facilities to ensure no odour impacts.	Ferry operator	Operation

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Property and land use				
Consultation regarding property and access	P1	<ul style="list-style-type: none"> • Landside works and access during construction and operation will be negotiated with BDA, Lend Lease, Roads and Maritime and SHFA. • Where necessary, easements will be created to protect services and allow Roads and Maritime Services to maintain them into the future. • Approvals will be sought prior to construction for construction works from: <ul style="list-style-type: none"> – Roads and Maritime – Port Authority of NSW. • Emergency access arrangements will be provided throughout construction and operation, with specific arrangements to be considered in consultation with emergency services, BDA and Lend Lease. • Should demolition of the King Street Wharf wave baffle be recommended, the removal will be subject to negotiation with Roads and Maritime Services. 	TfNSW	Pre-construction Construction
Special event management	P2	A special event management system will be prepared by the operator of the Barangaroo Ferry Hub prior to operation of the wharves. It will consider queue management and service provision to be implemented during special events. BDA, Lend Lease, Roads and Maritime and SHFA would be consulted during preparation of this management system.	Ferry operator	Operation
<u>Customer information and ticketing pod location</u>	<u>P3</u>	<u>The final location of the customer information and ticketing pods would be decided in consultation with BDA and Lend Lease, and would be selected to minimise the impact on the foreshore thoroughfare and visual amenity of the foreshore.</u>	<u>TfNSW</u>	<u>Pre-construction</u>

Environmental issue	ID	Environmental management measure	Responsibility	Timing
<u>Temporary queuing provision detail</u>	<u>P4</u>	<u>The final design of the temporary queuing provisions would be decided in consultation with BDA and Lend Lease, and would be selected to minimise the impact on the visual amenity of the foreshore.</u>	<u>TfNSW</u>	<u>Pre-construction</u>
Water quality and hydrology				
Drainage and flooding	WQ1	<ul style="list-style-type: none"> Weather forecasts will be checked regularly during construction and where flooding is forecast, all equipment and materials would be removed from the construction compound or appropriately secured where flood levels are expected to rise above existing surface levels for the area. 	Construction contractor	Construction
Erosion and sedimentation	WQ2	<ul style="list-style-type: none"> Prior to construction an erosion and sediment control management plan for all land construction activities will be developed in accordance with Managing Urban Storm Stormwater: Soils and Construction (The Blue Book) and included in the CEMP. The plan will require all erosion and sediment controls to be installed prior to any land works commencing, maintained throughout construction and removed only once all disturbed areas have been reinstated. The establishment of the temporary construction compound will be done in accordance with The Blue Book and outlined in the CEMP. 	Construction contractor	Construction
Water quality during construction	WQ3	A water monitoring program would be outlined within the CEMP to monitor key water quality parameters established in consultation with OEH and DP&E	Construction contractor	Pre-construction Construction
Stockpiling	WQ4	During construction, there will be no stockpiling of demolition or construction materials on the seabed.	Construction contractor	Construction
Wave baffle removal	WQ5	If the King Street Wharf wave baffle is agreed to be removed, prior to commencement of the demolition, the CEMP will include protections for water quality, including:	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Wave baffle removal	WQ5	<ul style="list-style-type: none"> Scaffolding or similar protection to prevent solid materials, paint or fragments entering the water during demolition. Silt curtains will be installed between the inner piles and the shore to protect remaining seawall and rock toe hard substratum habitats from potential smothering or excessive turbidity. The silt curtains will remain in place for the duration of the demolition activities. 	Construction contractor	Construction
Water quality during piling	WQ6	Prior to commencement of piling activities of each individual wharf, silt curtains will be installed between the inner piles and the shore to protect the remaining seawall and rock toe hard substratum habitats from potential smothering or excessive turbidity. The silt curtains will remain in place for the duration of the piling activities for that wharf.	Construction contractor	Construction
Spills during construction	WQ7	<p>Visual inspections will be carried out at the proposal area and included within the CEMP. Any water quality issues observed in or outside of the proposal area will be reported to TfNSW. In the event of a spill the TfNSW Incident Management Procedure will be followed and appropriate action will be taken.</p> <ul style="list-style-type: none"> Emergency spill kits will be kept on-site and maintained throughout construction work. The spill kits will be appropriately sized for the volume of substances at the work site and be specific to the marine environment. A spill kit will be kept on each barge and at the temporary construction compound site. During construction, all staff will be made aware of the location of the spill kits and trained in their use. If a spill occurs during construction, the TfNSW Contract Manager and TfNSW environment staff will be notified as soon as practicable, as outlined in the Incident Management Procedure. 	Construction contractor	Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Bunding	WQ8	<ul style="list-style-type: none"> • Equipment barges (carrying plant, machinery, fuels or chemicals) will be bunded to contain any accidental chemical spills or leaks. • Any chemicals or fuels stored at the temporary construction compound will be within double bunded areas. 	Construction contractor	Construction
Construction vehicles/vessels	WQ9	<ul style="list-style-type: none"> • All equipment, materials and wastes transported between an offsite facility, and the construction work area will be secured to avoid spills during transportation. • Vehicles, vessels and plant will be properly maintained and regularly inspected for fluid leaks during construction. • No vehicle or vessel wash down will occur on-site during construction. 	Construction contractor	Construction
Spills during construction	WQ10	<ul style="list-style-type: none"> • In an event of a spill during operation, the incident emergency plan will be implemented in accordance with the Port Corporations response to shipping incidents and emergencies outlined in the NSW State Waters Marine Oil and Chemical Spill Contingency Plan (TfNSW, 2012b). • Specific management measures are to be included in an Operation Environmental Management Plan (OEMP) prepared by the operator of the Barangaroo Ferry Hub, to minimise the risks of spillages of liquids and solids from pump-out and maintenance works.. 	Operator	Operation
Heat rejection system	WQ11	TfNSW will continue to work closely with stakeholders, in particular BDA and Lend Lease regarding the interface between the operation of the proposed ferry hub and approved heat rejection system to be included within the Barangaroo South development.	TfNSW	Detailed Design
Pump-out system	WQ12	<ul style="list-style-type: none"> • Detailed design of the pump-out system will address the risk of accidental spills, and an alarm system to identify any accidental spill will be considered. 	TfNSW	Detailed Design

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Indigenous heritage				
Indigenous heritage awareness	IH1	Project staff and contractors will be trained regarding their statutory obligations and responsibilities under the National Parks and Wildlife Act 1974 through the site induction and toolbox talks.	Construction contractor	Pre-construction and during construction as required
Unexpected finds	IH2	<p>The CEMP for the proposal will include provisions for unexpected finds. If, during the course of construction of the proposal, suspected Indigenous heritage material is uncovered:</p> <ul style="list-style-type: none"> • Work will cease in that area immediately and the area will be cordoned off. • TfNSW environment staff and a suitably qualified archaeologist will be contacted. <p>Should the finds constitute Indigenous heritage material then the Office of Environment & Heritage will be notified.</p>	Construction contractor	Construction
Unexpected finds	IH3	In the event that skeletal remains are uncovered, then works in the area will cease immediately, the area will be cordoned off and the TfNSW environment team and NSW Police Coroner will be contacted to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the OEH Enviroline 131 555 and relevant Aboriginal stakeholders will be contacted to determine an action plan for the management of the skeletal remains prior to works re-commencing.	Construction contractor	Construction
Socio-economic				
Community engagement during construction	SE1	<p><u>A Community Liaison Plan (CLP) would be prepared for the project to ensure stakeholders and the community are provided with timely and effective information about activities associated with the project, and opportunities to provide feedback, where appropriate. The CLP will ensure:</u></p> <ul style="list-style-type: none"> • <u>Stakeholders and the community have a high level of awareness of all processes and activities associated with the project.</u> 	TfNSW Construction contractor	Pre-construction Construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Community engagement during construction	SE1	<ul style="list-style-type: none"> <u>Accurate information is made available in an effective and timely manner.</u> <u>A timely response is given to feedback, enquiries and complaints received from stakeholders and the community.</u> <p>A community liaison plan will be prepared to support the Stakeholder and Community Engagement Strategy throughout project delivery.</p>	TfNSW	Pre-construction
			Construction contractor	Construction

Soils, geology and contamination

Contamination management	SC1	The CEMP will include a contamination plan outlining the methodology (in accordance with Waste Management Guidelines) to manage any potential contamination should small amounts of material be recovered (e.g. during pile removal). This plan would also include an unexpected finds protocol.	TfNSW	Pre-construction
			Construction contractor	Construction
Reinstate construction area	SC2	All construction areas (including the temporary compound site) will be reinstated to their intended state once construction is complete.	Construction contractor	Construction

Ecologically sustainable development

Sustainability initiatives	SD1	The applicable initiatives within the TfNSW Sustainable Design Guidelines and Sydney Ports Green Port Guidelines (refer to Appendix L) will be further considered during detailed design to identify sustainability opportunities through the design and construction of the proposal.	TfNSW	Detailed design
			Construction contractor	Construction
Environmental awareness	SD2	The environmental induction developed for the project will include measures to promote sustainable work practices by construction personnel.	Construction contractor	Pre-construction and during construction as required

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Utilities and services				
Utilities and service investigations	U1	Investigations will be carried out during the detailed design phase to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works. These measures will be outlined in the CEMP.	TfNSW	Detailed design
Consult utility and service providers	U2	Relevant service utility providers or owners will be consulted to verify locations, potential impact and any protection, relocation or decommissioning work required.	TfNSW	Detailed design
Dial before you dig	U3	In addition to current investigations into the location of sub-surface utilities in the vicinity of the proposal area, the construction contractor(s) will be required to confirm the locations of existing underground utilities and services prior to commencing construction work. This will include a revised and detailed Dial Before You Dig (DBYD) search.	Construction contractor	Pre-construction
Search for utilities and services	U4	A services search within land not covered by the DBYD search will be carried out to identify the location of utility services.	Construction contractor	Pre-construction
<u>Sydney Water stormwater channel</u>	<u>U5</u>	<u>Prior to construction of the third (southern) wharf TfNSW would consult with Sydney Water Corporation to manage any impact on the stormwater channel.</u>	<u>TfNSW</u>	<u>Pre-construction (third wharf)</u>
Waste and resource use				
Waste management plan	W1	A waste management plan will be prepared as part of the CEMP. Construction waste will be managed through the waste hierarchy established under the Waste Avoidance and Recovery Act 2001, which comprises the following principles:	Construction contractor	Pre-construction

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Waste and resource use				
Waste management plan	W1	<ul style="list-style-type: none"> Avoidance of waste: Minimising the amount of waste generated during construction by avoiding unnecessary resource consumption (e.g. avoiding the use of inefficient plant and construction equipment and avoiding materials with excess embodied energy, waste and excessive packaging) Resource recovery: Reusing, reprocessing and recycling waste products generated during construction to minimise the amount of waste requiring disposal Disposal: Where resources cannot be recovered, disposing of them appropriately to minimise the potential adverse environmental impact 	Construction contractor	Pre-construction
Reuse/recycle materials	W2	The materials removed as part of the demolition of the King Street Wharf wave baffle and the decommissioning of public transport elements of the King Street Ferry Wharf will be reused and/or recycled where feasible. Ways to reuse or recycle these materials will be investigated as part of detailed design.	TfNSW Construction contractor	Detailed design Construction
Off-site disposal	W3	All waste requiring off-site disposal will be classified in accordance with OEH's (2009) Waste Classification Guidelines prior to disposal.	Construction contractor	Construction
Reducing energy use	W4	Environmental management measures to reduce energy usage (and any associated greenhouse gas emissions) are discussed in Section 6.13.2.	Construction contractor	Construction
Operational Environmental Management Plan	W5	Operational policies and procedures will be prepared by the operator of the Barangaroo Ferry Hub, which will outline how waste, energy and demand on resources will be managed during operation.	Ferry operator	Operation

Environmental issue	ID	Environmental management measure	Responsibility	Timing
Hazards and risks				
Site safety management	R1	Site safety protocols, incident management and emergency procedures will be prepared prior to the commencement of construction works and implemented as required throughout construction.	Construction contractor	Pre-construction Construction
Minimising hazards and risks	R2	<p>activities with the potential to cause environmental, occupational and construction hazards and risks will be identified in the CEMP. Work practices which minimise such hazards and risks during work activities will be investigated and applied where reasonable and feasible to address the following issues:</p> <ul style="list-style-type: none"> • chemical spills and leaks • surface water quality • disposal of materials. 	TfNSW Construction contractor	Pre-construction Construction
Hazards and risks awareness	R3	Methods for management of hazards and risks will be incorporated into project inductions, training and pre-start talks.	Construction contractor	Pre-construction and during construction as required
Storage of hazardous goods	R4	<ul style="list-style-type: none"> • Chemicals and potentially hazardous substances will be used and stored according to regulatory requirements including the Work Health and Safety Act 2011 • Chemical, fuel and oil containers will be stored, transported and managed according to the Material Safety Data Sheet (MSDS) and manufacturers' directions. 	Construction contractor	Construction
Operational safety policies	R5	Sydney Ferries standard operational policies and procedures will be applied to the ongoing operation of the Barangaroo Ferry Hub in order to manage potential hazards and risks associated with spills (e.g. hydraulic fluid and/or fuel) from a ferry or pump-out waste entering the waters of Darling Harbour.	Ferry operator	Operation

9 Conclusion

The Barangaroo Ferry Hub EIS included a comprehensive assessment of the likely environmental impacts of the proposal and, where appropriate, proposed environmental management measures to address these potential impacts.

The EIS was placed on public exhibition between 11 December 2014 and 9 February 2015. During this period, government agencies, interested groups and the community were invited to make written submissions on the Barangaroo Ferry Hub proposal to DP&E.

A total of 31 submissions were received during the period of exhibition. These included 14 submissions from individual community members, 8 submissions from organisation stakeholders and 9 submissions from local government and/or agencies. This Submissions Report has documented submissions received and outlined Transport for NSW's responses to the issues raised.

Most community submissions were concerned about:

- proposal design and operations,
- traffic, transport and access issues
- proposal need and justification.

A number of design changes are proposed in response to the submissions received, opportunities to minimise environmental impacts, ongoing consultations with key stakeholders and further design development. These are identified and assessed in Chapter 6. The impacts associated with the proposed design changes would be manageable through the application of the environmental management measures documented in Chapter 8 of this Submissions Report, which includes some new and revised measures.

It is proposed that the Barangaroo Ferry Hub proposal, as described in the EIS, and as amended by this Submissions Report (incorporating a Preferred Infrastructure Report), should be submitted for determination by the Minister for Planning.

10 References

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Commonwealth of Australia 1992, Disability Discrimination Act 1992 Act No. 135 of 1992

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NSW Government 2011, NSW 2021: A Plan to Make NSW Number One, September 2011

NSW Government 2012, NSW Long Term Transport Master Plan, December 2012

NSW Government 2013, Draft Metropolitan Strategy for Sydney to 2031, March 2013

Roads and Maritime Services, Traffic Control at Work Sites Manual version 4, June 2010

Standards Australia, AS 4284:2008 Testing of building facades, April 2008

Standards Australia, AS 1680.5:2012 Interior and workplace lighting - Outdoor workplace lighting, May 2012

Standards Australia, AS 1742.3-2009 Manual of uniform traffic control devices - Traffic control for works on roads, January 2009

Transport for NSW (TfNSW) 2012a, Barangaroo Integrated Transport Plan, August 2012

Transport for NSW (TfNSW) 2012b, Construction Noise Strategy, April 2012

Transport for NSW (TfNSW) 2012c, Community Engagement Policy, April 2012

Transport for NSW (TfNSW) 2013a, Sydney City Centre Access Strategy, December 2013

Transport for NSW (TfNSW) 2013b, Sydney's Ferry Future: Modernising Sydney's Ferries, May 2013

Transport for NSW (TfNSW) 2013c, Sydney's Cycling Future, December 2013

Appendix A – Summary of submissions received

ID No.	Stakeholder	Response item/table number
1	Sydney Water Corporation	Table 4-7
2	Community member	5.3c, 5.3d, 5.6l, 5.6n
3	Organisation	5.2a, 5.2b, 5.3b, 5.6m, 5.6q, 5.6r
4	Organisation	5.2i, 5.6q
5	Community member	5.2d, 5.2g, 5.4a
6	Community member	5.2g, 5.4a
7	Community member	5.1a, 5.2d, 5.2f, 5.2g, 5.3h, 5.3i, 5.6d, 5.6i, 5.6j, 5.6k
8	Community member	5.2g
9	Barangaroo Delivery Authority	Table 4-1
10	Community member	5.2d, 5.2f, 5.2g, 5.3h, 5.4a, 5.6d, 5.6i, 5.6j, 5.6k
11	Community member	5.2d, 5.3a, 5.6h
12	Organisation	5.8a, 5.8c
13	Organisation	5.1a, 5.2d, 5.2f, 5.2g, 5.3h, 5.3i, 5.4a, 5.4e, 5.6d, 5.6i, 5.6j, 5.6k
14	Organisation	5.1a, 5.2d, 5.2e, 5.2f, 5.2g, 5.3h, 5.3i, 5.4a, 5.4b, 5.6d, 5.6i, 5.6j, 5.6k
15	Community member	5.2d, 5.2f, 5.2g, 5.3a, 5.4a, 5.6d, 5.6i, 5.6j
16	Community member	5.2d, 5.2f, 5.2g, 5.3h, 5.4a, 5.6d, 5.6h, 5.6i, 5.6j, 5.6k, 5.12b
17	Community member	5.2i, 5.3a, 5.6q, 5.12a, 5.12c, 5.12d

ID No.	Stakeholder	Response item/table number
18	Community member	5.2c, 5.6i
19	Community member	5.2d, 5.2g
20	Community member	5.2d, 5.2f, 5.2g, 5.3h, 5.4a, 5.6d, 5.6i, 5.6j, 5.6k
21	Organisation	5.2h, 5.2k, 5.3c, 5.3e, 5.3f, 5.3g, 5.4c, 5.4d, 5.5a, 5.5b, 5.5e, 5.5f, 5.6b, 5.6e, 5.6s, 5.6t, 5.6u, 5.7a, 5.8d, 5.10a, 5.10c, 5.10d
22	Community member	5.2j, 5.12e
23	Office of Environment and Heritage - Heritage Division	Table 4-6
24	Environmental Protection Authority	Table 4-4
25	Department of Primary Industries	Table 4-3
26	Organisation	5.2h, 5.3f, 5.6a, 5.6o, 5.6v, 5.8c, 5.10b
27	Leichhardt Council	Table 4 -5
28	Organisation	5.1b, 5.3f, 5.5c, 5.5d, 5.5g, 5.6c, 5.6f, 5.6g, 5.6p, 5.7b, 5.7c, 5.7d, 5.8b, 5.8e, 5.9a, 5.11a
29	City of Sydney	Table 4-2
30	Office of Environment and Heritage	Section 4.6
31	Transport for NSW (Land Use and Integrated Transport)	Section 4.9

Appendix B – Worley Parsons report



MEMORANDUM

DATE	20 May 2015
TO	Kate Doherty (Transport for NSW)
FROM	Campbell Grant
COPY	Chris Adamantidis (WorleyParsons), David Ho (WorleyParsons)
PROJECT	301015-03697-CFD
SUBJECT	Barangaroo Heat Rejection System - Near Field CFD - Draft Report
DOC NO	MEM001-A
FILE LOC	R:\301015-03697 - Barangaroo Heat Rejection System Near Field CFD\Report

1. Introduction

WorleyParsons was engaged by Transport for NSW (TfNSW) to carry out near field computational fluid dynamics (CFD) for the Heat Rejection System Outfall of the Lend Lease Barangaroo development.

WorleyParsons previously carried out near and far field modelling for the Heat Rejection System Outfall in 2012 [1]. The purpose of the modelling was to assess the dispersion of heated water from the Heat Rejection System Outfall. It was found that for all seasons a temperature reduction to 2°C above ambient was achieved within 4m of the outfall, and a temperature reduction to 1°C above ambient was achieved within 8 to 9m. A temperature reduction to 0.6°C above ambient was achieved by the end of the near field (approximately 15m) across all seasonal cases. The heat rejection system was found to comply with ANZECC [2] guidelines, with seasonal median temperatures at the boundary of the near field model that were calculated to be less than the measured pre-development seasonal 80th percentile values. This is below the low risk trigger value given in the ANZECC guidelines.

TfNSW has proposed placing a Ferry Hub consisting of three wharfs directly in front of the Heat Rejection System Outfall [3]. The proposed Ferry Hub contains infrastructure and allowances for vessel layover within the near field mixing zone of the outfall. There is concern that the Ferry Hub infrastructure and associated layover vessels will interact with the discharge from the Heat Rejection System Outfall. This interaction may impact the results of the previous near field modelling.

The previous near field modelling for the outfall was carried out using a Lagrangian buoyant jet model (VISJET). While this model has been shown to accurately predict buoyant jet flow paths and heat dissipation, it is unable to account for complex three dimensional geometry that may obstruct and/or trap flow. CFD is able to account for complex three dimensional geometry by modelling the entirety of the flow domain, including flow obstructions.

The near field modelling was carried out using the CFD software **FLOW-3D**® Version 11.0.4, which is licensed to WorleyParsons. WorleyParsons has previously validated Flow-3D for buoyant turbulent jet flow.



Four different seasonal flow cases were analysed for the Heat Rejection System Outfall. The approximate steady state near field heat distribution was extracted for the Heat Rejection System Outfall for each of the flow cases. The heat distributions were compared to the ANZECC guidelines to determine the impact of the Ferry Hub on the compliance of the outfall.

The details of the analysis methodology, input parameters, assumptions, and results, are described in this memorandum.

2. Analysis Cases

Four different seasonal flow cases were analysed for the Heat Rejection System Outfall; summer, autumn, winter, and spring.

The median and 80th percentile temperature for the receiving water was determined for each of the flow cases from long-term temperature data measured at the proposed development site [4].

The discharge from the Heat Rejection System Outfall was assigned a temperature 7°C greater than the receiving water for each for the flow cases. This is the expected discharge temperature from the outfall when the Heat Rejection System is operating at peak efficiency [1].

The maximum seasonal flow rate [1] was used for the discharge from the Heat Rejection System Outfall for each of the flow cases. This is a conservative assumption as dilution is generally reduced as flow rates are increased, due to the greater volume of heated water being discharged.

A worst case scenario was assumed for the receiving water for each of the analysis cases to ensure conservative results, specifically:

- Lowest astronomical tide (-0.925m AHD): Minimum vertical distance for buoyant mixing
- Slack water: Minimum turbulent mixing on discharge and minimum subsequent advection
- All lay over positions occupied by ferries with the largest possible draft (Lady Northcott): Largest possible obstacle to maximise trapping/obstruction of discharge

The analysis cases are summarised below in Table 1.

Table 1: Analysis cases

Parameter	Analysis case			
	Summer	Autumn	Winter	Spring
Receiving water <i>median temperature</i>	24.0 °C	21.2 °C	15.5 °C	18.1 °C
Receiving water <i>80th percentile temperature</i>	25.7 °C	22.5 °C	16.5 °C	20.0 °C
Outfall discharge <i>temperature</i>	31.0 °C	28.2 °C	22.5 °C	25.1 °C
Outfall discharge <i>flow rate</i>	380 L/s (pipes 1, 3-8)	373 L/s (pipes 1, 3-8)	265 L/s (pipes 5-8)	366 L/s (pipes 3-8)
	130 L/s (pipe 2)	0 L/s (pipe 2)	0 L/s (pipes 1-4)	0 L/s (pipes 1-2)



3. Model Setup

The supplied data was reviewed. A 3D geometry model was created from the supplied drawings, including the receiving water bathymetry, Heat Rejection System Outfall, and proposed Ferry Hub. The 3D geometry model was then imported into Flow-3D. The resulting CFD model was meshed and assigned appropriate fluid properties, initial conditions, and boundary conditions. Each analysis case was then run until an approximate steady state solution was obtained.

3.1 Geometry

A 3D geometry model was created from the supplied drawings. The geometry model incorporated the receiving water bathymetry, Heat Rejection System Outfall, proposed Ferry Hub, and layover ferries.

The proposed Ferry Hub geometry was limited to the components below the water line, that is, the piles, pontoons (main and layover), and arrestor structures; as only these parts of the proposed Ferry Hub will interact with the flow from the Heat Rejection System Outfall.

The layover ferries were all modelled as an approximation to the 'Lady Northcott' ferry hull. The approximation to the hull was based on the supplied ferry data and drawings.

The main pontoons, layover pontoons, and ferries were positioned in the geometry model so as to have the appropriate draft (1.5, 0.8, and 2.2m respectively) when the receiving water was set to the lowest astronomical tide level (-0.925m AHD).

Selected plots of the geometry model can be seen in Figure 1 to Figure 10. The receiving water is included in the plots in Figure 6 to Figure 10.

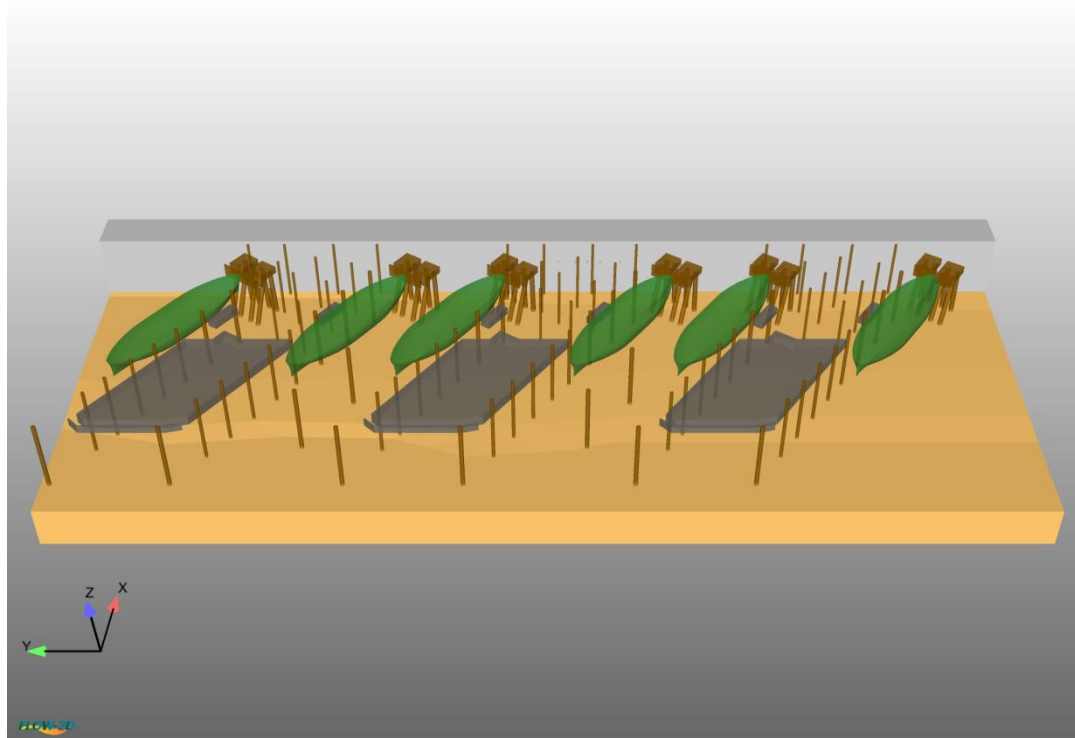


Figure 1: 3D geometry model, overview 1

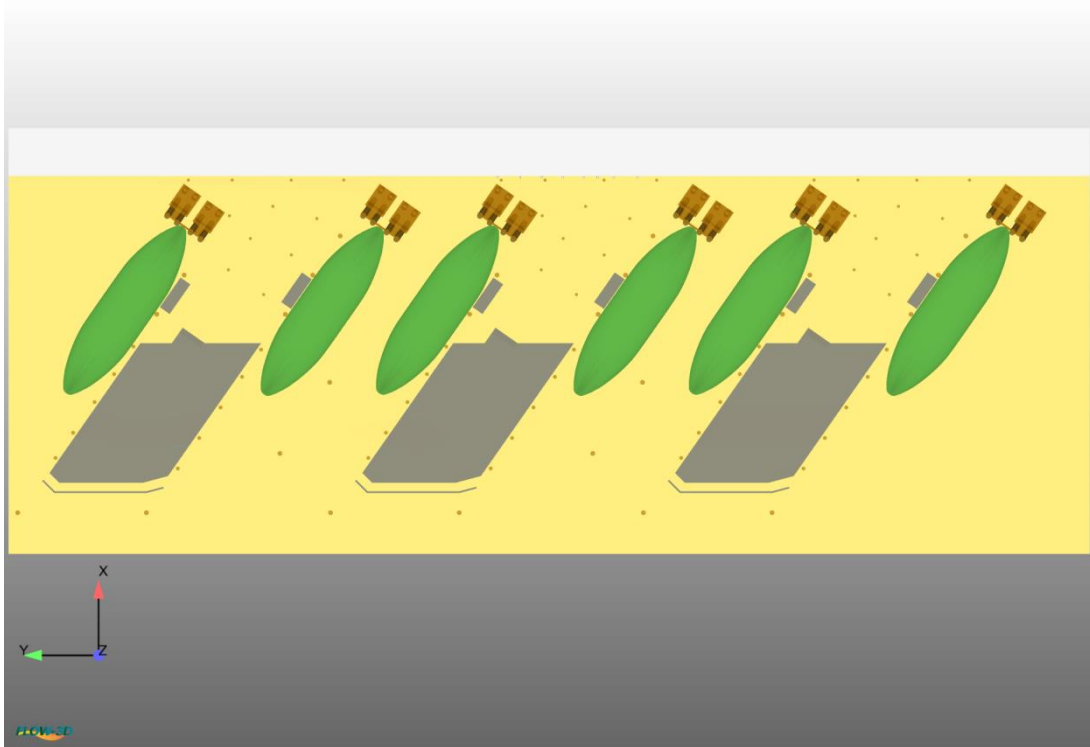


Figure 2: 3D geometry model, overview 2

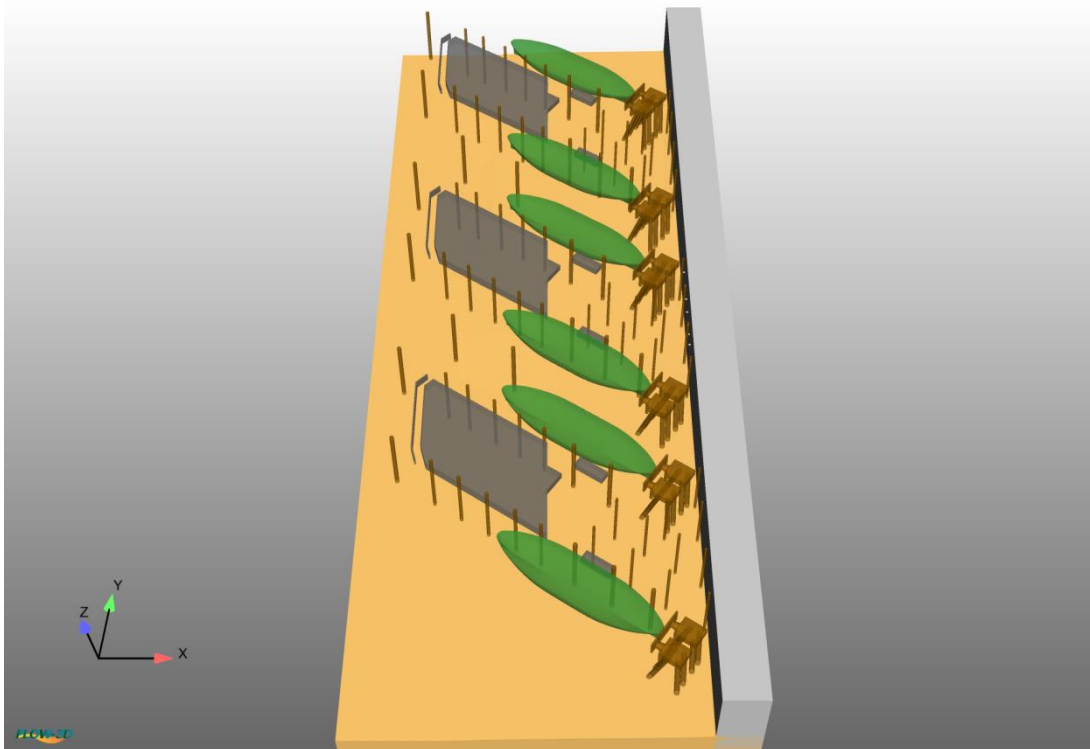


Figure 3: 3D geometry model, overview 3

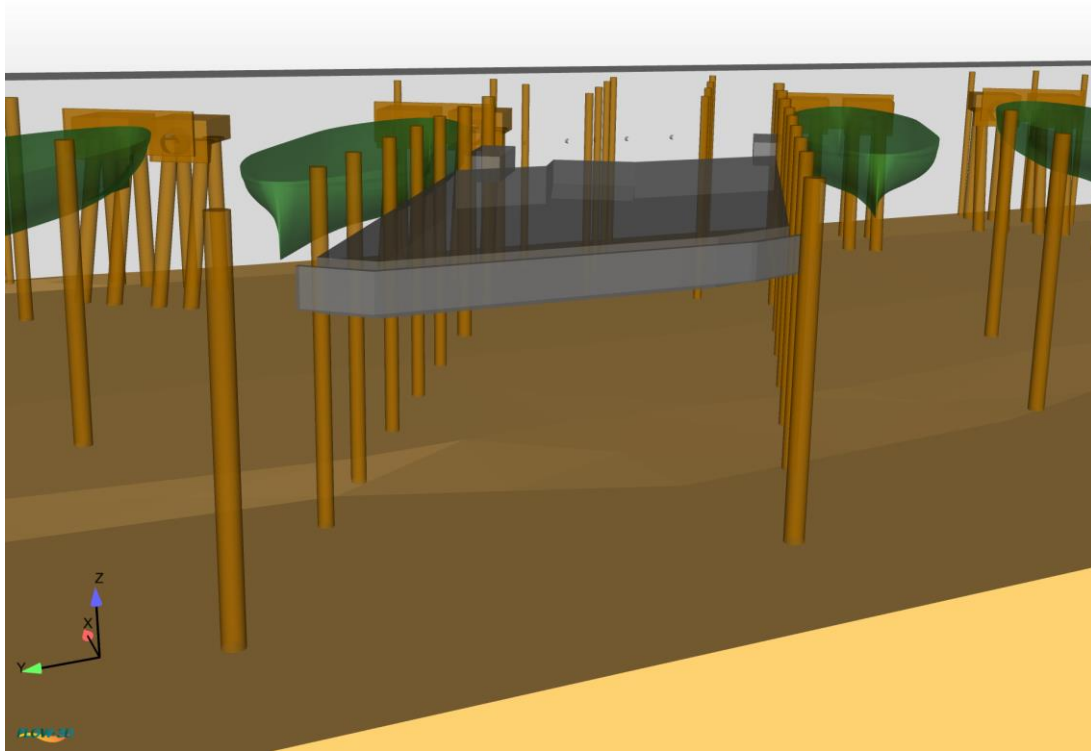


Figure 4: 3D geometry model, main pontoon

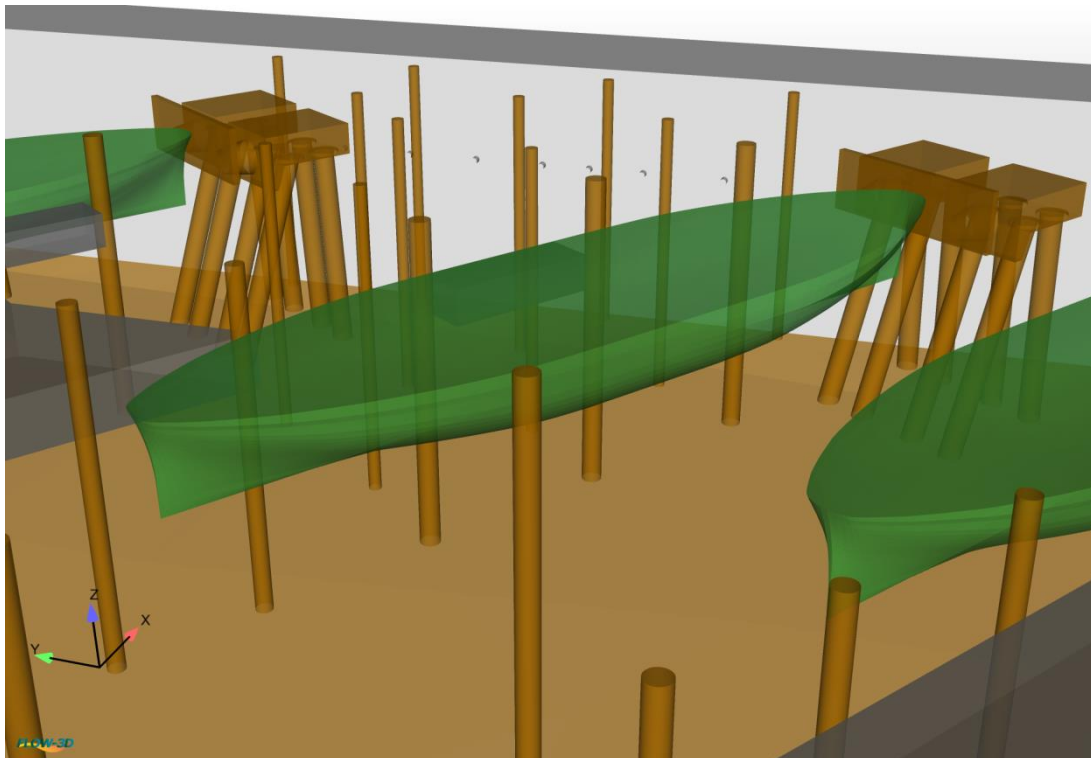


Figure 5: 3D geometry model, layover ferry and arrestor structure

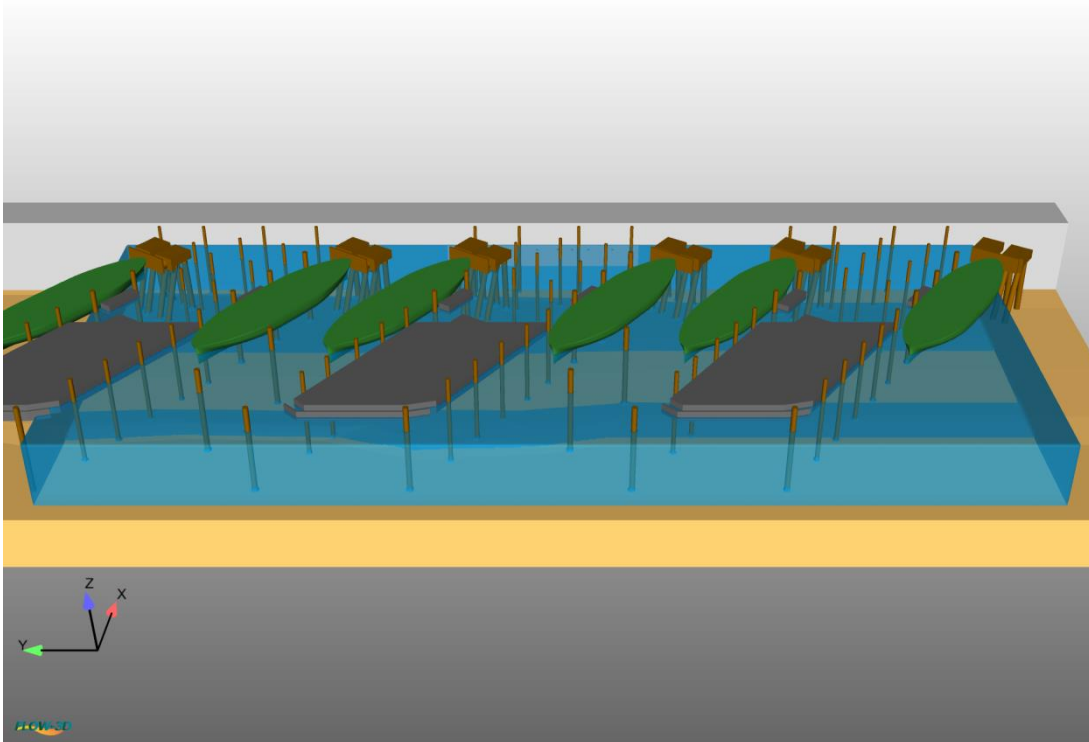


Figure 6: 3D geometry model including receiving water, overview 1

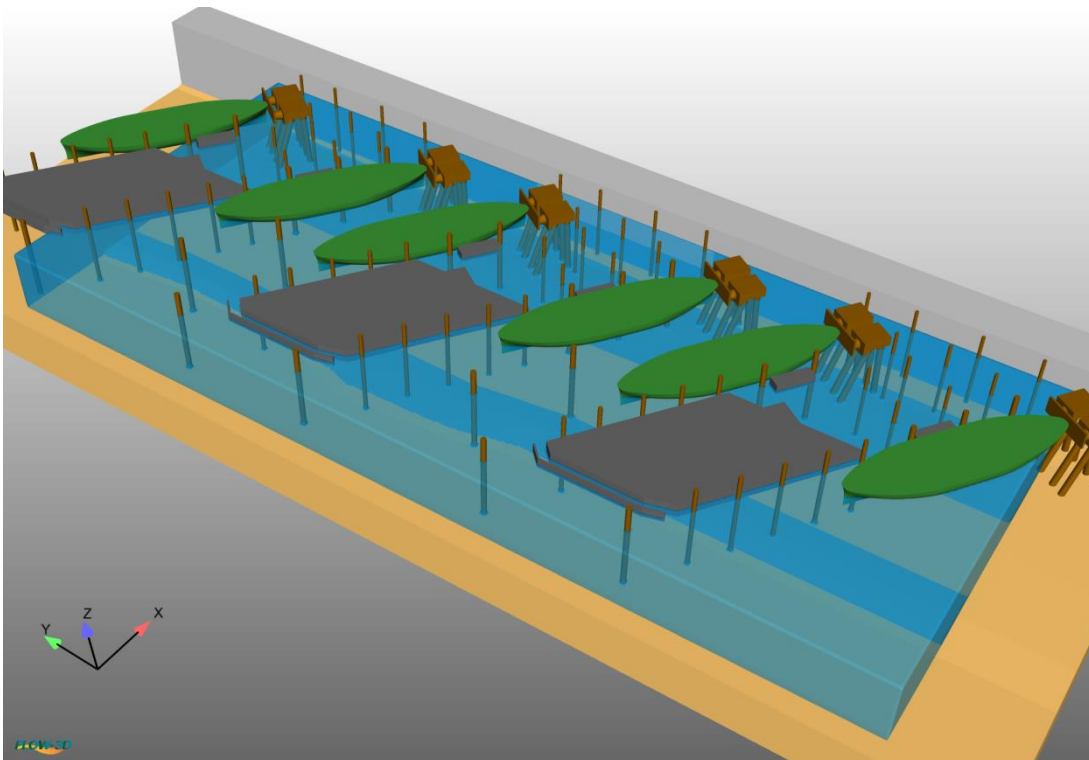


Figure 7: 3D geometry model including receiving water, overview 2

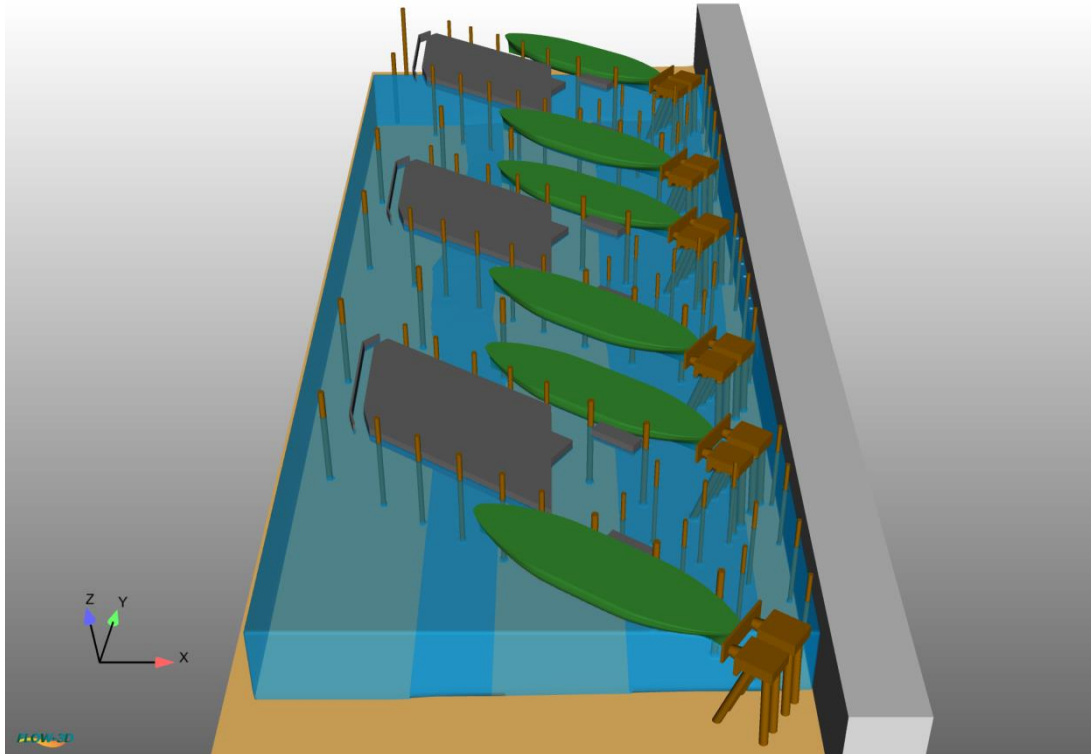


Figure 8: 3D geometry model including receiving water, overview 3

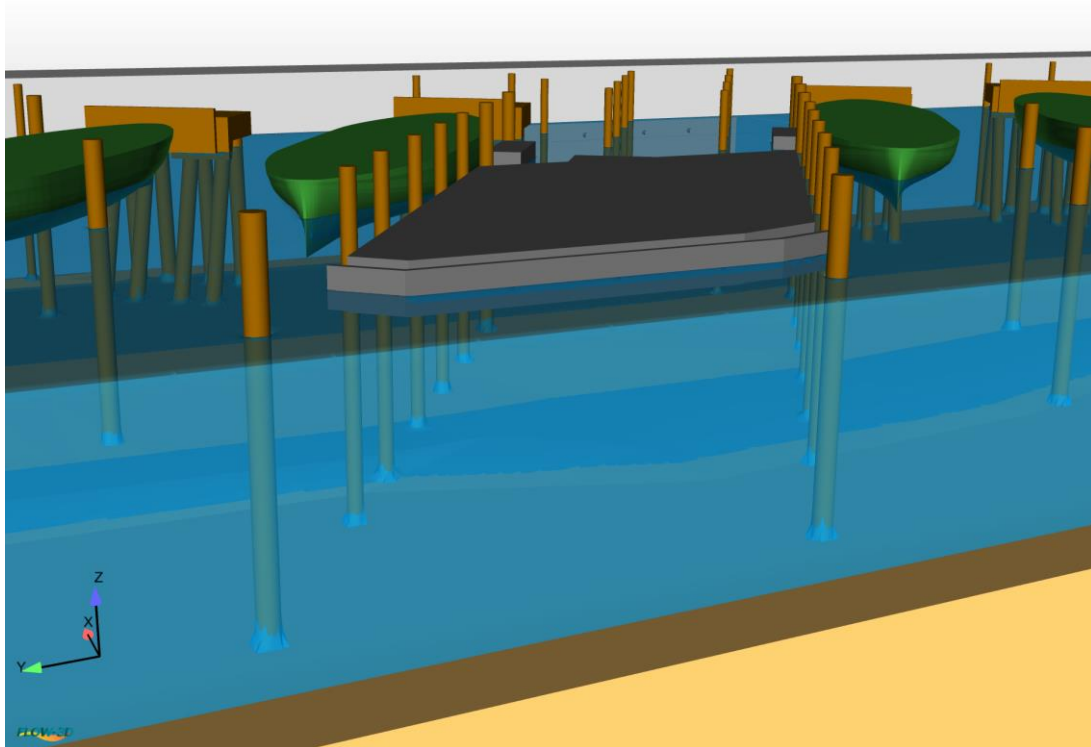


Figure 9: 3D geometry model including receiving water, main pontoon

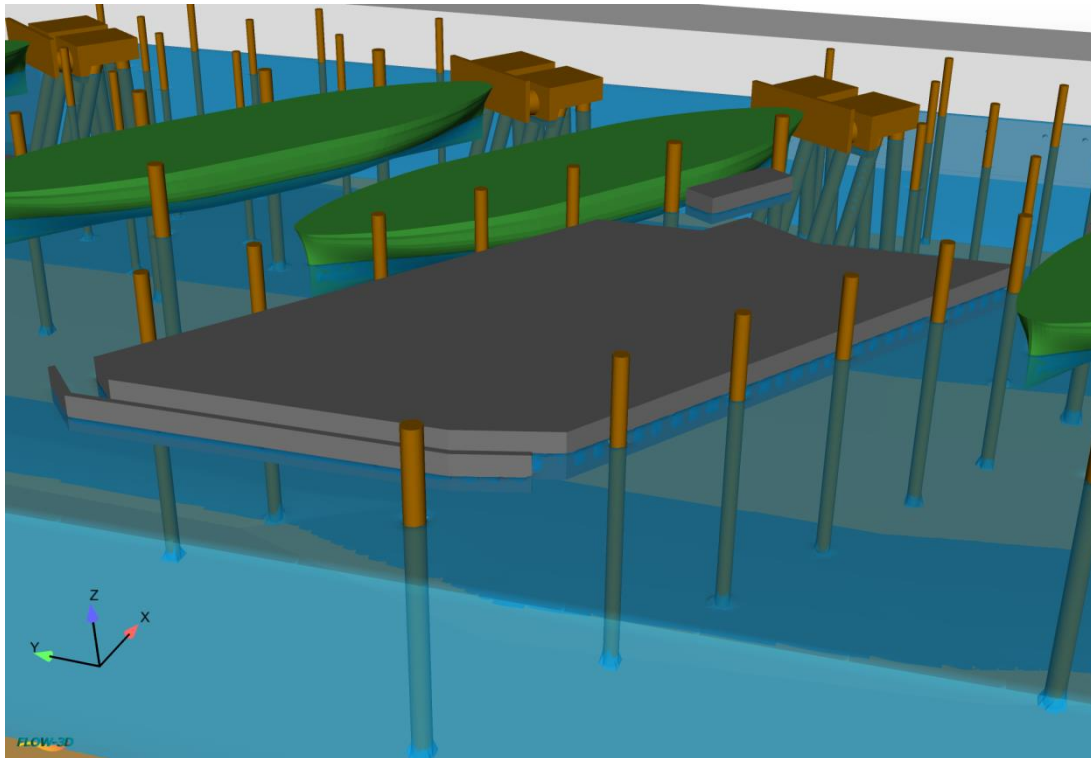


Figure 10: 3D geometry model including receiving water, main pontoon, layover pontoon, arrestor structure, and layover ferry

3.2 Meshing

The flow domain for the CFD analysis was discretised using a three-dimensional grid of variable-sized rectangular mesh cells which hold the values for basic flow quantities (e.g. velocity and temperature), as well as the proportion of obstacle and/or fluid in the cell and the location of the free surface.

The mesh that was used for the analysis can be seen in Figure 11 and Figure 12. Two different mesh blocks totalling approximately 7.4 million cells were used for the analysis. A high mesh density was used in the area near the outfall to provide increased detail. The mesh was graded out with distance from the outfall to reduce the required number of cells and subsequently minimise the model run time. Typical mesh sizes were approximately 0.12m near the outfall, 0.3m at the surface, and 1m at the floor. The mesh extended approximately 75m in each direction from the outfall.

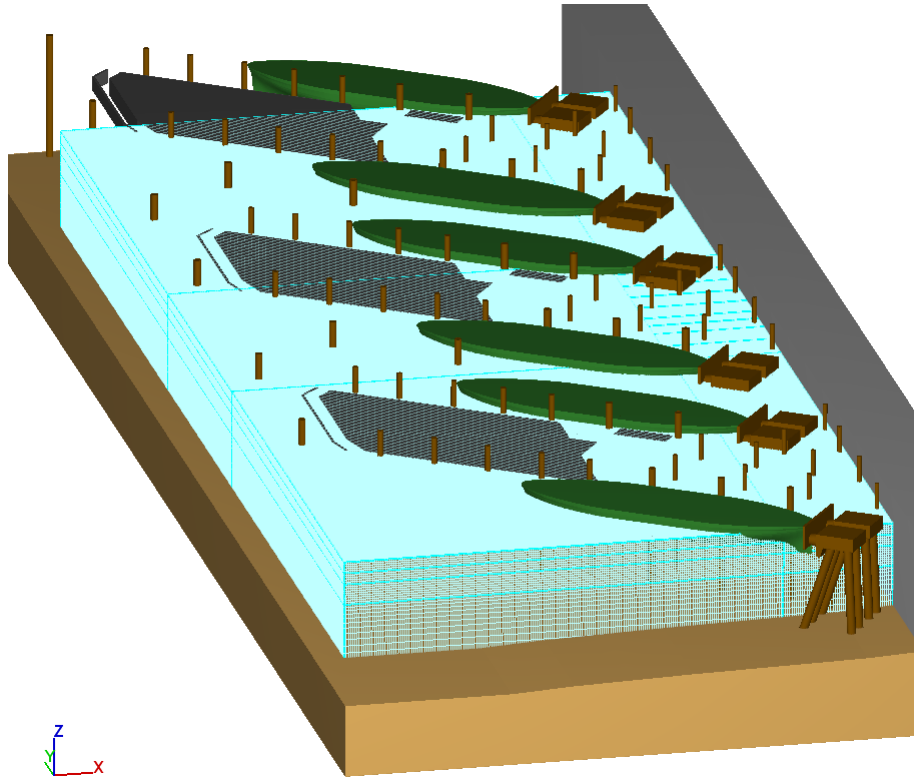


Figure 11: Analysis mesh, extents, 3D view

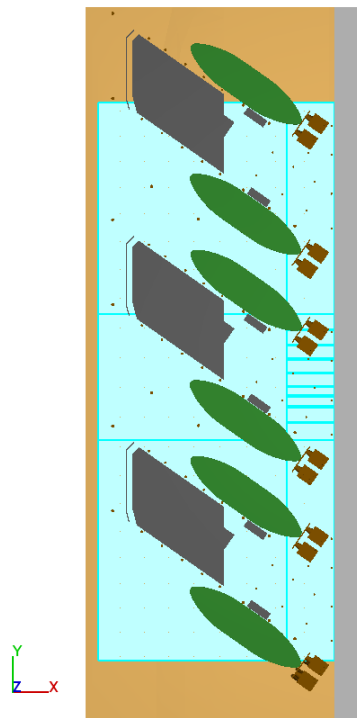


Figure 12: Analysis mesh, extents, plan view



3.3 Boundary Conditions

The receiving water boundary was set to a stagnation pressure boundary condition at the lowest astronomical tide level (-0.925m AHD). A stagnation pressure boundary condition assumes that the water both outside and at the boundary has a hydrostatic pressure profile corresponding to the prescribed water level. The computation also assumes that the velocity of the water outside the boundary is zero. This boundary condition approximates a large body of water on the other side of the boundary.

The temperature at the receiving water boundary was set to be equal to the receiving water temperature. The receiving water temperature is given for each analysis case in Table 1.

3.4 Initial Conditions

The analysis cases were each initialised with a single fluid block. The fluid block was given a free surface elevation equal to the lowest astronomical tide level (-0.925m AHD) and a uniform temperature equal to the receiving water temperature. The receiving water temperature is given for each analysis case in Table 1. The fluid block was not given any initial velocity or turbulence.

3.5 Fluid Properties

A single fluid model was used. The properties of water vary with both salinity and temperature. Based on data measured at the proposed development site [4] the fluid was modelled as water with a fixed salinity of 32.9ppt and temperature dependent density, dynamic viscosity, specific heat, and thermal conductivity.

The temperature dependent properties for the fluid were determined from relevant literature [5] and input into the CFD software in tabular format. The fluid properties that were input into the CFD software can be seen in Table 2.

Second order fluid-fluid heat transfer was applied to the model. This was the only heat transfer applied to the model; radiation, fluid-air convection/conduction, and fluid-solid convection/conduction were not modelled.

Acceleration due to gravity of 9.81 m/s^2 was applied to the model.

No additional turbulence or waves due to ferry (or other vessel) movement was included in the model.

The effects of wind-induced waves have not been assessed and were not included in the model.

**Table 2: Temperature dependent fluid properties**

Temperature (°C)	Density (kg/m ³)	Dynamic Viscosity (Pa.s)	Specific Heat (J/kg.K)	Conductivity (W/m.K)
14.0	1024.607	1.247E-03	4008.6	0.589
15.0	1024.412	1.214E-03	4008.9	0.591
16.0	1024.207	1.183E-03	4009.2	0.592
17.0	1023.993	1.154E-03	4009.6	0.594
18.0	1023.770	1.125E-03	4009.9	0.595
19.0	1023.538	1.098E-03	4010.2	0.597
20.0	1023.297	1.072E-03	4010.6	0.598
21.0	1023.047	1.046E-03	4010.9	0.600
22.0	1022.789	1.022E-03	4011.2	0.601
23.0	1022.521	9.986E-04	4011.5	0.603
24.0	1022.246	9.761E-04	4011.9	0.604
25.0	1021.961	9.543E-04	4012.2	0.606
26.0	1021.669	9.333E-04	4012.5	0.607
27.0	1021.368	9.131E-04	4012.8	0.608
28.0	1021.059	8.936E-04	4013.1	0.610
29.0	1020.742	8.747E-04	4013.4	0.611
30.0	1020.417	8.565E-04	4013.8	0.613
31.0	1020.085	8.389E-04	4014.1	0.614
32.0	1019.744	8.219E-04	4014.4	0.615

3.6 Turbulence Model

The Renormalization Group (RNG) k-ε turbulence model was used for the analysis. This is an industry standard model applicable to flow with relatively high Reynolds number that has been successfully used in our previous CFD studies.

The RNG model uses statistical estimates of the average turbulence levels to determine the net energy loss at each point in the system. As a result, individual turbulent fluctuations are not computed.

The maximum turbulent mixing length used for the turbulence model was dynamically calculated during the analysis.

3.7 Assumptions

A summary of the assumptions made for the analysis is as follows:

- Peak heat rejection system flow rate (for each given season)
- Lowest astronomical tide (-0.925m AHD) and slack water receiving conditions
- All layover positions occupied by ferries with the largest possible draft (Lady Northcott)
- No movement of geometry (pontoons/ferries)



- No additional turbulence or waves due to ferry (or other vessel) movement
- One fluid temperature dependent model (no air)
- Fluid-fluid heat transfer only; no radiation, fluid-air convection/conduction, or fluid-solid convection/conduction.
- Wind induced waves not modelled
- Temperature/salinity stratification not modelled

4. Analysis Results

Each analysis case was run until an approximate steady state solution was obtained. The convergence of each solution was determined by examining the temperature profile along the centreline of each of the eight pipelines that comprise the Heat Rejection System Outfall. When the temperature profile reached an asymptote the solution was taken to be approximately steady state.

4.1 Summer

The temperature profile along the centreline of each of the outfall pipelines is shown in Figure 13. It can be seen in Figure 13 that the temperature profiles asymptote after approximately 15m, and that the temperature at this point is beneath the 80th percentile value for the receiving water. This indicates that the analysis has reached an approximate steady state.

Temperature isosurfaces for the summer flow case are shown in Figure 14 to Figure 18. It can be seen in these plots that all of the outfall pipelines are used for discharge for the summer flow case. It can also be seen that the flow from pipelines 1, 2, and 3 interacts with the northern arrestor structure of the second wharf. The interaction of the flow with the piles of the arrestor structure creates turbulence which helps to mix the discharge from the outfall. The facing board of the arrestor structure directs the flow from pipelines 1, 2, and 3 into the open area where the other pipelines discharge. The arrestor structure does not appear to trap the flow. The ferries and layover pontoons have very little impact on the flow. The main pontoon is too far away from the outfall to have any impact on the flow.

The edge of the near field zone was determined to be where the velocity magnitude of the flow reached 0.2m/s. At this point the initial momentum and buoyancy of the flow has dissipated and it is only conveyed by advection. A velocity magnitude isosurface of 0.2m/s is shown for the summer flow case in Figure 19 to Figure 22. The velocity isosurface is coloured by temperature, with a contour that ranges from the receiving water temperature up to the 80th percentile temperature value. It can be seen in these plots that at the edge of the near field zone the temperature of the discharge is below the 80th percentile temperature value, with a maximum value of approximately 25.1°C.

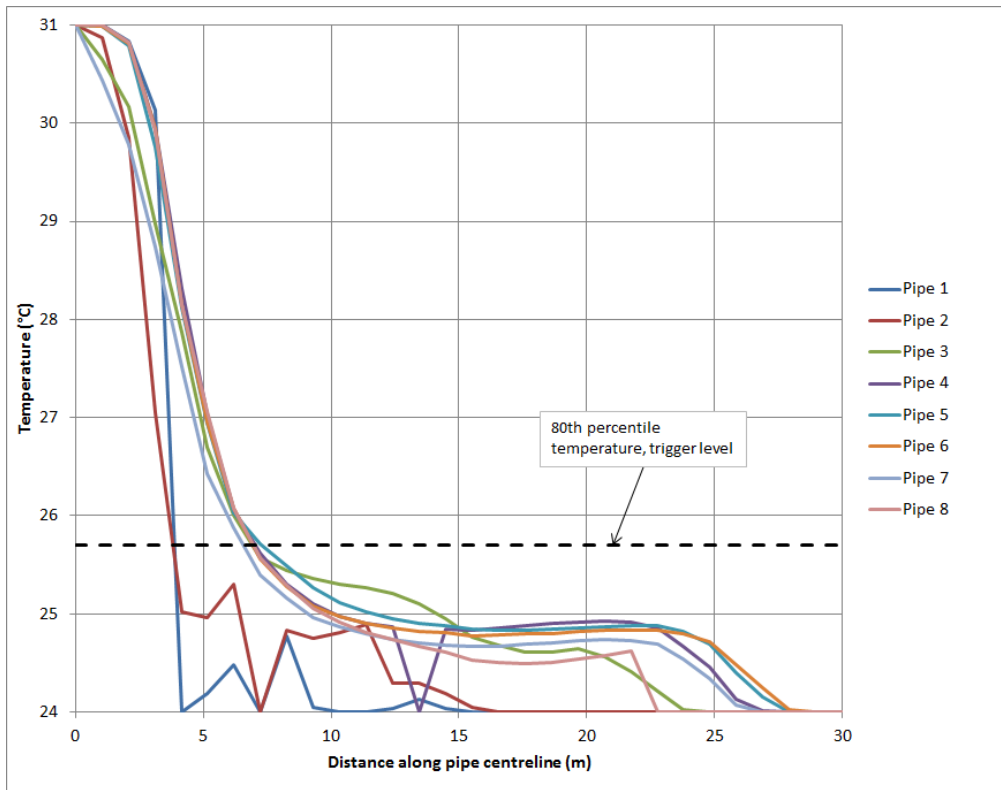


Figure 13: Summer – temperature profile along outfall pipe centrelines

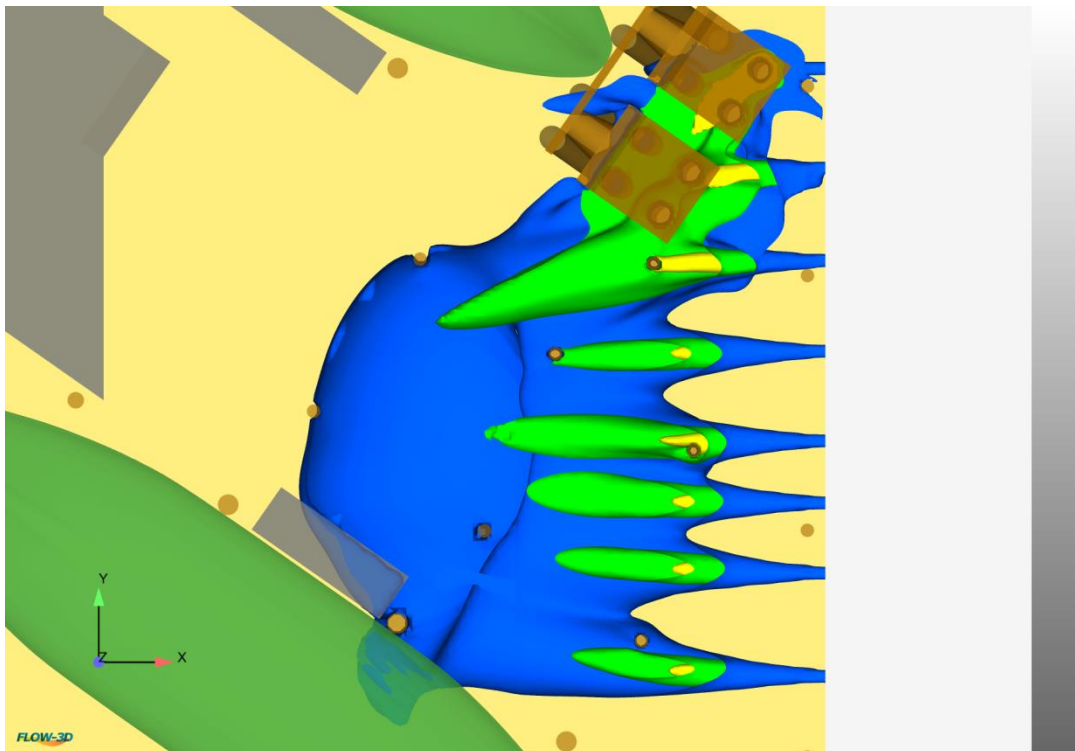


Figure 14: Summer – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view

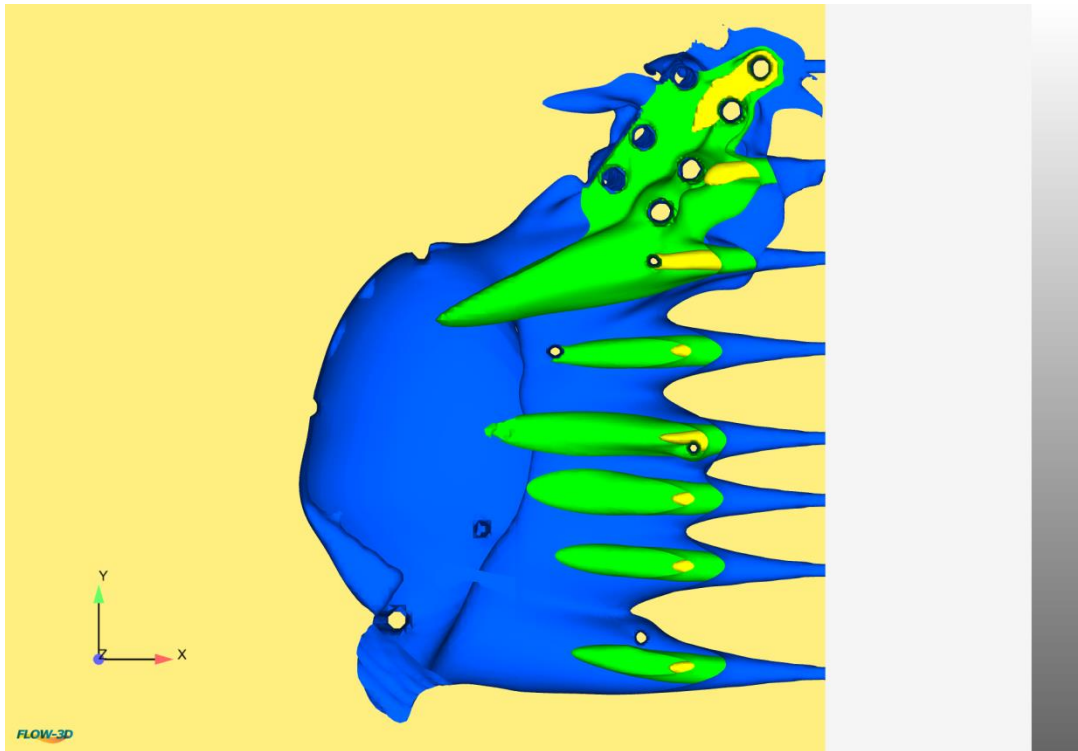


Figure 15: Summer – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view with geometry removed

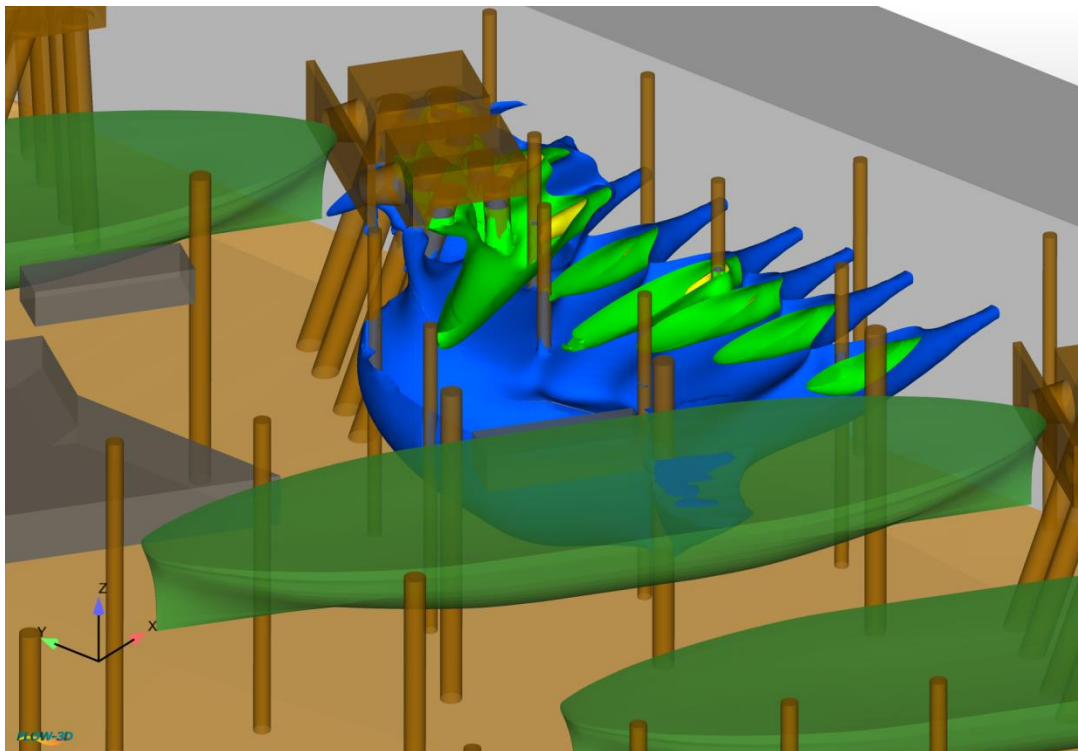


Figure 16: Summer – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 1

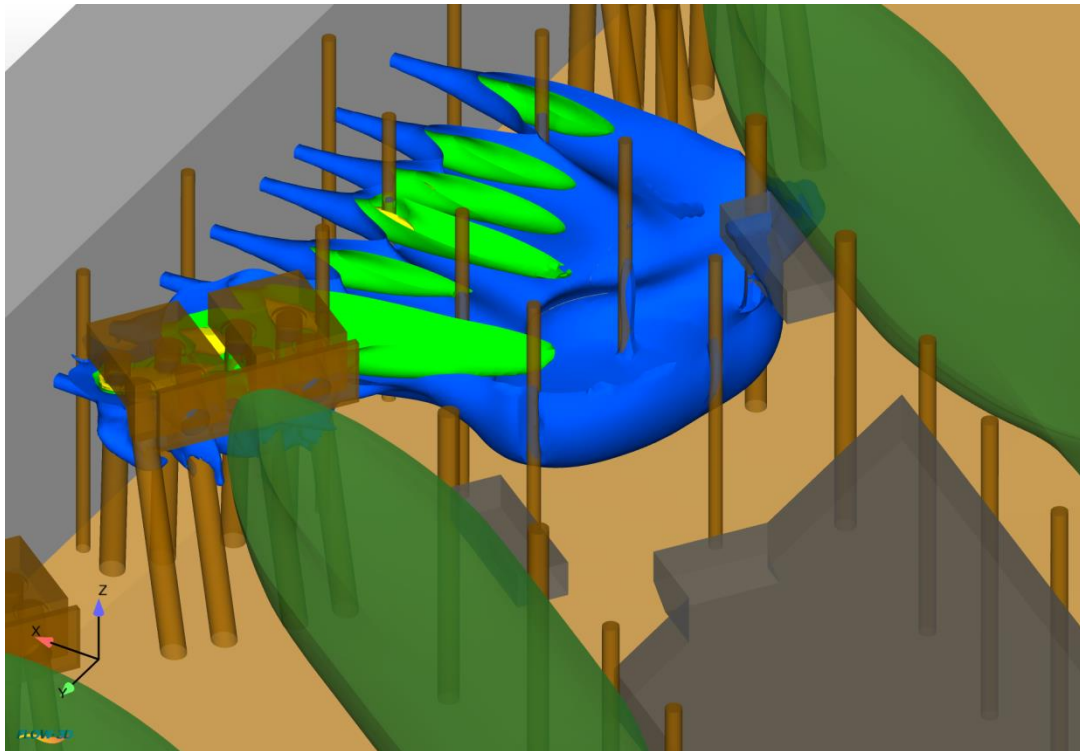


Figure 17: Summer – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 2

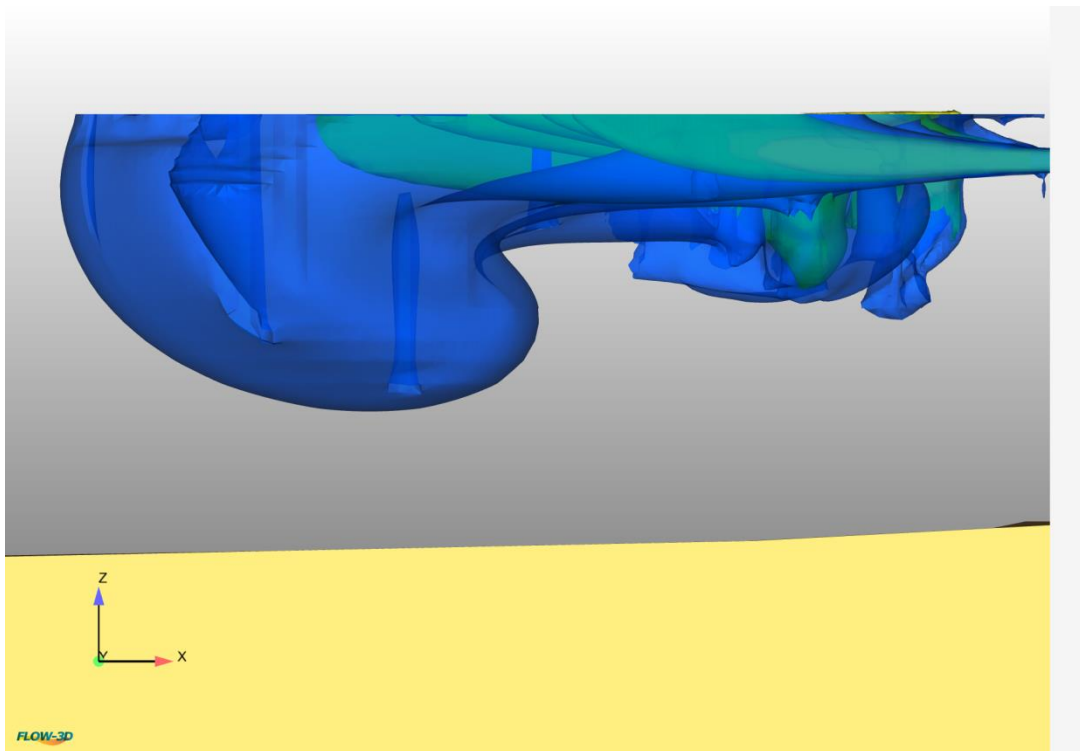


Figure 18: Summer – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, elevation view with geometry removed

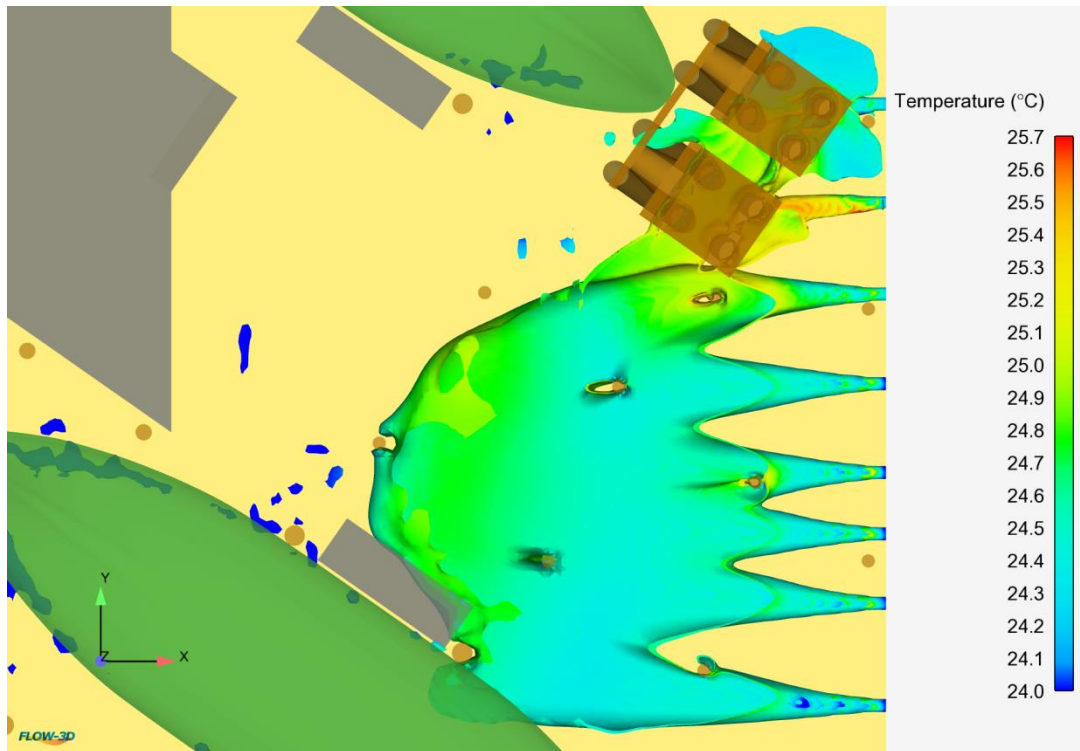


Figure 19: Summer – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view

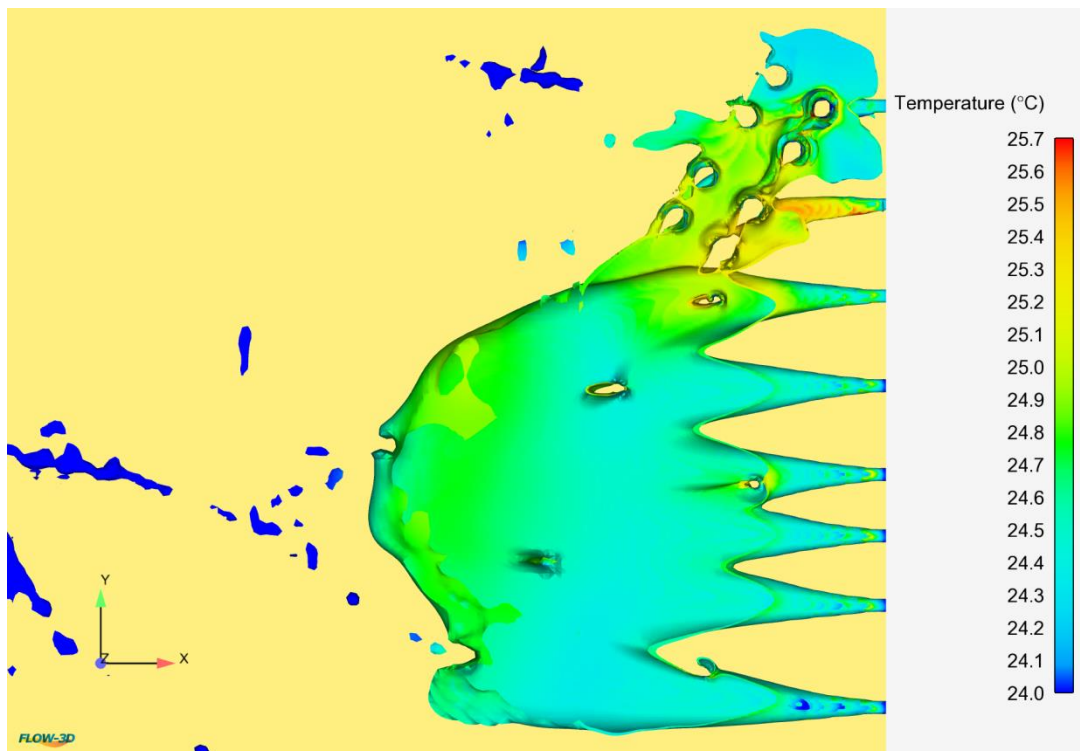


Figure 20: Summer – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view with geometry removed

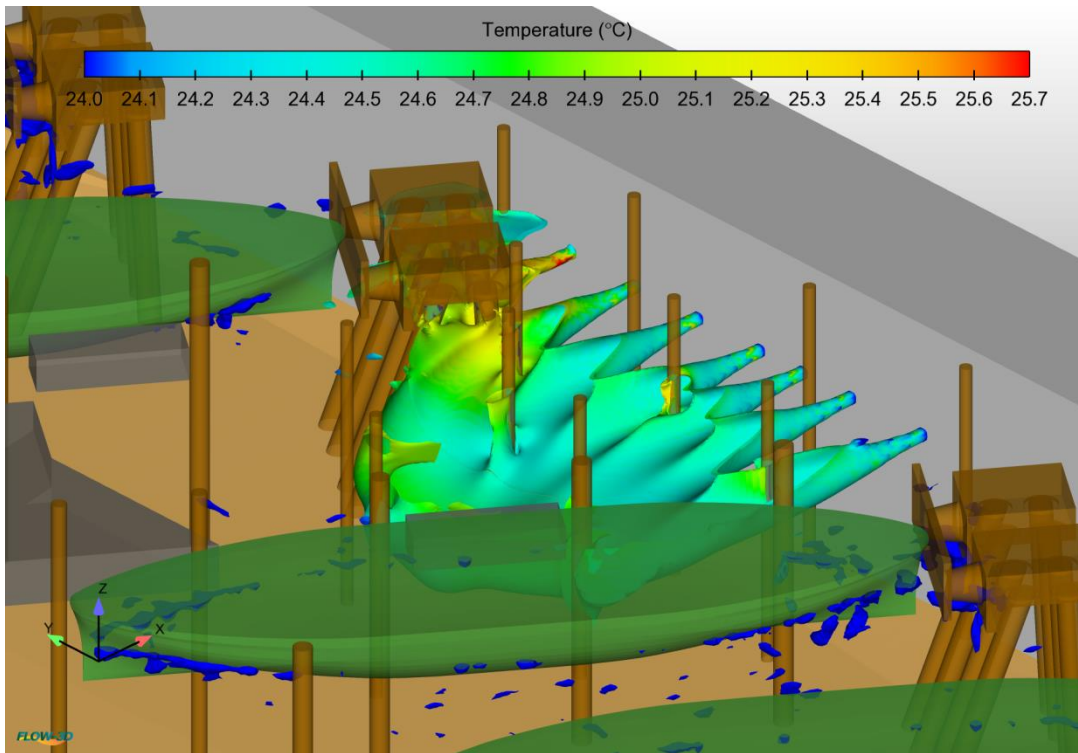


Figure 21: Summer – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 1

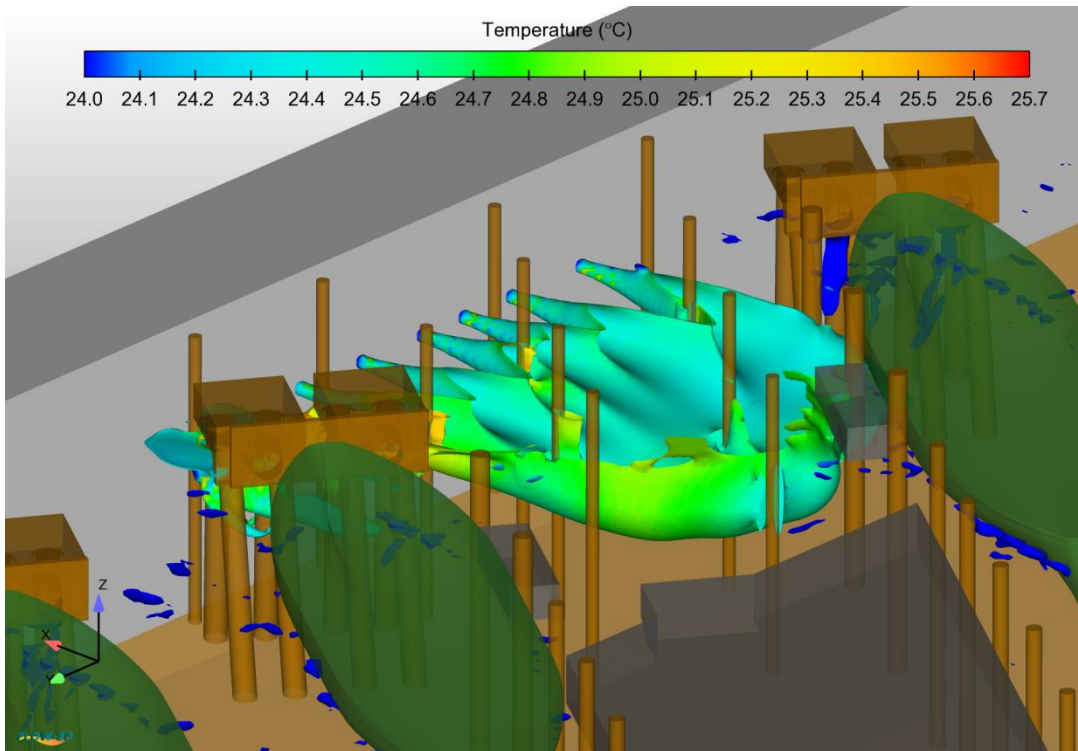


Figure 22: Summer – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 2



4.2 Autumn

The temperature profile along the centreline of each of the outfall pipelines is shown in Figure 23. It can be seen in Figure 23 that the temperature profiles asymptote after approximately 15m, and that the temperature at this point is beneath the 80th percentile value for the receiving water. This indicates that the analysis has reached an approximate steady state.

Temperature isosurfaces for the autumn flow case are shown in Figure 24 to Figure 28. It can be seen in these plots that pipeline 1 and pipelines 3-8 are used for discharge for the autumn flow case. It can also be seen that the flow from pipelines 1 and 3 interacts with the northern arrestor structure of the second wharf. The interaction of the flow with the piles of the arrestor structure creates turbulence which helps to mix the discharge from the outfall. The facing board of the arrestor structure directs the flow from pipelines 1 and 3 into the open area where the other pipelines discharge. The arrestor structure does not appear to trap the flow. The ferries and layover pontoons have very little impact on the flow. The main pontoon is too far away from the outfall to have any impact on the flow.

The edge of the near field zone was determined to be where the velocity magnitude of the flow reached 0.2m/s. At this point the initial momentum and buoyancy of the flow has dissipated and it is only conveyed by advection. A velocity magnitude isosurface of 0.2m/s is shown for the autumn flow case in Figure 29 to Figure 32. The velocity isosurface is coloured by temperature, with a contour that ranges from the receiving water temperature up to the 80th percentile temperature value. It can be seen in these plots that at the edge of the near field zone the temperature of the discharge is below the 80th percentile temperature value, with a maximum value of approximately 22.2°C.

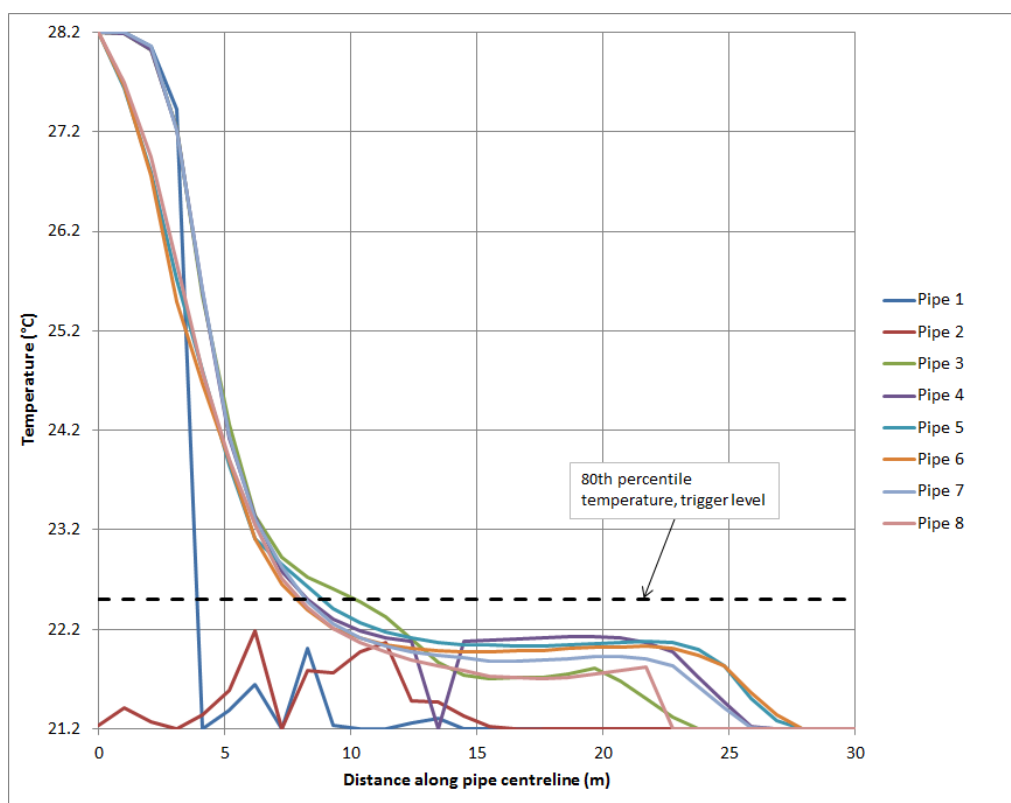


Figure 23: Autumn – temperature profile along outfall pipe centrelines

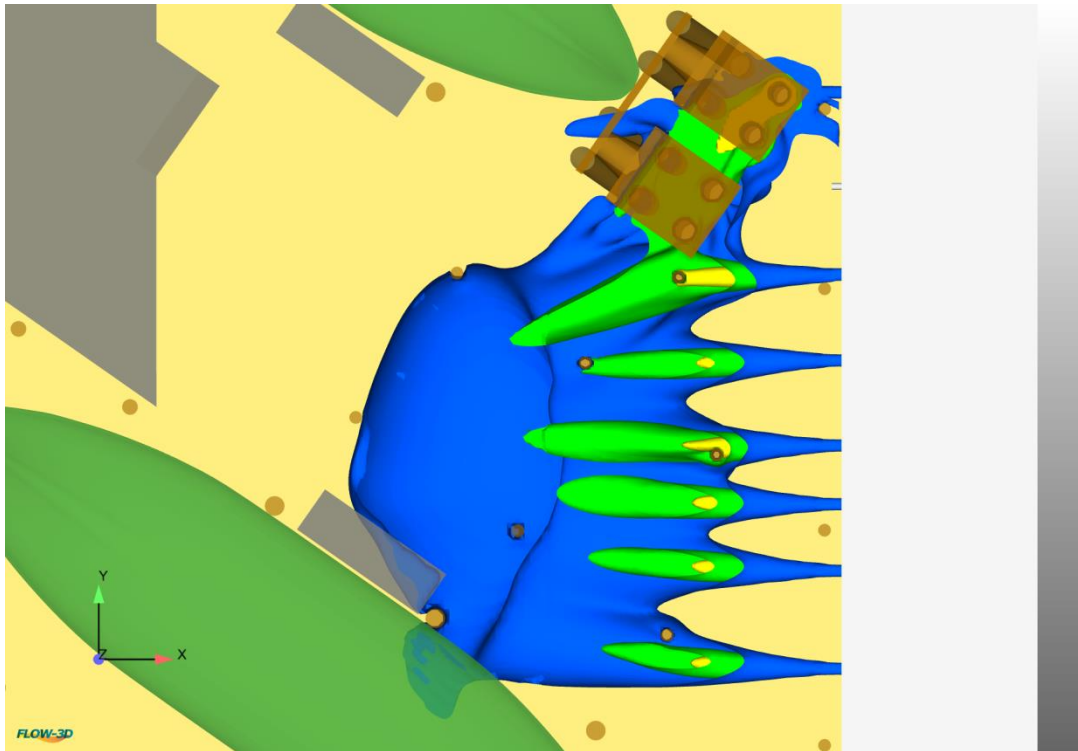


Figure 24: Autumn – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view

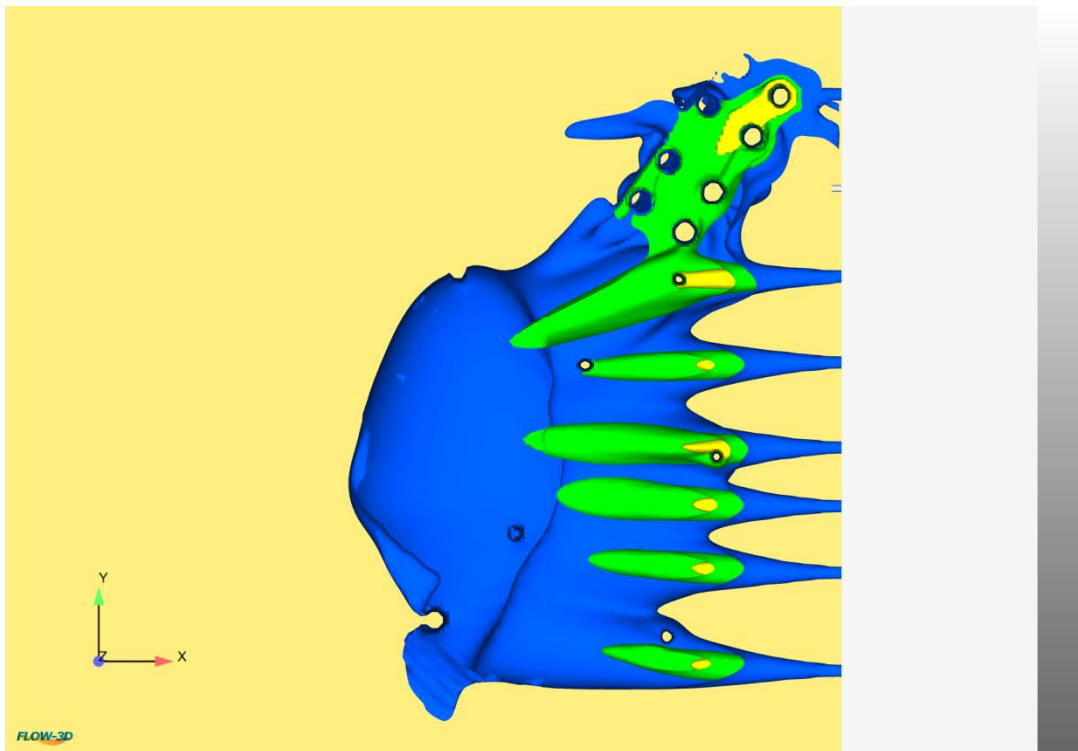


Figure 25: Autumn – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view with geometry removed

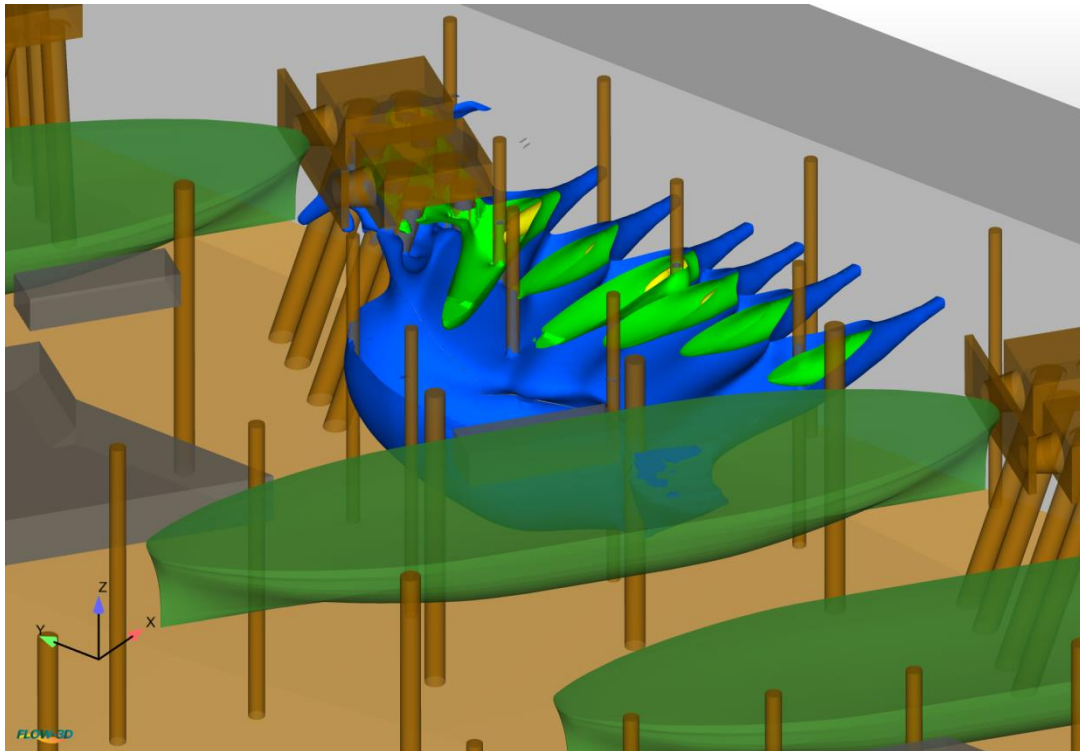


Figure 26: Autumn – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 1

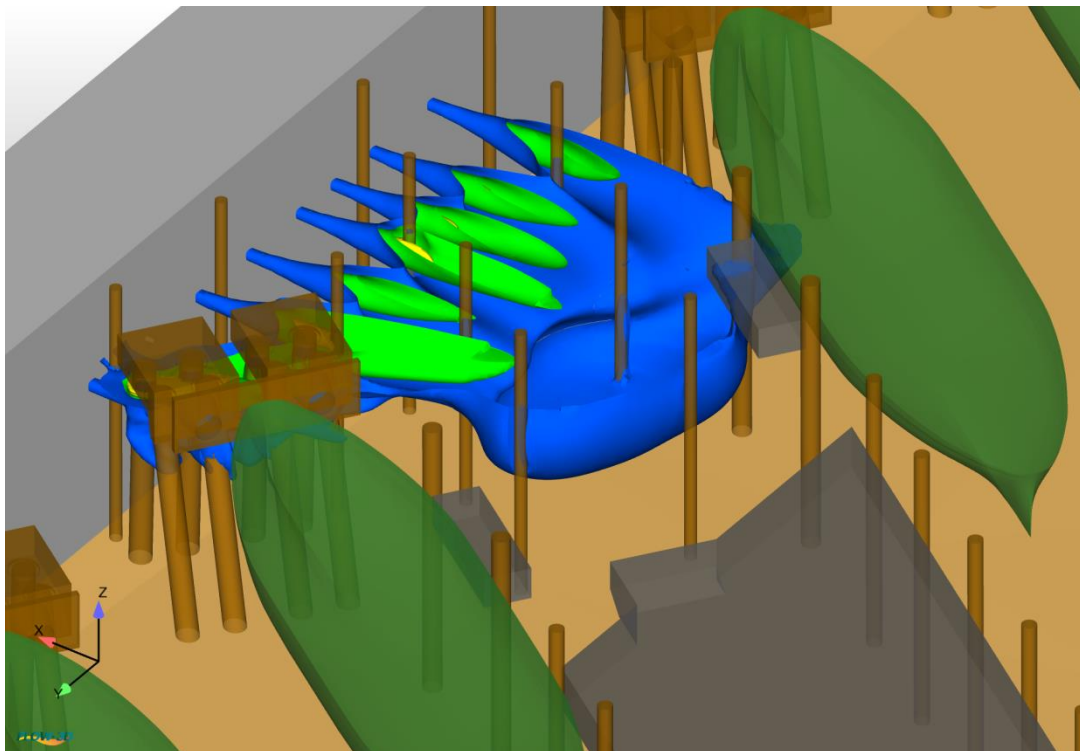


Figure 27: Autumn – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 2

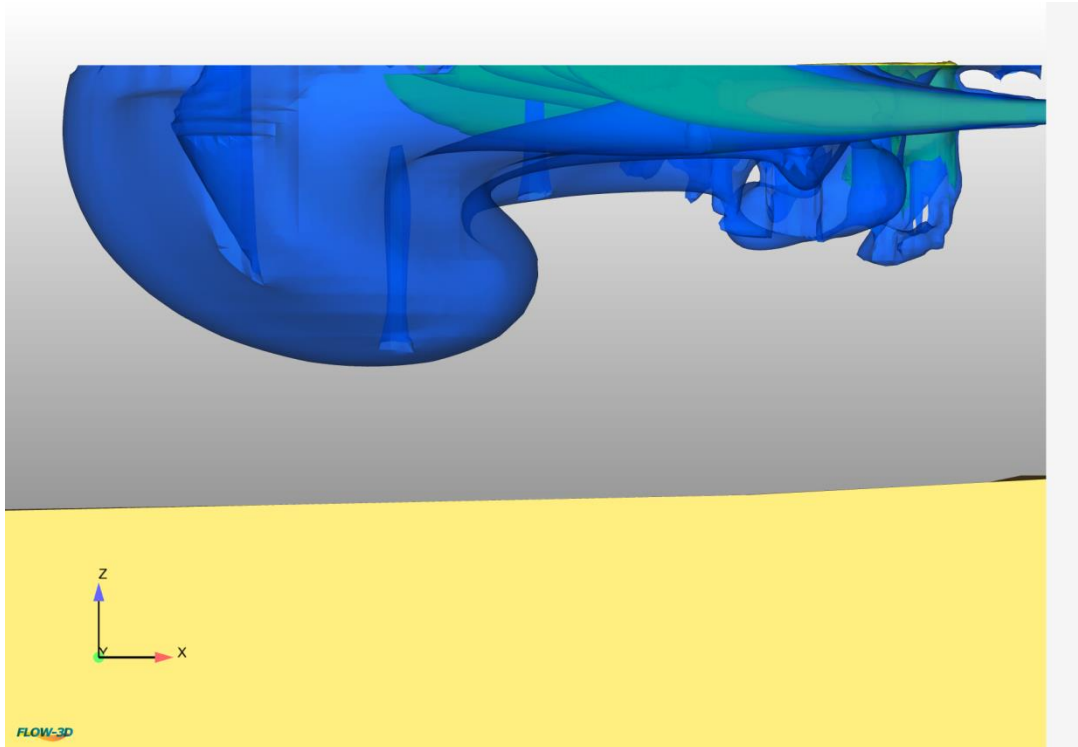


Figure 28: Autumn – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, elevation view with geometry removed

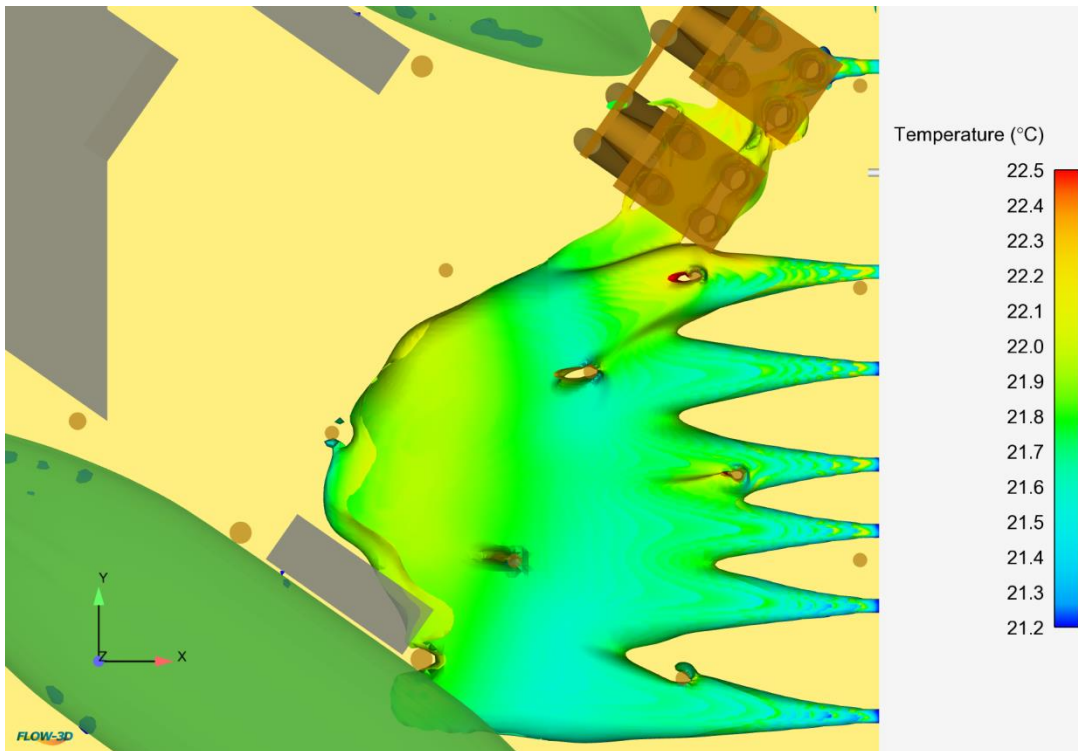


Figure 29: Autumn – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view

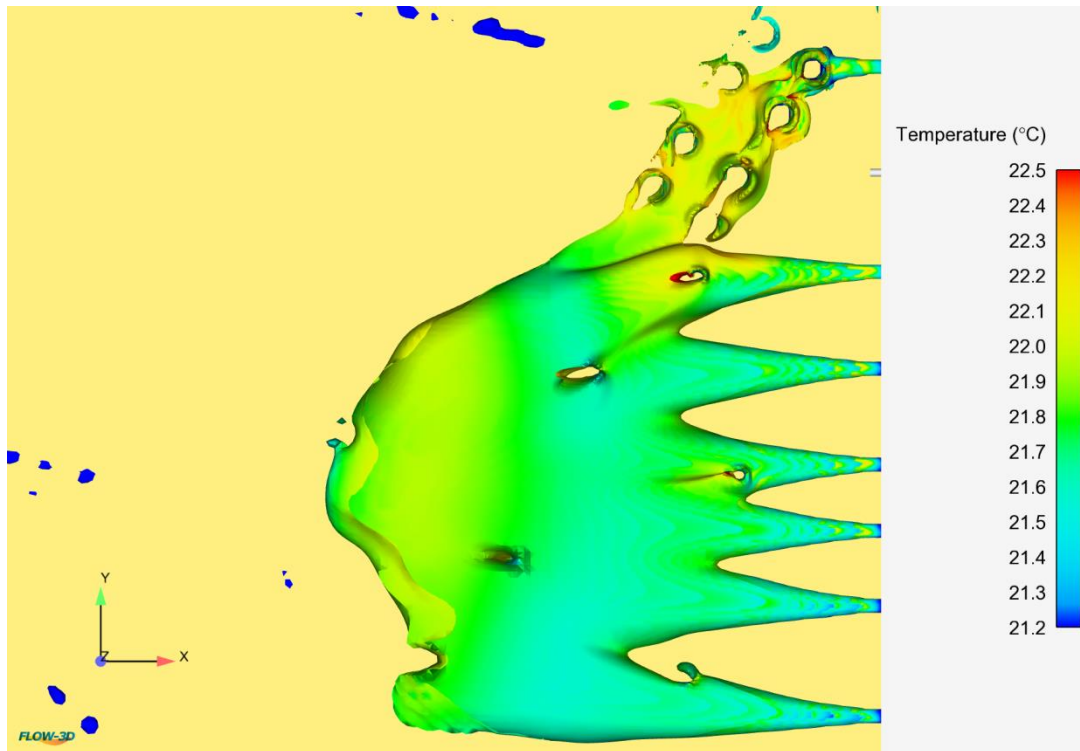


Figure 30: Autumn – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view with geometry removed

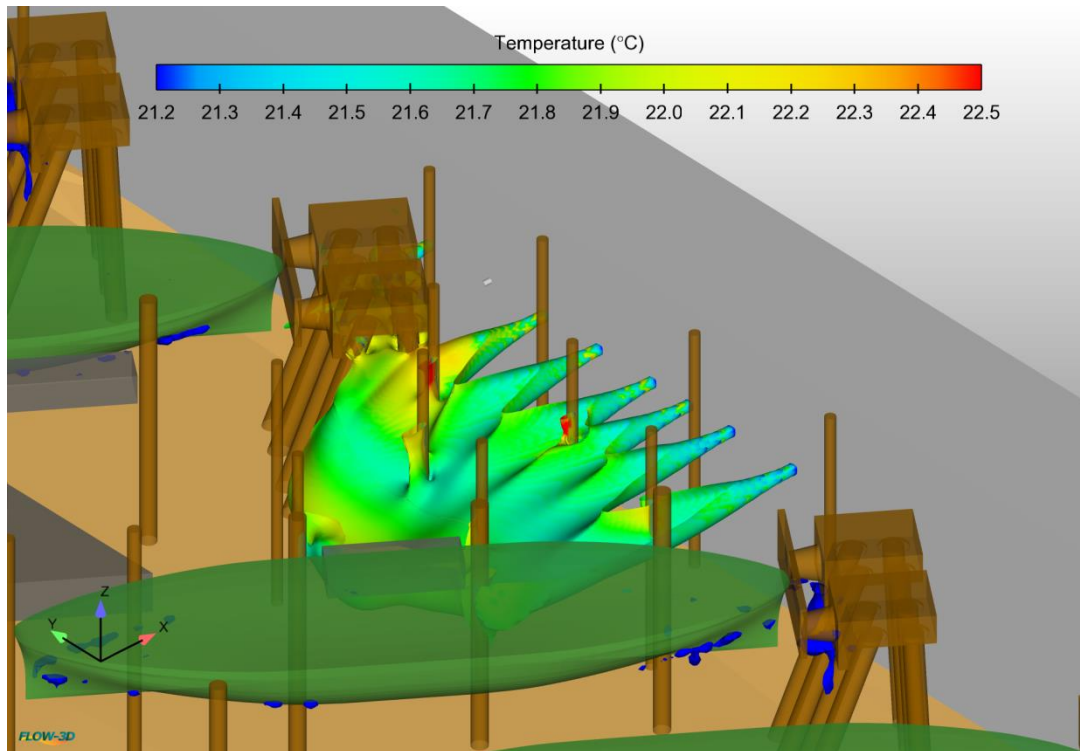


Figure 31: Autumn – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 1

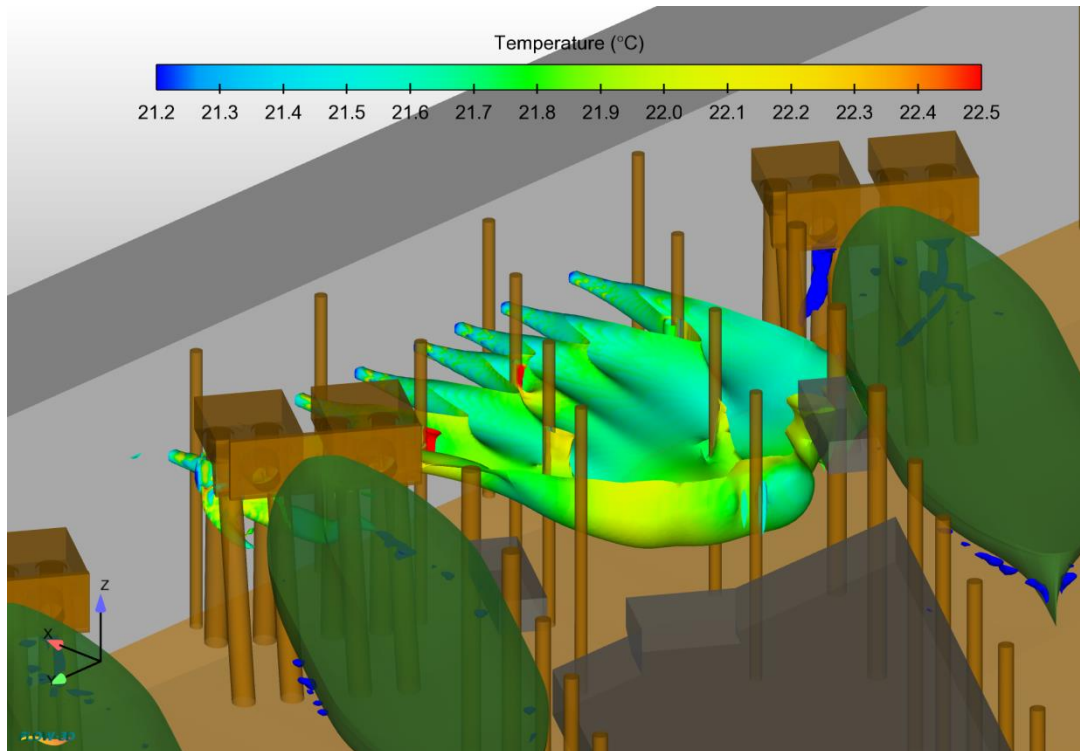


Figure 32: Autumn – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 2

4.3 Winter

The temperature profile along the centreline of each of the outfall pipelines is shown in Figure 33. It can be seen in Figure 33 that the temperature profiles asymptote after approximately 13m, and that the temperature at this point is beneath the 80th percentile value for the receiving water. This indicates that the analysis has reached an approximate steady state.

Temperature isosurfaces for the winter flow case are shown in Figure 34 to Figure 38. It can be seen in these plots that pipelines 5-8 are used for discharge for the winter flow case. It can also be seen that the ferries and layover pontoons have very little impact on the flow, and that the main pontoon and arrestor structure are too far away from the outfall to have any impact on the flow.

The edge of the near field zone was determined to be where the velocity magnitude of the flow reached 0.2m/s. At this point the initial momentum and buoyancy of the flow has dissipated and it is only conveyed by advection. A velocity magnitude isosurface of 0.2m/s is shown for the winter flow case in Figure 39 to Figure 42. The velocity isosurface is coloured by temperature, with a contour that ranges from the receiving water temperature up to the 80th percentile temperature value. It can be seen in these plots that at the edge of the near field zone the temperature of the discharge is just below the 80th percentile temperature value, with a maximum value of approximately 16.4°C.

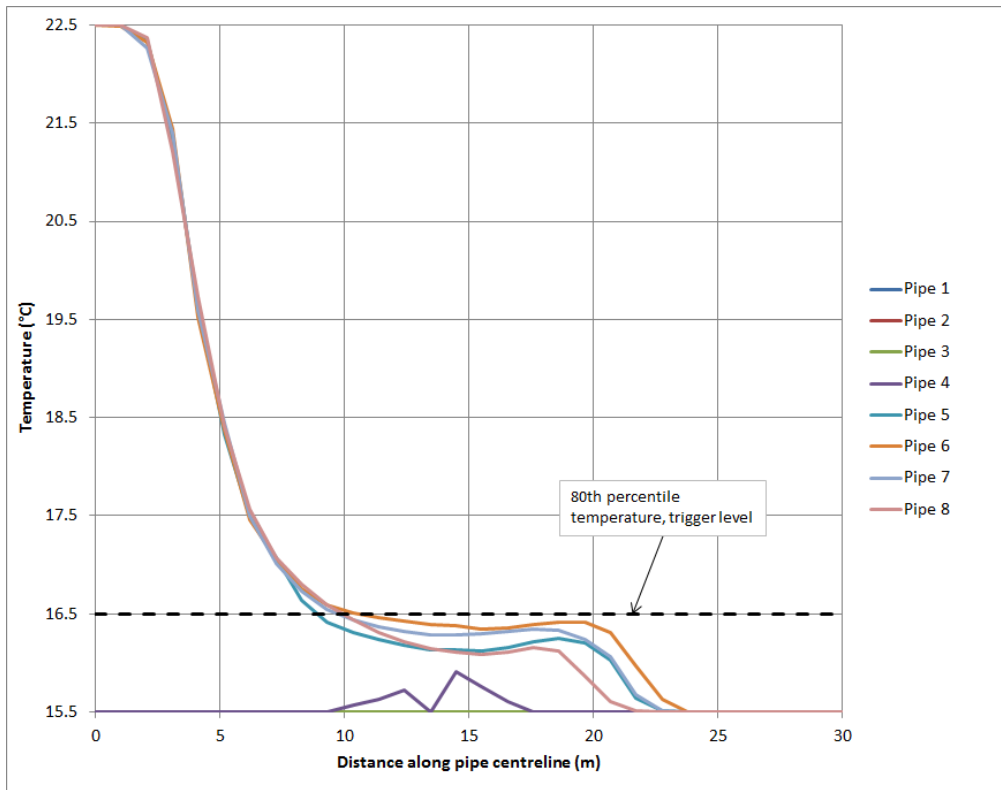


Figure 33: Winter – temperature profile along outfall pipe centrelines

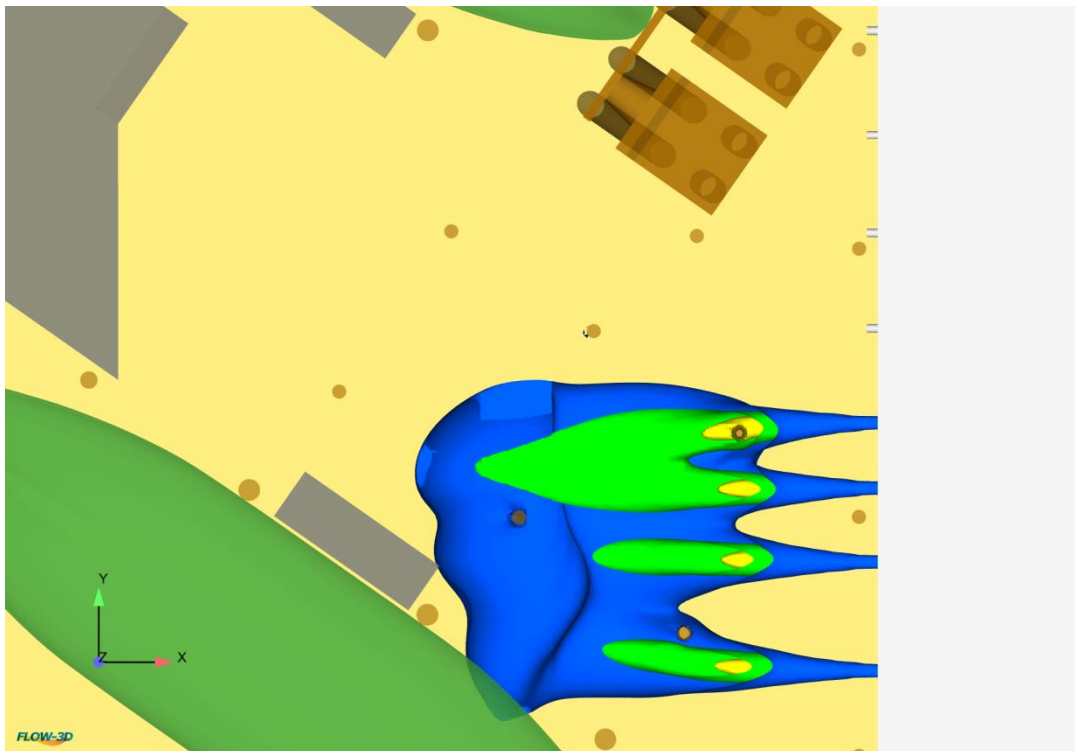


Figure 34: Winter – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view

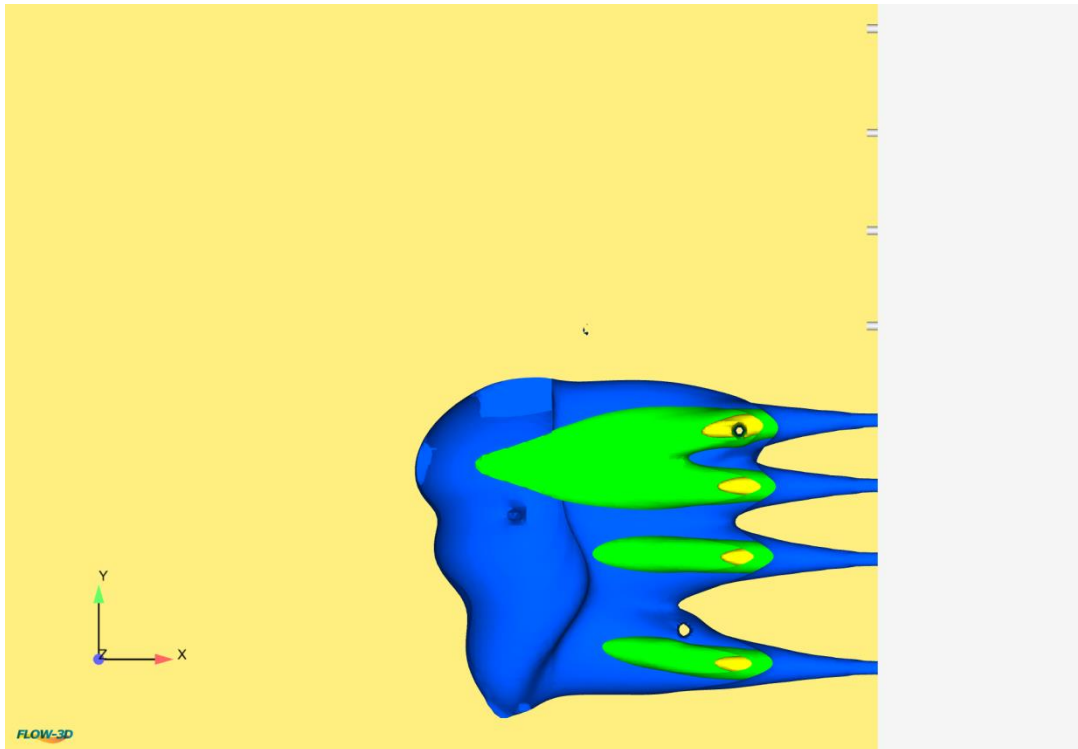


Figure 35: Winter – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view with geometry removed

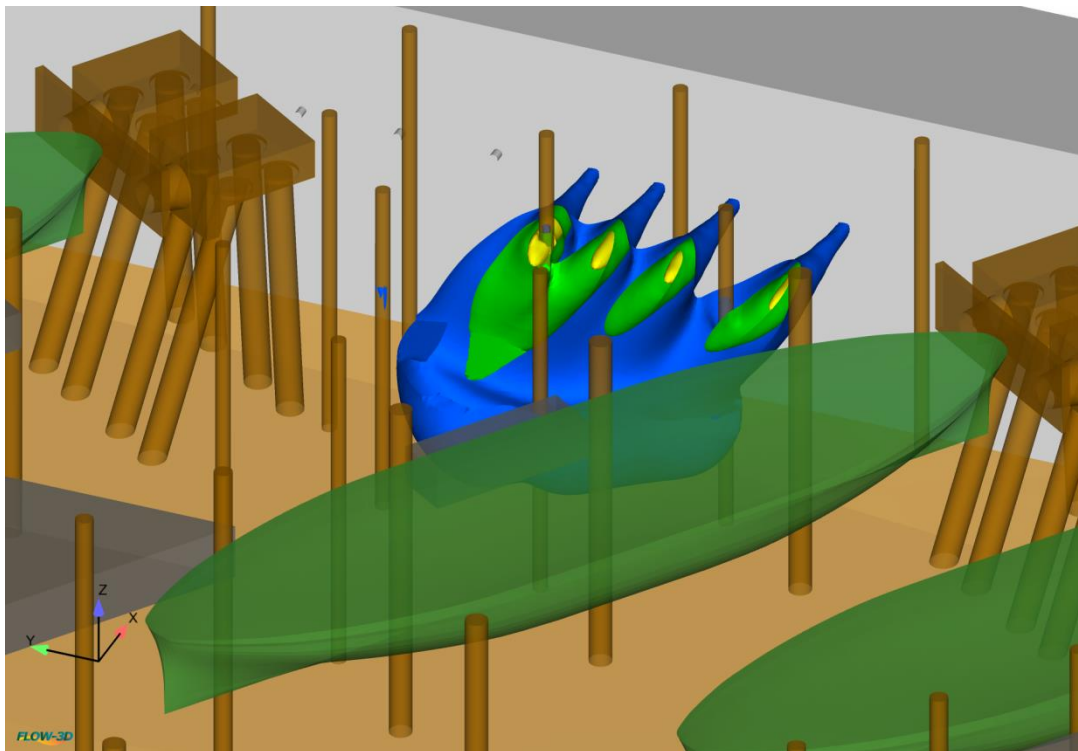


Figure 36: Winter – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 1

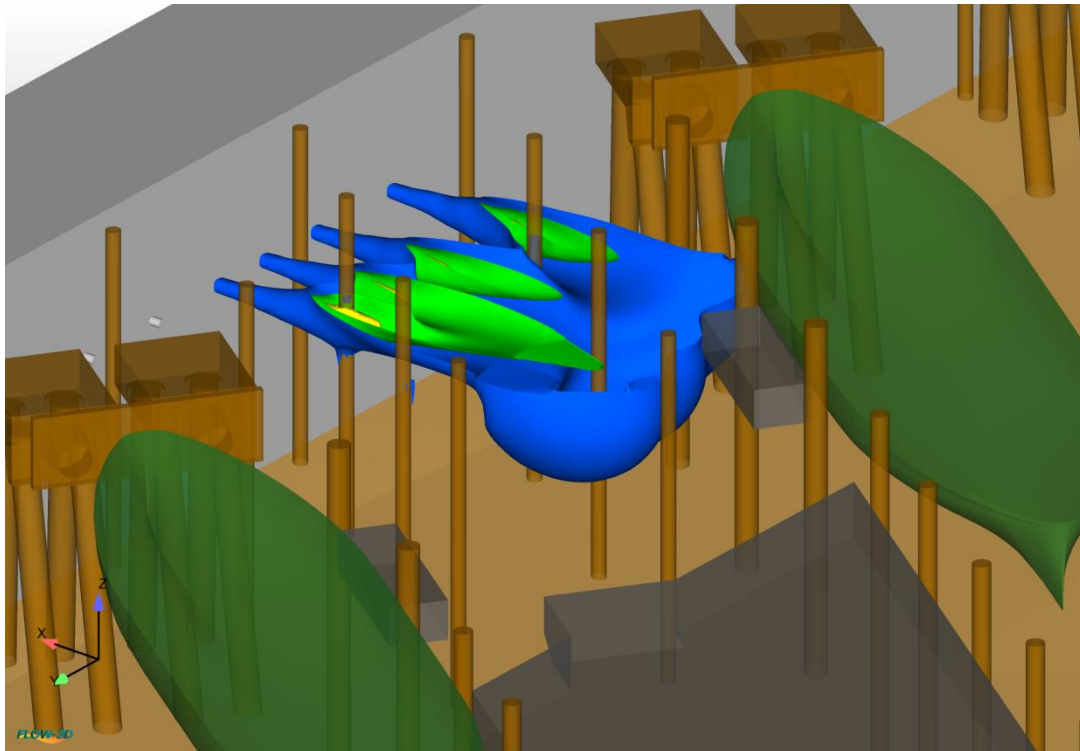


Figure 37: Winter – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 2

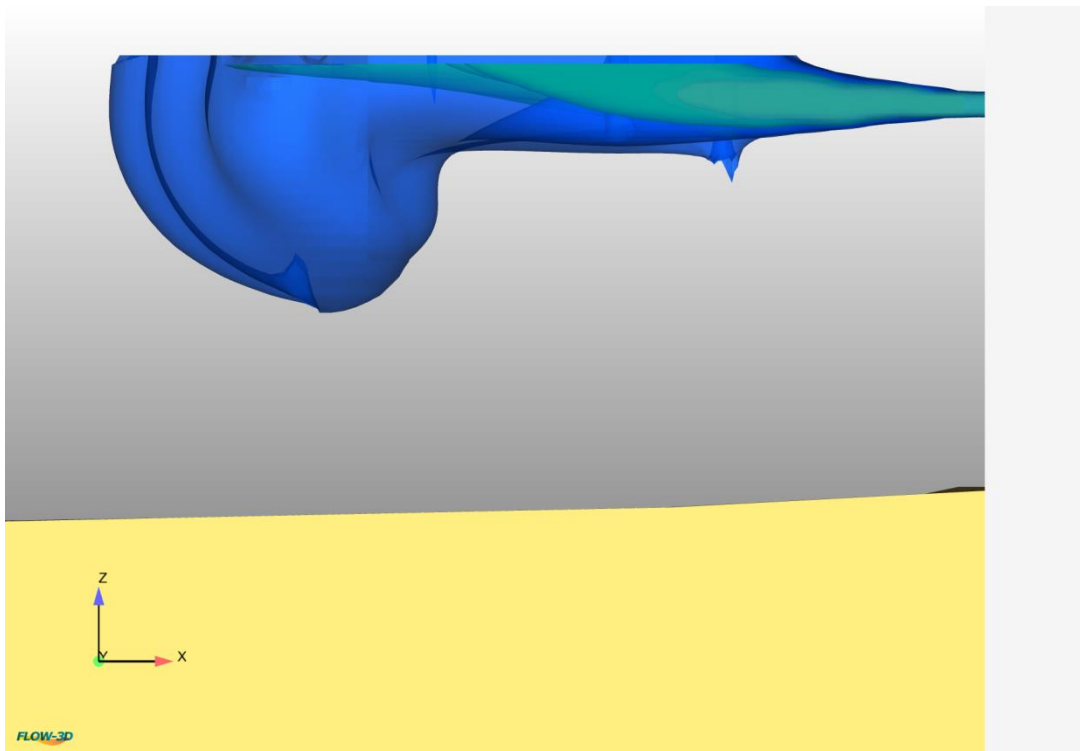


Figure 38: Winter – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, elevation view with geometry removed



Figure 39: Winter – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view

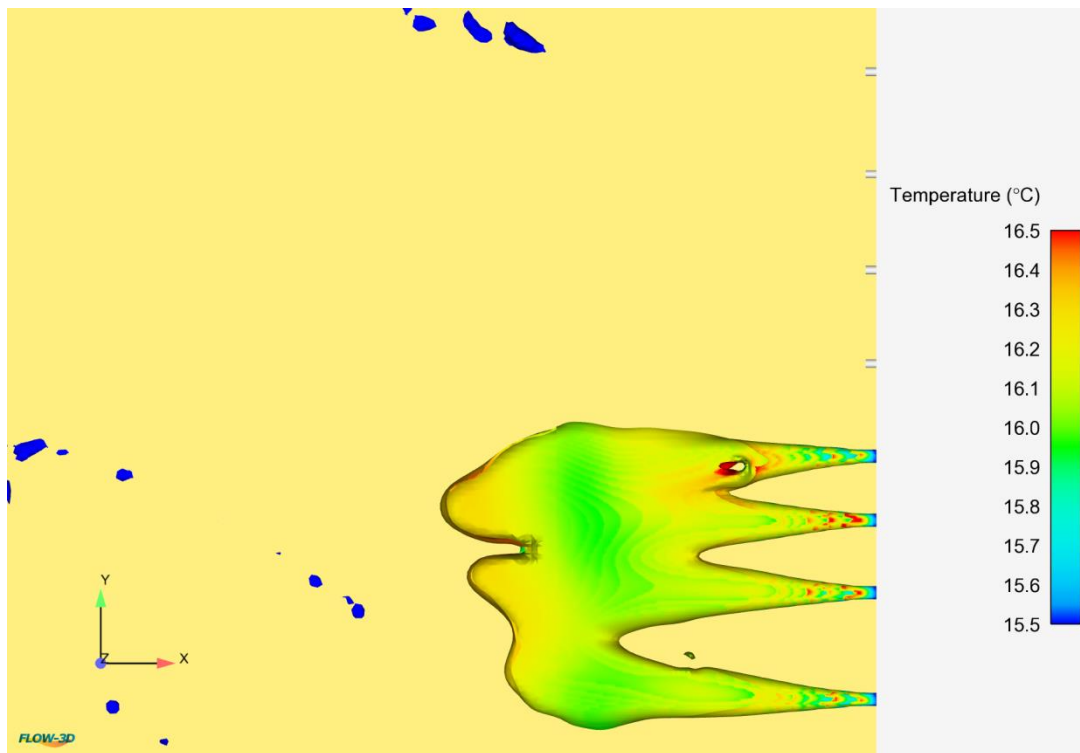


Figure 40: Winter – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view with geometry removed

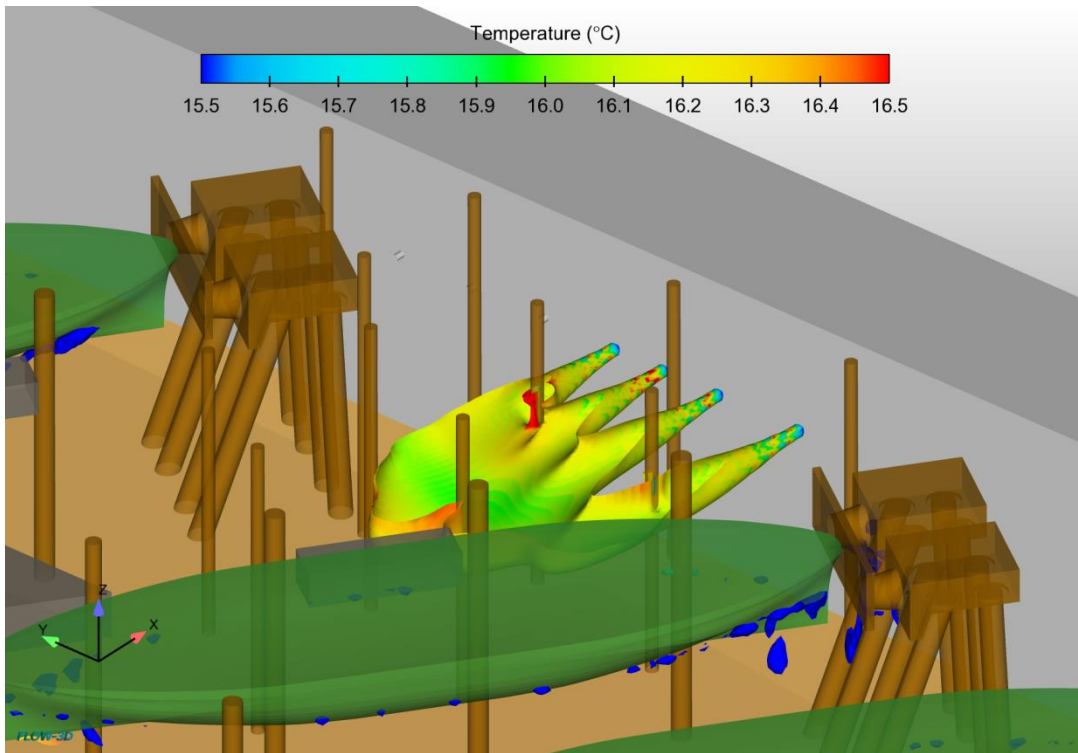


Figure 41: Winter – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 1

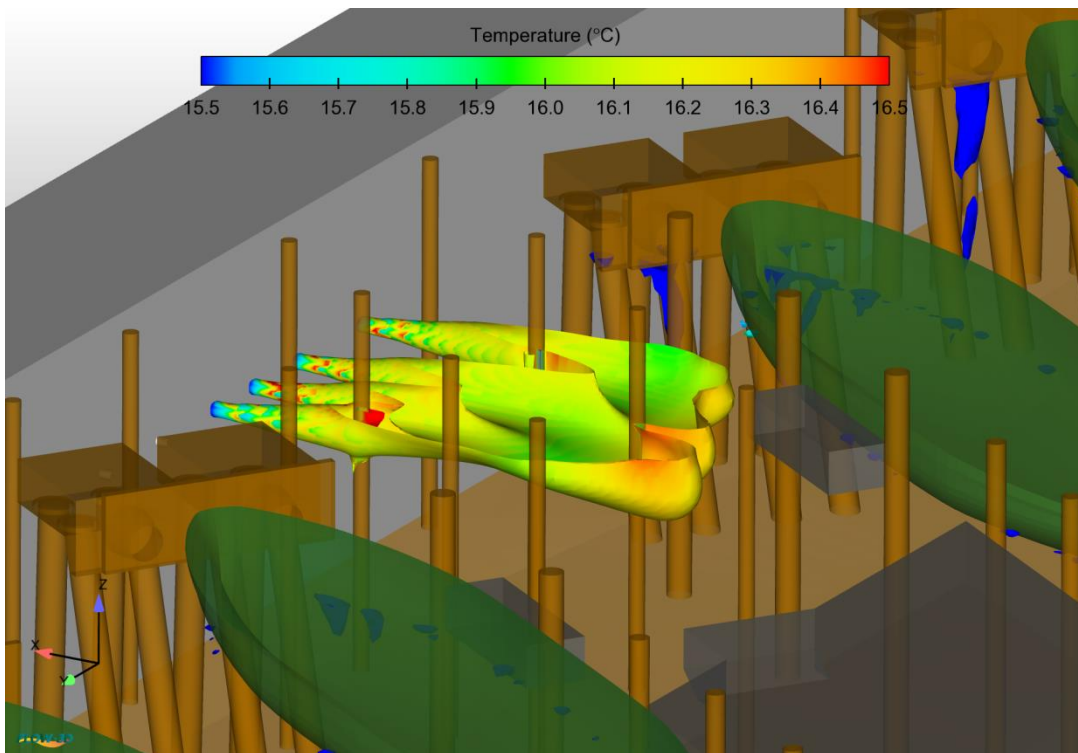


Figure 42: Winter – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 2



4.4 Spring

The temperature profile along the centreline of each of the outfall pipelines is shown in Figure 43. It can be seen in Figure 43 that the temperature profiles asymptote after approximately 15m, and that the temperature at this point is beneath the 80th percentile value for the receiving water. This indicates that the analysis has reached an approximate steady state.

Temperature isosurfaces for the spring flow case are shown in Figure 44 to Figure 48. It can be seen in these plots that pipelines 3-8 are used for discharge for the spring flow case. It can also be seen that the ferries and layover pontoons have very little impact on the flow, and that the main pontoon and arrestor structure are too far away from the outfall to have any impact on the flow.

The edge of the near field zone was determined to be where the velocity magnitude of the flow reached 0.2m/s. At this point the initial momentum and buoyancy of the flow has dissipated and it is only conveyed by advection. A velocity magnitude isosurface of 0.2m/s is shown for the spring flow case in Figure 49 to Figure 52. The velocity isosurface is coloured by temperature, with a contour that ranges from the receiving water temperature up to the 80th percentile temperature value. It can be seen in these plots that at the edge of the near field zone the temperature of the discharge is below the 80th percentile value, with a maximum value of approximately 19.0°C.

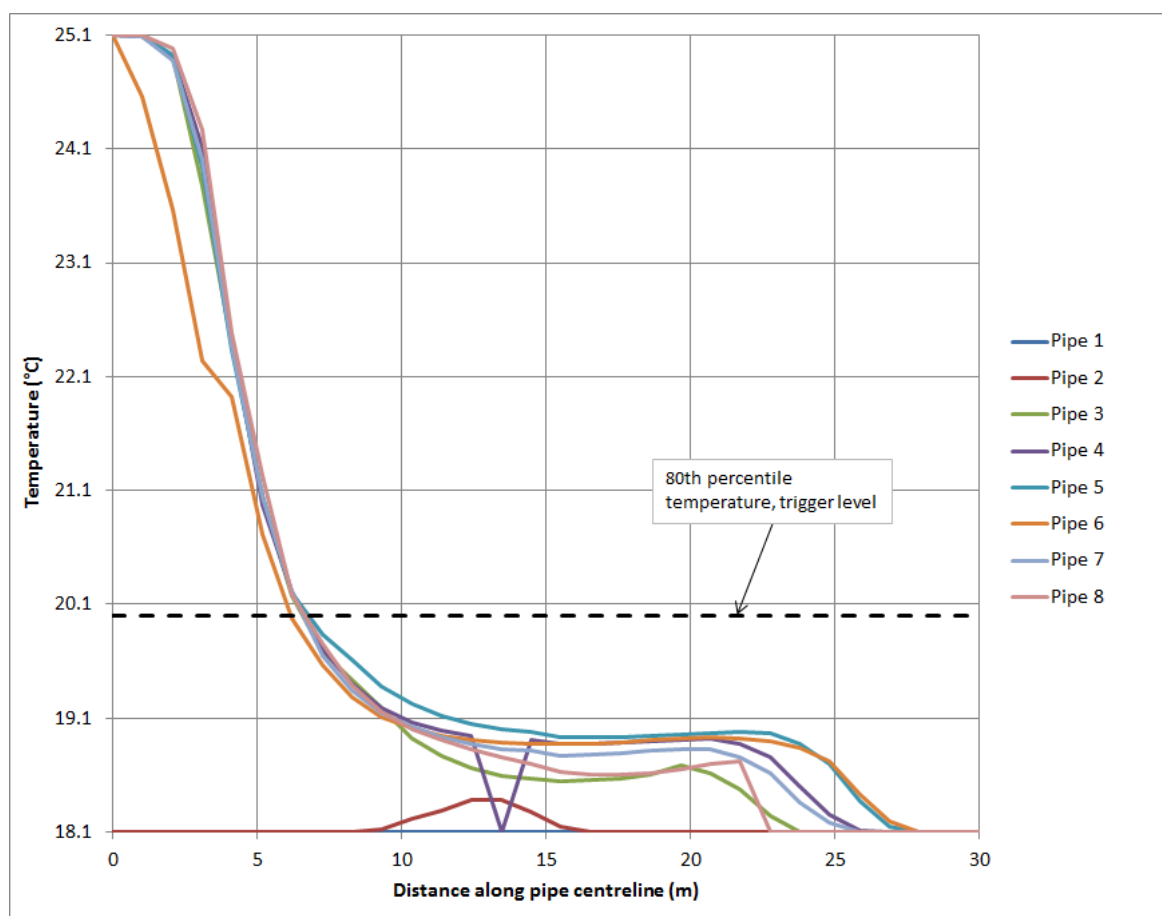


Figure 43: Spring – temperature profile along outfall pipe centrelines

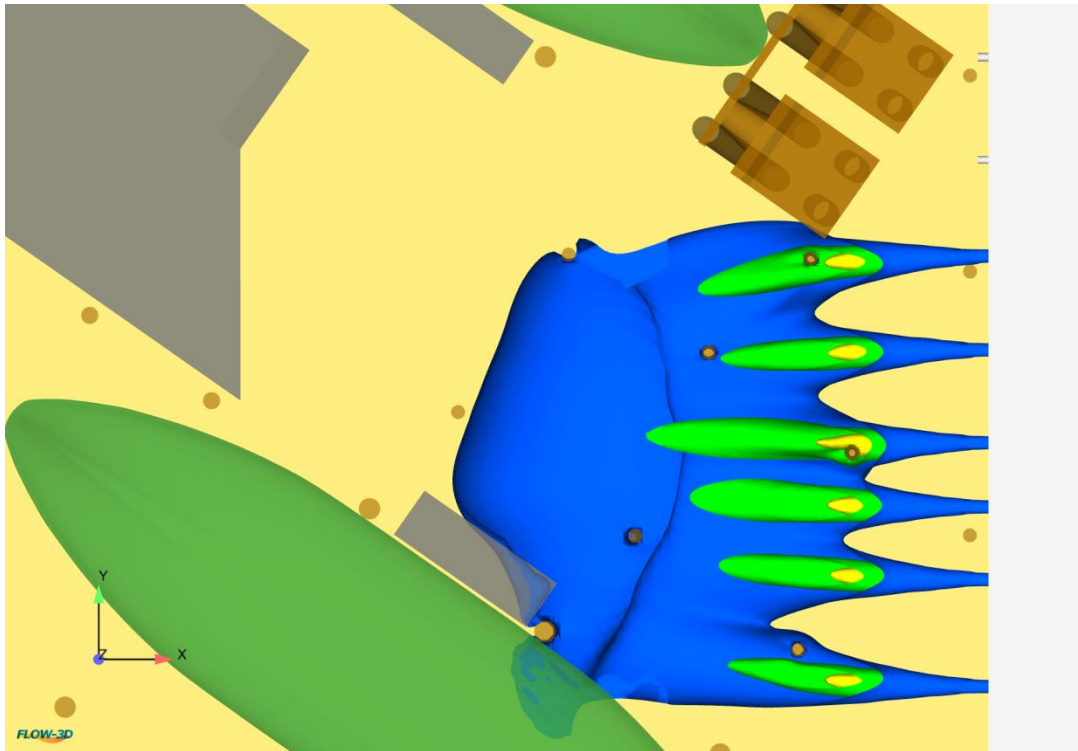


Figure 44: Spring – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view

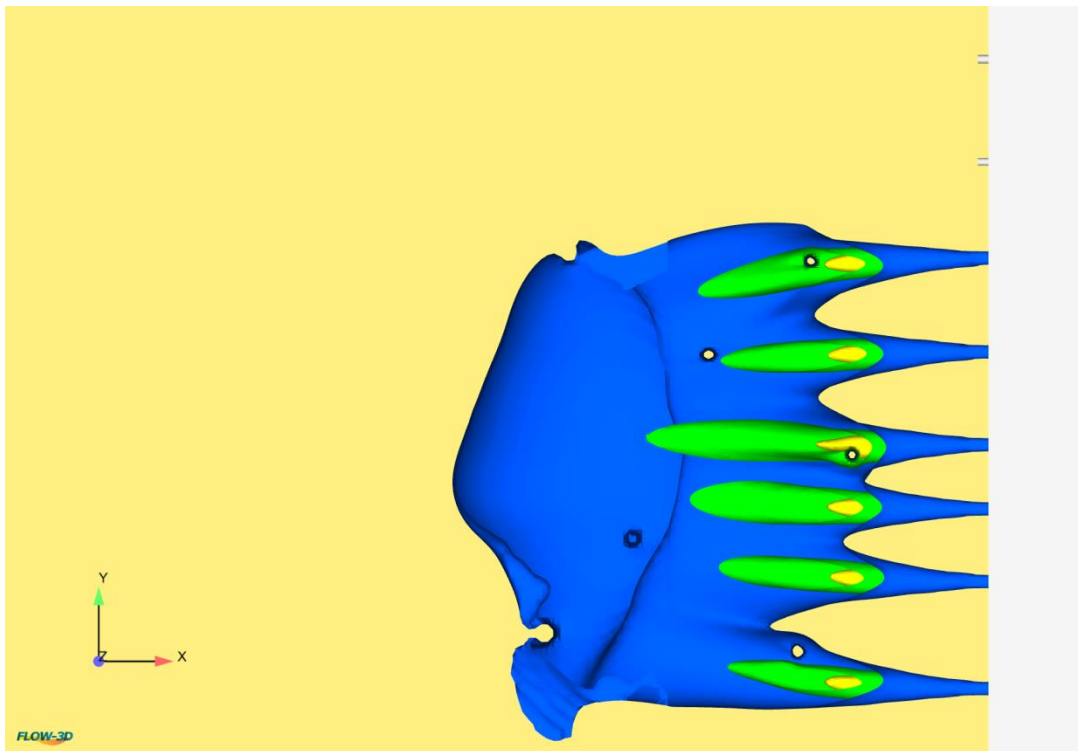


Figure 45: Spring – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, plan view with geometry removed

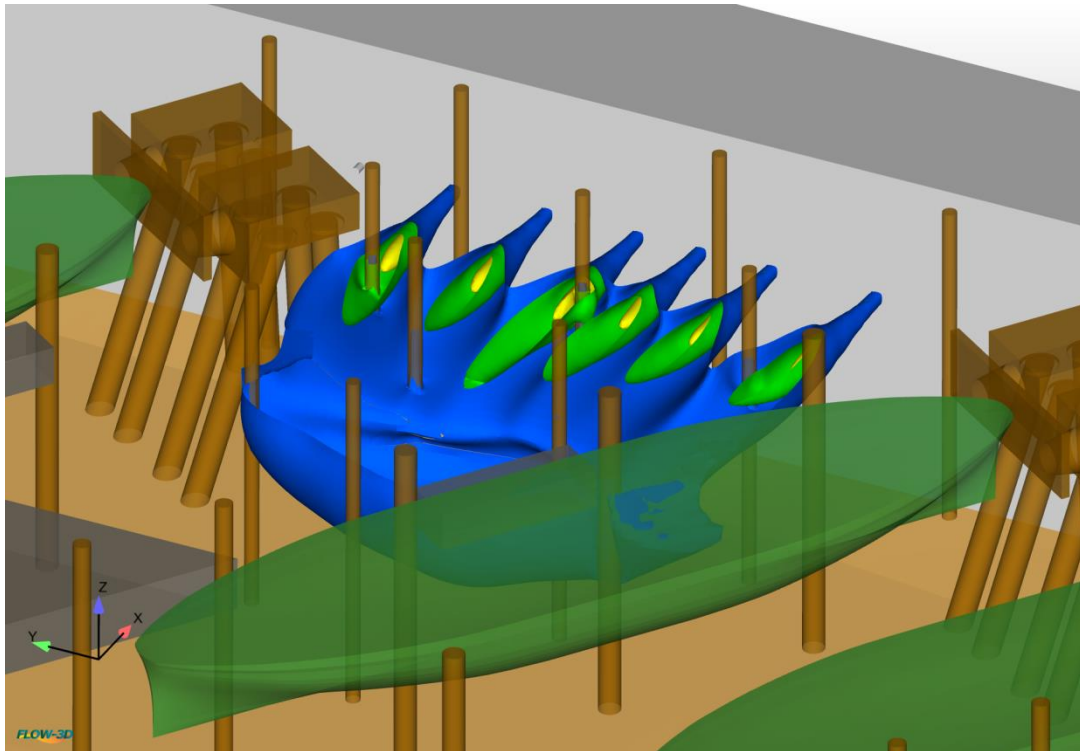


Figure 46: Spring – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 1

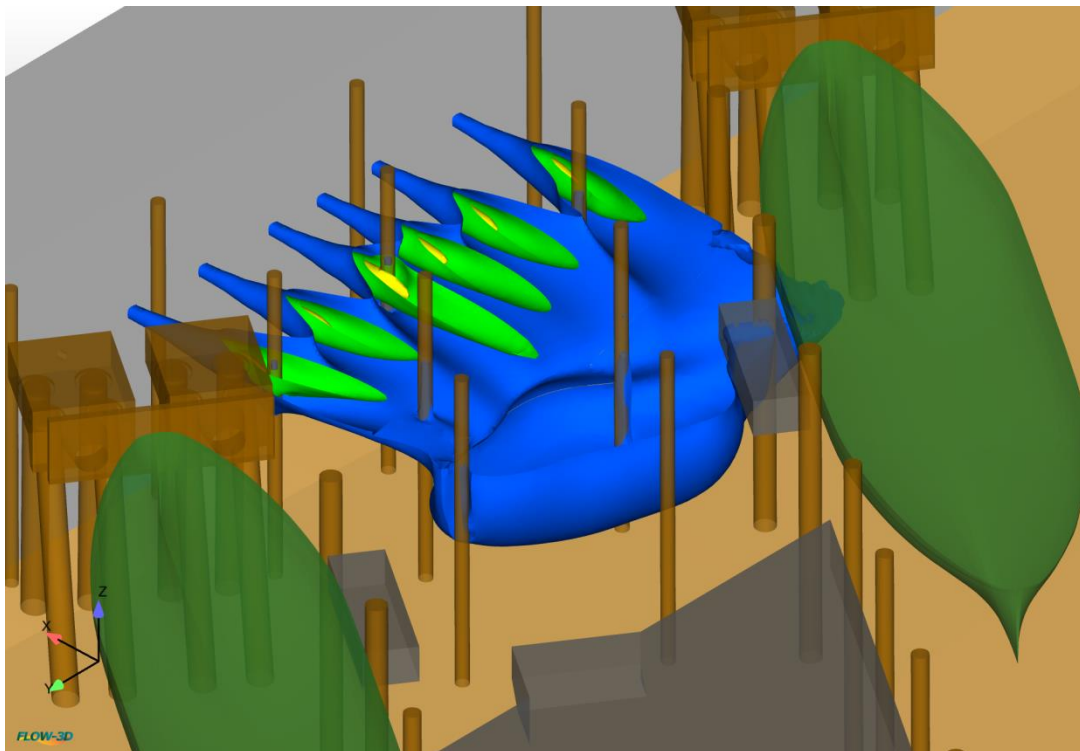


Figure 47: Spring – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, overview 2

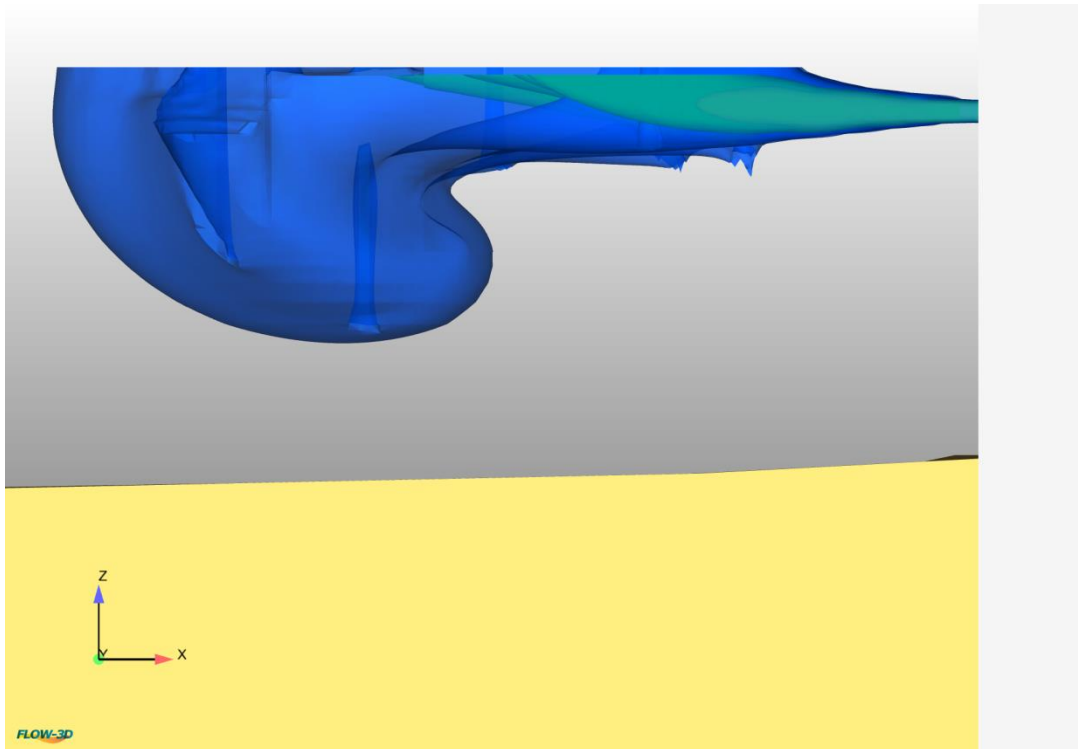


Figure 48: Spring – temperature isosurfaces, 0.5°C (blue), 1.0°C (green), and 1.5°C (yellow) above receiving water temperature, elevation view with geometry removed

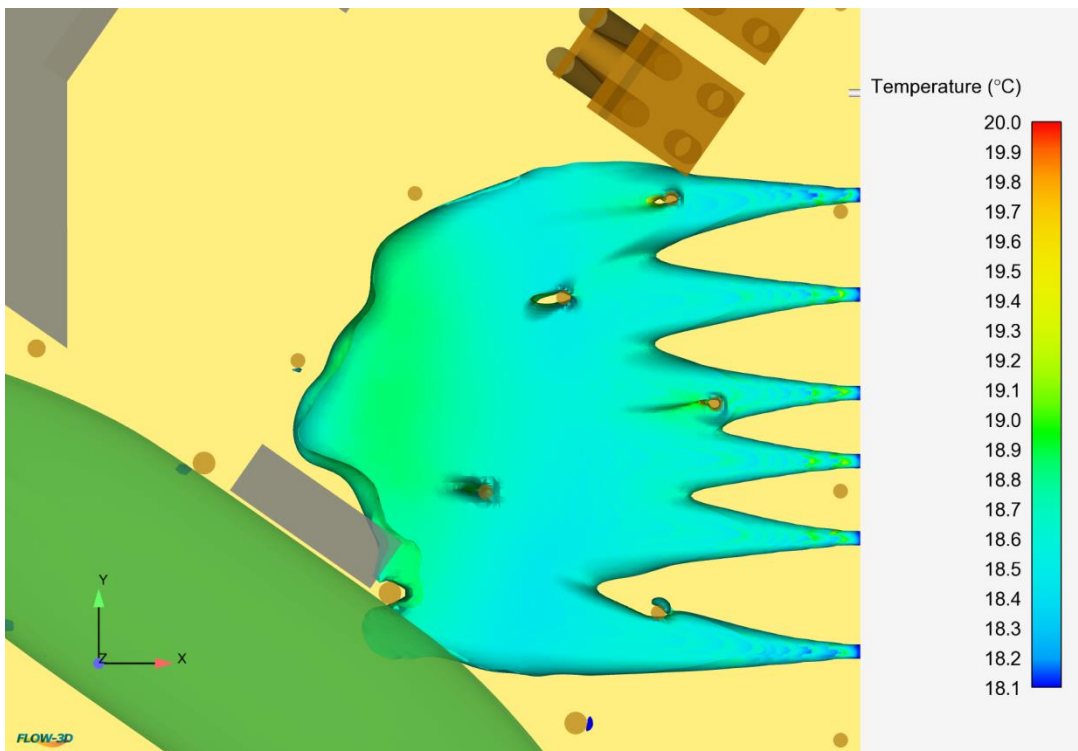


Figure 49: Spring – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view

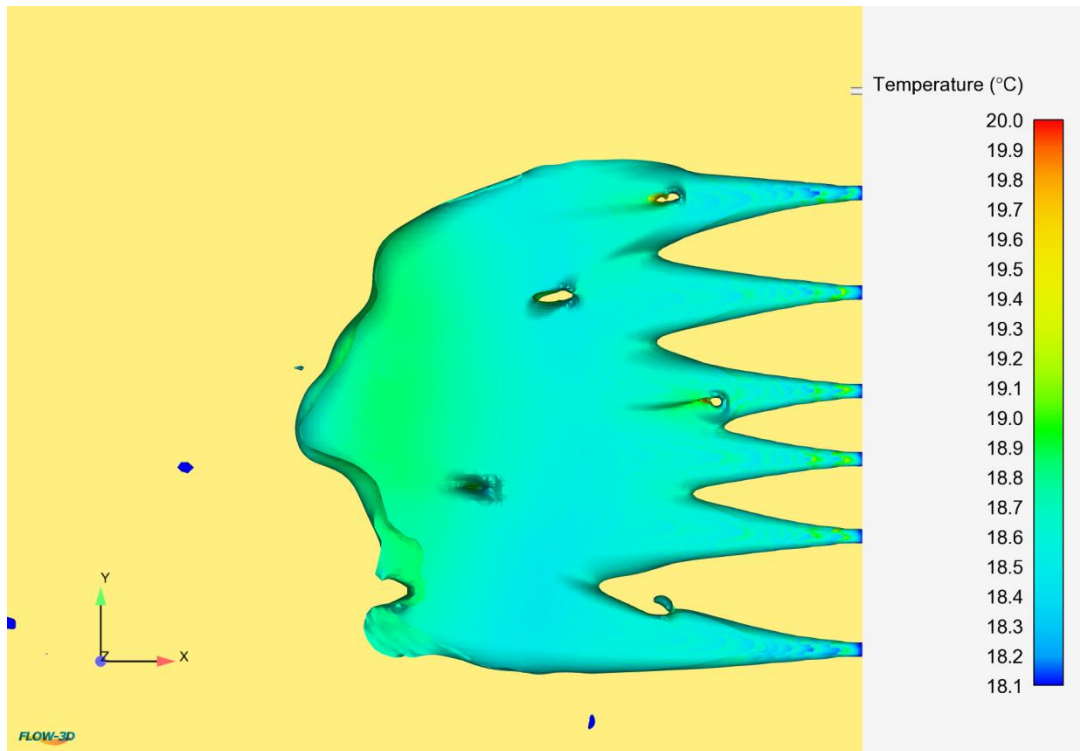


Figure 50: Spring – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, plan view with geometry removed

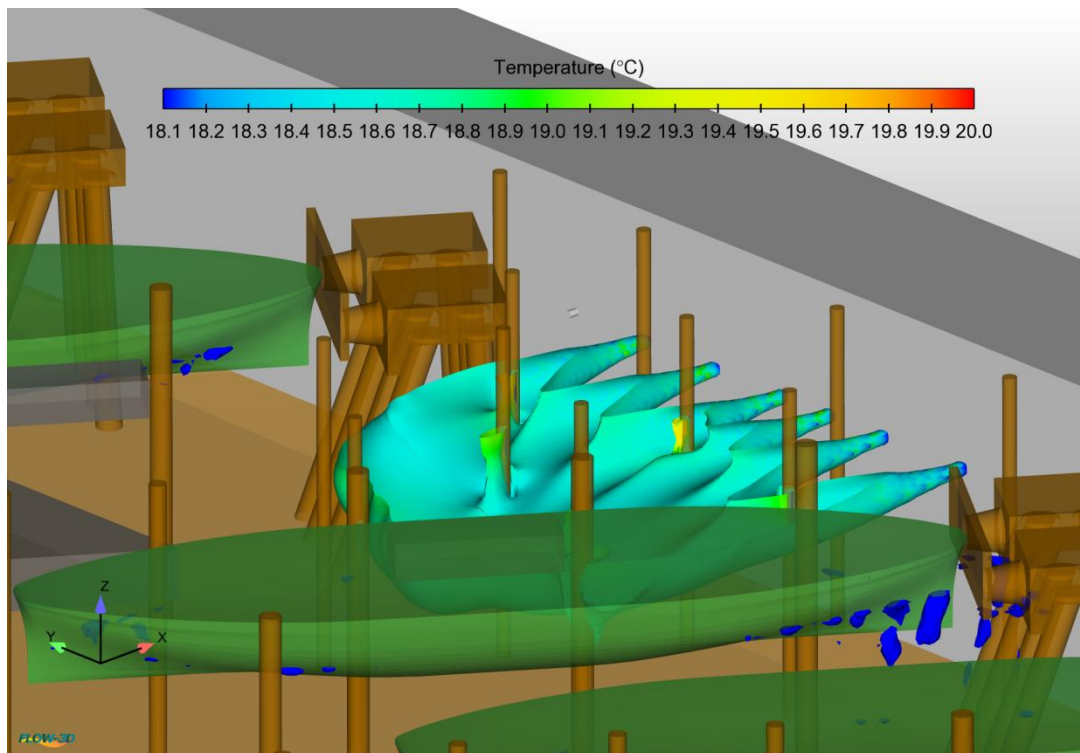


Figure 51: Spring – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 1

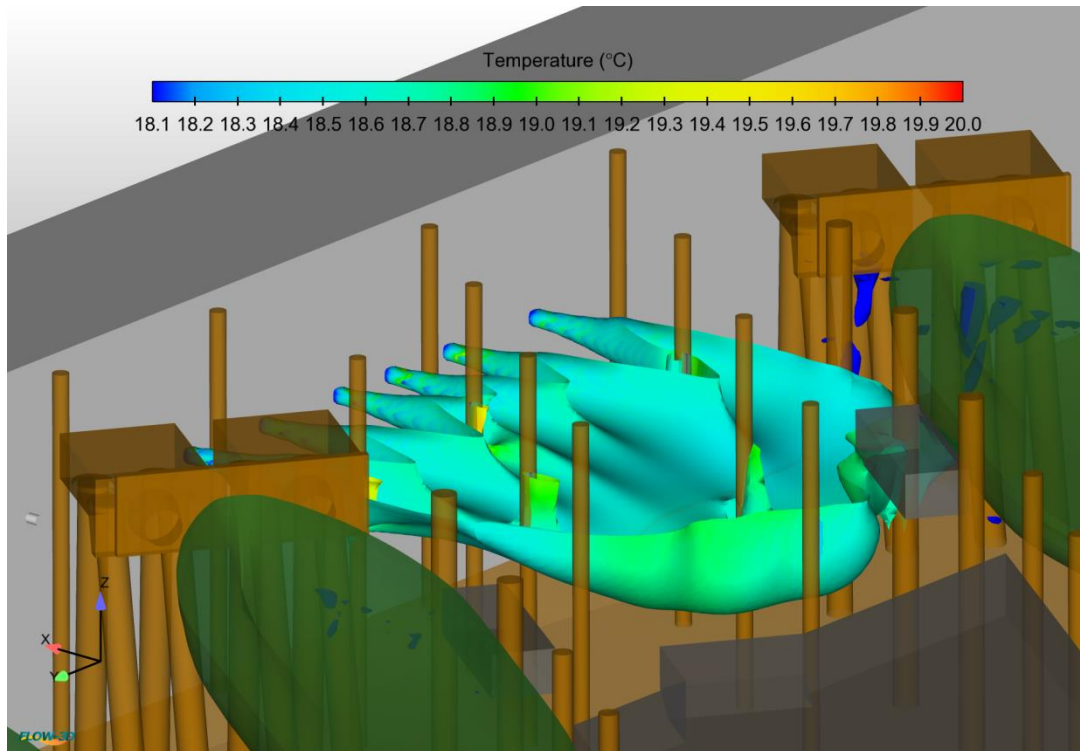


Figure 52: Spring – near field isosurface (velocity magnitude of 0.2 m/s) coloured by temperature, overview 2

5. Conclusions

The results of the modelling are summarised in Table 3. It can be seen in Table 3 that the Heat Rejection System Outfall complies with ANZECC guidelines [2], with maximum temperatures at the near field boundary that are below the measured pre-development seasonal 80th percentile values. This is below the low risk trigger level given in the ANZECC guidelines. The governing seasonal case for compliance was the winter analysis, where the near field boundary was found to have a maximum temperature that was only 0.1°C below the 80th percentile value for the receiving water. A temperature reduction to 1.1°C above ambient was achieved at the boundary of the near field across all seasonal cases.

The flow from the outfall was only found to significantly interact with the proposed Ferry Hub during the summer and autumn seasonal flow cases. The interaction for both of these flow cases was limited to the north arrestor structure of the second wharf. The interaction of the flow with the piles of the arrestor structure created turbulence which helped to mix the discharge from the outfall. The facing board of the arrestor structure helped to direct the flow. The arrestor structure did not appear to trap the flow. Significant interaction of the flow with the proposed Ferry Hub was not observed during the governing seasonal case for compliance.



Table 3: Results Summary

Parameter	Analysis Case			
	Summer	Autumn	Winter	Spring
Receiving water <i>Median temperature</i>	24.0 °C	21.2 °C	15.5 °C	18.1 °C
Receiving water <i>80th percentile temperature</i>	25.7 °C	22.5 °C	16.5 °C	20.0 °C
Near field boundary <i>maximum temperature</i>	25.1 °C	22.2 °C	16.4 °C	19.0°C
ANZECC guideline compliance	Yes	Yes	Yes	Yes
Compliance margin	0.6 °C	0.3 °C	0.1 °C	1 °C
Outfall Discharge <i>Interaction with Ferry Hub</i>	Significant	Significant	Minor	Minor



6. References

- [1] WorleyParsons (2012) *Barangaroo South – District Cooling Plant (DCP), Harbour Heat Rejection System, Numerical Modelling*, 301015-02234-06-RP001, 6th June 2012
- [2] Australian and New Zealand Environment and Conservation Council (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, ISBN 09578245 0 5 (set), ISSN 1038 7072
- [3] Transport for NSW (2014) *Barangaroo Ferry Hub – Environmental Impact Statement*, Version 6.0, 9th December 2014
- [4] WorleyParsons (2012) *Barangaroo South – District Cooling Plant (DCP), Harbour Heat Rejection System, Thermal Water Marine Ecological Impact Assessment*, 301015-02234-17-EN-REP-001, 19th September 2012
- [5] Sharqawy M.H., Lienhard V J.H., and Zubair S.M. (2010) *Thermophysical properties of seawater: a review of existing correlations and data*, Desalination and Water Treatment, Vol. 16, pp. 354-380

Appendix C – SLR report

8 May 2015

610.15102_Acoustic_Submission_Response_Final_20150508

Transport for NSW
Level 5, Tower A
Zenith Centre
821 Pacific Highway
CHATSWOOD NSW 2067

Attention: Ms Kate Doherty

Dear Kate

Barangaroo Ferry Hub Response to Acoustic Related Submissions

As part of the Environmental Impact Statement (EIS) for the proposed Barangaroo Ferry Hub (BFH) Project, a noise and vibration technical paper (Barangaroo Ferry Hub Construction and Operational Noise and Vibration Impact Assessment - November 2014) was prepared.

The EIS was publically exhibited in late 2014/early 2015 and a number of submissions on the project have been received. Transport for New South Wales (TfNSW) is currently preparing a Submissions Report and Preferred Infrastructure Report (PIR) to address the issues raised and identify and assess some minor amendments to the Project as described in the EIS.

SLR Consulting Pty Limited (SLR) has been engaged by TfNSW to assist in responding to issues raised in submissions and by agencies in relation to noise and vibration. This letter report for noise and vibration has been prepared by SLR in consultation with TfNSW to respond to noise and vibration submissions. Issues have been identified in the attached table, together with SLR's technical response.

This letter report is based on the indicative methodology and scope of works presented in the EIS and the noise and vibration technical paper, which presented a worst case scenario for noise impacts.

TfNSW has advised SLR that design refinements have led to an increased number of piles to be installed, with approximately 46 per wharf rather than the 30 per wharf originally considered. The main impact of the increase in the number of piles is an increased duration for construction, however the methodology as detailed in the EIS involving construction of one pile at a time remains the same. In this regard, it is not expected that there would be a change in the noise levels predicted in the EIS.

Yours sincerely



JOHN SLEEMAN
Principal - Acoustics

Item	Ref.	Comment	Response
A	EPA 2.1	<p>The project is likely to generate significant noise and vibration impacts on surrounding residences and other noise sensitive land uses during construction.</p> <p><i>Construction hours</i></p> <p>The EPA has an expectation that 'out of hours' work (especially night work) be kept to an absolute minimum and then only when fully justified on grounds other than production.</p> <p>Concern that the assessed extension of construction hours does not have adequate justification. Concern that alternate work methods which may avoid the need for night works have not been investigated.</p>	<p>It is recognised that certain construction activities associated with the proposal involve high noise levels, and most activities associated with the proposal would involve some audible noise for sensitive receivers. The high levels are a direct result of the source type and relatively close proximity of sensitive receivers to the works.</p> <p>The noisiest construction activities (associated with piling) are expected to result in noise levels greater than 75 dBA, or 'highly noise affected'. As identified in the EPA's <i>Interim Construction Noise Guideline</i> (ICNG) construction activities at these levels may result in a strong community reaction to noise. Accordingly the Guideline and TfNSW's <i>Construction Noise Strategy</i> recommend consideration of feasible and reasonable ways to reduce this noise level. Where no quieter work method is feasible and reasonable then it is recommended communicating with impacted residences by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.</p> <p>TfNSW is committed to minimising or avoiding noisy activities outside of standard working hours (particularly at night) where feasible and reasonable.</p> <p>The nature of the project is such that it may not be possible to undertake all activities during standard daytime construction hours. As identified in the EIS a number of the proposed activities require very still water for safety and accuracy of construction. These activities are:</p> <ul style="list-style-type: none"> ○ Pitching, vibrating and drilling piles into sediment and rock ○ Hammering piles to refusal. <p>The proposal area has unobstructed open water for over 2 km to the north, but is more protected to the east, west and south. Winds may create an unsuitable environment for piling works (small waves and chop), particularly in Spring and Summer due to prevailing northerly winds. The waterway is usually calmer during the night time and early morning periods with wind and wind chop increasing throughout the day at this location. Vessel wash may also impact barge stability in the busy Darling Harbour waterway, and there are higher levels of boating activity during the day and early evening, in particular after 7 am with the commencement of the morning peak period. Accordingly, the conditions required for piling usually occur during the night and early morning periods.</p> <p>TfNSW have collected wave data in Darling Harbour since April 2014 and this process is ongoing. However, until the specific details of the construction equipment and construction methodology are known, it cannot be confirmed what wave height and wave frequency would require the stoppage of piling works.</p> <p>As such, the proposal may require night works over about two to three months to complete the installation of piles. This timeframe provides some allowance for construction to be programmed to minimise the number of consecutive nights that impact on the same receptors and unfavourable conditions from weather, seas, swell, wind, and boat wash.</p>

Item Ref.	Comment	Response
		<p>Once the construction contractor is engaged by TfNSW it would be possible to consider the detailed construction methodology proposed and potential noise impacts in a greater level of detail, as would be required in the Construction Noise and Vibration Impact Statement (CNVIS) that will form part of the assessment and mitigation process. This would include consideration of alternative construction methodology such as a jack-up barge which would provide a stable work platform thereby enabling piling activities to be undertaken during standard working hours (see also response to Item B). The use of the jack up barge does not reduce noise levels but enables piling activities to be conducted during the less sensitive standard construction hours.</p> <p>If out-of-hours work is necessary (for example, if no jack-up barge is available and adverse weather precludes piling work during the day), more detailed supporting information would be available to provide the necessary justification, together with recommendations in respect of noise impacts and how these can be managed. Transport for NSW (TfNSW) and its contractor would work closely to communicate this information to the community/sensitive receivers and develop appropriate mitigation measures.</p> <p>Construction noise and vibration from the project is proposed to be managed in accordance with the TfNSW Construction Noise Strategy. This will include the following elements:</p> <ul style="list-style-type: none">○ Following the appointment of a construction contractor for the project a Construction Noise & Vibration Impact Statement (CNVIS) would be prepared. The statement would update the indicative methodology outlined in the EIS with the actual construction methodology and equipment to be used by the contractor. The CNVIS would therefore more accurately predict noise levels at receivers, based on actual construction techniques and equipment. In accordance with the <i>Construction Noise Strategy</i> where exceedances are identified mitigation measures would be considered and these will feed into the CNVMP.<ul style="list-style-type: none">○ A Construction Noise and Vibration Management Plan (CNVMP) would be produced, based on the CNVIS. The CNVMP would update the indicative methodology outlined in the EIS with the actual construction methodology and equipment to be used by the contractor.○ The CNVMP would include the standard mitigation measures, and additional mitigation measures described in the <i>Construction Noise Strategy</i>. The additional mitigation measures are important for this project, as they are applicable to works that may be required outside standard construction hours. The <i>Construction Noise Strategy</i> recognises that where out of hours work is required exceedances of the project's noise objectives is likely and a proactive engagement with affected sensitive receivers is required. Accordingly additional mitigation measures include, but are not limited to inter alia notifications, letter box drops, noise monitoring, and respite periods. The

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			active engagement with affected sensitive receivers would include consideration of the trade-off between the duration of construction vs the relative noise impact.
B	EPA 2.1.1	<p>It is recommended:</p> <p>i) the use of a jack-up barge would provide a stable work platform above the influence of wave action and may avoid the need for night works.</p> <p>ii) Use of a land-based piling rig should be investigated for piles close to shore (including crash barrier piles).</p>	<p>A jack-up barge would provide a stable work platform which would allow piling activities to be undertaken during standard working hours independent of any adverse weather or sea conditions. TfNSW has advised that use of a jack up barge is the preferred method of construction given the construction benefits it offers including reduced noise impacts and potential reduction in the construction period. The use of a jack up-barge is expected to reduce exceedances at the nearest sensitive receivers from up to 37 dB during night-time to up to 26 dB during daytime due to the difference in night-time and daytime noise management levels. Further, the use of a jack-up barge would avoid the exceedance of the sleep disturbance screening level (as no works during night-time would occur).l</p> <p>However, TfNSW has advised that it is unable to commit to the use of a jack up barge until the construction contractor is appointed and it is confirmed whether a jack-up barge is available (i.e. this is subject to the procurement of the construction contractor and the availability of this type of equipment within the time frame within which the project is to be delivered). TfNSW therefore proposes to commit to an additional mitigation measure to investigate the potential use of a jack-up barge for construction works where possible, subject to other project requirements and commitments also being met.</p> <p>TfNSW has advised that use of a land-based piling rig is not possible for this project as the caisson wall and foreshore surface have a limited load-rating which is not sufficient to support a piling rig.</p>
C	EPA 2.1.1	<p>The EPA recommends the following in relation to construction hours and respite periods including:</p> <p>(a) comply with the standard construction hours as recommended in Table 1 Chapter 2 of the <i>Interim Construction Noise Guideline</i>, July 2009 except where any deviation from those hours is -</p> <p>(i) fully justified in consultation with surrounding residents, and</p> <p>(ii) limited to specific high noise impact works subject to an explicitly limited duration in the context of the justification referred to in (i) above;</p> <p>(b) undertake night-time work on not more than 2 nights during any single week and then only to undertake such work as is unable to be undertaken during standard hours due to wind and sea conditions;</p> <p>(c) not undertake night work on a Sunday night/Monday</p>	<p>Comments on recommended respite periods and conditions follow:</p> <p>(a) As indicated above, TfNSW is committed to investigating the potential use of a jack-up barge for construction works where possible, subject to other project requirements and commitments also being met.</p> <p>If it is possible for the Contractor to obtain a jack-up barge for works requiring calm conditions then piling within standard hours would be possible. However, TfNSW has advised that it cannot commit to working within standard construction hours until a Contractor has been appointed for the project, and the availability of a jack up barge has been confirmed for the project. TfNSW notes that the standard hours adopted for the Barangaroo precinct are 7am – 6pm Mon – Fri, 7am – 5pm Sat (rather than ICNG standard hours). This could be considered further relative to TfNSW's proposal. Justification in consultation with residences and business to determine the detailed methodology relating specifically to high noise impact works would be available at a later stage when the contractor has been appointed and the CNVIS and CNVMP prepared. This work would be conducted in accordance with the TfNSW Construction Noise Strategy and consider the different requirements of residences and businesses. It is noted that work required outside standard hours, such as the delivery of large components if required under Road</p>

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	<p>morning or during a public holiday;</p> <p>(d) provide respite of not less than 3 nights between the last night of work during one week and the first night of work during the week immediately following;</p> <p>(d) undertake as much of the piling work as is practicable from the land and or a jack-up barge so as to avoid the limitations wind and sea conditions would impose on piling rigs mounted on barges; and</p> <p>(e) only undertake impact or hammer piling during standard hours and under no circumstances during night-time.</p>	<p>Occupancy Licences or Harbour Master Approval, would be subject to the standard exemptions.</p> <p>(b) The suggested respite periods have the potential to substantially extend the Barangaroo Ferry Hub construction period. This would be incompatible with the timing of Barangaroo precinct operations. The provision of transport solutions to support the occupation of the precinct was promised by the State Government in the <i>Sydney City Centre Access Strategy</i>. It is noted that occupation of residential buildings within the Barangaroo precinct is currently planned for about September 2015, and imposition of the suggested respite periods would extend the duration of impact of piling activities for sensitive receivers both within Barangaroo and in nearby precincts.</p> <p>TfNSW proposes to manage the impacts associated with noisy activities proposed out of hours in consultation with sensitive receivers and in accordance with the TfNSW <i>Construction Noise Strategy</i>. The TfNSW <i>Construction Noise Strategy</i> requires that “No more than four consecutive nights of high noise and/or vibration generating work may be undertaken over any seven day period”. This should be considered in the context of short duration of high-noise activities (e.g. pile hammering) involved in piling, and the longer duration of lower noise activities (e.g. pitching, drilling etc which are unlikely to be as intrusive). Consistent with this approach high noise and/or vibration generating works may only be undertaken for 4 consecutive nights in any 7 day period.</p> <p>(c) It is proposed no night work would be undertaken on a Sunday night/Monday morning or during a public holiday.</p> <p>(d) If it is possible for the Contractor to obtain a jack-up barge for works requiring calm conditions then piling works could be undertaken within standard hours. In relation to conducting piling works from the land, the land based structure at the wharf sea wall is not capable of supporting a piling rig, hence piling activities are required to be conducted from a barge or jack up barge.</p> <p>(e) As outlined in the response to Item A above, dot point 3, the requirement to restrict impact or hammer piling to standard construction hours is not feasible as calm water conditions are required. It is noted the Balmain East wharf is similarly exposed and affected by waves and chop during the daytime and the upgrade currently being undertaken requires piling to be undertaken outside standard construction hours from 5am to 7am. Similarly community announcements for upgrades at Pyrmont Bay Wharf, Cremorne Point Wharf and Mosman Bay Wharf indicated early morning or night works may be required when the water is at its calmest. TfNSW will continue to engage with RMS on lessons learnt from these projects, particularly in relation to community consultation and feedback, if received, to assist in developing a construction methodology and measures which minimise impacts on sensitive receivers.</p>

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D	EPA 2.1.2	<p>The EPA recommends adopting a regime of intra-day respite periods for activities generating noise with annoying or intrusive characteristics as identified in the ICNG as follows:</p> <p>(a) they are only undertaken after 8.00 am,</p> <p>(b) they are only undertaken over continuous periods not exceeding 3 hours with at least a 1 hour respite every three hours, and</p> <p>(c) 'continuous' means any period during which there is less than an uninterrupted 60 minute respite between temporarily halting and recommencing any of the work referred to in ICNG section 4.5</p>	<p>Intra-day respite periods of '3 hours on and 1 hour off' are proposed for high noise activities undertaken during the following hours:</p> <ul style="list-style-type: none"> 8.00 am and 5.00 pm Monday to Friday; and 8.00 am and 12.00 pm Saturdays <p>The proposed project respite period of 3 hours on and 1 hour off for high noise activities is consistent with the EPA recommendations, and the TfNSW <i>Construction Noise Strategy</i>.</p>
E	EPA 2.1.3	<p>The EPA recommends ensuring construction vehicles and vessels do not arrive at the project site or in surrounding residential precincts outside approved construction hours.</p>	<p>The EIS identified that the number of construction vehicles likely to be generated during construction landside would be in the order of 10 concrete trucks per day (during concrete pours), and a small number of light vehicles and occasional heavy vehicles throughout the construction period. The majority of construction plant, equipment, personnel and materials would access the site via boat or barge.</p> <p>TfNSW proposes to minimise the number of construction vehicles and vessels arriving at the project site or in surrounding residential precincts outside approved construction hours. It is noted the approved construction hours may include night-time and the 5am to 7am early morning period. The detail of construction vehicle and vessel numbers and arrival and departure times would be contained within the project specific Construction Traffic Management Plan (CTMP), the CNVMP and would take into account any requirements of the Barangaroo Integrated Transport Plan Working Group and the Harbour Master in minimising traffic and pedestrian impacts associated with the proposal.</p>
F	EPA 2.1.4	<p>The EPA recommends use of the least noisy feasible and reasonable method for pile removal (e.g. using divers to cut off piles at sea bed)</p>	<p>The demolition of the King Street Wharf wave baffle would be undertaken at a later stage of the proposal, if required, when the third wharf of the Barangaroo Ferry Hub is constructed.</p> <p>Prior to demolition it is proposed that TfNSW would undertake an assessment of the noise and vibration from the works. Where the potential noise and vibration exceeds the relevant criteria, less noisy feasible and reasonable methods for pile removal would be considered for the project. This procedure would form part of the CNVIS developed for that stage of the project.</p>
G	EPA 3.1	<p>Recommends TfNSW facilitates the logging of noise complaints during operation and provides an active and timely response to any such complaints.</p> <p>Recommends TfNSW develop and implement an effective community consultation and communication strategy (including a complaints management process)</p>	<p>Once constructed the Barangaroo Ferry Hub would be owned by Roads and Maritime Services (RMS) and operated by Sydney Ferries. It is not a standard TfNSW practice to prepare a consultation and communication strategy for operation of an asset. At the time of commissioning a new asset, an operational readiness communications plan would be prepared. This plan would outline community consultation on the future operation of the new hub to be undertaken during commissioning. Consultation would involve</p>

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			<p>communication tools such as stakeholder briefings, project notifications and website updates to let the community know about the operation of the hub and set expectations for future use and engagement.</p> <p>TfNSW would work closely with the owner and operator of the Barangaroo Ferry Hub to ensure a smooth transition from construction to operation.</p> <p>Currently, to register a compliment or complaint about a Sydney Ferries service customers are encouraged to contact Transport Information at http://www.transportnsw.info/ or telephone 131 500. It is anticipated that Barangaroo Ferry Hub would be dealt with using the same mechanism during operation. TfNSW have well-established practices for dealing with complaints in line with the TfNSW <i>Customer Complaints and Feedback Policy</i>.</p> <p>Sydney Ferries operator Harbour City Ferries (HCF) has a complaints management framework which follows the principles outlined in the TfNSW policy. This includes timely response times, commitments to investigate complaints and customer follow up. More information regarding HCF's complaints management is located on their website http://harbourcityferries.com.au/service-centre.</p>
H	EPA 3.1	The EPA recommends a noise monitoring program be undertaken to 'ground truth' noise impact predictions at set periods following commencement of operation. Results of monitoring should be used to guide improved noise mitigation and management measures	<p>TfNSW proposes to conduct post construction noise monitoring to validate the prediction of operational noise levels. The monitored noise levels would be used with concurrent vessel movements to confirm the accuracy of the noise modelling. As part of this process should significant variations in the predicted noise levels at the nearest sensitive receivers be identified, then noise mitigation measures and/or changes to operational practices can be considered. This approach is similar to post construction noise studies that are conducted for road and rail projects.</p>
I	EPA 3.1	The EPA recommends deliveries and waste collection are restricted to 'daytime hours' (7am-6pm Mon-Sat, 8am-6pm Sundays and public holidays).	<p>Barangaroo Ferry Hub will be located on one of the busiest routes within the Barangaroo South precinct (based on Barangaroo South Stage 1A public domain documentation which identifies this as a primary pedestrian corridor). It is considered that daytime collection of waste would potentially cause safety concerns, and a reduction in public enjoyment of the space, during the busiest periods. Daytime deliveries and waste collection may therefore not be suitable for the environment at this location. TfNSW is investigating opportunities to use the same service provider for waste collection as for the Barangaroo South foreshore to minimise cumulative impacts.</p> <p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan.</p>
J	EPA 3.1	The EPA recommends avoiding the use of leaf blowers, blower vacuums and the like to clean and maintain the wharves and surrounding area	<p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan. Note there is no proposal to use leaf blowers or vacuums (though high-pressure water cleaner use is proposed).</p>
K	EPA 3.1	The EPA recommends the proposal's public address system should be designed and operated to minimise noise impacts on surrounding residents, particularly during evening and	<p>Recommendations to address and control noise from the public address system will be considered at the detailed design stage. Indicative arrangements include:</p> <ul style="list-style-type: none"> • Each wharf would have public address speakers where each speaker is

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		night-time.	<p>individually adjusted and controlled, therefore allowing for zoned announcements.</p> <ul style="list-style-type: none"> • Around 12 speakers are expected to be installed on each wharf which would allow for lower volume announcements. • A hearing loop would be provided for customers with hearing impairment. <p>It is recommended this detail should be covered in an Operational Environmental Management Plan/Operational Noise Management Plan.</p>
L	LC ¹	Recommends high-noise activities including piling works and demolition of the existing wave baffle, proposed for the 5am-7am shoulder period, be scheduled so that noisy works would be conducted as late in the shoulder period as possible	This item has been addressed in the response to A and C above.
M	Others	Queries distance from Noise Catchment Area 01 to the area of proposed works (suggests figure used was incorrect). Recommends reviewing the noise calculations for NCA-01.	Table 6 of Report 610.14047 specifies a distance of 60 m to NCA-01 receivers. The table footnote specifies this distance as being from the 'centre of the Barangaroo Ferry Hub project (i.e. the centre of wharf 2)'. Calculations to receivers were based on the nearest distance from construction and operational noise sources to the receivers, rather than the 'indicative' distance specified in Table 6. The predicted noise levels presented in the EIS are therefore accurate and do not need to be reviewed.
N	Others	Barangaroo South residences (Buildings R8 and R9) will be occupied from September 2015. Recommends piling should be carried out prior to this if possible. Recommends restriction to standard working hours after the occupation of Barangaroo South residences. Requested CNVMP mitigation measures be provided in the response to submissions.	<p>It is noted that residents at R8 and R9 are not the only sensitive receivers which would potentially be impacted by Barangaroo Ferry Hub construction. The CNVIS and would consider all impacted sensitive receivers and the CNVMP would provide an appropriate response to manage these impacts.</p> <p>As detailed in the responses to Items A, B and C above, the particulars of construction timing and methodology cannot be committed to at this stage until a construction contractor is engaged. Once the construction contractor is engaged it would be possible to consider the methodology, timing and likely noise impacts in greater detail in the CNVIS. As outlined above it may not be possible to construct the proposal entirely within standard working hours if a jack-up barge is not available, or if it is possible to construct within standard working hours this would likely extend the duration of construction.</p> <p>The CNVMP would be prepared once the construction contractor is engaged and in line with the conditions of approval. The CNVMP would include the standard mitigation measures, and additional mitigation measures described in the TfNSW <i>Construction Noise Strategy</i>. The additional mitigation measures are important for this project, as they are applicable to works that may be required outside standard construction hours. The <i>Construction Noise Strategy</i> recognises that where out of hours work is required exceedances of the project's noise objectives is likely and a pro-active engagement with affected sensitive receivers is required. The additional mitigation measures include, but</p>

¹ Leichhardt Municipal Council

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			are not limited to inter alia notifications, letter box drops, noise monitoring, and respite periods. The pro-active engagement with affected sensitive receivers would include consideration of the trade-off between the duration of construction verses the relative noise impact.
O	Others	Noted that King Street Wharf noise catchment area is not expected to experience substantial noise impacts during construction. Any further design changes should meet those noise levels anticipated the EIS.	TfNSW has advised SLR that design refinements have led to an increased number of piles to be installed, with approximately 46 per wharf rather than the 30 per wharf originally considered. This change in the number of piles is being assessed in the Submissions Report and the Preferred Infrastructure Report. The increase in the number of piles will result in an overall duration of the piling element of the works. However the methodology as detailed in the EIS involving construction of one pile at a time remains the same. In this regard, it is not expected that there would be a change in the noise levels predicted in the EIS.
P	Others	Noted substantial noise exceedances (including sleep disturbance levels) anticipated during construction and operation for future Barangaroo noise catchment area, Pyrmont and Jones Bay Wharf (NCA-01, 03, 04). Noted there are not substantial mitigation measures proposed for operational noise impacts.	This issue of substantial noise exceedances has been addressed in the response to A and C above. It is noted the predicted noise levels are representative of the worst case or most intensive operation of equipment in any given scenario, and in general lower noise levels will be expected. Potential operational noise mitigation measures would be included the Operational Environmental Management Plan/Operational Noise Management Plan.
Q	Others	It is recommended larger vessels should not be moored (layover) at Barangaroo Ferry Hub to minimise noise impacts associated with out-of-hours maintenance	Minor maintenance of ferries would take place at the Barangaroo Ferry Hub on a daily basis, similar to the maintenance activities that currently occur at Circular Quay. This would be limited to ferries that layover and would include activities such as minor repairs, pump-out of sewage, cleaning of vessels and updating passenger information displays. Ferries would only be cleaned with low pressure hoses to remove salt. Ferry maintenance at the wharf would only be internal to the vessel (e.g. within engine rooms, or changing light bulbs etc.). No noisy maintenance works on vessels are anticipated. Noise levels associated with at-wharf maintenance are not expected to be any higher for larger vessels than smaller vessels, and are not anticipated to exceed noise management levels. Major scheduled maintenance would take place at Balmain Shipyard. There is significant operating time and cost associated with requiring vessels to be moved between Balmain Shipyard and Barangaroo Ferry Hub for pump out, minor maintenance and other cleaning functions. Undertaking these low impact activities at Barangaroo Ferry Hub would provide network and operational flexibility.

The EIS predicted noise and vibration impacts, and the ongoing management includes the TfNSW *Construction Noise Strategy* and the provision of the CNVIS which will feed into and inform the CNVMP. Having regard to the submissions received in relation to noise and vibration, TfNSW and SLR have further considered the mitigation measures for the construction and operation of the proposed Barangaroo Ferry Hub.

The management and mitigation commitments documented in Table 7-1 of the EIS which relate to noise and vibration and community consultation have been considered and revised (where necessary). New measures that are proposed have been denoted in **Table 1** with underlined text, while any environmental management measure proposed to be removed (or have text deleted from the measure) has been shown with strikethrough text.

Table 1 Review of Noise Management and Mitigation Measures

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
General environmental management	G1	<p>A Construction Environmental Management Plan (CEMP) will be prepared and implemented to ensure appropriate environmental management measures are followed during project delivery. The CEMP will provide a framework for environmental management during construction and will:</p> <ul style="list-style-type: none"> • Outline all environmental management practices and procedures to be followed during construction and demolition works associated with the project • Describe all activities to be undertaken on the site during construction of the project • Detail how the environmental performance of the construction works will be monitored • Detail what corrective actions will be taken to address identified adverse environmental impacts • Describe the roles and responsibilities for all relevant employees involved in the project • Include relevant sub-plans: <ul style="list-style-type: none"> – Construction Noise and Vibration Management Plan – Construction Traffic Management Plan – Erosion and Sediment Control Management Plan – Waste Management Plan <p>The CEMP will be developed in accordance with <i>Guideline for the Preparation of Environmental Management Plans</i> (Department of Infrastructure, Planning and Natural Resources, 2004).</p>	TfNSW Construction contractor	Pre-construction

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
Environmental awareness training	G2	Environmental awareness training will be provided, by the contractor, to all field personnel and subcontractors. The environmental induction will include: <ul style="list-style-type: none"> • Construction noise and vibration management • Traffic (road and maritime) management • Marine ecology • Non-Indigenous heritage • Air quality • Indigenous heritage • Ecologically Sustainable Development • Hazards and risks 	Construction contractor	Pre-construction and during construction as required
Construction Noise and Vibration Management Plan	N1	A Construction Noise and Vibration Management Plan (CNVMP) will be included in the CEMP to provide the framework and mechanisms for the management and mitigation of all potential noise and vibration impacts from the construction works. A CNVMP will be prepared and all work will be undertaken in accordance with the TfNSW Construction Noise Strategy (CNS) and Interim Construction Noise Guidelines where practicable. The CNVMP will as a minimum include: <ul style="list-style-type: none"> • Identification of nearby residences and sensitive land uses. • Details of construction activities, <u>examination of alternate methods (including investigation of using a jack-up barge)</u> and a schedule for construction works. • Determination of Noise Management Levels (NMLs) and the prediction of noise levels. • Description of approved hours of work <u>and justification for any activities to be undertaken outside these approved hours.</u> • An out of hours works protocol. • Restrictions on the hours of construction for specific works. • Details of work practices and measures that will be implemented to minimise noise impacts, <u>including any additional measures as negotiated with affected residents and other sensitive receivers.</u> • <u>Community consultation and notification process.</u> • Description of the complaints handling process. • Details of monitoring that is required. 	TfNSW Construction contractor	Pre-construction

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
<p><u>Construction Noise and Vibration Impact Statement</u></p>		<p>A <u>Construction Noise and Vibration Impact Statement (CNVIS)</u> will be prepared prior to the <u>Construction Noise and Vibration Management Plan</u>. The CNVIS will be prepared in accordance with the TfNSW Construction Noise Strategy and as a minimum will include:</p> <ul style="list-style-type: none"> • <u>Determination of noise and vibration objectives.</u> • <u>An assessment of construction scenarios including noise from construction vehicles and vessels.</u> • <u>All reasonable and feasible measures including adopting the least noisy available construction methods, systems and equipment.</u> • <u>Description and commitment to work practices which limit noise and vibration;</u> • <u>Description of specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency;</u> • <u>Justification for any activities to be undertaken outside the specified construction hours;</u> • <u>Additional noise and vibration mitigation measures which include:</u> <ul style="list-style-type: none"> ○ <u>Community consultation and notification</u> ○ <u>Negotiated specific mitigation with affected residents and other sensitive receivers</u> 	<p><u>Construction contractor</u></p>	<p><u>Pre-construction</u></p>
<p>Construction hours</p>	<p>N2</p>	<p>Construction and demolition activities, including heavy vehicle movements will generally be restricted to the standard construction hours of:</p> <ul style="list-style-type: none"> ○ <u>Monday to Friday 7:00 am to 6:00 pm.</u> ○ <u>Saturday 8:00 am to 1:00 pm.</u> ○ <u>No work on Sundays or public holidays.</u> <p>The installation of piles and intricate lifting works will require specific weather conditions, such as calmer water. Therefore works may be required in the evening or night-time period, or during the night-time/daytime shoulder period (e.g. 5:00 am to 7:00 am), for safety of workers, businesses, residents and pedestrians.</p>	<p>Construction contractor</p>	<p>Construction</p>

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
Out of hours work	N3	<p>All works will be undertaken in accordance with the construction hours detailed above, except for the following works, as outlined in the <i>TfNSW Construction Noise Strategy</i> (CNS), which will be permitted outside of these hours:</p> <ul style="list-style-type: none"> Any works which do not cause noise emissions to be more than 5dBA higher than RBL (background) noise levels at any nearby residential property and/or other noise sensitive receiver. The delivery of plant, equipment and materials which is required outside these hours as requested by police or other authorities for safety reasons and with suitable notification to the community as agreed by the TfNSW Principal Manager Environmental Management. Emergency work to avoid the loss of lives, property and/or to prevent environmental harm. Any other work in accordance with TfNSW's Out-of-Hours Work (OOHW) Procedure and considered essential to the project. <p>Where OOHW is proposed which has not been assessed in the EIS and CNVMP, activity and site specific Construction Noise Impact Statements (CNISs) will be developed to support an OOHW Application. The CNISs will provide a detailed assessment of potential noise levels and site specific measures to control potential noise impacts and minimise the potential for disturbance at affected receptors.</p> <p>Night works will be programmed to minimise the number of consecutive nights work impacting the same receptors, as per the TfNSW CNS.</p>	Construction contractor	Construction
Respite periods	N4	<p>The proponent and construction contractor(s) will schedule work to provide respite periods from the noisiest activities, and communicate with the impacted residents by clearly explaining the duration and noise level of the works, as per the TfNSW CNS.</p>	Construction contractor	Construction
Community consultation	N5	<p>Community notification and consultation, including notification regarding noisy works, will be undertaken in accordance with the TfNSW CNS. <u>This would typically include:</u></p> <ul style="list-style-type: none"> <u>Periodic and targeted notifications distributed to stakeholders prior to work commencing.</u> <u>The project website would be updated to provide information on upcoming noisy works.</u> <u>Construction Response Line, 1800 775 465 – providing a dedicated 24 hour contact point for any complaints regarding construction works.</u> <u>Project Infoline, 1800 684 490 – providing a dedicated contact point for any project enquiries.</u> <p><u>If noisy works are required to be done outside of standard construction hours additional notification activities would be undertaken. Additional measures which may be considered</u></p>	TfNSW	Construction

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
		<p><u>include:</u></p> <ul style="list-style-type: none"> <u>Individual briefings to inform stakeholders of the impacts of high noise activities and the mitigation measures that will be implemented</u> <u>Specific letter drops to affected sensitive receivers to inform the upcoming noisy works.</u> <p><u>Email distribution lists will be used to disseminate project information to interested stakeholders. Advanced warning of noisy activities can assist to reduce the impact of projects experienced by the community.</u></p>		
Avoid noisy works	N6	<ul style="list-style-type: none"> Broadband audible or non-tonal alarms will be used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work, as per the TfNSW CNS. The use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers will be avoided or limited where feasible and practicable. 	Construction contractor	Construction
Switch off noisy equipment	N7	Equipment which is used intermittently will be shut down or throttled down to a minimum when not in use. Plant items such as barge(s), concrete trucks will be turned off when parked or otherwise not in use.	Construction contractor	Construction
Compliance checks on equipment	N8	Regular compliance checks on the noise emissions of all plant and machinery used for the proposal will be undertaken to indicate whether noise emissions from plant items are higher than predicted and whether any silencing equipment on items of plant is defective.	Construction contractor	Construction
Environmental awareness	N9	<ul style="list-style-type: none"> Environmental awareness training will be provided, by the contractor, to all field personnel and subcontractors. Regular reinforcement (such as at toolbox talks) of the need to minimise noise will be undertaken. 	Construction contractor	Pre-construction and during construction as required
Specific Notifications	N10	Specific notifications will be letterbox dropped or hand distributed to nearby stakeholders and other sensitive receivers no later than seven days ahead of new construction activities and construction activities that are to be undertaken out-of-hours or are considered high noise generating. This form of communication is used to support periodic notifications.	Construction contractor TfNSW	Construction

Environmental Issue	ID	Environmental management measure	Responsibility	Timing
Monitoring	N11	Noise monitoring at sensitive receivers will be used during construction to assist in managing high noise OOHW activities and in response to complaints. All noise monitoring will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	Construction contractor	Construction
<u>Construction methodology</u>	<u>N12</u>	<u>Construction methodologies which reduce noise impacts, including the use of a jack-up barge, will be investigated and implemented where reasonable and feasible. The CNVMP and the Community Liaison Plan will be tailored to the construction methodology to ensure an appropriate response to the level of noise impact.</u>	<u>TfNSW Construction contractor</u>	<u>Pre-construction</u>
Community engagement during construction	SE1	<p><u>A Community Liaison Plan (CLP) would be prepared for the project to ensure stakeholders and the community are provided with timely and effective information about activities associated with the project, and opportunities to provide feedback, where appropriate. The CLP will ensure:</u></p> <ul style="list-style-type: none"> • <u>Stakeholders and the community have a high level of awareness of all processes and activities associated with the project</u> • <u>Accurate information is made available in an effective and timely manner.</u> • <u>A timely response is given to feedback, enquiries and complaints received from stakeholders and the community.</u> <p>A community liaison plan will be prepared to support the Stakeholder and Community Engagement Strategy throughout project delivery.</p>	TfNSW Construction contractor	Pre-construction Construction

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