Horton Coastal Engineering
Coastal & Water Consulting

HORTON COASTAL ENGINEERING PTY LTD
18 Reynolds Cres
Beacon Hill NSW 2100
+61 (0)407 012 538
peter@hortoncoastal.com.au
www.hortoncoastal.com.au
ABN 31 612 198 731
ACN 612 198 731

Hill Thalis Architecture + Urban Projects
Attention: Brett Sperling
Level 4, 15 Foster Street
Surry Hills NSW 2010
(sent by email only to brett.s@hillthalis.com.au)

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Foreshore Risk Management Report for Leichhardt Park Community Boat Shed

1. INTRODUCTION AND BACKGROUND

A new rowing facility is proposed above the water in Iron Cove (with the development footprint hereafter denoted as the 'site'), adjacent to Leichhardt Park. This is to support Community Rowing Club's Para Program, which provides opportunities for people with disabilities to participate in rowing and become involved in the rowing community, amongst other activities. A Development Application (DA) is to be submitted to Inner West Council for these works.

As the site is potentially affected by estuarine hazards, it is subject to *Leichhardt Development Control Plan 2013* (DCP)[1], in particular Part E. A Foreshore Risk Management Report is required for the site, as per Section E1.1.5 of the DCP, as it is identified to be adjacent to a foreshore flood control lot in the Appendix E mapping of the DCP.

The site is also adjacent to a Flood Control Lot in the Appendix E mapping of the DCP. However, rainfall-runoff flooding matters can be fully addressed by consideration of Foreshore Risk Management matters, as elevated water levels in Sydney Harbour are governed by estuarine processes and not catchment processes at the site. To state this another way, Sydney Harbour estuary levels are higher than land-based rainfall-runoff flood levels for a given probability event at the site. Therefore, a Flood Risk Management Report is not required for the site.

Horton Coastal Engineering was engaged to prepare the required Foreshore Risk Management Report, as set out herein. Clause 6.5 of *Inner West Local Environmental Plan 2022* (LEP 2022), *State Environmental Planning Policy (Resilience and Hazards) 2021* and *State Environmental Planning Policy (Biodiversity and Conservation) 2021* are also considered herein.

The report author is Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER]. Peter has postgraduate qualifications in coastal engineering and 31 years of coastal engineering experience, having completed numerous coastal inundation and foreshore risk management studies within Sydney Harbour, including along the Inner West Council shoreline. He is a Member of Engineers Australia and Chartered Professional Engineer (CPEng) registered on the National Engineering Register. Peter is also a member of the National Committee on Coastal and Ocean Engineering (NCCOE) and NSW Coastal, Ocean and Port Engineering Panel (COPEP) of

[1] Amendment 17 of the DCP, effective from 20 December 2022, was considered herein.

Engineers Australia. He has inspected the area in the vicinity of the site on several occasions in the last two decades or so, including a specific recent inspection of the site on 11 August 2023.

All levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present in the ocean immediately adjacent to the NSW mainland.

2. INFORMATION PROVIDED

Horton Coastal Engineering was provided with 12 Hill Thalis drawings of the proposed development, namely Drawings DA2.01, 2.10 to 2.13, 2.20, 2.21. 2.30 and 3.10. These drawings were all dated 25 September 2023 and Revision A.

A survey of the land to the east of the site completed by Norton Survey Partners was provided, reference 50303 and dated 28 July 2023. A bathymetric survey of the site and surrounds completed by the Port Authority of NSW was also provided, dated 28 February 2022.

3. EXISTING SITE DESCRIPTION

The site is within Iron Cove in Sydney Harbour adjacent to the shoreline of Leichhardt Park, with zoomed and broad aerial photographs provided in Figure 1 and Figure 2 respectively. A photograph of the site is provided in Figure 3. The shoreline of Leichhardt Park faces approximately WNW at the site.

Figure 1: Zoomed aerial view of site (red outline) on 1 May 2023

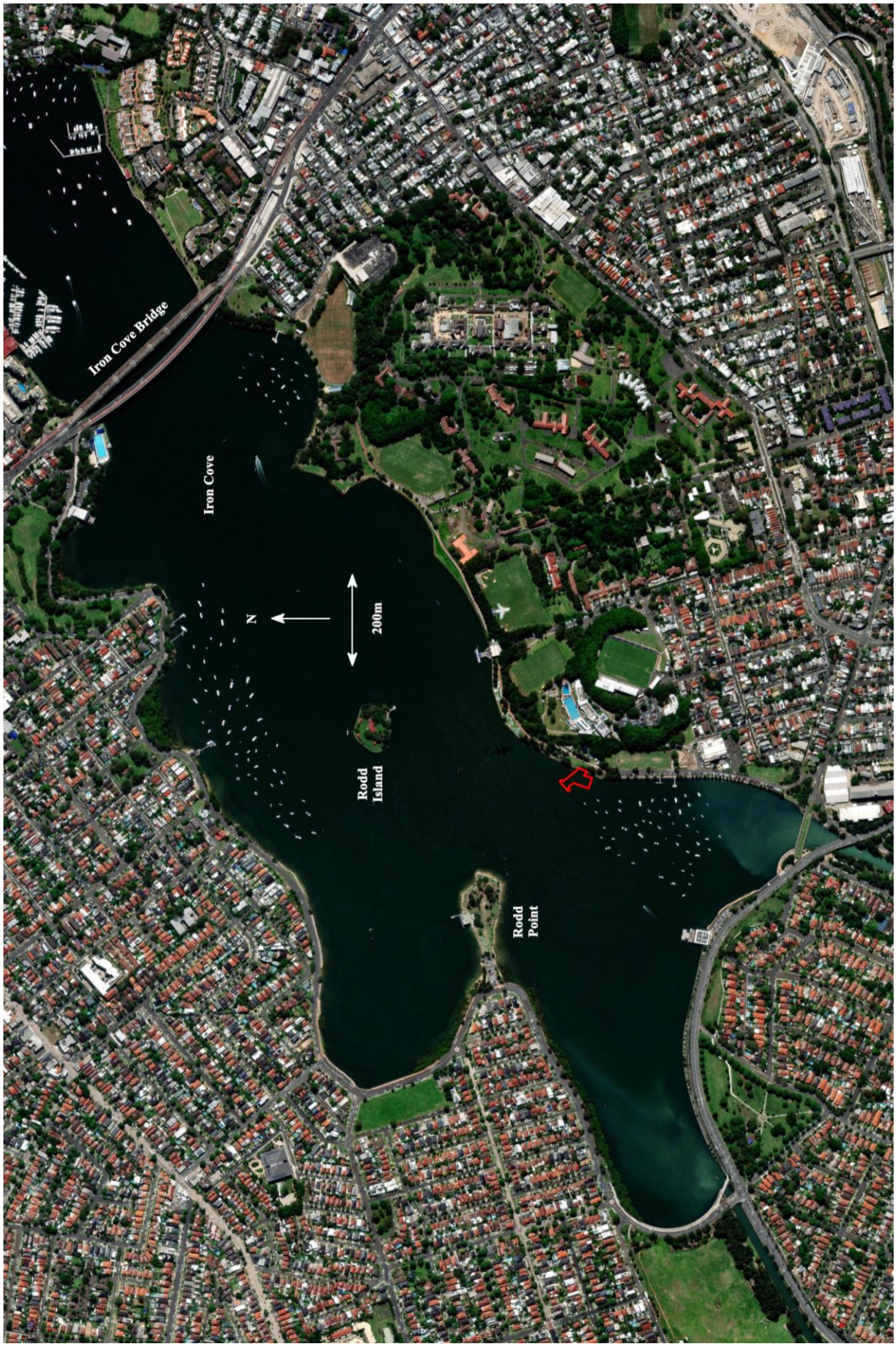

Figure 2: Broad aerial view of site (red outline) on 5 February 2023

Figure 3: View of site on 11 August 2023, facing north

The site has an exposed wind-wave fetch of about 1,020m to the WSW, 790m to the north and 650m to the NW. The site is also exposed to wash from passing vessels, although note that higher energy wash vessels such as Rivercats do not generally operate within Iron Cove.

Based on the survey, the top of the vertical sandstone block seawall at the site is at about 2.0m AHD, with the concrete path on the western side at about 1.0m AHD. A sandstone cobble/boulder revetment then falls to the seabed at about -0.5m AHD. The seabed falls to about -1m AHD at 8m offshore and -2m AHD at about 40m offshore.

4. PROPOSED DEVELOPMENT

The proposed development comprises a rowing facility with a finished ground floor at 2.17m AHD and first floor at 5.67m AHD. The ground floor level comprises a reinforced concrete floor at a boat storage area and kiosk, with a surrounding fibre-reinforced plastic (FRP) deck and two gangways leading to a pontoon.

The lowest seabed level over the development footprint is -2.5m AHD.

5. DESIGN LIFE

A design life of 50 years has been adopted for the proposed development. This is consistent with *Australian Standard AS 4997 (Guidelines for the design of maritime structures)*, considering the development as a 'normal commercial structure'. Furthermore, a design life of 50 years or more is considered to be reasonable for permanent structures used by people (AGS, 2007a, b).

In *AS 3600-2018 (Concrete structures)*, a 50 years ± 20% design life may be used in devising durability requirements for concrete structures, so a 50 year life is consistent with this Australian Standard that is applicable to part of the ground floor of the proposed development.

The design life has been applied at 2074, assuming that the proposed development would be constructed in 2024.

6. FORESHORE RISK MANAGEMENT REPORT REQUIREMENTS

Based on Section 3 of Appendix E of the DCP, the Foreshore Risk Management Report must be prepared by a qualified practicing Civil Engineer with demonstrated relevant experience in coastal engineering and address at least the following details:

1. Description of the site and surrounding geotechnical and coastal/estuarine features;
2. Description of the existing and proposed development;
3. Identification of the geotechnical constraints on the land including assessment of the sub surface conditions, geo mechanics, slope stability and ground water conditions;
4. Identification of the constraints due to coastal/estuarine processes on the land including an assessment of storm wave impact, coastal processes, erosion and tidal inundation likely to occur during a 100 year Average Recurrence Interval (ARI) storm event;
5. Establishment of the 100 year ARI flood level associated with storm wave action and tidal inundation, including provision of adequate freeboard;
6. Assessment of the stability of the existing seawall adjacent to the boundary of the site with the harbour. The report must include recommendations to ensure continued stability of the wall during the construction process and in the long term;
7. Recommendations for the design of the stormwater drainage system for the site, including subsurface conditions, collection of runoff and its disposal to the Harbour;
8. Certification that there is a low risk of instability of the site over the economic life of the development, including the proposed development and existing structures that are to be retained;
9. Where any floor levels of the proposed development and/or existing structures are proposed to be retained below the 100 year ARI flood level, the report must address whether and how the proposal is to be either flood proofed to protect the overall development or justify that periodic water inundation will not cause any adverse risk to the development, its occupants or uses. Note that inundation of habitable components of the development is not permissible and must be provided with adequate freeboard;
10. Where any part of the proposed and/or existing development is below the flood level, the Report must make recommendations on all precautions to minimise risk to occupants and the risk of property damage. These precautions shall include but not be limited to safe evacuation, ensuring all structures, electrical equipment, wiring, fuel lines or any other service pipes and connections shall be waterproofed below the flood level, and be capable of withstanding the effects of wave action and tidal inundation;
11. Certification that the proposed development will not cause adverse impacts on surrounding lands, coastal environment and public amenities;
12. The architectural/engineering plans on which the assessment is based;
13. The date of inspection; and
14. The professional qualifications and experience of the authors.

These items are addressed in turn below.

7. RESPONSE TO FORESHORE RISK MANAGEMENT REPORT REQUIREMENTS FROM SECTION 6

7.1 Item 1: Site Description

A general description of the site has been provided in Section 3. It can be noted that the shoreline in the vicinity of the site was previously about 30m further landward (as evident in 1930 aerial photography). The area landward of the seawall of the site is thus expected to comprise fill, most likely from dredging the adjacent seabed, but potentially waste or other materials. A geotechnical investigation would be required to determine the nature of these fill materials (if required), and the nature of the seabed sediments and if there is bedrock within the piling depth. This can be undertaken as part of detailed design, and does not affect the engineering feasibility of the project.

7.2 Item 2: Existing and Proposed Development

The existing and proposed development as relevant to foreshore risk management has been described in Section 3 and Section 4 respectively.

7.3 Item 3: Geotechnical Constraints on Land

As noted in Section 7.1, geotechnical constraints on the site (particularly relevant to piling design) can be assessed as part of detailed design. This information is not required at the DA stage. The land adjacent to the site is relatively flat and is not identified as being at particular geotechnical or landslide risk.

7.4 Item 4: Constraints due to Coastal/Estuarine Processes

With reference to the report "Estuarine Planning Levels Study, Foreshore Region of Leichhardt Local Government Area" completed on 1 April 2010 (denoted as the EPL Study herein):

- a present day 100 year ARI storm tide level of 1.45m AHD was adopted for Sydney Harbour at Fort Denison in the EPL Study. This is considered to be reasonable with reference to DECCW (2010), in which a corresponding value of 1.44m AHD was estimated;
- additional local wind setup of 0.09m in the 100 year ARI event was determined in the EPL Study for the site, which is considered to be conservative[2], giving a 100 year ARI design water level of 1.54m AHD at present;
- sea level rise projections of 0.4, 0.9 and 1.1m above 1990 mean sea level were applied in the EPL Study, with no projection specified as being mandatory (no sea level rise value is mandated in Appendix E of the DCP either);
- an example is given at the bottom of page 33 of the EPL Study where a sea level rise value of 0.4m was adopted based on a design life of 50 years. It is thus assumed that the sea level rise value adopted herein can be justified on the basis of the expected design life, which is considered to be reasonable;
- a 50 year design life, applied at 2074, has been adopted herein as discussed in Section 5;
- it is considered to be most appropriate to directly derive sea level rise values from Intergovernmental Panel on Climate Change [IPCC] (2021), which is widely accepted by competent scientific opinion;

[2] Weather systems that would cause storm surge conditions to elevate ocean water levels would generally have winds blowing from the south to east quadrant, which would cause a setdown rather than setup at the site. Setup at the site would only occur for winds blowing with a westerly component.

- for the proposed design life of 50 years (at 2074), and a median exceedance probability and average of the 5 shared socioeconomic pathways in IPCC (2021), and also regional sea level rise variations at Sydney as reported by the Physical Oceanography Distributed Active Archive Center (PO.DAAC), the sea level rise projection at 2074 is 0.33m (relative to 2010, when the 100 year ARI storm tide level of 1.45m AHD was determined);
- therefore, the 100 year ARI still water level (in the absence of wave action) at the site in 2074 is 1.87m AHD for a median sea level rise projection. This was determined as 1.45 (storm tide) + 0.09 (local wind setup) + 0.33 (sea level rise);
- assuming a 200mm thick floor slab, the soffit of the ground floor slab would be 100mm above this still water level;
- the finished ground floor level is 300mm above this still water level;
- using a 5% exceedance sea level rise projection of 0.58m, the 100 year ARI still water level (in the absence of wave action) in 2074 would be 2.12m AHD if local wind setup is included, but it is considered to be overly conservative to do so and excluding this the value reduces to 2.03m AHD;
- based on *AS 4997*, for a 50 year life a 500 year ARI design event should be adopted, which gives an encounter probability of 9.5% (that is, a 500 year ARI design event has a 9.5% probability of occurring at least once over a 50 year life);
- this means that rather than using a 100 year ARI event as per the EPL Study, a 500 year ARI design event should be adopted;
- the design still water level in 2074 for a 500 year ARI event and median sea level rise projection (and also conservatively including local wind setup) is 1.94m AHD, which is 230mm below the ground floor level;
- the equivalent value for a 5% exceedance sea level rise projection and no local wind setup is 2.09m AHD, which is 80mm below the ground floor level.

The proposed floor level is above the 500 year ARI design still water level in 2074 for a 5% exceedance sea level rise projection, which is considered to be acceptable.

Wave action would temporarily and periodically increase water levels further at times of high winds (particularly with a westerly component) and due to boat wash. Wave runup levels were determined in the EPL Study for five different foreshore edge treatments, but for an overwater structure this is not applicable.

An Estuarine Planning Level (EPL)[3] of 2.67m AHD can be adopted for the proposed development, which is 0.5m above the ground floor level. Below the EPL, only materials that can tolerate occasional inundation should be used.

To provide an acceptably low risk of damage to the proposed development from wave action, the following measures should be adopted:

- the structure should be designed to resist lateral and vertical (uplift) wave forces for the 500 year ARI design wave event;
- the potential for seabed scour due to wave action and boat wash should be considered in the piling design;
- these forces and scour levels should be provided by a coastal engineer as part of detailed design;

[3] Note that Estuarine Planning Levels are also referred to as Foreshore Planning Levels in the DCP.

- any electrical items or other items that would be damaged if they got wet should be raised at least above the EPL, or waterproofed if below that; and
- no potentially polluting items (if inundated) should be stored below the EPL.

If any timber is used below the EPL it is recommended that this is suitable for the marine environment. Examples of suitable species include turpentine, tallowwood, white mahogany, grey box, blackbutt, grey gum, yellow stringybark, white stringybark, woollybutt, forest red gum, mountain grey gum, brushbox and grey ironbark (NSW Maritime, 2005). Timber of Class 1 or 2 natural durability should be used below the EPL as per *AS 4997*.

7.5 Item 5: 100 year ARI Storm Tide Level and Freeboard

As noted in Section 7.4, the 100 year ARI design still water level at 2074 at the site is 1.87m AHD for a median sea level rise projection, and 2.03m AHD for a 5% exceedance sea level rise projection. As also discussed in Section 7.4, a 500 year ARI event was used for design.

It is not considered to be appropriate to add additional freeboard above the design water level for several reasons. Use of a freeboard in an estuarine inundation situation in Sydney Harbour is generally overly conservative. As defined in the *Floodplain Development Manual* (NSW Government, 2005) and also discussed in Department of Planning and Environment (2023a), freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels, such as wave action, localised hydraulic behaviour, and other effects such as climate change. It is usually applied as an increase to a design flood level to set a minimum habitable floor level.

It is common practice and appropriate to adopt a freeboard for rainfall-runoff related flooding. However, with estuarine inundation at the site and understanding the purpose of freeboard, it is evident that the design still water level generally takes account of the components that comprise freeboard. Specifically:

- there is a high level of confidence in the design still water level estimate, as it is based on analysis of over 100 years of data from Fort Denison;
- water levels only increase slightly for rarer events (eg 0.2m increase for the 10,000 year ARI event compared to the 100 year ARI event);
- wave action is to be considered in the design of the structure, so no wave-related freeboard component is required;
- there are no significant tributaries near the site that would be expected to cause localised hydraulic behaviour such that the design still water level would increase above the value adopted; and
- climate change (sea level rise) is included in the estimate of still water level.

It is reasonable to consider freeboard in this manner. As stated in the *Flood risk management manual* (Department of Planning and Environment, 2023b), “freeboard aims to provide reasonable certainty that the risk exposure selected in deciding on a specific event for development controls or mitigation works is achieved” (and it is considered that an acceptable level of risk has been achieved with the proposed floor level above a 500 year ARI design still water level at 2074 for a 5% exceedance sea level rise projection) and “freeboards for development control may vary with the type of flooding and with the type of development” (in this case we have estuarine flooding with relative certainty on probabilities, and direct account of additional effects such as wave action and sea level rise, plus a non-habitable development).

7.6 Item 6: Stability of the Existing Seawall

The existing seawall and revetment adjacent to the site, which is a public asset and not the responsibility of the applicant, has a number of defects as observed during the site inspection:

- gaps in the primary armour of the rock revetment;
- uncertainty as to whether these gaps could cause washout of underlying soil layers (there did not appear to be sufficient layers of primary armour nor adequate secondary armour and filter layers to prevent that occurring); and
- gaps in the mortar of the vertical sandstone wall that could also lead to washout of soil layers from landward of the wall if there are inadequate filter layers landward of the wall.

That stated, there is no evidence of significant instability of the existing seawall or revetment over the site footprint. However, other portions of the seawall and revetment (eg, 30m south of the site) have had collapse of the footpath occurring due to what appears to be removal of primary armour in the revetment and washout of underlying materials.

Construction of the proposed development would restrict access to the revetment and remaining portions of the vertical wall over the site footprint. It is thus recommended that the applicant works with the asset owner to ensure that sufficient maintenance of the revetment and seawall is undertaken over the footprint of the access deck to the facility prior to construction of the proposed works. The land-side supports for the access deck to the proposed development should also be designed not to place an unacceptable surcharge load on the seawall and revetment and to be appropriately outside the zone of influence of the seawall and revetment foundations.

In construction, care should be taken to avoid impacting on the stability of the seawall and revetment, eg by avoiding movement or operation of plant or equipment and avoiding stockpiling of significant mass of materials immediately adjacent to these structures.

7.7 Item 7: Design of Stormwater Drainage

Design of stormwater drainage for the proposed development has been provided in 5 drawings prepared by Acor Consultants. Three 5kL rainwater tanks are proposed, with roof drainage either directed to the tanks or directly to Iron Cove, and the tank overflow directed to Iron Cove via an 'Oceanguard' by Oceanprotect gully pit insert / basket.

The stormwater engineers should also ensure as part of the stormwater detailed design that drainage would not concentrate or build up landward of the seawall and revetment so as to adversely affect their stability.

7.8 Item 8: Certification that there is a Low Risk of Instability of the Site over the Economic Life of the Development

If the recommendations provided in Section 7.4 are followed, the proposed development would have an acceptably low risk of damage over the design life from a coastal engineering perspective, considering the design probability and design life advice in *AS 4997*.

If the recommendations provided in Section 7.6 are followed, it is considered that the seawall and revetment would not be adversely impacted by the proposed development. The asset owner is responsible for certifying and maintaining this seawall and revetment.

7.9 Item 9: Inundation of Development

The ground floor level of the development is above the 500 year ARI design still water level in 2074 for a 5% exceedance sea level rise projection, which is considered to be acceptable, in conjunction with adopting the measures outlined in Section 7.4 to deal with wave action.

7.10 Item 10: Recommendations to Minimise Risk to Occupants and Risk of Property Damage

Recommendations to minimise risk to occupants and risk of property damage were outlined in Section 7.4. If these recommendations are followed, the proposed development would be at an acceptably low risk of damage from a coastal engineering perspective.

It is unlikely that the proposed development would be occupied in the design event, as conditions would not be suitable for rowing and unlikely to even be suitable for being outdoors. It may be necessary to cease use of the site in severe storms towards the end of the design life so that occupants are not at significant risk of injury due to wave action. It is further noted that the largest component of elevated water level is astronomical tide, which is entirely predictable and independent of the storm event, so early warning is available. The inundation peak would also only have a duration of around 2 hours (at high tide).

7.11 Item 11: Certification that the Proposed Development will not Cause Adverse Impacts on Surrounding Lands

If the recommendations outlined in Section 7.6 are followed, the proposed development would not be expected to cause adverse impacts on the adjacent seawall and revetment.

The proposed development would not be expected to cause adverse impacts on the coastal environment as long as appropriate construction environmental controls are applied.

An aquatic ecology report prepared by Marine Pollution Research Pty Ltd concluded that the proposed works could be undertaken with a low risk of long-term impact on aquatic habitats at the site, with the potential impact of construction related impacts mitigated by the use of best practice work methods including the provisions outlined in Section 3.1 of their report.

The proposed development would not be expected to cause adverse impacts on public amenities and public use of the waterway, with the alignment and footprint of the proposal taking into consideration the surrounding waterway uses including a rowing regatta course and allowing for a 30m navigation channel to the existing moorings west and south of the site. Public access to the pontoon is understood to be proposed via an accessible gangway.

7.12 Item 12: Plans

The architectural plans on which the assessment was based were listed in Section 2.

7.13 Item 13: Inspection Date

Peter Horton of Horton Coastal Engineering inspected the site on 11 August 2023.

7.14 Item 14: Qualifications and Experience

The qualifications and experience of the report author, Peter Horton, were outlined in Section 1.

8. OTHER CONSENT MATTERS RELEVANT TO COASTAL/ESTUARINE ENGINEERING

8.1 Clause 6.5 of *Inner West Local Environmental Plan 2022*

Based on Clause 6.5(2) of *Inner West Local Environmental Plan 2022* (LEP 2022), "development consent must not be granted for development on land in the foreshore area[4] except for the following purposes:

(a) the alteration or rebuilding of an existing building wholly or partly in the foreshore area,
(b) boat sheds, sea retaining walls, wharves, slipways, jetties, waterway access stairs, swimming pools, fences, cycleways, walking trails, picnic facilities or other recreation facilities (outdoors)".

If the proposed works are considered to be a boatshed or recreation facility, then they are permissible at this location.

Based on Clause 6.5(3) of the LEP, "development consent must not be granted under subclause (2) unless the consent authority is satisfied that:

(a) the development will contribute to achieving the objectives for the zone in which the land is located, and
(b) the appearance of any proposed structure, from both the waterway and adjacent foreshore areas, will be compatible with the surrounding area, and
(c) the development will not cause environmental harm such as:
    (i) pollution or siltation of the waterway, or
    (ii) an adverse effect on surrounding uses, marine habitat, wetland areas, fauna and flora habitats, or
    (iii) an adverse effect on drainage patterns, and
(d) opportunities to provide continuous public access along the foreshore and to the waterway will not be compromised, and
(e) any historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out and of surrounding land will be maintained, and
(f) in the case of development for the alteration or rebuilding of an existing building wholly or partly in the foreshore area, the alteration or rebuilding will not have an adverse impact on the amenity or aesthetic appearance of the foreshore, and
(g) sea level rise or change of flooding patterns as a result of climate change has been considered".

With regard to (a), (b), (e), these are not coastal engineering matters so are not considered herein. Item (f) is not applicable.

[4] There is a foreshore area at the site located landward of the shoreline for tens of metres. It is uncertain if an overwater structure would be considered as being in the foreshore area, but for reporting purposes has been assumed to be.

With regard to (c), the development will not cause environmental harm as long as appropriate construction environmental controls are applied, and the recommendations in the aquatic ecology report are complied with. General drainage patterns would not be expected to be adversely affected by the development. The proposed works in the foreshore area would not impact on estuarine hydrodynamics and the like, with the deck suspended above almost all wave action, and water and waves flowing around the supporting piles.

With regard to (d), the proposed works incorporate stairs to maintain access along the foreshore footpath, and are not expected to impact on waterway users as discussed in Section 7.11.

With regard to (g), sea level rise has been considered in estimating extreme estuarine water levels in Section 7.5.

8.2 *State Environmental Planning Policy (Resilience and Hazards) 2021*

8.2.1 Preamble

Based on *State Environmental Planning Policy (Resilience and Hazards) 2021* (SEPP Resilience)[5] and its associated mapping, the site is within a "coastal environment area" and "coastal use area", and is therefore seemingly subject to Clause 2.10 and Clause 2.11 of SEPP Resilience. However, these clauses do not apply to land within the Foreshores and Waterways Area within the meaning of *State Environmental Planning Policy (Biodiversity and Conservation) 2021*, which is discussed in Section 8.3.

8.2.2 Clause 2.12

Based on Clause 2.12 of SEPP Resilience, "development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land".

The proposed development would not cause adverse impacts or increased risk of coastal hazards on that land or adjacent land, as the structure is to be supported on piles (allowing water and waves to flow around them) and adjacent lands having a seawall and revetment in place.

8.2.3 Clause 2.13

Based on Clause 2.13 of SEPP Resilience, "development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land".

It is understood that the *Parramatta River Estuary Coastal Zone Management Plan* (CZMP), that was gazetted on 1 July 2016, applies as a certified coastal management program at the site. The proposed development is consistent with the CZMP, eg Management Objective 7B to "ensure that recreational facilities continue to be provided for a range of different user groups at strategic locations".

[5] Formerly *State Environmental Planning Policy (Coastal Management) 2018*.

8.3 *State Environmental Planning Policy (Biodiversity and Conservation) 2021*

8.3.1 Preamble

The site is located entirely within a Foreshores and Waterways Area as per *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (SEPP Biodiversity)[6], see Section 8.3.3. It is also located within the "Sydney Harbour Catchment" (see Section 8.3.2) and a "Wetlands Protection Area" (see Section 8.3.4) as per SEPP Biodiversity.

8.3.2 Sydney Harbour Catchment (Clause 10.10)

Based on Clause 10.10 of SEPP Biodiversity, "the planning principles for land within the Sydney Harbour Catchment are as follows:

(a) development is to protect and, where practicable, improve the hydrological, ecological and geomorphological processes on which the health of the catchment depends,
(b) the natural assets of the catchment are to be maintained and, where feasible, restored for their scenic and cultural values and their biodiversity and geodiversity,
(c) decisions with respect to the development of land are to take account of the cumulative environmental impact of development within the catchment,
(d) action is to be taken to achieve the targets set out in *Water Quality and River Flow Interim Environmental Objectives: Guidelines for Water Management: Sydney Harbour and Parramatta River Catchment* (published in October 1999 by the Environment Protection Authority), such action to be consistent with the guidelines set out in *Australian Water Quality Guidelines for Fresh and Marine Waters* (published in November 2000 by the Australian and New Zealand Environment and Conservation Council),
(e) development in the Sydney Harbour Catchment is to protect the functioning of natural drainage systems on floodplains and comply with the guidelines set out in the document titled *Floodplain Development Manual 2005* (published in April 2005 by the Department),
(f) development that is visible from the waterways or foreshores is to maintain, protect and enhance the unique visual qualities of Sydney Harbour,
(g) the number of publicly accessible vantage points for viewing Sydney Harbour should be increased,
(h) development is to improve the water quality of urban run-off, reduce the quantity and frequency of urban run-off, prevent the risk of increased flooding and conserve water,
(i) action is to be taken to achieve the objectives and targets set out in the *Sydney Harbour Catchment Blueprint*, as published in February 2003 by the then Department of Land and Water Conservation,
(j) development is to protect and, if practicable, rehabilitate watercourses, wetlands, riparian corridors, remnant native vegetation and ecological connectivity within the catchment,
(k) development is to protect and, if practicable, rehabilitate land from current and future urban salinity processes, and prevent or restore land degradation and reduced water quality resulting from urban salinity,
(l) development is to avoid or minimise disturbance of acid sulfate soils in accordance with the Acid Sulfate Soil Manual, as published in 1988 by the Acid Sulfate Soils Management Advisory Committee".

[6] Formerly *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*.

With regard to (a), the proposed works would not be expected to affect hydrological and geomorphological processes significantly different to the existing situation.

With regard to (b) and (c), the proposed works would not be expected to affect the natural assets of the catchment or cause cumulative environment impact from a coastal engineering perspective.

With regard to (d) and (h), the proposed works would not adversely impact on water quality as long as appropriate construction environmental controls are applied.

With regard to (e), the functioning of natural drainage systems on floodplains would not be affected by the proposed works.

Items (f) and (g) are not coastal engineering matters.

With regard to (i), the objectives in the *Sydney Harbour Catchment Blueprint* mostly relate to maintenance and enhancement of the natural environment, scenic values and appropriate recreational activities; biodiversity; cultural heritage; and ecologically sustainable development. Catchment targets therein mostly relate to no net loss of threatened ecosystems, habitat or species; achieving appropriate water quality and river flow regimes; business for indigenous communities; and increased community awareness of cultural heritage. These items are either not relevant or are unaffected by the proposed works, except that recreational activities are enhanced by the proposed works.

With regard to (j), there are no riparian corridors nor remnant native vegetation known to exist in the vicinity of the proposed works.

With regard to (k), urban salinity is not an issue at the site.

With regard to (l), acid sulfate soils are not a coastal engineering matter, although it can be noted that significant excavation of the site exposing potential acid sulfate soils would not be expected.

8.3.3 Foreshores and Waterways Area (Clause 10.11)

Based on Clause 10.11 of SEPP Biodiversity, "the planning principles for land within the Foreshores and Waterways Area are as follows:

(a) development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores,
(b) public access to and along the foreshore should be increased, maintained and improved, while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation,
(c) access to and from the waterways should be increased, maintained and improved for public recreational purposes (such as swimming, fishing and boating), while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation,
(d) development along the foreshore and waterways should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands and foreshores,
(e) adequate provision should be made for the retention of foreshore land to meet existing and future demand for working harbour uses,

(f) public access along foreshore land should be provided on land used for industrial or commercial maritime purposes where such access does not interfere with the use of the land for those purposes,
(g) the use of foreshore land adjacent to land used for industrial or commercial maritime purposes should be compatible with those purposes,
(h) water-based public transport (such as ferries) should be encouraged to link with land-based public transport (such as buses and trains) at appropriate public spaces along the waterfront,
(i) the provision and use of public boating facilities along the waterfront should be encouraged".

Item (a) is not a coastal engineering matter, but it can be noted that the proposed works would not be expected to significantly adversely affect natural assets, given the findings of the aquatic ecology report,

With regard to (b), the proposed works would not affect public access along the foreshore on in the waterway (as discussed previously), and there are no wetlands, riparian lands nor remnant vegetation in its vicinity.

With regard to (c), the proposed works would improve access to the waterway for public recreational purposes.

Item (d) is not a coastal engineering matter.

Items (e) to (h) are not applicable.

With regard to (i), the public may become members of the rowing club, and public access to the pontoon is understood to be proposed via an accessible gangway, thus providing public boating (rowing) facilities.

8.3.4 Wetlands Protection Area

In Clause 10.63 of SEPP Biodiversity, various matters to be taken into consideration in relation to any development are listed. Given that the proposed works would not be expected to affect the quality of water entering the waterway (as long as appropriate construction environmental controls are applied), and assuming that it would not affect native vegetation and wildlife nor habitats for both indigenous and migratory species, nor affect the surface and groundwater characteristics of the site, nor any wetlands, this clause is satisfied.

9. CONCLUSIONS

A new rowing facility is proposed above the water in Iron Cove, adjacent to Leichhardt Park. The 500 year ARI design still water level at the site for a design life of 50 years and allowing for a 5% exceedance sea level rise projection is 2.03m AHD. This is below the ground floor level of 2.17m AHD. Taking wave action into account, the adopted Estuarine Planning Level (EPL) is 2.67m AHD.

Below the EPL, only materials that can tolerate occasional inundation should be used. To provide an acceptably low risk of damage to the proposed development from wave action, the following measures should be adopted:

- the structure should be designed to resist wave forces for the 500 year ARI design wave event;
- the potential for seabed scour should be considered in the piling design;
- these forces and scour levels should be provided by a coastal engineer as part of detailed design;
- any electrical items or other items that would be damaged if they got wet should be raised at least above the EPL, or waterproofed if below that; and
- no potentially polluting items (if inundated) should be stored below the EPL.

If the recommendations provided in Section 7.4 are followed, the proposed development would have an acceptably low risk of damage over the design life from a coastal engineering perspective, considering the design probability and design life advice in *AS 4997*. If the recommendations provided in Section 7.6 are followed, it is considered that the seawall and revetment would not be adversely impacted by the proposed development.

The applicant should work with the seawall and revetment asset owner to ensure that sufficient maintenance of the seawall and revetment is undertaken over the footprint of the access deck to the facility prior to construction of the proposed works. The land-side supports for the access deck to the proposed development should also be designed not to place an unacceptable surcharge load on the seawall and revetment. In construction, care should be taken to avoid impacting on the stability of the seawall and revetment, eg by avoiding movement or operation of plant or equipment and avoiding stockpiling of significant mass of materials immediately adjacent to these structures.

The proposed works are consistent with Clauses 6.5 of *Inner West Local Environmental Plan 2022*, Clauses 2.12 and 2.13 of *State Environmental Planning Policy (Resilience and Hazards) 2021*, and *State Environmental Planning Policy (Biodiversity and Conservation) 2021* for the matters considered herein.

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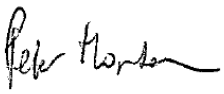
11. SALUTATION

If you have any further queries, please do not hesitate to contact Peter Horton via email at peter@hortoncoastal.com.au or via mobile on 0407 012 538.

Yours faithfully
HORTON COASTAL ENGINEERING PTY LTD



Peter Horton
Director and Principal Coastal Engineer