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Coastal Engineering Advice on 1132 Pittwater Road Collaroy

1. INTRODUCTION AND BACKGROUND

It is proposed to undertake alterations and additions at 1132 Pittwater Road Collaroy (hereafter denoted as the 'site'), for which a Development Application is to be submitted to Northern Beaches Council. Given the proximity of the site to Collaroy-Narrabeen Beach, a coastal engineering assessment is required by Council, as set out herein.

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 33 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia (MIEAust) and Chartered Professional Engineer (CPEng) registered on the National Engineering Register. He 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.

In previous employment, Peter was the main author of the *Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach* (CZMP) prepared for Warringah Council in 2014, and the *Coastal Erosion Emergency Action Subplan for Beaches in Warringah* prepared for Warringah Council in 2012. He has also prepared DA coastal engineering reports at numerous locations along Collaroy-Narrabeen Beach over the last two decades or so. Peter has inspected the area in the vicinity of the site on numerous occasions in the last few decades, including specific recent inspections of the site on 16 July 2023 and 10 September 2024.

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 13 drawings (Drawing Numbers DA1002 to 1005, 1007, 2001 to 2004, 3001, 4001, 4002 and 5001) of the proposed development prepared by Rapid Plans, all Revision 8 and dated 12 December 2024. A site survey completed by CMS Surveyors (Drawing 22638detail, Issue 2, dated 16 September 2024) was also provided.

3. EXISTING SITE DESCRIPTION

Collaroy-Narrabeen Beach is about 3.5km long, extending between Narrabeen Head and the Narrabeen Lagoon entrance in the north, to a cliff at Collaroy Rock Baths in the south. The site

is located between Stuart Street and Ramsay Street at Collaroy, landward of a rock revetment (which was designed by Horton Coastal Engineering) that has recently been constructed at and seaward of the site in accordance with DA2017/05910.

At this location, the beach faces approximately east, and is somewhat sheltered from the dominant south to south-easterly storm wave climate offshore of Sydney, but is fully exposed to waves from the east and north of east. An oblique aerial view of the site is provided in Figure 1, and site photographs are given in Figure 2 and Figure 3.

Based on the survey provided, ground levels at the site vary from about 6.0m AHD at the seaward boundary, 6.2m AHD about 1m to 3m seaward of the dwelling (which has a ground floor level of 7.15m to 7.16m AHD) eastern balcony, 5.2m AHD under the balcony, 5.3m AHD (north) and 5.6m AHD (south) adjacent to the seaward face of the dwelling, 5.8m to 5.9m AHD at the landward edge of the dwelling, 5.6m to 5.7m AHD at the landward property boundary, and 5.4m AHD in the gutter at Pittwater Road. The rock revetment seaward of the site has an as-built crest level of about 6.1m AHD.

The revetment has been covered in sand and this area has been partly vegetated. The beach seaward of the vegetation has a typical width to the shoreline at mean sea level (based on the NSW Beach Profile Database) of about 30m to 70m, varying with erosion and accretion cycles.

In June 2016, a coastal storm occurred that caused erosion to extend under the dwelling at the site (Figure 4). At that time there were upper level and lower level balconies, and a storage area under the lower balcony. The undermining of the lower level balcony evident in Figure 4 led to it being demolished, and also note the remnants of the storage area in Figure 4.

Figure 1: Oblique aerial view of site (at arrow) on 22 July 2024, facing west

Figure 2: View of site (at arrow) from near revetment crest on 10 September 2024, facing SW

Figure 3: View of site (at arrow) from beach on 10 September 2024, facing WNW

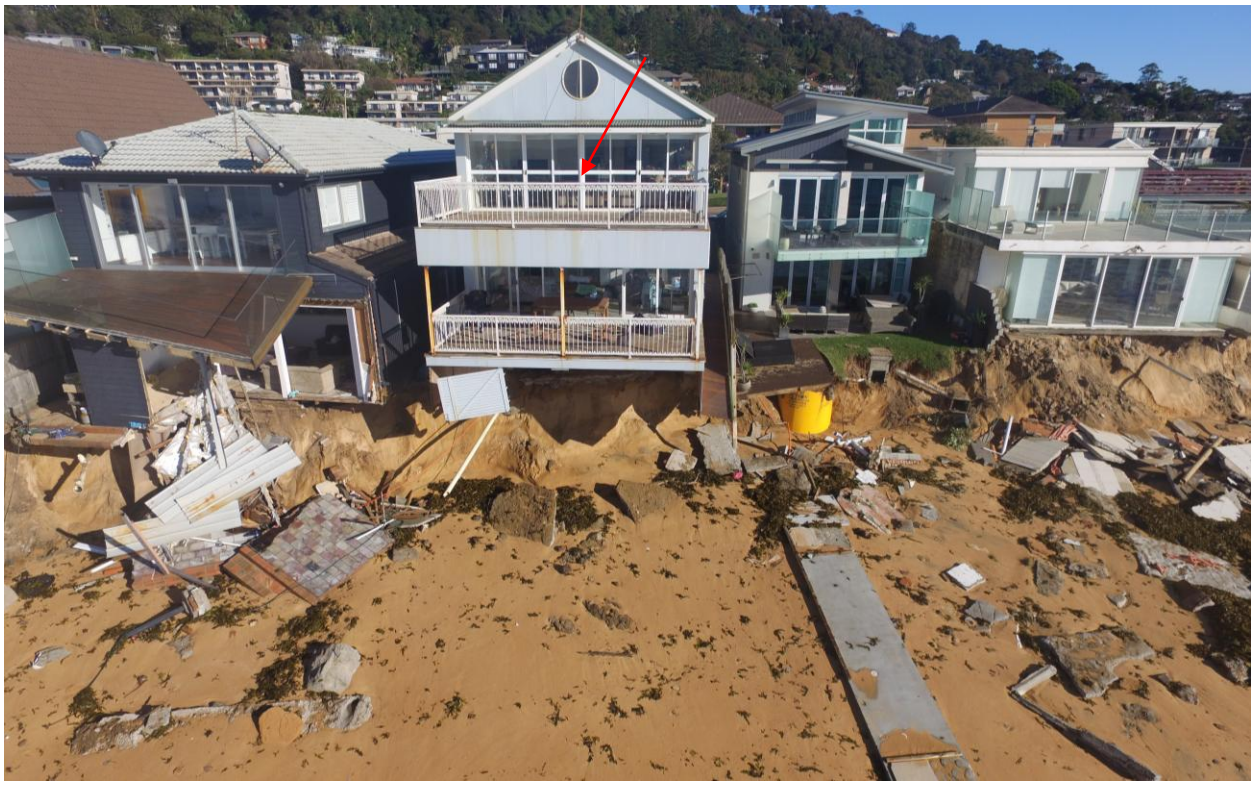


Figure 4: View of coastal storm damage at site on 10 June 2016, with lower balcony evident prior to being demolished, as well as remnants of storage area under the lower balcony

4. PROPOSED DEVELOPMENT

It is proposed to undertake alterations and additions at the site, including a new ground floor deck on the seaward side with a floor level of 7.09m AHD (essentially replacing the balcony that was in place prior to the June 2016 storm), with a basement (storage area and bathroom) underneath with a floor level of 4.60m AHD (upgrading the storage area that was in place prior to the June 2016 storm), and new stairs on the northern side. The stairs are to fall to 4.53m AHD (at the door entry to the basement) moving west from 6.20m AHD on the seaward side, and then rise moving further west to about 6.8m where the stairs will link to an existing ramp rising to the ground floor entry. Ground levels are to be increased to about 6.2m AHD along most of the southern side of the dwelling.

5. SUBSURFACE CONDITIONS AND FOUNDATION REQUIREMENTS

A geotechnical investigation of the site has been completed by Nepean Geotechnics (2024). Based on five Perth Sand Penetrometer tests within the basement footprint, this area was found to generally be underlain by sand down to the limit of investigation at about 3.0m AHD (2.3m AHD at one location). A borehole undertaken as part of a geotechnical investigation (Nepean Geotechnics, 2023) of the adjacent property to the south of the site (1130 Pittwater Road[1]) generally found sand down to the limit of investigation at -2.9m AHD.

The proposed development would not be expected to cause a surcharge load that would impact on the revetment seaward of the site, as the geotechnical modelling undertaken for the revetment DA found a satisfactory factor of safety applying a dwelling surcharge load of 100kPa, which is understood likely to be less than the proposed works. As part of detailed

[1] Note that in Nepean Geotechnics (2024), this property is incorrectly referred to as No. 1 Pittwater Road.

design, the structural engineer should advise Horton Coastal Engineering if the surcharge load would exceed 100kPa. The proposed development is landward of the zone of influence of the revetment. As part of detailed design, the footings should be extended below the zone of influence of the sewer and stormwater located in the services easement seaward of the proposed development.

There are no additional foundation requirements from a coastal engineering perspective given that the proposed development is located landward of a certified rock revetment.

6. EROSION/RECESSION COASTAL HAZARDS

Nielsen et al (1992) has delineated various coastal hazard zones, as discussed below and shown in Figure 5, assuming an entirely sandy (erodible) subsurface. These are not applicable at the site, as it is landward of a rock revetment. However, for historical reference and to emphasise the importance of maintenance of the rock revetment to provide protection to the site from erosion/recession, the zones are explained below.

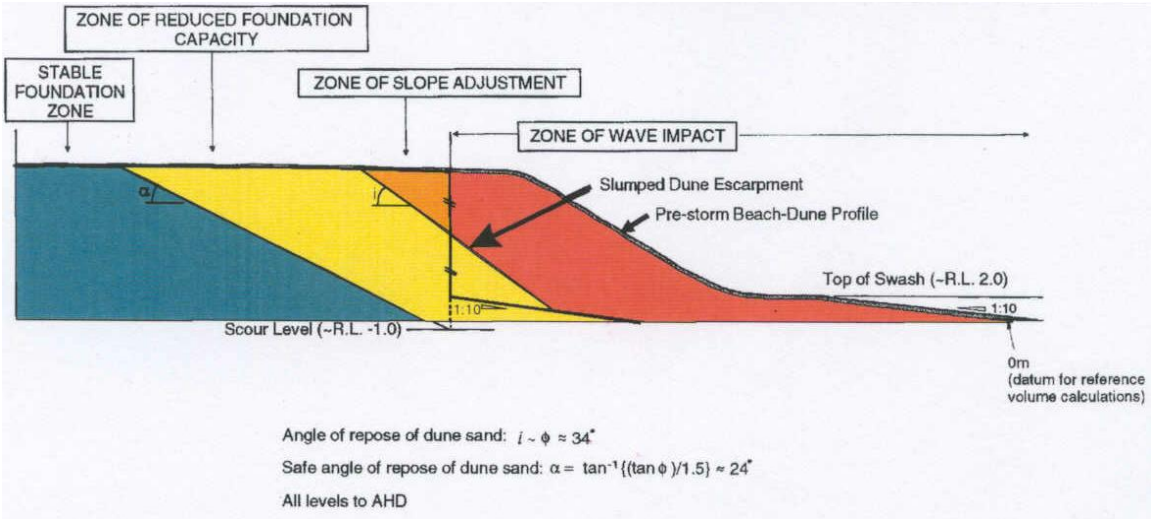


Figure 5: Schematic representation of coastal hazard zones (after Nielsen et al, 1992)

The Zone of Wave Impact (ZWI) delineates an area where any structure or its foundations would suffer direct wave attack during a severe coastal storm. It is that part of the beach which is seaward of the beach erosion escarpment.

A Zone of Slope Adjustment (ZSA) is delineated to encompass that portion of the seaward face of the beach that would slump to the natural angle of repose of the beach sand following removal by wave erosion of the design storm demand. It represents the steepest stable beach profile under the conditions specified.

A Zone of Reduced Foundation Capacity (ZRFC) for building foundations is delineated to take account of the reduced bearing capacity of the sand adjacent to the storm erosion escarpment. Nielsen et al (1992) recommended that structural loads should only be transmitted to soil foundations outside of the ZRFC (ie landward or below), as the factor of safety within the ZRFC is less than 1.5 during extreme scour conditions at the face of the escarpment. In general (without the protection of a terminal structure such as a seawall or revetment), dwellings/structures not piled and located within the ZRFC would be considered to have an inadequate factor of safety.

In Figure 6, various coastal hazard lines are depicted at the site, with an outline of the basement of the proposed development also shown in yellow. It is reiterated that the hazard lines are not applicable at the site with the revetment in place.

Geomarine (1991) devised former adopted Council hazard lines at Collaroy-Narrabeen Beach, with these lines (1991 ZWI, 1991 ZSA and 1991 ZRFC), all defined for an immediate planning period, depicted in Figure 6. Even though they are superseded, the *Warringah Local Environmental Plan 2011* Coastline Hazard Map still depicts these lines.

As part of the CZMP, revised (compared to 1991) coastal hazard lines were delineated at Collaroy-Narrabeen Beach for immediate, 2050 and 2100 planning periods. These CZMP hazard lines (Immediate ZSA, 2050 ZSA and 2100 ZSA) are depicted in Figure 6, with all 3 lines at the landward edge of the ZSA.

In the CZMP, a line defining the required minimum setback for new piled beachfront development located landward of appropriately design and constructed coastal protection works at Collaroy-Narrabeen Beach was delineated, denoted as the "minimum setback for piled development" in Figure 6. The proposed development extends up to about 3m seaward of this line.

In Figure 6, a revetment maintenance setback and landward edge of a sewer and stormwater services easement are also depicted. The proposed development is immediately landward of this services easement.

As the main author of the CZMP, it is emphasised that the minimum setback for new piled beachfront development at this location was not delineated on the basis of coastal engineering risk considerations. Rather, it was delineated based on the following factors:

- equity (for example, view loss for neighbours due to existing building lines);
- beach amenity (for example, visual impact of structures near the public beach);
- available space for construction of protective works on private land; and
- protective works maintenance (allowing space for plant and equipment to work seaward of development to undertake maintenance on the protective works if required).

However, the adopted 10m setback (landward of the seaward property boundary) for the minimum setback for new piled development was arbitrary, simply being chosen to be less than 15m as generally applied elsewhere on the beach. It was not based on a detailed analysis of the above issues. Moving forward, with a rock revetment now constructed between Stuart Street and Ramsay Street, it is considered that the intent of the CZMP would be met by adopting the landward edge of the services easement as the minimum setback for new piled development between Stuart Street and Ramsay Street, given that this:

- matches the existing building alignment of many structures on this section of beach, with structures at 1126, 1128, 1130, 1132 and 1140 Pittwater Road already extending to the landward edge of the services easement;
- is landward of the easements for services and revetment maintenance, as required, so would not cause any impact on future services and revetment maintenance access; and
- provides the only equitable outcome.

Figure 6: Coastal hazard lines and CZMP setbacks at site (at pink arrow), with proposed basement/deck in yellow, and aerial photograph taken on 23 November 2024

It is thus considered that the small extent of works extending seaward of the minimum setback for piled development is acceptable from a coastal planning perspective, and consistent with the intent of the CZMP. It is acceptable overall if it provides a satisfactory outcome in terms of view loss and amenity impacts on adjacent development, which are not coastal engineering considerations and hence not addressed herein.

It can also be noted that a similar reasoning for works extending seaward of the minimum setback for piled development was applied in DA2023/1438 for 1130 Pittwater Road Collaroy, which was approved by Council on 1 March 2024.

7. COASTAL INUNDATION COASTAL HAZARDS

In Geomarine (1991) and the CZMP, a present day wave runup level of 8m AHD was adopted at Collaroy-Narrabeen Beach in the vicinity of the site (which can be taken as a 100 year ARI[2] wave runup level exceeded by 2% of waves), assuming a foreshore at the runup level or higher. However, this runup level is unlikely to be realised at the site as the foreshore is around 2m below this level, and severe runup that overtopped the revetment would 'fold over' the foreshore crest level and travel as a bore at shallow depth for a distance inland.

In the revetment DA coastal engineering report, mean overtopping discharges were determined to be 0.7L/s/m for the present day, and 2.7L/s/m at 2077 (allowing for sea level rise), for a 100 year ARI storm. Therefore, some wave overtopping of the revetment can be expected in severe storms. The risk of this impacting on the proposed development is reduced given that the proposed dwelling setback is at least about 7.5m landward of the revetment, but the following measures are required to reduce coastal inundation risks to acceptable levels:

- any power points and other electrical items that could be damaged by inundation shall be raised at least 0.8m above the ground floor in the basement;
- the glass windows on the seaward side of the basement shall have toughened and laminated glass such that the glass holds together when shattered, and shall also have conventional weatherproofing features along its base;
- the basement floor and walls shall be able to withstand inundation (eg concrete or tiles) up to 0.8m above the floor;
- any items not tolerant of inundation, or potentially polluting if inundated, shall be stored at least 0.8m above the basement floor;
- drainage shall be provided to the basement floor, or at the landing of the steps adjacent to the basement door, to reduce the risk of ponding of water in the basement; and
- cross falls shall be introduced into the basement to enable it to drain if inundated.

8. CONSENT MATTERS

8.1 *Warringah Local Environmental Plan 2011*

Based on Clause 6.5(3) of the *Warringah Local Environmental Plan 2011* (LEP), "development consent must not be granted unless the consent authority is satisfied that the development:

(a) will not significantly adversely affect coastal hazards, and
(b) will not result in significant detrimental increases in coastal risks to other development or properties, and
(c) will not significantly alter coastal hazards to the detriment of the environment, and

[2] Average recurrence interval.

(d) incorporates appropriate measures to manage risk to life from coastal risks, and
(e) avoids or minimises exposure to coastal hazards, and
(f) makes provision for relocation, modification or removal of the development to adapt to coastal hazards and NSW sea level rise planning benchmarks".

Based on Clause 6.5(4), "development consent must not be granted unless the consent authority is satisfied that the foundations of the development have been designed to be constructed having regard to coastal risk".

With regard to Clauses 6.5(3)(a), (b) and (c), the proposed development is unlikely to have a significant impact on coastal hazards or increase the risk of coastal hazards in relation to any other land (or the environment), as it is located landward of a certified rock revetment, and as long as the measures to reduce the risk of inundation damage outlined in Section 7 are adopted. The proposed development has an acceptably low risk of being affected by erosion/recession coastal hazards as it is landward of a certified rock revetment, and Clauses 6.5(3)(d) and (e) are therefore satisfied, again as long as the measures to reduce the risk of inundation damage outlined in Section 7 are adopted.

With regard to Clause 6.5(3)(f), the proposed development has been designed to not be damaged by coastal hazards for an acceptably rare storm and acceptably long design life, rather than relocated or removed. This is consistent with the CZMP.

With regard to Clause 6.5(4), requirements for foundations of the proposed development were outlined in Section 5.

8.2 *Warringah Development Control Plan 2011*

Part E9 of the *Warringah Development Control Plan 2011* (DCP)[3] has discussion on "Coastline Hazard". Based on the DCP, the risk of damage from coastal processes is to be reduced through development having appropriate setbacks and foundations. If foundation design is carried out consistent with Section 5, the proposed development would be appropriately founded. The proposed setback of the development is consistent with the intent of the CZMP, as discussed at the end of Section 6.

Furthermore, based on Part E9 of the DCP, the applicant must demonstrate compliance with the *Northern Beaches Coastal Erosion Policy*, the CZMP and the *Collaroy-Narrabeen Protection Works Design Specifications*. As no protection works are proposed (they have already been constructed), neither the *Northern Beaches Coastal Erosion Policy* (except as noted below) nor *Collaroy-Narrabeen Protection Works Design Specifications* are generally applicable for the subject DA. As noted above, the proposed setbacks are consistent with the intent of the CZMP.

The proposed development has an acceptably low risk of being damaged by coastal erosion/recession as it is landward of a certified rock revetment.

With regard to the *Northern Beaches Coastal Erosion Policy*, as noted above this is mostly focussed on the construction of coastal protection works. However, it can be noted that:

- as per 2(b), the risk of damage to the proposed development from coastal processes is acceptably low; and

[3] Amendment 22 of the DCP was reviewed, which commenced on 1 June 2022.

- as per 2(d), the proposed development would not adversely impact on adjoining properties or coastal processes.

Therefore, the proposed development complies with the *Northern Beaches Coastal Erosion Policy,* where relevant.

Also, based on the DCP, development must be constructed with a suitable floor level or in a manner that minimises the risk of coastal inundation for severe coastal storms occurring over the next 50 years. This is the case for the proposed development if the requirements outlined in Section 7 are implemented.

8.3 *State Environmental Planning Policy (Resilience And Hazards) 2021*

8.3.1 Preamble

Based on *State Environmental Planning Policy (Resilience and Hazards) 2021*[4] (SEPP Resilience) and its associated mapping, the site is the site is within a "coastal environment area" (see Section 8.3.2) and "coastal use area" (see Section 8.3.3).

8.3.2 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, and would not be expected to adversely affect the biophysical and hydrological (surface and groundwater) environments. The proposed works are at an already developed site, and existing stormwater arrangements are not to be significantly altered. The proposed development would not be a source of pollution as long as appropriate construction environmental controls are applied.

Assuming that there is no native vegetation or fauna and their habitats at the site that would be impacted by the works, the proposed works would not be expected to adversely affect the ecological environment.

[4] Encompassing the former *State Environmental Planning Policy (Coastal Management) 2018*.

With regard to (b), the proposed development would not be expected to adversely affect coastal environmental values or natural coastal processes over its design life, as it is at an acceptably low risk of damage from erosion/recession and inundation for an acceptably rare storm and over an acceptably long design life (60 years for the rock revetment).

With regard to (c), the proposed development 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 necessarily definitively considered herein. That stated, there are no undeveloped headlands nor rock platforms in proximity to the proposed development, no marine vegetation in the area to be developed, and no known native vegetation of significance at the site. No significant impacts on marine fauna and flora would be expected as a result of the proposed development, as the development would not be expected to interact with subaqueous areas over the design life.

With regard to (e), the proposed development 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 19 December 2024. This resulted in no Aboriginal sites nor Aboriginal places being recorded or declared within at least 1km of the site.

With regard to (g), the proposed development is entirely on private property and would not be expected to interact with the surf zone over its design life, being landward of a rock revetment.

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).

8.3.3 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 development would not impact on foreshore or beach 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 particular Aboriginal sites nor Aboriginal places within 1km of the proposed development, as noted in Section 8.3.2.

With regard to (a)(v), the nearest environmental heritage item to the proposed development listed in Schedule 5 of the LEP is the house known as "Chez Nous" at 19 Frazer Street Collaroy, some 220m from the site. The proposed development would not be expected to impact on this or more distant heritage items.

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).

8.3.4 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 noted in Section 8.1, the proposed development would not be expected to give rise to any increased coastal hazard on that land or adjacent land.

8.3.5 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".

The CZMP only operated as a certified coastal management program until 31 December 2023, but consistency with the CZMP has been discussed in Section 6.

8.3.6 Synthesis

The proposed development satisfies the requirements of *State Environmental Planning Policy (Resilience and Hazards) 2021* for the matters considered herein.

9. CONCLUSIONS

It is proposed to undertake alterations and additions at 1132 Pittwater Road Collaroy. The foundations of the proposed development should satisfy the requirements described in Section 5. The measures outlined in Section 7 are required to be adopted to reduce coastal inundation risks to acceptable levels.

The proposed works extend seaward of the "minimum setback for piled development" from the CZMP, but landward of the revetment maintenance setback and a sewer and stormwater services easement. This is considered to be acceptable from a coastal planning perspective, and consistent with the intent of the CZMP, as discussed in Section 6.

If the requirements outlined in Section 5 and Section 7 are followed, the proposed development would be consistent with the coastal engineering requirements listed in Clause 6.5 of *Warringah Local Environmental Plan 2011,* Part E9 of the *Warringah Development Control Plan*, *State Environmental Planning Policy (Resilience and Hazards) 2021*, the CZMP, and the *Northern Beaches Coastal Erosion Policy*.

10. REFERENCES

Geomarine (1991), "Narrabeen-Collaroy Fishermans Beach, Criteria for the Siting and Design of Foundations for Residential Development", *Geomarine Report No. 69021R02*, in association with Coffey Partners International, for Warringah Shire Council, February

Nepean Geotechnics (2023), *Geotechnical Investigation Report, Proposed Residential Development, 1130 Pittwater Road, Collaroy NSW (Lot 1 on DP121939)*, Report No R23146.Rev1, prepared for Azzwic Holdings Pty Ltd, 21 September

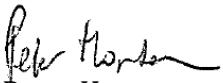
Nepean Geotechnics (2024), *Geotechnical Investigation and Preliminary Acid Sulfate Assessment Report, Proposed Alterations and Additions, 1132 Pittwater Road, Collaroy NSW (Lot 5 on DP121939)*, Report No. R24150.Rev1, 27 November

Nielsen, AF; Lord, DB and HG Poulos (1992), "Dune Stability Considerations for Building Foundations", *Australian Civil Engineering Transactions*, Institution of Engineers Australia, Volume CE34, No. 2, June, pp. 167-173

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



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