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6 January 2023

## **Estuarine Risk Management Report on 137 Riverview Road Avalon Beach**

### **1. INTRODUCTION AND BACKGROUND**

It is proposed to construct an inclinor at 137 Riverview Road Avalon Beach. A Development Application (DA2022/1548) has been submitted to Northern Beaches Council for these works. As the property is potentially affected by estuarine hazards, it is subject to the *Pittwater 21 Development Control Plan* (DCP)<sup>1</sup>, in particular Chapter B3.9, and the *Estuarine Risk Management Policy for Development in Pittwater* (Estuarine Policy, which is Appendix 7 of Part D of the DCP). *State Environmental Planning Policy (Resilience and Hazards) 2021* (SEPP Resilience) should also be considered.

Horton Coastal Engineering Pty Ltd was engaged to complete the estuarine risk management report required by Council, as set out herein. The report author is Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER]. Peter has postgraduate qualifications in coastal engineering and 30 years of coastal engineering experience, including numerous studies along the Pittwater shoreline and particularly along Riverview Road at Avalon Beach. 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 Engineers Australia. He has inspected the area in the vicinity of the subject property on several occasions in the last two decades or so, including a specific recent inspection of the property on 20 November 2022.

Note that all levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present.

### **2. INFORMATION PROVIDED**

Horton Coastal Engineering was provided with 3 drawings of the proposed works prepared by Inclined Lifts (Drawing Nos 028/1 to 028/3), all dated 23 June 2022 and Revision P1. A site survey by Degotardi Smith & Partners (Reference 35841, Revision A and dated 10 June 2021) was also provided.

### **3. EXISTING SITE DESCRIPTION**

A vertical aerial view of the subject property in relation to the Pittwater waterway is provided in Figure 1, with a closer oblique aerial view provided in Figure 2.

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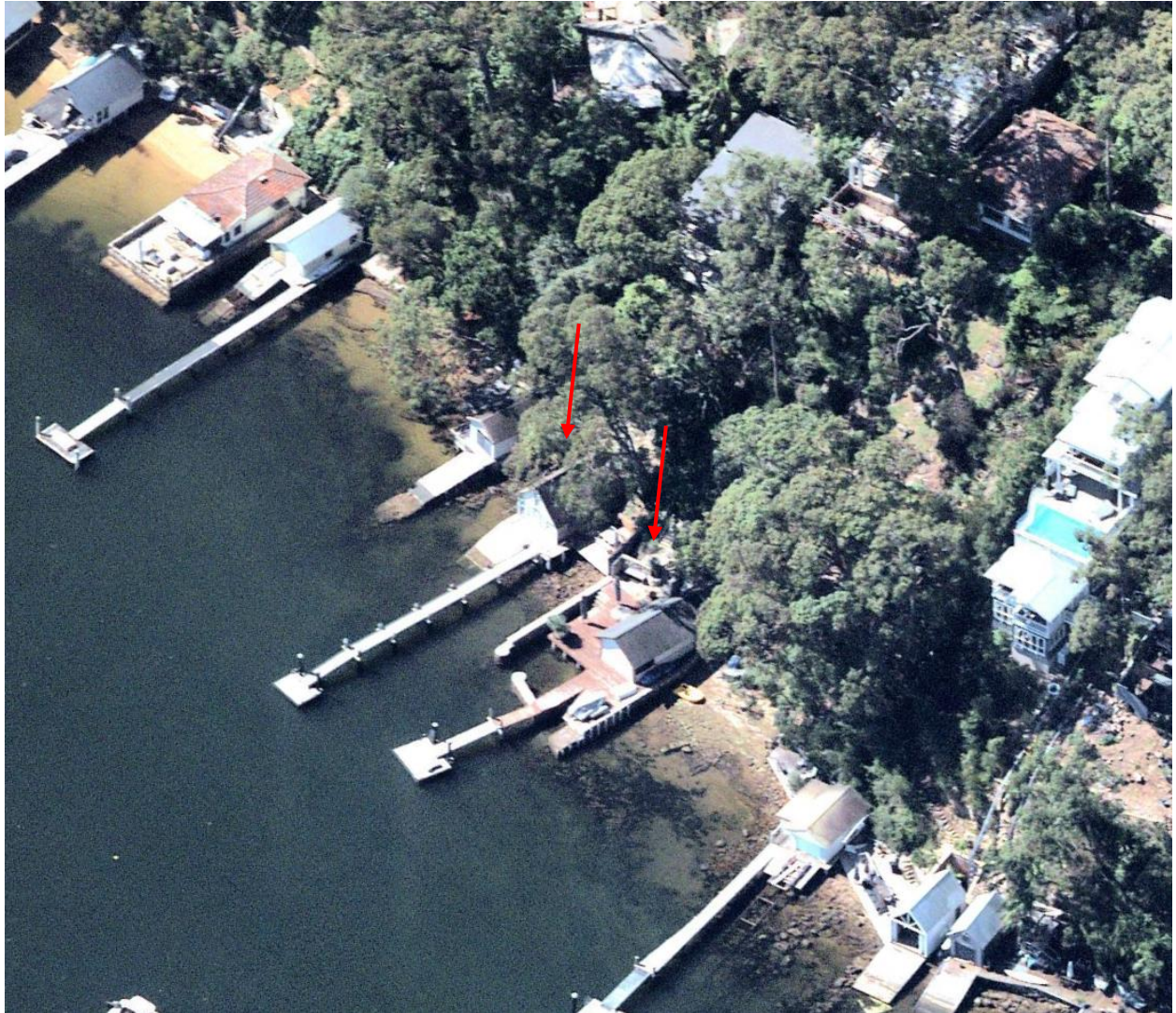
<sup>1</sup> The version up to Amendment 27 (effective from 18 January 2021) was considered herein.





**Figure 1: Aerial view of subject property on 30 August 2018**





**Figure 2: Oblique aerial view of subject property (between arrows) on 5 April 2022, facing NE**

The property is located about 780m south of Stokes Point and adjacent to the Pittwater waterway, and is most exposed to wind-wave fetches from the north, SSW/SW (towards Location A in Figure 1, fetch length of 4.2km), and WSW (towards Lovett Bay, fetch length of 4.0km). A photograph of the foreshore at the subject property is provided in Figure 3.

Based on the survey, the seawall at the property (visible in Figure 3) has a crest level of about 1.66m AHD. At the time of the site inspection, the seawall crest was about 1.5m above the adjacent sandy beach<sup>2</sup>, so having a visible toe level of about 0.2m AHD. Landward of the seawall, there is a pathway with stone flagging and then a sandstone retaining wall with a crest level of about 2.65m AHD.

The boatshed to the right in Figure 3 has a floor level of 1.81m AHD. Ground levels increase moving landward to about 38m AHD at Riverview Road.

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<sup>2</sup> Likely to be more correctly described as bedrock with a veneer of sand above.





**Figure 3: View of foreshore at subject property towards the ESE on 20 November 2022 (proposed location of inclinator is towards left of image)**

#### **4. PROPOSED DEVELOPMENT**

It is proposed to construct an inclinator about 1m from the northern boundary of the property, extending from near the dwelling (at 15.6m AHD) down to the foreshore. The carriage floor level at the bottom station is to be 1.81m AHD. The existing sandstone retaining wall landward of the seawall is to be rebuilt to allow access for the inclinator.

#### **5. DESIGN LIFE**

In the Estuarine Policy, it is noted that a design project life of 100 years should be adopted, unless otherwise justified. A 60-year design life (that is, at 2083) has been adopted for the proposed development. This is the same design life as adopted in the *Coastal Zone Management Plan [CZMP] for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)* that was gazetted on 14 July 2017. Although this CZMP does not geographically apply at the subject property, it is the only gazetted CZMP in the former Pittwater Council area, and hence is relevant to consider in the selection of design life.

As justified in the CZMP, a 60 year life is considered to be appropriate for infill residential development as it is consistent with the design life used in various Australian Standards (eg *AS 3600 – Concrete structures*), tax legislation, and community expectations. That stated, a 60 year life is considered to be conservative for an inclinator, which is non-habitable and only occasionally used.

## **6. ESTUARINE PROCESSES**

### **6.1 Design Still Water Level at End of Design Life**

In Cardno (2015), the 100-year Average Recurrence Interval (ARI) present day water level in the region covering the subject property is reported as 1.50m AHD. This includes the effects of astronomical tide and storm surge (combined level of 1.44m AHD), plus local wind setup (0.06m). Wave action can temporarily and periodically increase water levels above this level, particularly in severe storms if they generate wind-waves that propagate towards the property.

Cardno (2015) estimated a 2050 Estuarine Planning Level (EPL) of 2.66m AHD, and 3.16m AHD at 2100, at the foreshore<sup>3</sup>. These EPL's include wave runup and overtopping effects and a freeboard of 0.3m<sup>4</sup>, and do not include any reduction with distance landward of the foreshore.

At present at the subject property, Mean High Water is approximately 0.5m AHD and Mean High Water Springs is about 0.6m AHD. The combined astronomical tide and storm surge level for a monthly and bi-annual event is about 1.0m and 1.2m AHD respectively. Corresponding water levels only increase slightly for rarer events, eg 1 year ARI level of 1.24m AHD, 10 year ARI level of 1.34m AHD and 50 year ARI water level of 1.41m AHD (Department of Environment, Climate Change and Water [DECCW] (2010).

In Cardno (2015), sea level rise values of 0.4m at 2050 and 0.9m at 2100 were applied relative to 2010 (based on DECCW, 2010), which is not correct as those benchmarks were derived relative to 1990, and historical sea level rise has not been discounted. Appropriate equivalent sea level rise values (relative to 2010) with discounting of historical sea level rise would be 0.34m at 2050 and 0.84m at 2100.

For the proposed design life of 60 years (at 2083), it would be possible to interpolate between the 2050 and 2100 benchmarks. However, given the non-linear rate of sea level rise, 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.

Using the same methodology as applied in the acceptable risk assessment in the *Coastal Zone Management Plan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)* prepared by the author for Council in 2017, and using a base year of 2010 as Cardno (2015) water levels were derived at 2010, the sea level rise values presented in Table 1 (at 2083) were determined for the five illustrative scenarios (shared socioeconomic pathways, SSP's<sup>5</sup>) considered in IPCC (2021)<sup>6</sup>.

This includes regional sea level rise variations at Sydney as reported by the Physical Oceanography Distributed Active Archive Center (PO.DAAC), a NASA Earth Observing System Data and Information System data centre operated by the Jet Propulsion Laboratory in Pasadena, California. The sea level rise values were determined at 2083, relative to the average sea level from a 1995-2014 baseline (taken to be at 2005).

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<sup>3</sup> Assuming that the seawall had a crest level of 1.5m AHD.

<sup>4</sup> Use of a freeboard is not considered to be appropriate in a wave runup scenario.

<sup>5</sup> Known as representative concentration pathways in the previous IPCC (2013) assessment.

<sup>6</sup> The five illustrative scenarios represent varying projected greenhouse gas emissions, land use changes and air pollutant controls in the future.

**Table 1: Mean sea level rise (m) at Sydney from a 1995-2014 average level (taken at 2005) to 2083 derived from IPCC (2021) and PO.DAAC**

Emissions Scenario (Shared Socioeconomic Pathway)	Exceedance Probability		
	95% exceedance	Median	5% exceedance
SSP1-1.9	0.12	0.27	0.52
SSP1-2.6	0.16	0.32	0.60
SSP2-4.5	0.24	0.41	0.71
SSP3-7.0	0.30	0.49	0.81
SSP5-8.5	0.35	0.56	0.92
Average	0.23	0.41	0.71

Taking the median exceedance probability and average of the 5 SSP's, a sea level rise value of 0.41m at 2083 (relative to 2005) was derived. Given that Cardno (2015) water levels were derived at 2010, the sea level rise should be determined relative to 2010. Watson (2020) found that the rate of sea level rise from satellite altimetry in the SE Australia region was 3.5mm/year from 1992-2019. Applying this rate from 2005 to 2010, the projected sea level rise from 2010 to 2083 at Sydney is 0.39m.

Therefore, the design 100 year ARI estuarine still water level at 2083 is 1.89m AHD. This still water level is 80mm above the carriage floor level at the bottom station.

## 6.2 Wave Action

Cardno (2015) estimated that the 100 year ARI wave climate in the region covering the subject property was a significant wave height of 0.92m (average of the highest one-third of waves) and mean wave period of 2.4s (or peak spectral wave period of 3.4s assuming a 1.4 multiplier).

In the design event at 2083, the seawall would be submerged and waves would break at the seawall crest and propagate landward towards the new retaining wall. It is considered reasonable to adopt an Estuarine Planning Level (EPL) of 2.81m AHD, taken as the design still water level plus the wave height<sup>7</sup>.

## 7. RISKS OF DAMAGE TO PROPOSED INCLINATOR AND MITIGATION OF THOSE RISKS

Any fixed electrical or other items of inclinator infrastructure that could be damaged by inundation or wave runup, such as the inclinator controls, should be located above the EPL of 2.81m AHD or waterproofed below that level.

The inclinator should be designed so that the carriage docks temporarily at the bottom landing and then automatically returns to the top landing station after say several hours, thus meaning that the carriage would not be inundated in a coastal storm due to being left unattended at the bottom landing.

Materials should be selected that are inundation compatible below the EPL and suitable for the marine environment, eg with suitable allowances for corrosion. There should be allowances for buoyancy and wave forces on fixed components of the inclinator (derived by a coastal engineer) as part of detailed design.

<sup>7</sup> The full quantum of the wave height is unlikely to overtop the seawall, but there will be runup on the face of the retaining wall landward of the seawall that would increase the elevation that wave action reaches.



If the recommendations within this Section 7 are followed, the risks of damage to the proposed inclinor from estuarine inundation would be suitably mitigated, and it would have an adequately low risk of damage.

## **8. MERIT ASSESSMENT**

### **8.1 Section B3.9 of the Pittwater 21 DCP**

Based on the DCP (numbering added herein for convenience):

1. All development or activities must be designed and constructed such that they will not increase the level of risk from estuarine processes for any people, assets or infrastructure in surrounding properties; they will not adversely affect estuarine processes; they will not be adversely affected by estuarine processes; and
2. All structural elements below the Estuarine Planning Level shall be constructed from flood compatible materials; and
3. All structures must be designed and constructed so that they will have a low risk of damage and instability due to wave action and tidal inundation; and
4. All electrical equipment, wiring, fuel lines or any other service pipes and connections must be waterproofed to the Estuarine Planning Level; and
5. The storage of toxic or potentially polluting goods, materials or other products, which may be hazardous or pollute the waterway, is not permitted to be stored below the Estuarine Planning Level; and
6. For existing structures, a tolerance of up to minus 100mm may be applied to the Estuarine Planning Level in respect of compliance with these controls.
7. To ensure Council's recommended flood evacuation strategy of 'shelter in place' it will need to be demonstrated that there is safe pedestrian access to a 'safe haven' above the Estuarine Planning Level.

With regard to Item 1, the proposed works would not be expected to change estuarine processes nor increase the level of risk in surrounding areas for the design event, given that they are landward of a seawall and follow an existing slope. If the measures outlined in Section 7 are adopted, the proposed inclinor would be at an acceptably low risk of being adversely affected by estuarine processes.

With regard to Item 2, see Section 7.

With regard to Item 3, for the proposed works to have a low risk of damage and instability due to wave action and tidal inundation, there should be allowance for buoyancy and wave forces on fixed components of the inclinor (derived by a coastal engineer) as part of detailed design, as noted in Section 7.

With regard to Item 4, this has been adopted as discussed in Section 7.

Item 5, Item 6 and Item 7 are not applicable to the proposed inclinor.

With further regard to Item 7, occupants are not at significant risk of injury on the site for the design coastal storm event, and can shelter-in-place in the dwelling without any need for evacuation. 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).

No mitigation works are proposed that would significantly modify the wave action or tidal inundation behaviour within the development site (including the filling of land, the construction of retaining structures and the construction of wave protection walls).

## **8.2 *Estuarine Risk Management Policy for Development in Pittwater***

The requirements of the *Estuarine Risk Management Policy for Development in Pittwater* (Estuarine Policy) have been met herein by consideration of:

- estuarine processes and the Estuarine Planning Level in Section 6; and
- the controls in Section B3.9 of the Pittwater 21 DCP in Section 8.1.

Furthermore, although the current Estuarine Policy does not have a form that is required to be filled in, Council has in the past requested that a form provided in a former Estuarine Policy be filled in, as provided at the end of the document herein.

## **8.3 *Clause 7.8 of Pittwater Local Environmental Plan 2014***

### **8.3.1 *Preamble***

The proposed inclinor is in the Foreshore Area as it is located west of the Foreshore Building Line. Therefore, Clause 7.8 of *Pittwater Local Environmental Plan 2014* (LEP 2014) applies, as discussed below.

### **8.3.2 *Clause 7.8(1)***

In Clause 7.8(1) of LEP 2014, it is stated that the “objectives of this clause are as follows:

- (a) to ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area,
- (b) to ensure continuous public access along the foreshore area and to the waterway”.

The proposed inclinor would not significantly impact on natural foreshore processes (given that it is landward of a seawall and follows an existing slope), and would not affect public access as the works are entirely within private property.

### **8.3.3 *Clause 7.8(2)***

Based on Clause 7.8(2) of LEP 2014, “development consent must not be granted for development on land in the foreshore area except for the following purposes:

- (a) the extension, alteration or rebuilding of an existing building wholly or partly in the foreshore area, if the levels, depth or other exceptional features of the site make it appropriate to do so,
- (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)”.



An inclinor is not specifically identified in Clause 7.8(2)(b). However, given the intent of this Clause to allow access stairs, and the fact that the proposed inclinor enables access to the foreshore and would not impact on estuarine processes, the inclinor is acceptable from a coastal engineering perspective.

#### 8.3.4 Clause 7.8(3)

Based on Clause 7.8(3) of LEP 2014, “development consent must not be granted under this clause 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, or
  - iv) the removal or disturbance of remnant riparian vegetation, and
- (d) the development will not cause congestion or generate conflict between people using open space areas or the waterway, and
- (e) opportunities to provide continuous public access along the foreshore and to the waterway will not be compromised, and
- (f) 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
- (g) 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
- (h) sea level rise, coastal erosion and recession, or change of flooding patterns as a result of climate change, have been considered”.

For Item (a), the subject property is zoned as C4 Environmental Living, for which the objectives in LEP 2014 are as follows:

- to provide for low-impact residential development in areas with special ecological, scientific or aesthetic values;
- to ensure that residential development does not have an adverse effect on those values;
- to provide for residential development of a low density and scale integrated with the landform and landscape; and
- to encourage development that retains and enhances riparian and foreshore vegetation and wildlife corridors.

The proposed development does not impact on any of these objectives from a coastal engineering perspective.

For Item (b), this is not a coastal engineering matter.

For Item (c), the proposed development would not cause any significant pollution or siltation of the waterway and would not adversely impact on adjacent areas, if appropriate construction

environmental controls are applied. Also, no remnant riparian vegetation is to be removed as part of the proposed works. Therefore, this item is satisfied.

For Item (d), the proposed works would not affect public use of the foreshore and would not cause any conflict with waterway uses, as they are entirely on private property.

For Item (e), the proposed works would not affect public access along the foreshore area.

For Item (f), there is no known historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out.

Item (g) is not applicable.

For Item (h), sea level rise was considered in Section 6.

#### *8.3.5 Clause 7.8(4)*

Based on Clause 7.8(4) of LEP 2014, “in deciding whether to grant consent for development in the foreshore area, the consent authority must consider whether and to what extent the development would encourage the following:

- (a) continuous public access to and along the foreshore through or adjacent to the proposed development,
- (b) public access to link with existing or proposed open space,
- (c) public access to be secured by appropriate covenants, agreements or other instruments registered on the title to land,
- (d) public access to be located above mean high water mark,
- (e) the reinforcing of the foreshore character and respect for existing environmental conditions”.

As stated above, the proposed works are entirely on private land and would not affect public access along the foreshore.

### **8.4 State Environmental Planning Policy (Resilience and Hazards) 2021**

#### *8.4.1 Preamble*

Based on *State Environmental Planning Policy (Resilience and Hazards) 2021* (SEPP Resilience) and its associated mapping, the subject property is within a “coastal environment area” (see Section 8.4.2) and a “coastal use area” (see Section 8.4.3).

#### *8.4.2 Clause 2.10*

Based on Clause 2.10(1) of SEPP Resilience, “development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

- (a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,
- (b) coastal environmental values and natural coastal processes,



- (c) the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,
- (d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,
- (e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
- (f) Aboriginal cultural heritage, practices and places,
- (g) the use of the surf zone”.

With regard to (a), the proposed works are in a developed residential area. The works would not be expected to adversely affect the biophysical, hydrological (surface and groundwater) and ecological environments. Existing stormwater drainage arrangements are not to be significantly altered. The proposed works would not be a source of pollution as long as appropriate construction environmental controls are applied.

With regard to (b), the proposed works would not be expected to adversely affect estuarine processes in Pittwater.

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

With regard to (d), this is not a coastal engineering matter so is not definitively considered herein. That stated, there are no undeveloped headlands or rock platforms in proximity to the proposed development, and no marine vegetation in the area to be developed. If there is no native vegetation and fauna and their habitats of significance at the site, this clause has been satisfied.

With regard to (e), the proposed works would not impact on public open space and access to and along the foreshore, being entirely within private property.

With regard to (f), a search of the Heritage NSW “Aboriginal Heritage Information Management System” (AHIMS) was undertaken on 6 January 2023. This resulted in no Aboriginal sites being recorded nor Aboriginal places being declared within at least 200m of the subject property.

With regard to (g), there is no significant or practical surf zone offshore of the subject property, so this is not applicable. That stated, the proposed works would not be expected to alter wave and water level processes seaward of the property.

Based on Clause 2.10(2) of SEPP Resilience, “development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

- (a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or
- (b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
- (c) if that impact cannot be minimised—the development will be managed to mitigate that impact”.

The proposed development has been designed and sited to avoid the adverse impacts referred to in Clause 2.10(1).

#### 8.4.3 Clause 2.11

Based on Clause 2.11(1) of SEPP Resilience, “development consent must not be granted to development on land that is within the coastal use area unless the consent authority:

- (a) has considered whether the proposed development is likely to cause an adverse impact on the following:
  - (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
  - (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,
  - (iii) the visual amenity and scenic qualities of the coast, including coastal headlands,
  - (iv) Aboriginal cultural heritage, practices and places,
  - (v) cultural and built environment heritage, and
- (b) is satisfied that:
  - (i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or
  - (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
  - (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and
- (c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development”.

With regard to (a)(i), the proposed works would not impact on foreshore access, as discussed previously.

With regard to (a)(ii), (a)(iii), and (c), these are not coastal engineering matters so are not considered herein.

With regard to (a)(iv), there are no Aboriginal sites recorded nor Aboriginal places declared within at least 200m of the subject property, as noted in Section 8.4.2.

With regard to (a)(v), there are no environmental heritage items as per Schedule 5 of *Pittwater Local Environmental Plan 2014* within 180m of the subject property.

With regard to (b), the proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 2.11(1).

#### 8.4.4 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”.

As discussed in Section 8.1, the proposed development is unlikely to have a significant impact on estuarine (coastal) hazards nor increase the risk of estuarine (coastal) hazards in relation to any other land.



#### 8.4.5 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”.

No certified coastal management program applies at the subject property.

## 9. CONCLUSIONS

It is proposed to construct an inclinator at 137 Riverview Road Avalon Beach. For a design life of 60 years, the adopted Estuarine Planning Level (EPL) is 2.81m AHD.

If the recommendations in Section 7 are followed, the risks of damage to the inclinator from estuarine inundation would be suitably mitigated, and it would have an adequately low risk of damage.

Specifically, any fixed electrical or other items of inclinator infrastructure that could be damaged by inundation should be located above the EPL or waterproofed below that level. The inclinator should be designed so that the carriage docks temporarily at the bottom landing and then automatically returns to the top landing station. Materials should be selected that are inundation compatible below the EPL and suitable for the marine environment. There should be allowances for buoyancy and wave forces on fixed components of the inclinator (derived by a coastal engineer) as part of detailed design.

The proposed development satisfies the requirements of Section B3.9 of the Pittwater 21 DCP, the *Estuarine Risk Management Policy for Development in Pittwater*, Clause 7.8 of *Pittwater Local Environmental Plan 2014*, and *State Environmental Planning Policy (Resilience and Hazards) 2021* for the matters outlined herein.

## 10. REFERENCES

Cardno (2015), *Pittwater Estuary Mapping of Sea Level Rise Impacts*, LJ2882/R2658v7, Revised Draft, for Pittwater Council, February

Department of Environment, Climate Change and Water [DECCW] (2010), *Coastal Risk Management Guide: Incorporating sea level rise benchmarks in coastal risk assessments*, DECCW 2010/760, August, ISBN 978 1 74232 922 2

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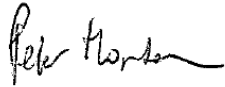
Watson, Phil J (2020), "Updated Mean Sea-Level Analysis: Australia", *Journal of Coastal Research*, Volume 36, Issue 5, September, pp. 915-931

## **11. SALUTATION**

If you have any further queries, please do not hesitate to contact Peter Horton via email at [peter@hortoncoastal.com.au](mailto: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

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*Estuarine Risk Management Policy for Pittwater Form No. 1 is provided overleaf*



FORM NO. 1

**To be submitted with Estuarine Risk Management Report**

**Development Application for** Greg O'Neill

Name of Applicant

**Address of site** 137 Riverview Road Avalon Beach

***Declaration made by a Coastal Engineer as part of an Estuarine Risk Management Report***

I, Peter Horton on behalf of Horton Coastal Engineering Pty Ltd  
(Insert Name) (Trading or Company Name)

on this the 6<sup>th</sup> January 2023 (date)

certify that I am a Coastal Engineer as defined by the Estuarine Risk Management Policy for Development in Pittwater and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least \$2 million.

**Please mark appropriate box**

- ☒ I have prepared the detailed Estuarine Risk Management Report referenced below in accordance with the Estuarine Risk Management Policy for Development in Pittwater
- ☐ I am willing to technically verify that the detailed Estuarine Risk Management Report referenced below has been prepared in accordance with the Estuarine Risk Management Policy for Development in Pittwater
- ☐ I have examined the site and the proposed development/alteration in detail and, as detailed in my report, am of the opinion that the Development Application only involves Minor Development/Alterations or is sited such that a detailed Estuarine Risk Management Report is not required.

**Estuarine Risk Management Report Details:**

Report Title:

Estuarine Risk Management Report on 137 Riverview Road Avalon Beach

Report Date:

6 January 2023

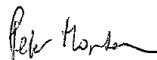
Author: Horton Coastal Engineering Pty Ltd

**Documentation which relate to or are relied upon in report preparation:**

See Section 2 and Section 10 of report

I am aware that the above Estuarine Risk Management Report, prepared for the above mentioned site is to be submitted in support of a Development Application for this site and will be relied on by Northern Beaches Council as the basis for ensuring that the estuarine risk management aspects of the proposed development have been adequately addressed to achieve an acceptable risk management level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that all reasonable and practical measures have been identified to remove foreseeable risk.

Signature



Name

Peter Horton

Chartered Professional Status

MIEAust CPEng

Membership No.

452980