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Estuarine and Flood Risk Management Report Relating to 28 Delecta Avenue Clareville

1. INTRODUCTION AND BACKGROUND

Alterations and additions are proposed at 28 Delecta Avenue Clareville (the 'site'), for which a Development Application (DA) is to be submitted to Northern Beaches Council. As the site is potentially affected by estuarine hazards, it is subject to *Pittwater 21 Development Control Plan* (DCP)¹, in particular Chapter B3.7, and the *Estuarine Risk Management Policy for Development in Pittwater* (hereafter denoted as the Estuarine Policy). The site is also potentially affected by overland flow flooding, and is therefore subject to Chapter B3.11 of the DCP.

Horton Coastal Engineering Pty Ltd was engaged to prepare an Estuarine and Flood Risk Management Report to meet Council's requirements, as set out herein. The report author is Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER]. Peter has postgraduate qualifications in coastal and water engineering and 33 years of coastal and water engineering experience, including numerous estuarine risk management studies along the Pittwater shoreline and at Clareville, and preparation of numerous flood management reports on the Northern Beaches. He is a Member of Engineers Australia 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.

Peter has inspected the area in the vicinity of the site on several occasions in the two decades or so, including specific recent inspections of the site on 13 May 2022 and 21 November 2024. He completed a similar report to the report herein as part of a previous DA (DA2022/0986) that was approved by Council on 19 December 2022.

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, and in the Pittwater waterway adjacent to the site.

2. INFORMATION PROVIDED

Horton Coastal Engineering was provided with 7 drawings (Drawings DA01 to 06) prepared by Gerald Gilchrist and Associates, Job 5024, all dated 1 November 2024. A site survey prepared by DP Surveying was also provided, reference 1886 and dated 19 January 2022.

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

3. EXISTING SITE DESCRIPTION

The site is located adjacent to the Pittwater waterway about 700m east of Taylors Point, with broad and zoomed aerial views depicted in Figure 1 and Figure 2 respectively. At the site location, the adjacent Clareville Beach faces NW. Views of the site are provided in Figure 3, Figure 4 and Figure 5 (all photographs taken on 21 November 2024).



Figure 1: Broad aerial view of site in Pittwater waterway on 6 April 2016

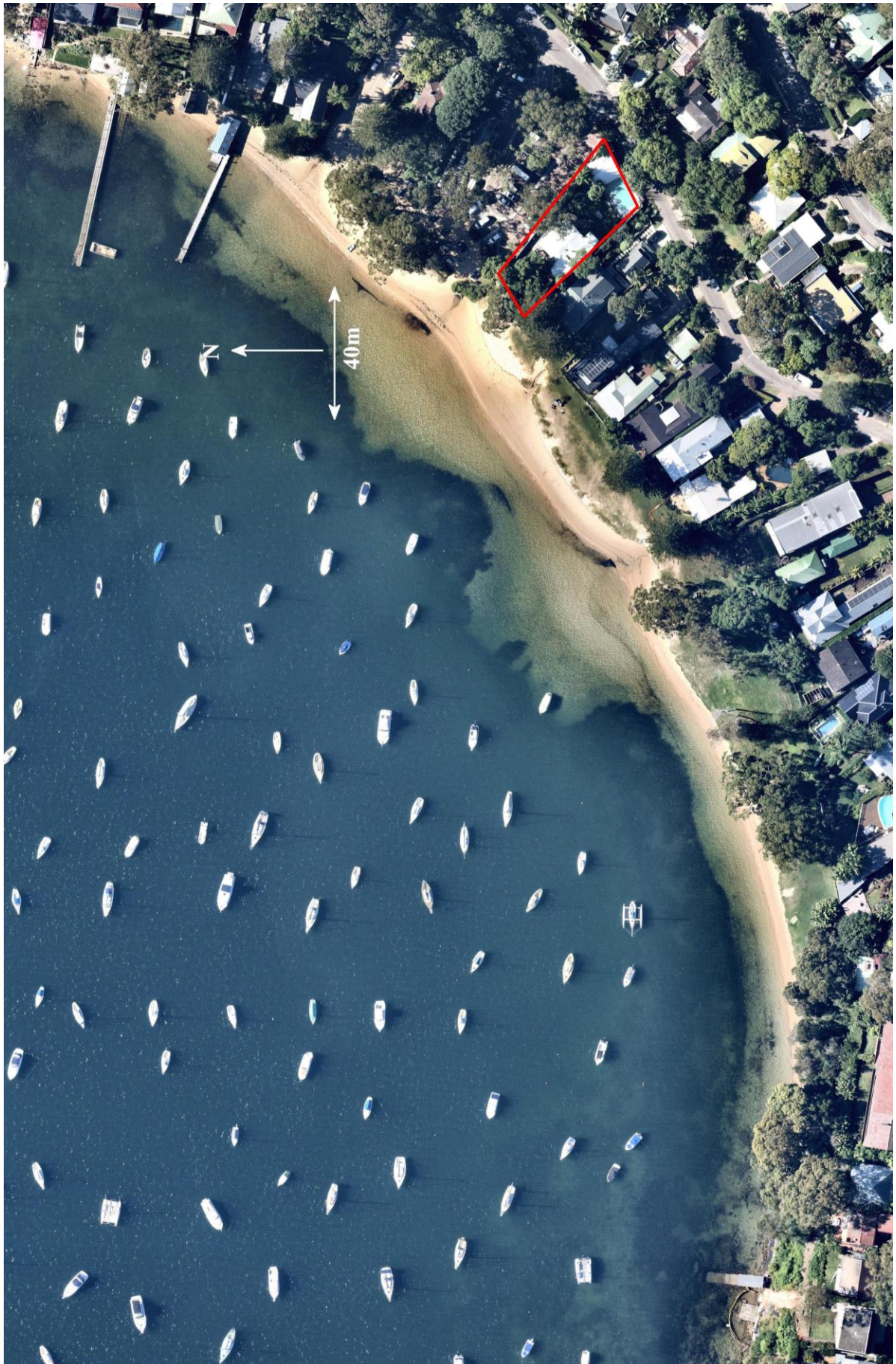


Figure 2: Zoomed aerial view of site (red outline) on 18 May 2022



Figure 3: View of site (at arrow) from Clareville Beach, facing SE

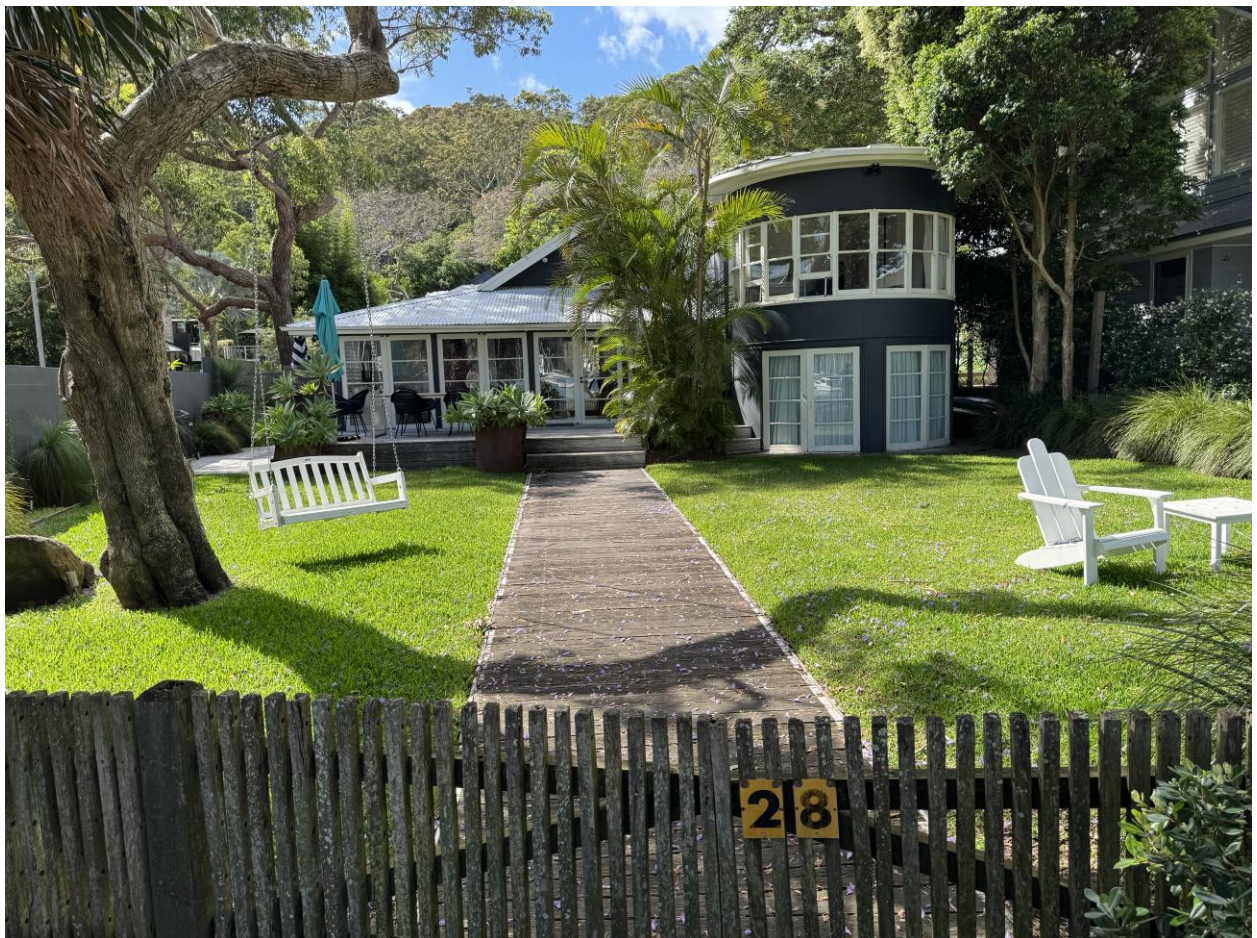


Figure 4: View of seaward portion of site, facing SE



Figure 5: View looking seaward from site, facing NW

Based on the survey provided, ground levels at the site vary from about 2.9m to 3.0m AHD at the landward site boundary, reducing to about 1.9m to 2.1m AHD at the seaward site boundary. Most of the existing dwelling has a ground floor level of 2.75m AHD, with the SW portion at 2.90m AHD. The NW portion comprises a non-habitable (ceiling height of only 1.7m) storage area with a floor level of 2.25m AHD. The garage floor level is 2.81m AHD.

Seaward of the site, a sandy beach falls to the Pittwater waterway. Based on NSW Government LiDAR data, the shoreline at 0m AHD is typically about 35m seaward of the site.

Based on the hydrographic chart AUS 215, the seabed slope from 0m AHD to -11m AHD is about 1:10 (vertical:horizontal), and the seabed level reduces to about -13m AHD at 220m offshore.

4. PROPOSED DEVELOPMENT

It is proposed to demolish and rebuild the garage with a higher floor level of 2.92m AHD, with a second level (studio) added above. Deck additions are proposed on the northern and southern sides of the dwelling, with a finished level of about 2.75m AHD. A second level addition to part of the dwelling is also proposed.

No changes are proposed to the existing two-level NW portion of the dwelling, which has the non-habitable storeroom on the lower level. The existing habitable floor levels of 2.75m AHD and 2.90m AHD are to be retained on the ground floor.

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 2085) 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 site, 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.

Based on *Australian Standard AS 4997 - Guidelines for the Design of Maritime Structures*, and classifying the works as a 'normal structure', the required design event for a 60 year life is 600 year Average Recurrence Interval (ARI). Therefore, a 600 year ARI design event has been adopted herein, which has a 9.5% probability of occurring over the 60 year life.

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 site is reported as 1.52m AHD. This includes the effects of astronomical tide and storm surge (combined level of 1.44m AHD), and local wind setup (0.08m). 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 site.

Based on Department of Environment, Climate Change and Water [DECCW] (2010) and using linear-log extrapolation, the 600 year ARI elevated still water level at the site is 1.60m AHD, including local wind setup².

At present at the site, 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).

Cardno (2015) estimated a 2050 Estuarine Planning Level (EPL) of 2.73m AHD, and 3.21m AHD at 2100, at the foreshore³. These EPL's include wave runup and overtopping effects and a freeboard of 0.3m⁴, and do not include any reduction with distance landward of the foreshore.

² It is conservative to include local wind setup at this site. 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 be expected to cause a setdown rather than setup at the site. Setup at the site would only be expected to occur for winds blowing with a N through NW to SW component.

³ For a grassed or sandy 1V:10H slope with a crest level of 2m AHD, which is approximately applicable at the site.

⁴ Use of a freeboard is not necessarily considered to be appropriate in a wave runup scenario.

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

For the proposed design life of 60 years (at 2085), it would be possible to interpolate between the 2050 and 2100 sea level rise values noted above. However, given the non-linear rate of sea level rise and lack of probabilistic analysis associated with these values, it is considered to be most appropriate to directly derive the sea level rise value for the design life 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 *CZMP 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 2085) were determined for the five illustrative scenarios (shared socioeconomic pathways, SSP's⁵) considered in IPCC (2021)⁶.

Table 1 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 2085, relative to the average sea level from a 1995-2014 baseline (taken to be at 2005).

Table 1: Sea level rise (m) at Sydney from a 1995-2014 average level (taken at 2005) to 2085 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	0.54
SSP1-2.6	0.16	0.33	0.61
SSP2-4.5	0.24	0.42	0.73
SSP3-7.0	0.31	0.51	0.85
SSP5-8.5	0.37	0.58	0.96
Average	0.24	0.42	0.74

Taking the median exceedance probability and average of the 5 SSP's, a sea level rise value of 0.42m at 2085 (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 2085 at Sydney is 0.40m.

Therefore, the design 600 year ARI estuarine still water level at 2085 is 2.00m AHD. This still water level is below the lowest habitable floor level in the dwelling of 2.75m AHD.

⁵ Known as representative concentration pathways in the previous IPCC (2013) assessment.

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

6.2 Wave Action

Cardno (2015) estimated that the 100 year ARI wave climate in the region covering the site was a significant wave height of 0.98m (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). A 600 year ARI wave height can be estimated as 1.03m, assuming a similar form of linear-log extrapolation as applied to water levels. The site is also exposed to wash from passing vessels, with wave heights expected to be of a similar magnitude (up to about 0.8m).

In the design event at 2085, waves would overtop the foreshore at about 2.0m AHD, and propagate towards the dwelling. Using the methodology outlined in Cardno (2015), the runup level in the design event would be 2.49m AHD (ignoring landward attenuation), and it is considered reasonable to adopt an Estuarine Planning Level (EPL) of 2.49m AHD for the purpose of this investigation. The proposed lowest habitable floor level in the dwelling is 2.75m AHD, which is above the EPL. The garage floor level of 2.92m AHD is also above the EPL, although it would not be expected that wave runup would reach the garage in the design event.

No freeboard has been applied in the EPL above. Use of a freeboard in an estuarine inundation situation in Pittwater is generally overly conservative. As defined in the *Floodplain Development Manual* (NSW Government, 2005), 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 catchment 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);
- 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.

7. OVERLAND FLOW FLOODING

Based on a Flood Information Report prepared by Council, the site is affected by overland flow flooding as follows:

- maximum 1% Annual Exceedance Probability (AEP) flood level of 2.30m AHD, with a maximum depth of 0.39m;
- maximum Flood Planning Level of 2.80m AHD (applying a freeboard of 0.5m);
- maximum 1% AEP flood level of 2.43m AHD for a climate change (30% rainfall intensity increase and 0.9m sea level rise) scenario, with a corresponding value of 2.37m AHD adjacent to the dwelling; and
- Probable Maximum Flood (PMF) Level of 2.47m AHD, with a maximum depth of 0.54m.

Taking any calculation point within the site, the 1% AEP flood level is 2.2m AHD or lower, and the Flood Planning Level is thus 2.70m AHD or lower. In reality, the proposed development is beyond the 1% AEP flood extent and mostly beyond the PMF flood extent (with the PMF extent just crossing the NE corner of the dwelling). Given that the proposed development is outside the 1% AEP flood extent, it is considered conservative to adopt a Flood Planning Level of 2.70m AHD at the dwelling.

The existing/proposed dwelling habitable floor levels of 2.75m and 2.90m AHD are above the Flood Planning Level of 2.70m AHD and beyond the 1% AEP flood extent, so are acceptable from a flood risk perspective. The lowest existing/proposed habitable ground floor level of 2.75m AHD is also 0.38m above the 1% AEP climate change flood level, which includes a 0.9m allowance for sea level rise⁷, and 0.28m above the PMF level.

The garage floor level of 2.92m AHD is above the Flood Planning Level, but overland flow flooding is not applicable at the garage as it is well beyond the 1% AEP and PMF flood extents.

8. RISKS OF DAMAGE TO PROPOSED DEVELOPMENT AND MITIGATION OF THOSE RISKS

With the habitable portions of the ground floor, and garage, above the design EPL for a 60 year life, and the dwelling beyond the 1% AEP flood extent and above the Flood Planning Level, there are no requirements from an estuarine inundation or flooding perspective, except that:

- any new structural elements in the dwelling below 2.7m AHD should comprise materials that would withstand inundation;
- as part of detailed design, the development should be designed to resist buoyancy, hydrostatic and wave forces as advised by a coastal/water engineer (considering flowing water with debris);
- any electrical items below 2.7m AHD should be waterproofed; and
- no potentially toxic, polluting or buoyant items shall be stored below 2.7m AHD.

It is recommended that a difference in ground floor level and surrounding natural ground is maintained as proposed into the future, as this is a simple and effective mechanism for significantly reducing the risk of inundation flowing into the dwelling.

With regard to the non-habitable NW portion at 2.25m AHD, which is not being altered as part of the proposed development, note that existing low-level windows are to have their sills raised to 2.75m AHD, with the area below replaced with flood resistant materials. This would reduce the risk of this non-habitable storage area being inundated.

9. MERIT ASSESSMENT

9.1 *Pittwater 21 DCP*

9.1.1 *Chapter B3.7 (Estuarine Hazard)*

Based on Chapter B3.7 of the DCP (numbering added herein for convenience):

⁷ Adoption of 0.9m sea level rise is equivalent to a 2150 (128 year) planning period using a median exceedance probability and average of the 5 shared socioeconomic pathways in IPCC (2021), and also allowing for regional sea level rise variations at Sydney as reported by the Physical Oceanography Distributed Active Archive Center (PO.DAAC).

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 development would not significantly change estuarine processes nor increase the level of risk in surrounding areas for the design event, as the movement of water and waves over the area seaward of and besides the site would not be significantly altered. If the recommendations in Section 8 are followed, the risk of the proposed development being adversely affected by estuarine processes would be suitably mitigated. That is, the development is at an acceptably low risk of being adversely affected by estuarine processes with the measures outlined in Section 8 adopted. Therefore, Item 1 is satisfied.

Item 2 and Item 3 are satisfied with the measures outlined in Section 8 adopted.

Items 4 and 5 were noted as being required in Section 8.

Item 6 has not been applied herein.

With regard to Item 7, occupants are not at significant risk of injury at the site for the design coastal storm event (with the ground floor above the EPL), 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).

With regard to another item in Chapter B3.7 of the DCP, 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).

Also, it is noted in Chapter B3.7 of the DCP that "all floor levels within the dwelling, including floor levels of the existing dwelling, but excluding open balconies (with open balustrades), shall be at, or above, or raised to the Estuarine Planning Level". The existing non-habitable storage space at the NW corner of the dwelling is not being modified as part of the proposed development (except to have windows raised to reduce the risk of inundation), and is below the EPL.

However, a variation is noted in Chapter B3.7 of the DCP that an alteration or addition to an existing residential dwelling may be permissible where existing floor levels are retained below the EPL provided that (numbering added herein for convenience):

1. The total gross floor area (GFA) of any additions to the dwelling, at any point in time can only be increased to a maximum total area not exceeding 30m² if any part of the existing gross floor area (GFA) of the dwelling is below the EPL ; and,
2. The floor levels of the addition must be at or above the EPL ; and,
3. If the floor level of the existing dwelling is to be retained below the EPL, the existing dwelling must be satisfactorily protected to minimise risk against wave action or tidal inundation; and,
4. The addition must be designed and constructed such that it does not preclude the raising of the floor level of the existing structure to the EPL when further additions are undertaken; and,
5. Where a first floor addition to the dwelling is to be constructed the floor level of the first floor is to be of a height that allows for the internal ground floor of the existing dwelling to be either at or raised to the EPL (whilst maintaining minimum floor to ceiling height requirements).

With regard to Item 1, the GFA of the proposed additions exceeds 30m². However, the only portion of the existing dwelling retained below the EPL is a non-habitable storeroom, with all habitable portions of the existing dwelling (existing GFA) above the EPL.

With regard to Item 2, the floor levels of the addition are above the EPL.

Item 3 is satisfied with the measures outlined in Section 8 adopted.

With regard to Item 4 and Item 5, the addition is above a ground floor level that is already above the EPL, so this is not applicable. The level above the non-habitable storeroom is not being altered as part of the proposed development.

Therefore, it can be accepted that the existing non-habitable storage space at the NW corner of the dwelling can be retained below the EPL, noting also that the risk of inundation of this space would be reduced as part of the proposed development.

9.1.2 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 Chapter B3.7 of the Pittwater 21 DCP in Section 9.1.1.

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.

9.1.3 Chapter B3.11 (Flood Prone Land)

The site is in the medium flood risk precinct. Therefore, based on Chapter B3.11 of the DCP and for a “Residential Use”, Controls A1, A2, B1, B2, B3, C1, C3, C4, C6, D1, D2, D3, D4, D5, D6, E1, F1, G1 and H1 potentially apply to the proposed works.

With regard to A1, “development shall not be approved unless it can be demonstrated in a Flood Management Report that it has been designed and can be constructed so that in all events up to the 1% AEP event (a) There are no adverse impacts on flood levels or velocities caused by alterations to the flood conveyance; and (b) There are no adverse impacts on surrounding properties; and (c) It is sited to minimise exposure to flood hazard”.

There are no adverse impacts on flood levels or velocities caused by alterations to flood conveyance with the proposed works. Flood conveyance would not be altered. There are hence no adverse flooding impacts on surrounding properties from the proposed works. The works are generally within the footprint of the existing dwelling and garage, and outside the 1% AEP flood extent.

With regard to A2, “development shall not be approved unless it can be demonstrated in a Flood Management Report that in all events up to the 1% AEP event there is no net loss of flood storage. Consideration may be given for exempting the volume of standard piers from flood storage calculations. If Compensatory Works are proposed to balance the loss of flood storage from the development, the Flood Management Report shall include detailed calculations to demonstrate how this is achieved”. There is no change in flood storage up to the 1% AEP event with the proposed works.

With regard to B1, “all buildings shall be designed and constructed with flood compatible materials in accordance with ‘Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas’, Hawkesbury-Nepean Floodplain Management Steering Committee (2006)”. It was noted in Section 8 that any new structural elements in the dwelling below 2.7m AHD should comprise materials that would withstand inundation (ie, flood compatible materials).

With regard to B2, “all new development must be designed and constructed to ensure structural integrity up to the Flood Planning Level, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the Probable Maximum Flood level. Structural certification shall be provided confirming the above”. It was noted in Section 8 that as part of detailed design, the development should be designed to resist hydrostatic and wave forces as advised by a coastal/water engineer.

With regard to B3, “all new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or located above the Flood Planning Level. All existing electrical equipment and power points located below the Flood Planning Level within the subject structure must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected”. It was noted in Section 8 that any electrical items below 2.7m AHD should be waterproofed.

With regard to C1, “new floor levels within the development shall be at or above the Flood Planning Level”. C1 has been complied with as the proposed ground floor level is above the Flood Planning Level.

With regard to C3, “all new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event”. As discussed previously, this is satisfied for the proposed development.

With regard to C4, “a one-off addition or alteration below the Flood Planning Level of less than 30 square metres (in total, including walls) may be considered only where...”. This is not applicable to the proposed development, as no alterations or additions below the Flood Planning Level are proposed (except raising windows at the non-habitable storeroom to reduce inundation risks).

With regard to C6, “consideration may be given to the retention of an existing floor level below the Flood Planning Level when undertaking a first floor addition provided that: (a) it is not located within a floodway; and (b) the original foundations are sufficient to support the proposed final structure above them. The Flood Management Report must include photos and the structural certification required as per Control B2 must consider whether the existing foundations are adequate or should be replaced; and (c) none of the structural supports/framing of existing external walls of are to be removed unless the building is to be extended in that location; and (d) the ground floor is floodproofed”.

For (a), the existing non-habitable floor level in the NW portion is not in a floodway. For (b), this is not applicable, as the addition is above a ground floor that is already above the Flood Planning Level. That stated, geotechnical and structural engineering advice will be required as part of detailed design to assess if any alterations to foundations will be required to support the proposed addition. For (c), this is not applicable. For (d), the ground floor of the proposed development is above the Flood Planning Level, and the existing unaltered non-habitable storeroom is to have windows raised to reduce inundation risks. Therefore, it can be accepted that the existing non-habitable storage space at the NW corner of the dwelling can be retained below the Flood Planning Level.

With regard to D1 to D4 and D6, no open carpark or carport is proposed, so these controls are not applicable.

With regard to D5, “enclosed Garages must be located at or above the 1% AEP level”. The proposed garage is located above the 1% AEP level, as required.

With regard to E1, as the site has a maximum H2 flood life hazard category, this control does not apply.

Based on F1, “fencing, (including pool fencing, boundary fencing, balcony balustrades and accessway balustrades) shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. At least 50% of the fence must be of an open design from the natural ground level up to the 1% AEP flood level. Less than 50% of the perimeter fence would be permitted to be solid. Openings should be a minimum of 75 mm × 75mm”. The only change to fencing that is proposed is adjacent to Delecta Avenue, where there is currently solid boundary fencing, and this fencing is simply to be reconfigured. F1 is not applicable at this location anyhow, as it is beyond the 1% AEP flood extent.

Based on G1, “hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards”. As noted in Section 8, no potentially toxic or polluting items shall be stored below 2.7m AHD.

H1 does not apply to the proposed development, as a pool is not proposed.

Therefore, the proposed development satisfies Chapter B3.11 of the DCP.

9.2 State Environmental Planning Policy (Resilience and Hazards) 2021

9.2.1 Preamble

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

9.2.2 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”.

This is not a coastal engineering matter, but it can be noted that with regard to (a), the proposed development would not be expected to adversely affect the biophysical, hydrological (surface and groundwater) and ecological environments, being in an existing developed area and with similar stormwater discharge arrangements as at present (and assuming no impacts on threatened species and the like).

With regard to (b), the proposed development would not be expected to adversely affect coastal environmental values or natural coastal processes over an acceptably long design life, as it is located well landward of typical estuarine processes and above the design EPL on an already developed site, and will not alter inundation extents compared to the existing situation.

With regard to (c), the proposed development would not be expected to adversely impact on water quality, with the residential land use, as long as appropriate construction environmental controls are applied. No sensitive coastal lakes are located in the vicinity of the proposed development.

With regard to (d), the proposed development would not impact marine vegetation, native vegetation and fauna and their habitats (of significance, which are not known to exist at the site), undeveloped headlands and rock platforms, with none of these items in proximity. No

significant impacts on marine fauna and flora would be expected as a result of the proposed development, as the development would not typically interact with subaqueous areas over the design life.

With regard to (e), it can be noted that the proposed development is entirely within the site boundary and will not alter existing public access arrangements seaward or east of the site.

With regard to (f), a search of the Heritage NSW “Aboriginal Heritage Information Management System” (AHIMS) was undertaken on 7 June 2022. This resulted in no Aboriginal sites nor Aboriginal places being recorded or declared within at least 200m of the site.

With regard to (g), the proposed development would not interact with the surf zone for an acceptably rare storm occurring over an acceptably long life, so would not impact on use of the surf zone. Note also that the relatively low wave climate seaward of the site is such that there is not a practical surf zone at this location.

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 any potential adverse impacts referred to in Clause 2.10(2).

9.2.3 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 Clause (a)(i), the proposed development will not affect public beach access.

Clauses (a)(ii) and a(iii) are not coastal engineering matters so are not considered herein.

With regard to (a)(iv), there are no Aboriginal sites nor Aboriginal places recorded or declared within at least 200m of the site.

With regard to (a)(v), the nearest environmental heritage item listed in Schedule 5 of the LEP is Angophora Reserve, the lower reaches of which are located about 70m south of 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) for the matters considered herein.

Clause (c) is not a coastal engineering matter so is not considered herein.

9.2.4 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”.

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, as it is located well landward of typical estuarine processes and above the EPL, and will not alter inundation extents compared to the existing situation.

9.2.5 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 coastal management program applies at the site.

10. CONCLUSIONS

Alterations and additions are proposed at 28 Delecta Avenue Clareville. The design Estuarine Planning Level (EPL) for a 60 year life at the seaward edge of the dwelling is 2.49m AHD, which is 0.26m below the proposed ground floor level of 2.75m AHD. The proposed development is beyond the 1% AEP flood extent, and the proposed ground floor level is above the Flood Planning Level of 2.70m AHD and PMF level of 2.47m AHD.

If the recommendations in Section 8 are followed, the risk of the proposed development being adversely affected by estuarine processes and overland flow flooding would be suitably mitigated.

The proposed development complies with Chapters B3.7 and B3.11 of the Pittwater 21 DCP, the *Estuarine Risk Management Policy for Development in Pittwater*, and *State Environmental Planning Policy (Resilience and Hazards) 2021* as described.

11. 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

Intergovernmental Panel on Climate Change [IPCC] (2013), *Climate Change 2013, The Physical Science Basis, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, [Stocker, TF; Qin, D; Plattner, G-K; Tignor, M; Allen, SK; Boschung, J; Nauels, A; Xia, Y; Bex, V and PM Midgley (editors)], Cambridge University Press, Cambridge, United Kingdom and New York, New York, USA

Intergovernmental Panel on Climate Change [IPCC] (2021), *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, [V Masson-Delmotte, P Zhai, A Pirani, SL Connors, C Péan, S Berger, N Caud, Y Chen, L Goldfarb, MI Gomis, M Huang, K Leitzell, E Lonnoy, JBR Matthews, TK Maycock, T Waterfield, O Yelekçi, R Yu and B Zhou (editors)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

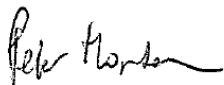
NSW Government (2005), *Floodplain Development Manual: the management of flood liable land*, April, Department of Infrastructure, Planning and Natural Resources, ISBN 0 7347 5476 0, DIPNR 05_020

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

12. 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

This report has been prepared by Horton Coastal Engineering Pty Ltd on behalf of and for the exclusive use of Rob & Sheridan Belgiovane (the client), and is subject to and issued in accordance with an agreement between the client and Horton Coastal Engineering Pty Ltd. Horton Coastal Engineering Pty Ltd accepts no liability or responsibility whatsoever for the report in respect of any use of or reliance upon it by any third party. Copying this report without the permission of the client or Horton Coastal Engineering Pty Ltd is not permitted.

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 Rob & Sheridan Belgiovane / Gerald Gilchrist and Associates Pty Ltd

Name of Applicant

Address of site 28 Delecta Avenue Clareville

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 14th February 2025 (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 and Flood Risk Management Report Relating to 28 Delecta Avenue Clareville

Report Date:

14 February 2025

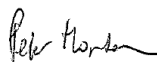
Author: Horton Coastal Engineering Pty Ltd

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

See Section 2 and Section 11 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