Horton Coastal Engineering
Coastal & Water Consulting

Coastal Engineering Report and Statement of Environmental Effects for Buried Coastal Protection Works at Newport SLSC

Prepared by Horton Coastal Engineering Pty Ltd

for Adriano Pupilli Architects

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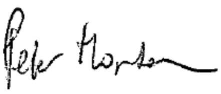

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1. INTRODUCTION AND BACKGROUND

It is proposed to undertake alterations and additions at Newport Surf Life Saving Club (SLSC). To provide protection such that the redeveloped SLSC clubhouse would be at an acceptably low risk from undermining due to coastal erosion/recession over its design life, buried coastal protection works have been proposed. Details of the coastal protection works design, and a merit assessment of the works from a coastal engineering perspective (a Statement of Environmental Effects consistent with Section 4.15(1) of the *Environmental Planning and Assessment Act 1979*), are provided herein.

The document herein has been prepared as part of a Development Application (DA) for the redevelopment of the Newport SLSC clubhouse. A coastal engineering investigation and merit assessment for the clubhouse component of the works has been considered in a separate report by Horton Coastal Engineering (2021).

Note also that various measures have been proposed to reduce wave runup and wave forces on the clubhouse, as discussed in Horton Coastal Engineering (2021), that would be assessed further in detailed design. These potential measures include installation of staggered solid seating at the seaward and landward edges of the promenade, installing wider stairs or a wider promenade extending up to 2m further east, installing the underside of the stairs at a higher elevation, allowance for bollard cast-in sleeves and the like for installation of a temporary bollard and infill panel barrier on the promenade prior to coastal storms, installing remedial measures on the seaward face of the retained portion of the SLSC building (such as steel stiffening plates or a concrete wall), and using sufficiently thick reinforced concrete walls to maintain the structural integrity of the new portion. Various other construction and operational measures to manage coastal inundation were also listed in Horton Coastal Engineering (2021).

Based on Horton Coastal Engineering (2021), a suitable mix of practical measures would be able to be formulated to reduce the wave forces on the SLSC building to acceptable levels, and to provide remedial measures to support the seaward face of the existing building against wave forces (if required). The project as proposed is feasible. For the purpose of the merit assessment in Section 6, it has been assumed that a suitable mix of construction and operational measures would be adopted as part of detailed design, in consultation with a coastal and structural engineer, to reduce the risk of coastal inundation damage to the building to acceptable levels.

The proposed buried coastal protection works design comprises a secant piling wall (to reduce the risk of soil migration through the wall), with a reinforced concrete capping beam and high-level steps to provide beach access at relatively lower typical beach sand levels[1]. Based on historical beach behaviour, and allowing for lower beach levels in the future caused by long term recession due to sea level rise, the piled wall would be expected to be buried under sand for most of the time over its 60 year design life.

Anchors attached to the capping beam/stairs (and permanently buried landward of the wall) are required to reduce the risk of the wall overturning at times of beach scour (low sand levels) on the seaward side of the wall. Further details on the proposed works[2] are provided on the

[1] The steps are not designed to provide beach access at times of severe storms when sand levels can drop by several metres on the beach.
[2] The term "proposed works" as used herein means the proposed coastal protection works, broadly comprising piling. concrete steps, and anchors.

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coastal protection works DA Drawings (jointly prepared by Horton Coastal Engineering and the structural engineering firm James Taylor & Associates), as provided in Attachment A.

The author of the report herein, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional coastal engineer with 29 years of experience. He has postgraduate qualifications in coastal engineering, and 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 recent experience in designing coastal protection works in conjunction with James Taylor & Associates at numerous locations along the NSW open coast.

Peter has inspected the area in the vicinity of the SLSC on numerous occasions in the last two decades, including specific recent inspections on 11 July 2019, 17 August 2019, 26 February 2020, 18 May 2020, 31 May 2020, 17 August 2020, and 31 May 2021.

The report is structured as follows:

- a description of the existing subject site is provided in Section 2;
- a general description of the proposed coastal protection works design and materials is provided in Section 3;
- justification for proposed works is given in Section 4;
- a basis of design for the proposed works is provided in Section 5;
- a merit assessment of the proposed works in relation to relevant coastal engineering considerations is provided in Section 6;
- conclusions and references are provided in Section 7 and Section 8 respectively; and
- Drawings of the proposed works are provided in Attachment A.

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

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2. EXISTING SITE DESCRIPTION

Please refer to a separate report prepared by Horton Coastal Engineering (2021) for:

- a general description of the Newport SLSC site;
- details on emergency rock boulder (revetment) placement that was undertaken as a response to storm erosion threatening the clubhouse in 1974 (including results of a geotechnical investigation to determine its location and characteristics);
- details on historical beach profiles at Newport SLSC for 15 dates from 1941 to 2020 inclusive;
- analysis of the variation in beach volume and beach contour levels at Newport SLSC from 1941 to 2018;
- discussion on subsurface conditions at Newport SLSC based on JK Geotechnics (2020);
- information on coastal inundation (wave overtopping) hazards at the clubhouse, and how this is to be managed; and
- delineation of lines representing the landward edge of erosion/recession (Zone of Slope Adjustment) and associated Zone of Reduced Foundation Capacity as per Nielsen et al (1992) for a severe coastal storm for immediate, 2050 and 2100 planning periods.

In summary, the existing revetment works may provide some protection in a severe coastal storm, but do not satisfy current design standards, and cannot be certified by a qualified coastal engineer (nor relied upon) as providing an acceptable level of protection. Therefore, future effectiveness of these existing protection works in acceptably reducing the risk of undermining of Newport SLSC from coastal erosion/recession cannot be guaranteed.

The plots of the variation in beach volume and contour position in Horton Coastal Engineering (2021) show the relative long term stability of Newport Beach, without an obvious recessionary or accretionary trend.

The boreholes drilled by JK Geotechnics (2020) showed that in the active coastal zone (where erosion occurs above about -1m AHD), the natural subsurface seaward of the SLSC would be expected to be fully erodible and sandy, with no constraint on erosion due to stiff clays or bedrock (ignoring any reduction in erosion caused by the existing rock revetment). Clayey materials were found in some of the boreholes, generally around -3m to -4m AHD.

It is evident from the hazard lines depicted in Horton Coastal Engineering (2021) that the existing/proposed SLSC building is expected to be almost completely undermined in a severe coastal storm at present (ignoring any reduction in erosion from the existing rock boulder protection works, but which cannot be relied upon to provide sufficient protection), without coastal protection works being in place.

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3. GENERAL DESCRIPTION OF PROPOSED DESIGN AND MATERIALS

As depicted on the Drawings (see Attachment A), the proposed coastal protection works design comprises reinforced concrete stairs supported on continuous flight auger (alternating reinforced concrete and unreinforced concrete) secant piles. The secant piles have been designed as a complete and permanent barrier to soil migration through the wall. Anchors attached to the capping beam/stairs above the wall (and permanently buried landward of the wall) have been designed to provide support for the wall and piling at times of beach erosion when sand levels lower on the seaward side of the wall. The layout of the proposed protection works, along with other relevant features, is depicted in Figure 1. Photomontages of the works for various sand levels are in Figure 2 to Figure 4.

The design was prepared as an integrated coastal and structural engineering investigation. As part of detailed design, geotechnical engineering advice would be integrated to produce a design solution with a demonstrated factor of safety exceeding 1.5 for both global stability and structural stability (with consideration of disturbing and balancing forces and moments) considering the particular subsurface conditions at the site. As part of detailed design, there will be consideration of coastal engineering issues (beach scour, elevated water levels, waves), geotechnical engineering issues (subsurface conditions, global stability, analysis to determine pile embedment and anchor capacity) and structural engineering issues (bending moments, shear forces, deflections, strength, serviceability and durability) leading to concrete member and anchor design. There may be a slight change to the pile embedment depth in detailed design to meet the factor of safety requirements, but there can be confidence that the proposed design is feasible and will achieve these requirements, based on similar designs completed by these consultants.

The existing rock boulders will be removed and sorted (particularly by size) as part of the coastal protection works construction. The works have been designed to not be reliant on any rock toe, allowing the rocks to be removed from the site if required, although at this stage Council has directed that they intend to place some rock boulders as additional scour protection and to provide some wave energy dissipation and to elevate sand levels adjacent to the wall. If this rock boulder placement was to be undertaken, the boulders would be placed sufficiently low in the profile and in a low profile arrangement such that they would be expected to be acceptably stable in a coastal storm, under the direction of a coastal engineer. If this was achieved, the boulders would not be an impact on beach access or public safety as they would only be visible when the beach was essentially unusable (and closed) after storms, and would be buried under sand otherwise.

There are no boundary constraints to the proposed works, with the entire Newport SLSC clubhouse area and Newport Beach seaward of the clubhouse for about 30m to 40m being Crown Land, with Council understood to be the Crown Land Manager. Any approval matters relating to Crown Lands are not considered herein.

The proposed piling (vertical wall) is to be located just seaward of the seaward edge of the existing concrete path (promenade) seaward of the clubhouse, buried below this level. The distance between the clubhouse and the landward edge of the concrete stairs (which is coincident with the seaward edge of the existing concrete promenade) is between about 3m and 4m. Therefore, any required wall maintenance would most likely only be possible from the beach when conditions have subsided after a coastal storm, due to insufficient space for excavators to track landward of the wall, although significant maintenance is unlikely to be required.

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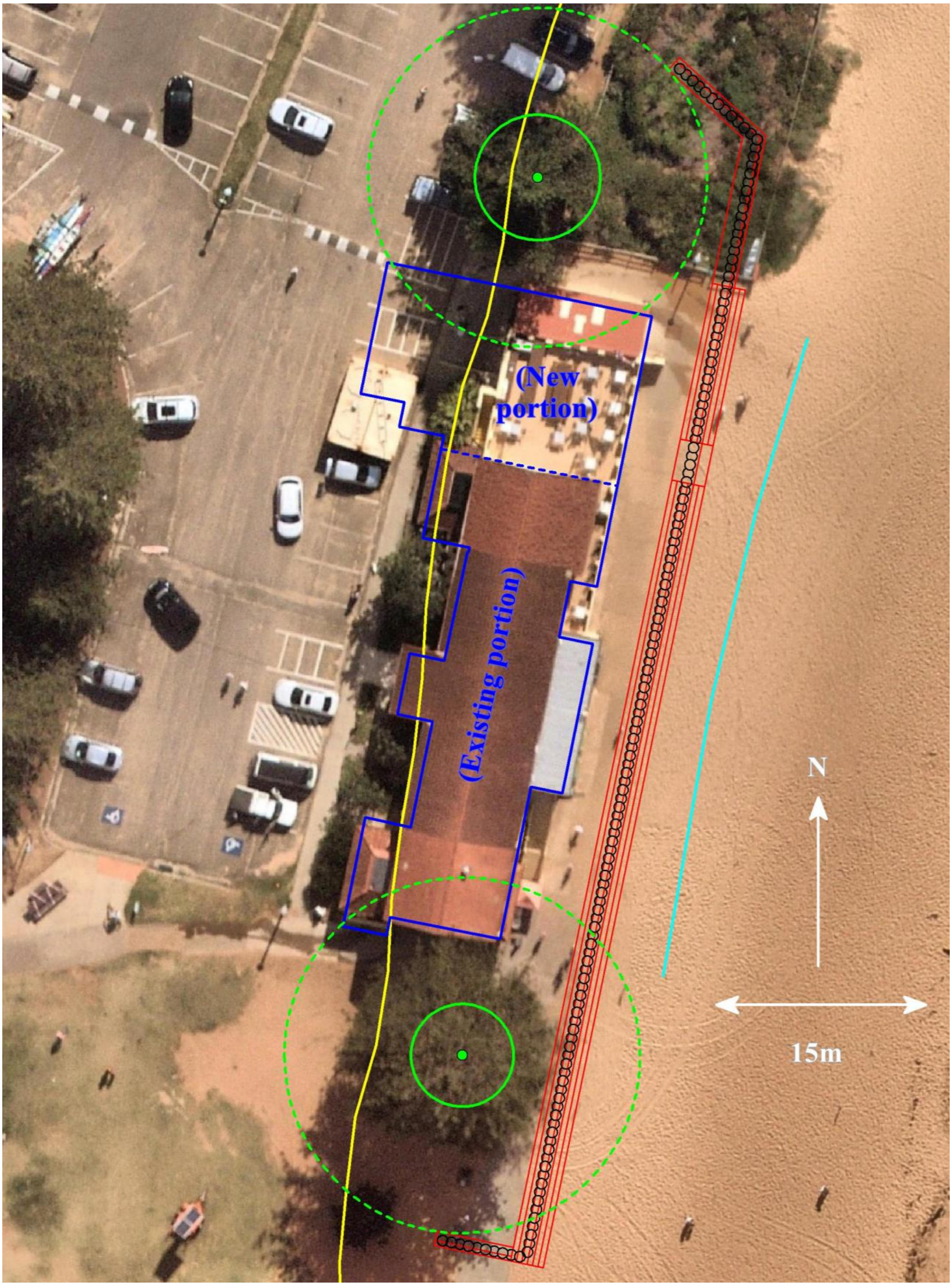

Figure 1: Layout of proposed protection works, with buried secant piles (black), and concrete steps and capping beams in non-stepped areas (red), tree protection zones (dashed) and structural root zones (solid) for adjacent Norfolk Island pine trees (green), seaward extent of existing rock boulders (light blue), immediate Zone of Slope Adjustment (yellow), and layout of proposed clubhouse in dark blue (existing and new portions depicted), with aerial photograph taken 13 April 2020

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Figure 2: Photomontage of proposed works (buried under sand) with typical present-day sand levels

Figure 3: Photomontage of proposed works (with stairs exposed) under future conditions with lower typical sand levels caused by long term recession due to sea level rise

Figure 4: Photomontage of proposed works (with piling exposed) as may temporarily occur after severe storm erosion which requires beach closure, until sand levels are naturally restored, or this process is mechanically accelerated by Council undertaking beach scraping. A temporary solid barrier may also be employed to reduce wave forces on the clubhouse, see Horton Coastal Engineering (2021)

The northern and southern extent of the buried coastal protection works was delineated in consultation with an arborist (Lee Brennan of Tree Management Strategies) to minimise the impact on Norfolk Island pine trees to the north and south of the clubhouse respectively. From a coastal protection perspective, the northern and southern extents of the works could have been about 6m and 13m shorter respectively than proposed to provide satisfactory protection to the clubhouse from erosion/recession over the design life. This proposed extent of the coastal protection works also means that both trees would be protected from undermining while the works are in place.

There was also consideration of reducing the northern and southern extents of the coastal protection works and constructing longer returns as an alternative means of providing protection to the clubhouse. This was not adopted due to the length of returns required being greater than the north-south extent of coastal protection works saved, the potential impacts on both Norfolk Island pine trees (roots and canopy), and the potential impacts on the heritage structure by piling in close proximity to it.

It is evident in Figure 1 that the northern extent of the coastal protection works does not encroach into the Tree Protection Zone (TPZ) of the northern Norfolk Island pine tree. The southern extent of the works encroaches into the eastern edge of the southern Norfolk Island pine tree TPZ, but the works have been extended to the south so that the southern return does not encroach into the TPZ of the southern Norfolk Island pine tree. There was consideration of stepping the coastal protection works seaward at the southern tree to further reduce the encroachment, but this was not adopted as it would require the seaward extent of the works to be increased, and also would not prevent impact on the TPZ during construction (as excavation to form the piling working platform would still encroach into the TPZ).

There was consideration of reducing the northern extent of the coastal protection works and length of the northern return by constructing the new portion of the redeveloped clubhouse on deep foundation piles, such that the new portion could remain supported if it was undermined by coastal erosion/recession. Although this is feasible (from a coastal, structural and geotechnical engineering perspective), and may lead to cost savings (particularly if one contractor was to carry out the piling for both the coastal protection works and clubhouse), this was not adopted by Council due to the potential for separate contracts for clubhouse and coastal protection works construction (hence reducing the potential for piling synergies for both works).

There would be a temporary requirement for clearing of a portion of the vegetated dune area to the north of the clubhouse, along the piling alignment, to enable construction of the buried coastal protection works. This area would be restored with vegetation at the completion of the coastal protection works.

It is evident in Figure 1 that a ramp has been proposed towards the northern end of the clubhouse. This would be constructed at the same slope as the stairs, and thus has not been designed to comply with disabled access requirements[3], but rather has been designed for the convenience of assisting with traversing of wheeled equipment from the beach to the clubhouse and return.

[3] Due to relatively flat slope requirements, it would be necessary for such a disabled access to extend tens of metres, which would produce a massive structure either extending a significant distance on to the beach, or extending a significant distance alongshore and dislocating general pedestrian access to the foreshore from the clubhouse.

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The proposed coastal protection works would not prevent waves overtopping the crest of the steps in a severe coastal storm. A substantially higher crest would be required to prevent wave overtopping, which was not adopted as this would dislocate public access from the clubhouse to the beach and vice versa, and also impact on visual amenity. Various construction and operational measures to reduce the risk of inundation damage to the clubhouse have been discussed in Horton Coastal Engineering (2021), including installation of staggered solid seating at the seaward and landward edges of the promenade to reduce wave forces and inundation depths at the building, with an indicative layout of this seating depicted in the photomontages.

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4. JUSTIFICATION FOR PROPOSED WORKS

The proposed alterations and additions to Newport SLSC comprise internal modifications to the existing building (retaining key heritage aspects), as well as a two-storey extension of the building at the NW corner (the new portion at the northern end is within the existing north-south footprint of the clubhouse, with an extension to the west).

The initial concept design for the redevelopment of Newport SLSC was completed in June 2018. At that time, it was proposed that the retained and new portions would be placed on conventional foundations (that is, not designed with deep piled foundations to provide support to the building if undermined by coastal erosion/recession), and there was no consideration of constructing coastal protection works to prevent undermining of the building by coastal erosion/recession.

The limitations of this initial concept, if it had been adopted, are that:

- there would be an unacceptably high risk that the clubhouse would be undermined and catastrophically damaged due to coastal erosion/recession over its design life (given that the existing rock boulders cannot be relied upon to prevent undermining of the SLSC); and
- the requirement to retain heritage aspects of the building would not be achieved if the building was ever undermined and damaged.

Given the necessity to retain the clubhouse in its current location, as it has heritage status[4] and surf lifesaving functions, it was not a feasible option for the existing clubhouse to be demolished and rebuilt as a means of dealing with the erosion/recession risk (either by reconstructing the clubhouse on deep foundation piles such that it would remain supported if undermined[5], and/or by rebuilding the clubhouse further landward where there would be a reduced likelihood of erosion/recession reaching the clubhouse over the design life).

Given that it was not a feasible option for the existing clubhouse to be demolished and rebuilt, and given that it was considered unacceptable that the SLSC may be substantially damaged in a severe coastal storm (to the extent of having to be completely rebuilt) over its design life[6], the only option to enable the Newport SLSC redevelopment to occur while retaining heritage aspects of the building would be to have coastal protection works constructed seaward of the clubhouse, as has been adopted. This would acceptably reduce the risk of erosion/recession undermining the building over the design life. Thus, in summary, coastal protection works are required at Newport SLSC given the:

- risk to the existing and proposed development from coastal erosion/recession;
- necessity to retain the building in its current location, as it has heritage status and surf lifesaving functions; and

[4] Alternatively, Council could have attempted the process of de-listing Newport SLSC as a heritage item, but this was not considered to be a desirable outcome.
[5] Note that retrofitting deep foundation piles to the existing SLSC building was considered to be too invasive and costly to be feasible.
[6] Which would not only cause economic impacts, but potential public safety and beach amenity impacts. Furthermore, resources of Council and emergency services would have to be diverted to deal with the immediate storm dangers and subsequent clean up and risk management for several months after a such a damaging storm.

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- lack of feasibility for retrofitting deep foundation piles to the existing SLSC building as an alternative means of reducing the risk of damage to the clubhouse from erosion/recession.

The proposed buried coastal protection works would provide protection to the SLSC building from erosion/recession for an acceptably rare storm over an acceptably long life, and also allows the seaward extent of existing rock boulders to be reduced or removed entirely if required.

There has been considerable coastal engineering analysis and consultation (with Council staff and Club members) on coastal engineering issues in developing the buried coastal protection works design concept presented in the subject DA, including as documented in Horton Coastal Engineering (2018, 2020). There was consideration of various forms of coastal protection works in this analysis, including rock revetment designs and vertical or stepped concrete designs. The proposed vertical design was adopted as it has the minimum possible coastal protection works footprint, and thus the minimum possible extent on to Newport Beach. A rock revetment would extend in the order of 15m further seaward than the proposed works.

MHL (2019) considered vertical wall versus sloping rock revetment coastal protection works designs at Collaroy-Narrabeen Beach, and found that the relative potential impacts of such works on coastal processes was mostly dependent on their cross-shore alignment within the active beach profile. This is also considered to be applicable at Newport Beach. That is, with the proposed works well landward of the required extent of a rock revetment, this is considered to provide the lowest potential impact on coastal processes for coastal protection works at this location.

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5. BASIS OF DESIGN

5.1 Design Life

A design life of 60 years has been adopted for the proposed protection works (that is, at the year 2080, with the initial design undertaken in 2020[7]). As outlined in Horton et al (2014) and Horton and Britton (2015), this design life is considered to be appropriate in relation to beachfront development (that relies on the protection works for protection against erosion/recession over the design life) as:

- it is consistent with Australian Standards applying to the clubhouse development landward of the protection works:
    - in *AS 3600-2018 (Concrete structures)*, a 50 years ± 20% design life[8] (that is, 40 years to 60 years) is used in devising durability requirements for concrete structures;
    - in *AS 2870-2011 (Residential slabs and footings)*, for design purposes the life of a structure is taken to be 50 years for residential slabs and footings construction (it is recognised that the SLSC is not a residential structure though);
    - in *AS 1170.0-2002* (*Structural Design Actions – General Principles)*, the design life for normal structures (Importance Level 2, as would be expected to apply to the proposed clubhouse) is generally taken as 50 years; and
    - in *AS 4678-2002 (Earth-retaining structures),* the design life for earth-retaining structures (structures required to retain soil, rock and other materials) is noted as 60 years for river and marine structures and residential dwellings.
- a design life of at least 50 years would be considered to be reasonable for permanent structures used by people (AGS, 2007a, b); and
- this design life of 60 years has been adopted in the two gazetted *C*oastal Zone Management Plans (CZMPs) that apply in the Northern Beaches Council area, namely the *Collaroy-Narrabeen Beach and Fishermans Beach CZMP* and *CZMP for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)*.

The proposed design life of 60 years is thus considered to be appropriate, and consistent with coastal management in other areas of the Northern Beaches.

As noted in Horton Coastal Engineering (2021), UNSW Water Research Laboratory (WRL) has completed a peer review and desktop assessment of various issues relating to the proposed development. Council decided after this work of WRL to adopt a 500 year Average Recurrence Interval (ARI) event at 2080 for design in relation to wave forces and wave overtopping. For structural design, a 2,000 year ARI event at 2080 has been adopted herein, as discussed in Section 5.7.

5.2 Application of 60 Year Design Life to Concrete and Anchor Design

A 60 year design life (and beyond) is achievable for the concrete steps and concrete piling. As noted above, *AS 3600* applies to structures with a design life of 40 to 60 years, while *AS 5100* (although for bridge design) can be used to provide guidance on extending the design life of concrete structures to 100 years. For ≥ 50MPa concrete, as would be applied, the required

[7] This can be updated to a later year at the time that detailed design is completed. An extension of the design life to 2021 or 2022 would be insignificant to the conclusions made herein.
[8] Period for which a structure or a structural member is intended to remain fit for use for its designed purpose with maintenance.

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cover for an Exposure Classification of C2 (in the tidal or splash zone) from *AS 3600* and *AS 5100*, is 65mm and 80mm respectively (the latter applying to ≥ 55MPa concrete). The proposed wall would only occasionally be in the tidal and splash zone, and would generally be in the spray zone (Exposure Classification of C1) from *AS 3600* and *AS 5100*, for which the required cover is 50mm and 70mm respectively. Nonetheless, a cover of 65mm to 80mm would be adopted.

Other features that would be adopted to ensure a minimum 60 year life for the concrete would include specification of workmanship standards to exceed the base level performance assumed by the deemed to satisfy the provisions of the relevant Australian Standards. Such items include concrete cover and tolerance, standard of formwork and vibration, use of non-ferrous bar chairs, and regular quality inspections.

A 60 year design life (and beyond) is achievable for the anchoring, and a minimum 100 year life has been specified on the Drawings (see Attachment A). Features that would be adopted to ensure a minimum 100 year life for the anchors would include assessment of the (in ground) corrosive environment that the anchors would be located in, and ensuring adequate thickness accounting for corrosion. Additional means of protection such as coatings (galvanic) or grout filling pipes are also available for extending the life of ground anchors.

5.3 Historical Beach Profiles

Historical beach profiles at Newport SLSC from 1941 to 2020, derived from the NSW Beach Profile Database, are depicted in Figure 5. The top surfaces of the existing rock boulders placed in 1974 at the site, based on JK Geotechnics (2020) test pits (TP), are also shown[9], along with an outline of the proposed coastal protection works[10].

It is evident in Figure 5 that there has not been significant variability in sandy beach levels adjacent to the clubhouse over the historical record, although note that erosion in the lowest profile on record (in 1974) would have been limited by the emergency placement of rock boulders at that time, and this could have also limited erosion in storms since that time (although there is no evidence of significant exposure of the boulders in any recorded profile since 1974).

[9] TP5 was adjacent to the southern end of the clubhouse, TP6 was approximately centred on the clubhouse, TP7 was adjacent to the northern extent of the clubhouse to be retained, and TP8 was adjacent to the northern end of the clubhouse (with all test pits seaward of the clubhouse, on the beach).
[10] Note that the proposed piling would extend below -2m AHD.

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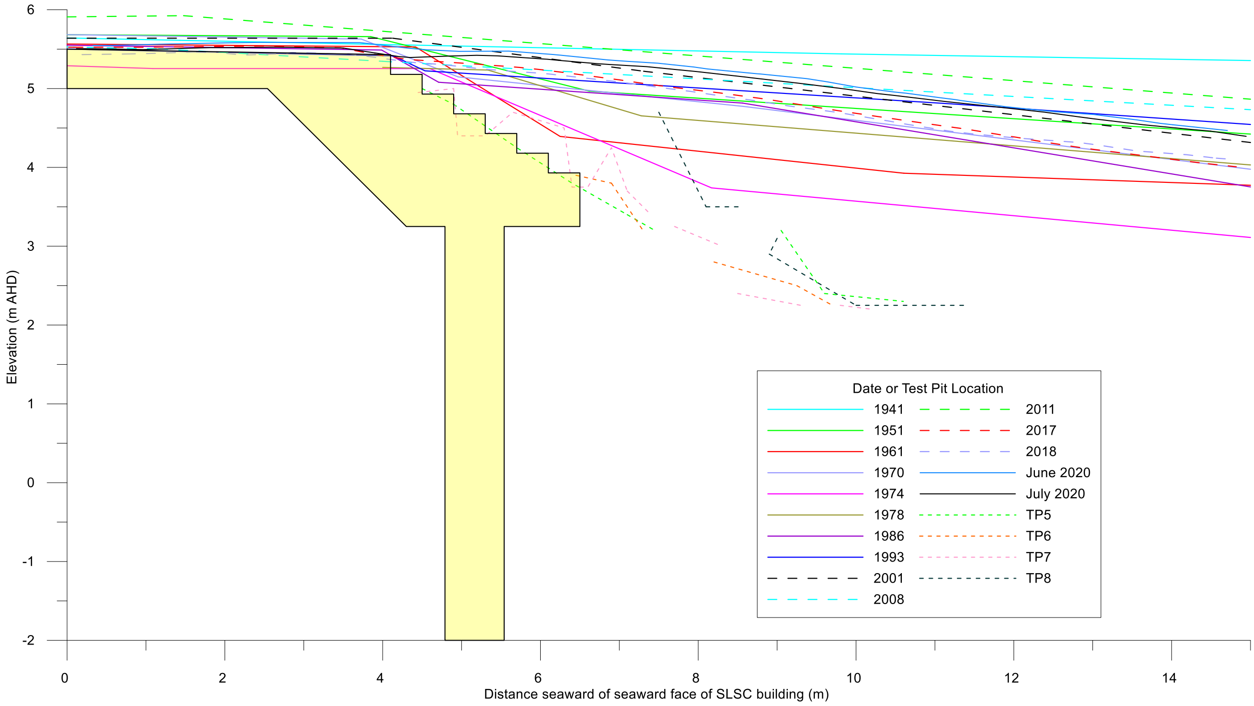

Figure 5: Historical beach profiles at Newport SLSC from 1941 to 2020, and top surface of rock boulders placed in 1974, in relation to proposed coastal protection works

5.4 Effect of Long Term Recession Due to Sea Level Rise on Beach Profiles

Analysis of the variation in beach volume and beach contour levels at Newport SLSC from 1941 to 2018, as discussed in Horton Coastal Engineering (2021), indicated no clear recession or accretion trend, and thus a zero long term recession rate due to net sediment loss would be reasonable in the study area.

Bruun (1962) proposed a methodology to estimate long term recession due to sea level rise, the so-called Bruun Rule. It can be described by the equation (Morang and Parson, 2002):

$$R = \frac{S \times B}{h + d_c} \quad (1)$$

where R is the recession (m), S is the long-term sea level rise (m), h is the dune height above the initial mean sea level (m), d_c is the depth of closure of the profile relative to the initial mean sea level (m), and B is the cross-shore width of the active beach profile, that is the cross-shore distance from the initial dune height to the depth of closure (m). Equation 1 is a mathematical expression that the recession due to sea level rise is equal to the sea level rise multiplied by the average inverse slope of the active beach profile, with the variables as illustrated in Figure 6.

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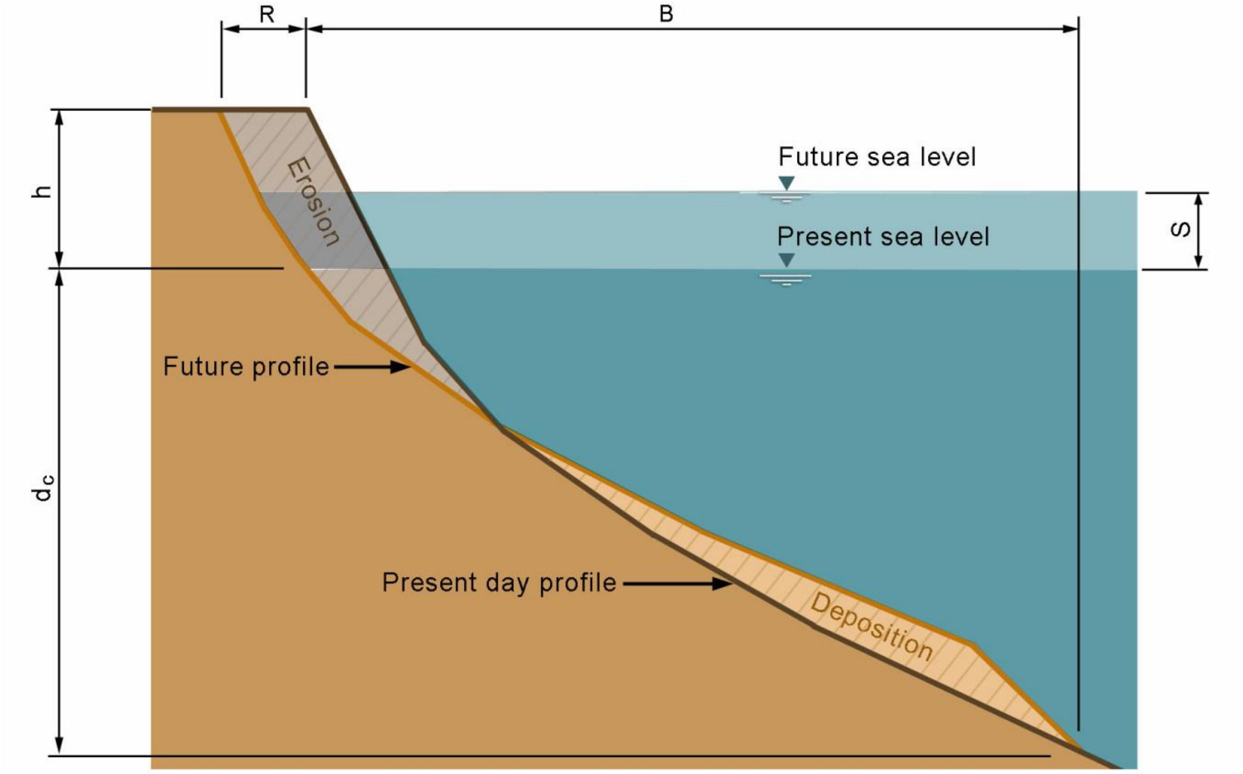

Figure 6: Illustration of variables in the Bruun Rule

There are a number of methods available to estimate the depth of closure, including techniques based on wave (and sediment) characteristics, sedimentological data, and field measurements. Hallermeier (1981, 1983) defined two closure depths, namely "inner" (closer to shore) and "outer" (further from shore) closure depths. The "inner" closure depth is considered to be appropriate to use herein. From Hallermeier (1981), the "inner" closure depth is approximately 12m relative to AHD at Newport Beach, with the average inverse slope of the active beach profile corresponding to this depth equal to 31.

Therefore, for the median sea level rise of 0.36m at 2080 (see Section 5.8.3), long term recession can be estimated as 11.2m at the end of the design life. However, note that the analysis below was derived based on a more severe sea level rise of 0.44m at 2080, thus giving 13.6m of long term recession at the end of the design life[11].

As long-term recession is realised, scour levels may lower at a particular cross-shore position where the beach profile translates landward. An illustration of the historical profiles as per Figure 5, with 13.6m of recession applied (as a 13.6m landward translation of the profiles and a 0.44m raising of the profiles for sea level rise) is provided in Figure 7[12].

[11] The 0.44m of sea level rise was derived from IPCC (2013) in combination with an assumed 15% increase for regional sea level rise variation (ie, a difference between Sydney and the global average) in a previous version of the report herein released for community engagement in November 2020. The 0.36m of sea level rise was derived herein from the recently released IPCC (2021), explicitly including regional sea level rise variation. The IPCC (2021) sea level rise is lower than the IPCC (2013) value as the regional (Sydney) value is 20% lower than the global mean in IPCC (2021), whereas it was assumed to be 15% higher in using IPCC (2013). It was not considered warranted to rederive Figure 7 for the lower sea level rise, as it would not alter the conclusions of the report herein.

[12] Of course, the presence of the coastal protection works would prevent the realisation of the profiles landward of the works as has been depicted in Figure 7.

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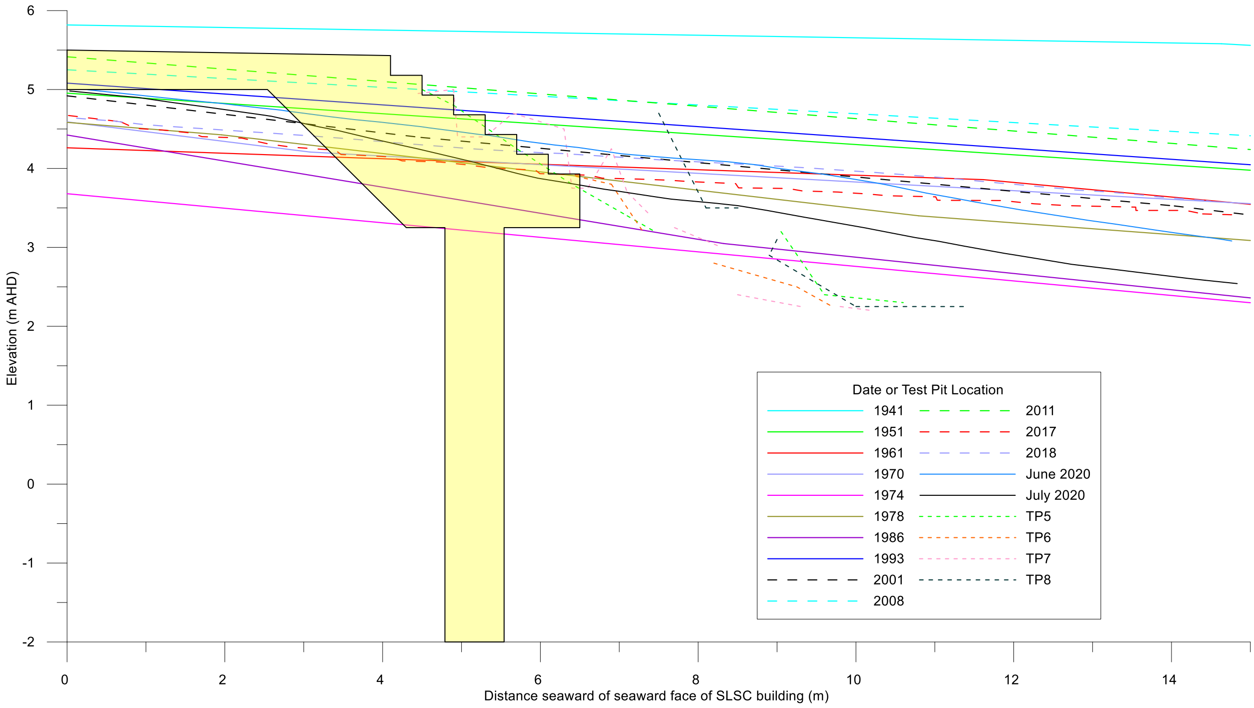

Figure 7: Historical profiles, top of boulders and proposed coastal protection works as per Figure 5, with profiles receded to account for long term recession due to sea level rise over the design life

It is evident in Figure 7 that the proposed steps would be expected to facilitate beach access for almost all of the time under recessionary conditions at the end of the design life, with most receded historical profiles within the range of step levels. That is, it is expected that the proposed piling would hardly ever be exposed over the design life. It would also be possible for Council to mechanically scrape sand landward to raise sand levels near the steps in the future, if required.

Even with projected long term recession due to sea level rise over the design life, there is the expectation of significant beach width seaward of the proposed works for most of the time, in the order of 50m to 60m (on average) at the end of the design life. That is, the proposed works would only be expected to be interacting with wave action occasionally.

5.5 Beach Scour

A storm scour level of -1m AHD is typically adopted at NSW beaches. This is based on stratigraphic evidence of historical scour levels and observed scour levels occurring during major storms (Carley et al, 2015).

Carley et al (2015) also noted that it is common practice for vertical coastal protection works on the open coast of east Australia to be designed for a beach scour level of -2m AHD (assuming an erodible sandy subsurface).

It is evident from Figure 5 and Figure 7 that a scour level of -2m AHD is barely credible at Newport SLSC considering historical behaviour and also allowing for potential long term recession due to sea level rise over the design life. Historical profiles have not been recorded below 4m AHD in the vicinity of the proposed works, and allowing for recession this only reduces to 3m AHD[13]. However, given the potential consequences of scour in causing failure of the works, a barely credible scour level of -2m AHD has been adopted herein.

As noted in Horton Coastal Engineering (2021), UNSW Water Research Laboratory has completed a peer review and desktop assessment of the design scour level. They found that the scour level adopted herein of -2m AHD was conservative. For a 2,000 year ARI event at 2080, the most severe event considered, WRL calculated a scour level of -0.7m AHD, some 1.3m higher than adopted. For Council's adopted design scenario of a 500 year ARI event at 2080, the scour level at the seawall calculated by WRL was -0.1m AHD, some 1.9m higher than adopted herein. This supports the adoption of a -2m AHD scour level as barely credible over the design life.

5.6 Groundwater Levels

For analysis as part of detailed design, it is expected that a conservative groundwater level difference of 4m between the landward and seaward sides of the wall at the time of maximum scour will be assumed. This is conservative as weepholes are proposed through the wall, and because groundwater is not restricted from flowing through the sandy subsurface to the north and south of the wall, thus limiting the potential for groundwater to build up landward of the wall.

5.7 Adopted Design Probability and Risk to be Used in Detailed Design

In Australian Standard *AS 4997-2005*, *Guidelines for the design of maritime structures*, recommendations are given for the design wave height event to adopt for various design lives and types of structures. Normal maritime structures are considered to be Function Category 2, while "high property value or high risk to people" structures are considered to be Function Category 3.

In Table 1, the *AS 4997* recommended design wave height event Average Recurrence Interval (ARI) is presented for both Function Category 2 and Function Category 3, for two different design lives, namely 50 and 100 years respectively. A design life of 50 years is recommended in *AS 4997* for normal maritime structures, while a design life of 100 years or more is recommended for "special structures / residential developments". For each of these 4 scenarios, the probability of the event occurring over the design life is calculated as shown in Table 1.

Table 1: Design lives and design event ARI's for various Function Categories in *AS 4997*, with probability of event occurring over design life shown

Function Category	Design Life (years)	Design Event (ARI)	Probability of event occurring over design life (%)
2	50	500	9.5%
2	100	1,000	9.5%
3	50	1,000	4.9%
3	100	2,000	4.9%

It is evident that both Function Category 2 scenarios in Table 1 have a 9.5% probability of occurring over the design life, while both Function Category 3 scenarios have a 4.9% probability. To be conservative, a Function Category 3 has been adopted herein (that is, with a

[13] It is also recognised that historical beach profiles may not have been captured at the time of peak erosion during all storms.

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4.9% probability of the design event occurring over the design life) as the minimum requirement. This is also consistent with Gordon et al (2019), who recommended a 4 to 5% encounter probability for design of coastal protection works for normal residential structures with a design life of 60 to 100 years (which can also be considered to apply to Newport SLSC).

It is considered that beach scour is the key design parameter for structural stability of the wall and the key determinant for the design life probability, and can be treated as an equivalent parameter to the design wave height in *AS 4997*. As discussed in Section 5.5, a barely credible scour level has been adopted for design. The ARI event to potentially cause the design scour is considered to be rarer than 2,000 year ARI. The probability of such a scour level (at 2,000 year ARI) being realised over the adopted 60 year design life is 3%, which is satisfactory in relation to *AS 4997* and Gordon et al (2019).

5.8 Water Levels and Waves

5.8.1 Design Event and Design Life

A 2,000 year ARI event (Section 5.7) would be adopted over a 60 year life (Section 5.1) for detailed structural design of the proposed works.

If required for consideration of wave overtopping for detailed design, which is generated by depth-limited waves, it is considered to be reasonable to adopt 100 year ARI water level and wave parameters in conjunction with the barely credible (> 2000 year ARI) scour level of -2m AHD. This is because the scour level governs water depths and hence the depth-limited wave heights impacting on the proposed wall. This combination of 100 year ARI water level and wave parameters, and a > 2000 year ARI scour level, is likely to be in the order of a 2000 year ARI event or rarer.

That stated, as discussed in Section 5.1, Council decided after the peer review and assessment work of WRL to adopt a 500 year Average Recurrence Interval (ARI) event at 2080 for design in relation to wave forces and wave overtopping (which was based on a scour level of -0.1m AHD at the seawall). This is discussed further in Horton Coastal Engineering (2021).

The 100 year ARI water level and wave parameters are outlined below.

5.8.2 Present Design Ocean Water Level

Based on Department of Environment, Climate Change and Water [DECCW] (2010), the 100-year ARI ocean water level (in the absence of wave action) as of 2010 in Sydney is 1.44m AHD. This is similar to be the corresponding value reported by Manly Hydraulics Laboratory [MHL] (2018)[14].

5.8.3 Sea Level Rise

It is considered to be most appropriate to derive sea level rise values from the recently released Intergovernmental Panel on Climate Change [IPCC] (2021), which is widely accepted by competent scientific opinion. The methodology used to adopt the sea level rise values herein is generally similar as that used in the two gazetted Northern Beaches Council CZMPs.

[14] MHL (2018) determined a corresponding level of 1.42m AHD (along with lower and upper 95% confidence limits of 1.38m AHD and 1.53m AHD respectively).

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The sea level rise values presented in Table 2 were determined for the five illustrative scenarios (shared socioeconomic pathways, SSP's[15]) considered in IPCC (2021)[16]. 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 2080, relative to the average sea level from a 1995-2014 baseline (taken to be at 2005).

Table 2: Mean sea level rise (m) at Sydney from a 1995-2014 average level (taken at 2005) to 2080 derived from IPCC (2021) and PO.DAAC

Emissions Scenario (Shared Socioeconomic Pathway)	Exceedance Probability		
	95% exceedance	Median	5% exceedance
SSP1-1.9	0.12	0.25	0.50
SSP1-2.6	0.15	0.31	0.57
SSP2-4.5	0.22	0.39	0.67
SSP3-7.0	0.28	0.46	0.76
SSP5-8.5	0.33	0.52	0.85
Average	0.22	0.38	0.67

Taking the median exceedance probability and average of the 5 SSP's, a sea level rise value of 0.38m at 2080 (relative to 2005) was derived. Given that DECCW (2010) water levels were derived at 2010, as discussed in Section 5.8.2, 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 2080 at Sydney is 0.36m.

Therefore, the 100 year ARI still water level at 2080 based on DECCW (2010) and IPCC (2021) is 1.80m AHD.

5.8.4 Design Ocean Water Level at End of Design Life

As noted in Section 5.8.3, the adopted 100 year ARI still water level at 2080 (at the end of the design life) is 1.80m AHD. Wave setup, caused by breaking waves adjacent to a shoreline, can also increase still water levels, as discussed further in Section 5.8.7.

5.8.5 Design Depth at Plunging Distance

As noted in Section 5.5, a design scour level of -2m AHD has been adopted at the proposed wall for structural design. For design, depth limited wave conditions must be determined at a plunging distance (plunge length) seaward of the toe of the proposed works. Based on Coastal Engineering Research Center (1984) and Smith and Kraus (1991), the plunging distance is approximately equal to 10m. At this location, the bed level has been assumed to be -1m AHD (with the scour level of -2m AHD for structural design only applying as a trough at the wall). The design ocean depth (excluding wave setup) is thus 2.80m at the plunging distance.

[15] Known as representative concentration pathways in the previous IPCC (2013) assessment.
[16] The five illustrative scenarios represent varying projected greenhouse gas emissions, land use changes and air pollutant controls in the future.

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5.8.6 Ocean Waves

Extreme value offshore wave conditions have recently (since the June 2016 storm) been re-evaluated for Sydney by Louis et al (2016), based on offshore Waverider buoy records. They determined 100-year ARI offshore significant wave heights (H_s) of 9.5m and 8.7m for 1 hour and 6 hour durations respectively.

Beach erosion and relatively large wave run-up is strongly linked to the occurrence of high wave conditions with elevated ocean water levels, so erosion and run-up are more likely to be significant when large waves coincide with a high tide. Consistent with MHL (2016), a 6-hour duration is considered to be appropriate for design, as storms with a duration of 6 hours are likely (50% probability) to coincide with high tide on the NSW coast (which is a prerequisite for elevated water levels to occur). A 1 hour duration only has an 8% probability of coinciding with high tide. Therefore, an offshore H_s (or H_o) of 8.7m was adopted herein.

In adopting 100-year ARI wave conditions herein, it was assumed that the design water level and wave can occur at the same time, which is conservative. Shand et al (2012) found that considering the joint probability of waves and tidal residuals for Sydney, the wave height for the joint 100 year ARI event reduced by about 10% as the tidal residual increased from 0.05m to 0.4m (with the latter necessary to achieve the design water level). That stated, adopting joint 100 year ARI water level and wave conditions is not entirely unreasonable, as elevated waves and water levels can be generated by the same weather systems.

A design peak spectral wave period (T_p) of 13s was adopted, based on Shand et al (2011), who determined the associated wave period for the 100 year ARI H_s event at Sydney as 13.0s (± 0.7s considering 90% confidence intervals).

5.8.7 Design Wave Height at Structure

If required as part of detailed design, the method of Goda (2010b) for incipient breaking of significant waves would be employed to determine the design wave height at the structure, with other wave parameters determined using the methodology of Battjes and Groenendijk (2000) for wave height distributions in the shoaling and breaking zone. This would also require calculation of wave setup at the plunging location using Goda (2010a).

One potential area for large forces on the proposed works is wave uplift on the underside of the concrete stairs. This would be addressed in detailed design, and if required there could be thickening of the base of the stairs for some extra mass, or relative movement of the piles and stairs to reduce the overhang of the stairs, subject to consideration of wave overtopping.

6. MERIT ASSESSMENT OF COASTAL PROTECTION WORKS

6.1 Permissibility of Works

Based on Clause 19(1) of *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal), the proposed works are permissible with consent. Given that the study area does not have a gazetted CZMP or Coastal Management Program, the Sydney North Planning Panel has the function of determining the DA, as coastal protection works are proposed.

The study area is zoned as RE1 (Public Recreation) in *Pittwater Local Environmental Plan 2014* (LEP 2014). Coastal protection works are not specifically permitted in this zone. However, SEPP Coastal, as per Clause 7(1), prevails over LEP 2014. Furthermore, non-inclusion of protection works as being permitted in this zone is considered to be related more to the restrictive nature of the *Standard Instrument -Principal Local Environmental Plan* rather than any deliberate intention of Council to exclude these works[17].

6.2 Statement of Environmental Effects Requirements

As set out herein, a Statement of Environmental Effects is required to accompany the DA for the proposed protection works. Based on the *Environmental Planning and Assessment Regulation 2000*, this Statement of Environmental Effects must include consideration of the environmental impacts of the development, how the environmental impacts of the development have been identified, and the steps to be taken to protect the environment or to lessen the expected harm to the environment. Statement of Environmental Effects matters related to coastal engineering are considered herein.

6.3 Integrated Development

The proposed works are not considered to be integrated development as:

- no reclamation is being carried out in a waterway (the works are in an area that will usually be buried under sand) in relation to the *Fisheries Management Act 1994*; and
- the works are not a controlled activity based on the *Water Management Act 2000*, as this does not apply to this open coast beach area (which is covered by the *Coastal Management Act 2016*) as per Department of Primary Industries – Water (2016).

6.4 Coastal Management Strategy, Warringah Shire

In 1981, a working party was established comprising Warringah Council and Public Works Department (PWD) staff at that time, with the aim of integrating Council's management and planning with coastal engineering advice to produce an overall strategy for coordination of beach reserves management and identification of areas of the coastal zone that required specific development controls (PWD, 1985).

This resulted in the completion of an investigation by PWD (1985), entitled "Coastal Management Strategy, Warringah Shire" in which coastline management strategies were developed for the beaches and headland areas of the entire Warringah Shire Council Local

[17] This anomaly is common to many Local Government Areas where coastal protection works are considered to be appropriate through the CZMP process, including the *Gosford Local Environmental Plan 2014* applying to Wamberal Beach, the *Pittwater Local Environmental Plan 2014* applying to Bilgola Beach and Basin Beach, and the *Warringah Local Environmental Plan 2011* applying to Collaroy-Narrabeen Beach.

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Government Area (LGA), which extended from Freshwater to Palm Beach at that time (thus covering the former Pittwater and Warringah LGA's that are now incorporated into the Northern Beaches Council LGA, along with the former Manly Council).

For the subject site, PWD (1985) noted that there should be consideration of relocating the clubhouse further landward when it is to be replaced, renovated or extended. However, given the necessity to retain the building in its current location (as it has heritage status and surf lifesaving functions), relocation was considered to be unacceptable to Council and could not therefore be adopted. This necessitated the proposal to construct coastal protection works, as the only practical means of retaining the heritage structure at an acceptably low risk of damage from coastal erosion/recession over the design life.

6.5 Pittwater Ocean Beaches Plan of Management

The *Pittwater Ocean Beaches Plan of Management* for Newport Beach was adopted on 19 June 2006. In the Master Plan therein, it is noted for the Newport Beach Surf Club building that "Council together with the Newport Beach SLSC to maintain and upgrade surf club building and surrounds as required, having regard to public safety".

The proposed coastal protection works are considered to be consistent with this Master Plan item, in particular as the proposed upgrading works enable to clubhouse to be maintained over the next 60 years, increase public safety in relation to significantly reduced risk of damage to the clubhouse, and also improve beach access over varying sand levels.

6.6 Coastline Risk Management Policy for Development in Pittwater

6.6.1 Preamble

Chapter 8.2 of the *Coastline Risk Management Policy for Development in Pittwater* (Coastline Policy), which is Part B and Appendix 6 of *Pittwater 21 Development Control Plan*, applies to the proposed coastal protection works, in particular Item (ii) of the Controls therein. As stated therein:

> "Hazard mitigation and coastal protection works that modify the oceanic inundation and wave action behaviour within the development site, may be permitted subject to a Coastal Risk Management Report that demonstrates the following:
>
> (a) The works do not have an adverse impact on any surrounding properties or coastal processes
> (b) A Section 88B notation under the Conveyancing Act 1919 is to be placed on the title describing the location and the types of mitigation works with a requirement for their retention and maintenance.
> (c) Hazard mitigation works will result in the protection of the proposed development from coastal processes.
> (d) Where coastal protection structures such as rock revetments or boulder seawalls already exist within the beach compartment, the position of such structures has been used to determine the location and alignment for any new terminal revetment or coastal protection works for the land on which development is proposed.
> (e) In the case of an existing protection structure, a suitably qualified professional/s with appropriate expertise in the applicable areas of engineering has certified the

structural integrity and competency of the works for their intended purpose and for the design storm event".

6.6.2 Item (a)

With regard to Item (a), the proposed works would be buried under sand and would not interact with coastal processes for most of the time over the design life. Some may argue that there is a potential end effect (a potential for additional erosion) to the immediate north and south of the works

Carley et al (2013) developed *Technical Advice to Support Guidelines for Assessing and Managing the Impacts of Long-Term Coastal Protection Works* for the NSW Government. Although this advice is considered to have limitations[18], it can be noted that they presented an analysis of the volume of sand seaward of coastal protection works versus its alongshore impact, based on an assessment of potential end effects observed at NSW beaches, see Figure 8. The X axis in Figure 8 represents the sand volume seaward of a wall divided by the design storm erosion of 235m^3/m, which at Newport SLSC (based on an average volume above 0m AHD of 160m^3/m) is calculated as 0.68, as represented by the red X in Figure 8. At the end of the design life, this ratio is 0.52 (based on an average volume above 0m AHD of 123m^3/m at the end of the design life), as per the yellow X in Figure 8.

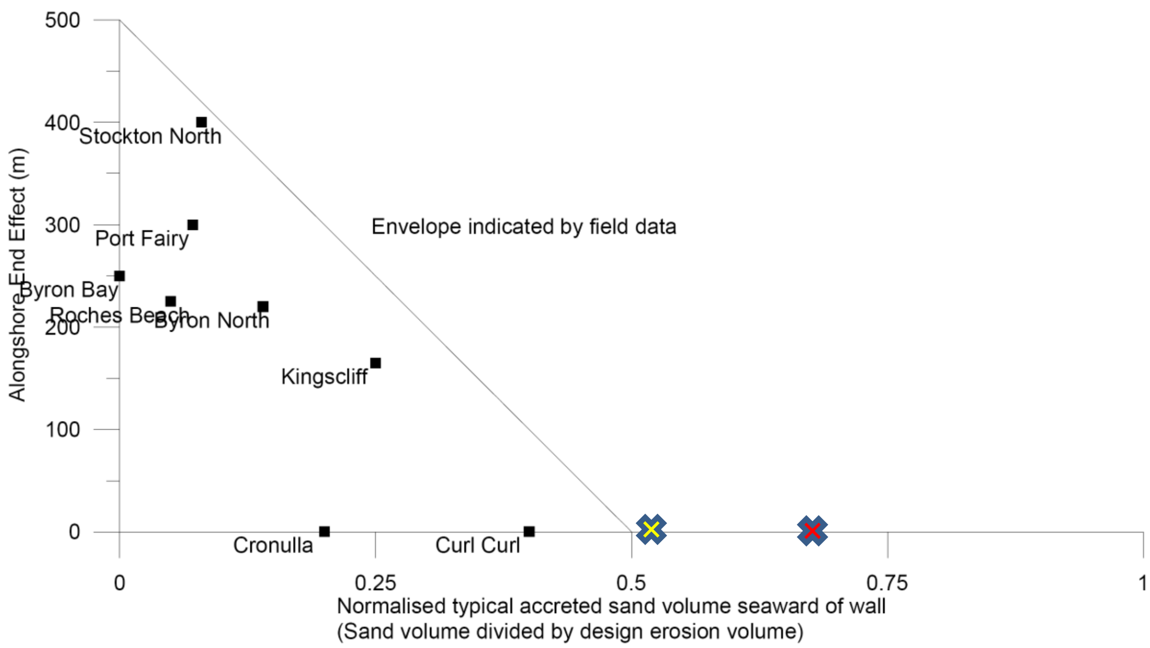

Figure 8: Relationship between alongshore extent of end effect and relative sand volume seaward of coastal protection works from Carley et al (2013), with the red X and yellow X showing the relative volume at Newport SLSC at present and at the end of the design life respectively

Figure 8 would suggest that significant end effects would be unlikely due to the proposed works, given that the relative volume of sand seaward of the works exceeds the Carley et al (2013) envelope indicated by NSW field data for end effects to occur, both at present and at the end of the design life. Kraus and McDougal (1996) found that the key parameter in coastal protection works and beach interaction was the location of the works relative to the shoreline.

[18] That is, the methodology of Carley et al (2013) is not endorsed as being reasonable.

With the proposed works beyond the limit at which Carley et al (2013) observed end effects at NSW beaches, it is reasonable to conclude that it is unlikely that there would be a significant end effect from the proposed works over the design life.

However, UNSW Water Research Laboratory (WRL), as reported in a letter report dated 8 July 2021, has completed an assessment of potential end effects as a result of the construction of the proposed seawall. Therein, it is argued that despite the above evidence, short term end effects could still occur. Note also that WRL used the so-called "Dean approximate principle" to develop their estimate of end effects, which is not supported by numerous field studies such as Jones and Basco (1996), and literature such as Basco (2006). The WRL assessment of potential end effects as a result of the construction of the proposed seawall is summarised in Figure 9.

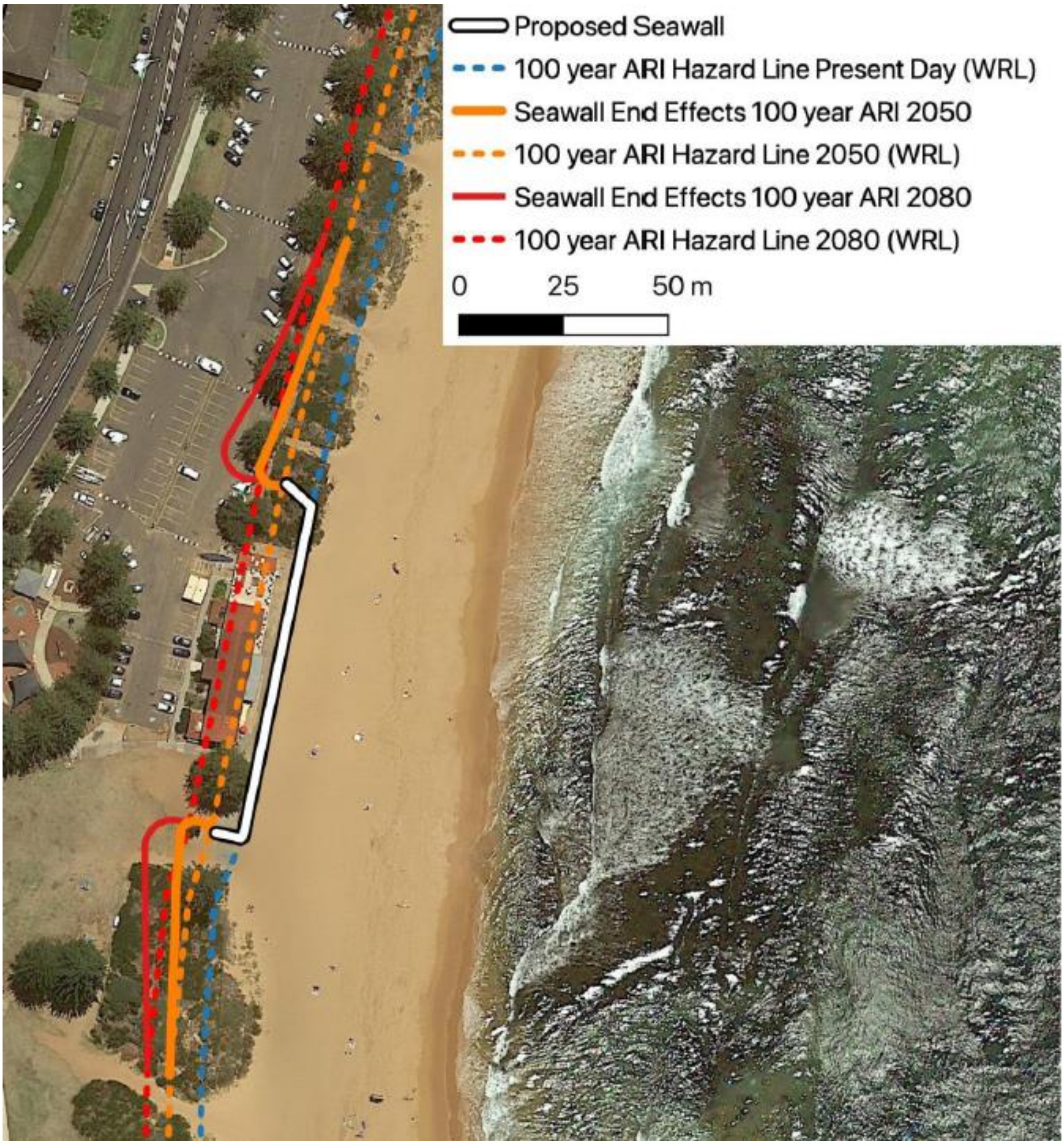

Figure 9: Theoretical end effect from proposed seawall determined in WRL letter report dated 8 July 2021

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If these end effects were realised, the additional erosion would only affect Council's assets such as parkland and a car park, and would be short-term and relatively inconsequential. Council, the asset owner, has advised that it could accept such additional erosion if it occurred, given the benefit of protecting the SLSC asset. It would be far more catastrophic to Council's assets if the proposed coastal protection works were not undertaken.

Therefore, the proposed works would not be expected to have an adverse impact on any surrounding properties or coastal processes over the design life, satisfying Item (a).

6.6.3 Item (b)

If this item is relevant to public land, this is not a coastal engineering matter and hence is not considered herein.

6.6.4 Item (c)

The proposed works would result in the proposed clubhouse development having an acceptably low risk of being damaged from erosion/recession coastal processes, thus satisfying Item (c). Other measures to provide an acceptably low risk of damage from wave runup coastal processes were briefly listed in Section 1, and have been considered in Horton Coastal Engineering (2021).

6.6.5 Item (d)

The proposed works have been positioned as far landward as possible, and are located landward of the existing rock boulders at the site. That stated, Item (d) is more about integrating with any adjacent existing coastal protection works, which is not applicable adjacent to Newport SLSC as no such works are present. Therefore, Item (d) is satisfied.

6.6.6 Item (e)

This item is not applicable, as no existing works are being certified.

6.7 *State Environmental Planning Policy (Coastal Management) 2018*

6.7.1 Preamble

Based on *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal) and its associated mapping, the subject site is within the "coastal environment area" (see Section 6.7.2) and "coastal use area" (see Section 6.7.3).

6.7.2 Clause 13

Based on Clause 13(1) of SEPP Coastal, "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 coastal protection works would not be expected to adversely affect the hydrological (surface and groundwater) environment, as groundwater can flow freely around the works in free-draining sandy material, and weepholes are proposed through the wall itself. The proposed works would not be expected to adversely affect the visible biophysical or ecological environments, being buried under sand.

With regard to (b), the proposed works would not be expected to adversely affect coastal environmental values or natural coastal processes over a reasonable design life, as they are at an acceptably low risk of being damaged by coastal erosion/recession over the design life, and are not expected to have an adverse impact on any surrounding properties or coastal processes over the design life as discussed in Section 6.6.2.

The proposed works would cause a short-term impact on coastal environmental values and beach amenity during the construction period (eg, through noise and possibly some restriction on alongshore beach access), which is unavoidable. As the impacts are short-term and localised they can be accepted.

With regard to (c), the proposed works would not be expected to adversely impact on water quality, as long as appropriate construction environmental controls are applied. No sensitive coastal lakes are located in the vicinity of the proposed works. The proposed works would improve water quality compared to the existing situation, as they would significantly reduce the risk of the clubhouse being undermined due to coastal erosion/recession, and hence reduce the risk of debris and non-sandy materials being scattered on the beach.

An Erosion and Sedimentation Control Plan has been provided as part of the Drawings (Drawing S05, see Attachment A). Sandy beach materials are naturally subject to erosion and accretion cycles, and excavation of such materials does not require any erosion and sedimentation controls. Sandy material entering the ocean is a natural process that does not need to be (and cannot be) prevented seaward of the works.

The main form of erosion and sedimentation control proposed for the works area is construction of a sand bund seaward of the works, as shown on Drawing S05. In addition, materials that would be deleterious if washed into the ocean would need to be stockpiled where they would not be impacted by wave action.

With regard to (d), the proposed works would not impact marine vegetation, native vegetation and fauna and their habitats of significance (which are assumed not to exist at the site), and 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 works, as the works would hardly ever be expected to interact with subaqueous areas over its design life, and only at times when marine fauna would struggle to survive in the energetic

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wave environment. Indeed, the proposed works offer a better outcome for marine fauna and flora than the existing situation of deleterious materials being washed into the ocean after storms.

A small area of beach and dune face that birds may visit would not be available during construction, but there would be ample area to the north and south of the works for birds to access, should existing anthropogenic disturbances at these locations allow that access. There would be some invertebrate fauna habitat removed during the construction process as the upper layer of the beach sand is excavated, stockpiled and replaced. The impact of this is comparable with natural erosion events and accretion cycles and it is not considered that this would result in significant ongoing impacts.

With regard to (e), it can be noted that the proposed works will not affect public access to Newport Beach to the north and south of the building, with existing beach accessways being maintained. The fact that these accessways are to be landward of coastal protection works means that these accessways have been enhanced and made essentially ‘permanent' and safe over the design life. With inclusion of beach access stairs as part of the proposed works, public beach access and public safety will be enhanced between the clubhouse and beach and vice versa. The proposed works do not interfere with alongshore beach access at all, and are located further landward than the existing rock boulders.

With regard to (f), this is not a coastal engineering matter so has not been considered herein.

With regard to (g), the proposed works would hardly ever be expected to interact with the surf zone over the design life, and only at times when swimming and surfing would be hazardous and the beach would be closed. Therefore, the proposed works would not significantly impact on the use of the surf zone.

Based on Clause 13(2) of SEPP Coastal, “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 works have been designed and sited to avoid any potential adverse impacts referred to in Clause 13(1).

6.7.3 Clause 14

Based on Clause 14(1) of SEPP Coastal, “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 works will enhance public beach access and related public safety.

Clauses (a)(ii), a(iii), a(iv) and a(v) are not coastal engineering matters so are not considered herein. That stated, with regard to (a)(ii), the proposed works are to be mostly buried under sand and to have a crest elevation matching historical sand levels, so would not be expected to generate adverse overshadowing or wind funnelling, nor affect views from public places to foreshores.

Furthermore, with regard to a(v), the proposed works enable the heritage clubhouse to be maintained over the design life. Without the proposed works being undertaken, the heritage structure would have an unacceptably high risk of being undermined over the design life.

With regard to (b), the proposed works have been designed and sited to avoid any potential adverse impacts referred to in Clause 14(1) for the matters considered herein.

Clause (c) is not a coastal engineering matter so is not considered herein, although it can be noted that the proposed works are mostly buried.

6.7.4 Clause 15

Based on Clause 15 of SEPP Coastal, "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 works are unlikely to have a significant impact on coastal hazards or increase the risk of coastal hazards in relation to any other land, as discussed in Section 6.6.2. The proposed works would have a significantly improved effectiveness (that is, improved mitigation of erosion/recession hazards) compared to the existing boulder works.

Other measures to provide an acceptably low risk of damage from wave runup coastal processes were briefly listed in Section 1, and have been considered in Horton Coastal Engineering (2021).

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6.7.5 Clause 16

Based on Clause 16 of SEPP Coastal, "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 site.

6.7.6 Synthesis

The proposed works satisfy Clauses 13, 14, 15 and 16 of *State Environmental Planning Policy (Coastal Management) 2018* for the matters considered herein.

6.8 Section 27 of the *Coastal Management Act 2016*

Based on Section 27 of the *Coastal Management Act 2016*, "development consent must not be granted under the *Environmental Planning and Assessment Act 1979* to development for the purpose of coastal protection works, unless the consent authority is satisfied that:

(a) the works will not over the life of the works
  - (i) unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or
  - (ii) pose or be likely to pose a threat to public safety; and,

(b) satisfactory arrangements have been made (by conditions imposed on the consent) for the following for the life of the works:
  - (i) the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by the presence of the works,
  - (ii) the maintenance of the works".

With regard to (a)(i), the proposed works enhance public access to and from the beach compared to the existing situation, by providing a formed interface between the clubhouse and variable sand levels. They are also located as far landward as possible, and over as small a footprint as possible, such that the heritage clubhouse can remain where it is at an acceptably low risk of damage.

With regard to (a)(ii), the proposed works pose no significant threat to public safety, having been designed to withstand an acceptably rare storm over a 60 year design life, and are far less of a threat to public safety than the do-nothing scenario.

With regard to (b)(i), the beach would be expected to naturally accrete and be restored seaward of the proposed works after storm events, and no differently to the existing situation. Any increased erosion (if any) on the beach would be only short term and not be measurable or significant. If any mechanical intervention is desired to accelerate beach recovery, Council has the means to undertake beach scraping.

Further with regard to (b)(i), there are no significant end effects (increased erosion on adjacent land) expected as a result of the proposed works, as discussed in Section 6.6.2. That stated, Council again has the means to undertake beach scraping and the like to deal with any such impacts, which would be on its own land.

With regard to (b)(ii), Council would be responsible for maintaining the proposed works. To maintain the proposed works, it would be necessary for a suitably qualified and experienced coastal engineer to undertake an inspection after severe storms that expose the works, and advise on any required remedial action. Potential maintenance activities would include:

- Inspection of the wall after significant coastal storms. This would comprise inspection of the seaward side for any damage to the concrete steps, gap formation in the piling (where visible), and integrity of the weepholes. This would also comprise inspection of the landward side for evidence of the formation of any sinkholes (indicating migration of soil though the wall), wall displacement, and assessment of any wave overtopping damage at the surface.
- Should a significant impact event cause localised damage to the concrete steps structure exposing reinforcement, the concrete wall should be locally scabbled and patched with an approved repair mortar. Any concrete steps damage is unlikely, with high strength concrete and appropriate cover to reinforcement for a 60 year life being used.
- Dealing with any gap formation in the piling through either shotcreting from the seaward side (after excavation of sand for access to the gaps as required), on the landward side (with sand in this case left in place against the gap on the seaward side to act as a "formwork" for the grouting). That stated, the construction procedure would involve hold points to inspect the piling for gaps, to minimise the possibility of gaps occurring in the first place. The construction contract terms would be such that there is an incentive for the contractor to take care with the piling to minimise the potential for gaps, as these defects would be their responsibility to correct and would be inspected by the project engineers.
- If any weepholes were found to be leaking soil they could be filled with concrete. Weepholes are not necessary for structural integrity of the wall (the wall would be designed assuming limited drainage, with landward groundwater levels of 3.5m AHD), so can be sacrificed if the geotextile sock on the weephole failed.
- Any formation of sink holes on the landward side would be an indication of gap formation in the piling, which could be addressed as described above.
- If significant displacement of the wall occurred, which is not expected, this may be indicative of an anchor failure. To address this issue, it may be necessary to re-drill an anchor. That stated, field testing of anchor performance would be a hold point in the construction procedure, requiring signoff of the project engineers, thus minimising the possibility of sub-standard anchor performance.

6.9 *Pittwater Local Environmental Plan 2014*

Clause 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014) does not strictly apply at the subject site, as it is not identified as a "Coastal erosion / wave inundation" area on the Coastal Risk Planning Map (Sheet CHZ_018). However, for consistency with coastal planning for adjacent private development, Clause 7.5 of LEP 2014 has been considered herein.

Based on Clause 7.5(3) of LEP 2014, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

(a) is not likely to cause detrimental increases in coastal risks to other development or properties, and
(b) is not likely to alter coastal processes and the impacts of coastal hazards to the detriment of the environment, and

(c) incorporates appropriate measures to manage risk to life from coastal risks, and
(d) is likely to avoid or minimise adverse effects from the impact of coastal processes and the exposure to coastal hazards, particularly if the development is located seaward of the immediate hazard line, and
(e) provides for the relocation, modification or removal of the development to adapt to the impact of coastal processes and coastal hazards, and
(f) has regard to the impacts of sea level rise, and
(g) will have an acceptable level of risk to both property and life, in relation to all identifiable coastline hazards".

With regard to (a) and (b), the proposed works would not increase coastal risks nor alter coastal processes and the impacts of coastal hazards over its design life, as discussed in Section 6.6.2. The proposed works would reduce the coastal hazard of beach erosion/recession at the Newport SLSC clubhouse.

As has been demonstrated from review of historical beach profile data extending back to 1941, sand that is eroded off Newport Beach in coastal storms (caused by large waves and elevated water levels) returns to the subaerial beach in calmer conditions after storms, such that there is no long-term trend of recession at the beach. That is, the existing rock boulders do not adversely affect the sediment budget of the beach, and the same can be expected for the proposed works (which are also located further landward than the existing boulders). Therefore, the proposed works would not be expected to cause detrimental increases in coastal risks.

With regard to (c) and (g), the proposed works themselves would be at an acceptably low risk of damage from coastal erosion/recession over its design life, and also provide a similar acceptably low risk of damage to the clubhouse. Risk to life related to redevelopment of Newport SLSC was considered in Horton Coastal Engineering (2021).

Other measures to provide an acceptably low risk of damage from wave runup coastal processes were briefly listed in Section 1, and have been considered in Horton Coastal Engineering (2021).

With regard to (d), the proposed works would minimise the adverse effects from the impact of coastal processes and the exposure to coastal hazards for the proposed clubhouse. Given that the proposed development would be at an acceptably low risk of damage for the design life, (e) is not necessary, and relocation would be inconsistent with its heritage status and surf lifesaving functions.

With regard to (f), sea level rise has been considered herein, as discussed in Section 5.8.3 and applied in Section 5.4.

The proposed works thus satisfy Clause 7.5 of LEP 2014.

6.10 Section 4.15(1) of the *Environmental Planning and Assessment Act 1979*

Based on Section 4.15(1) of the *Environmental Planning and Assessment Act 1979*, in determining a DA, "a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the DA:

(a) the provisions of:

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(i) any environmental planning instrument, and
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and
(iii) any development control plan, and
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,
(c) the suitability of the site for the development,
(d) any submissions made in accordance with this Act or the regulations,
(e) the public interest".

With regard to (a)(i), *Pittwater Local Environmental Plan 2014* has been considered in Section 6.9, and the proposed works were found to be consistent with this.

With regard to (a)(ii), this is not applicable.

With regard to (a)(iii), the *Coastline Risk Management Policy for Development in Pittwater*, which is Part B and Appendix 6 of the *Pittwater 21 Development Control Plan*, has been considered in Section 6.6, and the proposed works were found to be consistent with this.

With regard to (a)(iiia) and (iv), these are not applicable.

With regard to (b), environmental impacts have been considered in previous sections. There are no significant long-term environmental impacts on flora and fauna expected from the proposed works. The proposed works would limit the social and economic impacts of the loss of Newport SLSC in a severe coastal storm.

With regard to (c), the proposed works are the only option to retain the heritage building, and hence are suitable for the site.

With regard to (d), no submissions have been made in accordance with the Act or the regulations in relation to the proposed works. However, as discussed in Horton Coastal Engineering (2021), concepts for redevelopment of Newport SLSC were released for public comment in November 2020, with community engagement conducted until January 2021. This included previous versions of the report herein and Horton Coastal Engineering (2021). The main coastal engineering issue raised by the community was in relation to coastal inundation (wave runup) coastal hazards, which has been addressed in Horton Coastal Engineering (2021).

With regard to (e), the proposed works are not contrary to the public interest, as they enable retention of Newport SLSC with its heritage status and surf lifesaving functions over the design life. Sand will continue to come and go off Newport Beach, and the proposed works are as far landward as possible, minimising the public impact. Indeed, public beach access is enhanced to and from Newport Beach by undertaking the proposed works, which is in the public interest.

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7. CONCLUSIONS

It is proposed to undertake alterations and additions at Newport SLSC. To provide protection such that the redeveloped SLSC would be at an acceptably low risk from undermining due to coastal erosion/recession over its design life, buried coastal protection works have been proposed. Details of the coastal protection works design, and a merit assessment of the works from a coastal engineering perspective, have been provided herein.

The proposed buried coastal protection works design comprises a secant piling wall, with a reinforced concrete capping beam and high-level steps to provide beach access. Anchors attached to the capping beam/stairs (and permanently buried landward of the wall) are required to reduce the risk of the wall overturning at times of beach scour (low sand levels) on the seaward side of the wall.

Based on historical beach behaviour, and allowing for lower beach levels in the future caused by long term recession due to sea level rise, the piled wall would be expected to be buried under sand for most of the time over its 60 year design life.

The northern and southern extent of the buried coastal protection works was delineated in consultation with an arborist to minimise the impact on Norfolk Island pine trees to the north and south of the clubhouse respectively. The proposed extent of the works means that both trees would be protected from undermining while the works are in place.

Coastal protection works are required at Newport SLSC given the risk to the existing and proposed development from coastal erosion/recession, necessity to retain the building in its current location (as it has heritage status and surf lifesaving functions), and the lack of feasibility for retrofitting deep foundation piles to the existing SLSC building as an alternative means of reducing the risk of damage to the clubhouse from erosion/recession.

There are existing rock boulders seaward of the clubhouse that were placed as a response to storm erosion threatening the clubhouse in 1974. The future effectiveness of these boulders in acceptably reducing the risk of undermining of Newport SLSC from coastal erosion/recession cannot be guaranteed.

The proposed buried coastal protection works would provide protection to the SLSC building from erosion/recession for an acceptably rare storm over an acceptably long life, and also allows the seaward extent of existing rock boulders to be reduced or removed entirely if required. Measures to provide an acceptably low risk of damage from wave runup coastal processes have been considered in Horton Coastal Engineering (2021).

The proposed coastal protection works are considered to be consistent with the *Pittwater Ocean Beaches Plan of Management* for Newport Beach, *Coastline Risk Management Policy for Development in Pittwater*, Clauses 13, 14, 15 and 16 of *State Environmental Planning Policy (Coastal Management) 2018*, Section 27 of the *Coastal Management Act 2016*, and Clause 7.5 of *Pittwater Local Environmental Plan 2014* for the matters considered herein.

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ATTACHMENT A: DA DRAWINGS OF BURIED COASTAL PROTECTION WORKS PREPARED BY HORTON COASTAL ENGINEERING AND JAMES TAYLOR & ASSOCIATES

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DOCUMENTATION OF

BURIED COASTAL PROTECTION WORKS

AT NEWPORT SLSC, NEWPORT, NSW

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Sheet List Table

Sheet Number	Sheet Title
S01	GENERAL NOTES
S02	COASTAL PROTECTION WORKS PLAN
S05	EROSION AND SEDIMENT CONTROL PLAN AND WASTE MANAGEMENT PLAN
S10	SECTION 1

GENERAL NOTES

N1. ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD), UNLESS NOTED OTHERWISE

N2. FGL REFERS TO FINISHED GROUND LEVEL

STRUCTURAL

S1. ALL STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH AS 4100

S2. ALL TIMBER STRUCTURES SHALL BE IN ACCORDANCE WITH AS 1720, AS 1684 AS REQUIRED

S3. ALL PILING AND CONCRETE STRUCTURES SHALL BE IN ACCORDANCE WITH RELEVANT AUSTRALIAN STANDARDS

REFERENCE DOCUMENTS

1. SURVEY DRAWING PREPARED BY:
   C.M.S. SURVEYORS
   Ph. (02) 9971 4802
   REF No. 17692
   DATED: 13/04/18

2. GEOTECHNICAL REPORT BY
   JK GEOTECHNICS
   Ph. (02) 9888 5000
   REF No. 32537RE
   DATED: 7-8-19

NOT FOR CONSTRUCTION

BY	CHKD	DESCRIPTION	DATE	REV
P.P.	R.Y.	REVISED AFTER CONSULTATION	24.08.21	D
P.P.	R.Y.	REVISED FOR DA	20.11.20	C
P.P.	R.Y.	REVISED FOR DA	12.11.20	B
P.P.	R.Y.	FOR DA	09.11.20	A

BURIED COASTAL PROTECTION WORKS
AT NEWPORT SLSC, NEWPORT NSW

GENERAL NOTES

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DESIGN	P.H.	DRAWN	P.P.
CHKD.	R.Y.		
APPRD.	P.H.		
SCALE		DATE	

PROJECT NO. 6268

DRAWING NO. S01

REV D

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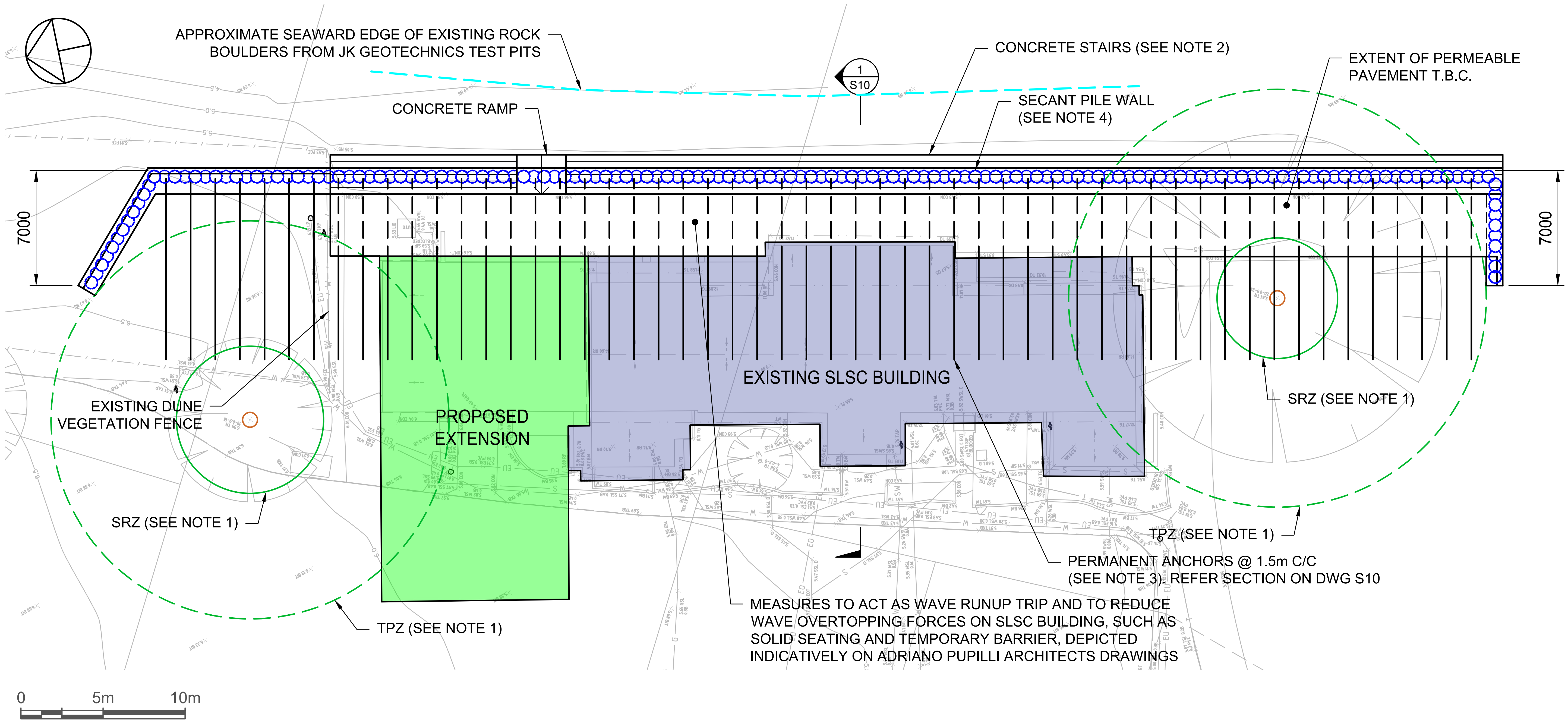

1. STRUCTURAL ROOT ZONE (SRZ) AND TREE PROTECTION ZONE (TPZ) FOR NORFOLK ISLAND PINE TREES DERIVED FROM "ARBORICULTURAL IMPACT ASSESSMENT, NEWPORT SLSC" PREPARED BY LEIGH BRENNAN OF TREE MANAGEMENT STRATEGIES, DATED 23 MARCH 2020
2. LANDWARD EDGE OF THE NEW CONCRETE STAIRS IS COINCIDENT WITH THE SEAWARD EDGE OF THE EXISTING CONCRETE PATH
3. ALTERNATIVE ANCHOR SETOUTS AND/OR TYPES MAY BE SUBMITTED FOR APPROVAL. TO BE AGREED WITH CONTRACTOR SUBJECT TO CONFIRMATION OF STRUCTURAL & GEOTECHNICAL ENGINEER
4. ALTERNATIVE PILING TYPES MAY BE SUBMITTED FOR APPROVAL, SUCH AS CONTIGUOUS PILES COMBINED WITH PLUG PILES. TO BE AGREED WITH CONTRACTOR SUBJECT TO CONFIRMATION OF STRUCTURAL & GEOTECHNICAL ENGINEER

NOT FOR CONSTRUCTION

BY	CHKD	DESCRIPTION	DATE	REV
P.P.	R.Y.	REVISED AFTER CONSULTATION	24.08.21	D
P.P.	R.Y.	REVISED FOR DA	20.11.20	C
P.P.	R.Y.	REVISED FOR DA	12.11.20	B
P.P.	R.Y.	FOR DA	09.11.20	A

BURIED COASTAL PROTECTION WORKS
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COASTAL PROTECTION WORKS PLAN

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DESIGN P.H.	DRAWN P.P.	PROJECT NO.	6268
CHKD. R.Y.			
APPRD. P.H.		DRAWING NO. S02	REV D
SCALE 1 : 250	DATE		

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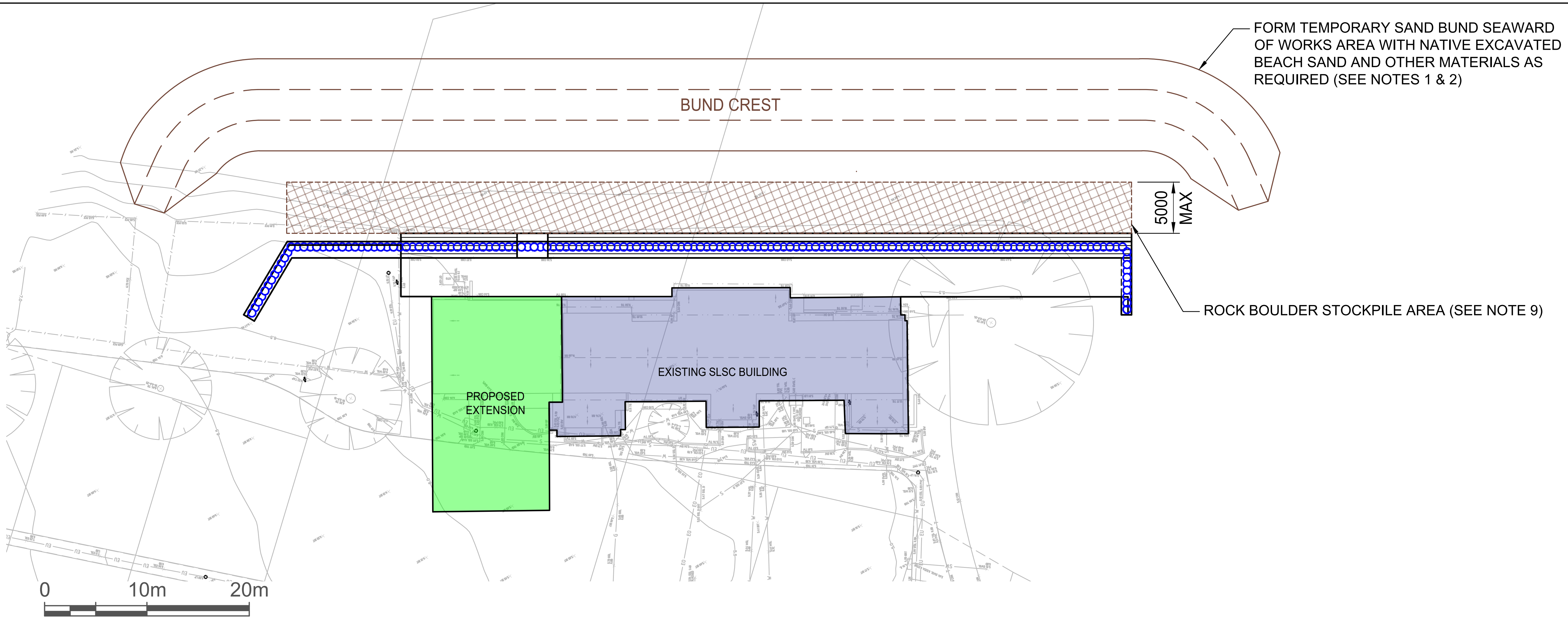

1. BUND MAY BE FORMED OVER A PORTION OR OVER THE ENTIRETY OF THE WORKS AREA DEPENDING ON CONSTRUCTION PROGRAM AND WAVE AND WATER LEVEL CONDITIONS, AS DIRECTED BY COASTAL ENGINEER OR CONTRACTOR. BUND IS TO BE REMOVED, WITH SAND SHAPED TO A NATURAL PROFILE, PRIOR TO COMPLETION OF THE WORKS
2. RUBBLE AND OTHER MATERIALS OR WASTE THAT WOULD BE UNSUITABLE ON A BEACH ARE TO BE SEPARATED AND STOCKPILED WHERE ENCOUNTERED DURING EXCAVATION (POTENTIALLY TO BE REUSED, SEE NOTE 7). EXCAVATED (LARGER FRACTION) ROCK BOULDERS MAY BE TEMPORARILY PLACED ON BEACH, IN BUND, AS DIRECTED BY COASTAL ENGINEER, TO PROVIDE SOME PROTECTION TO EXCAVATED WORKS AREA. IMPORTED MATERIALS THAT WOULD BE TEMPORARILY SUITABLE ON A BEACH SUCH AS CONCRETE BLOCKS AND THE LIKE MAY ALSO BE USED IN THE BUND. SHEET PILING MAY ALSO BE CONSIDERED FOR USE AS TEMPORARY PROTECTION
3. ALL DELETERIOUS MATERIALS AND EQUIPMENT THAT COULD BE DAMAGED ARE TO BE REMOVED FROM WORK AREA IF BUND CANNOT BE MAINTAINED DUE TO ELEVATED WAVES AND WATER LEVELS. WORKS IN BEACH AREA MAY NEED TO TEMPORARILY CEASE UNDER THESE CONDITIONS
4. ALL MATERIAL STOCKPILES ARE TO BE LOCATED LANDWARD OF THE EXISTING CLUBHOUSE, UNLESS AGREED BY COASTAL ENGINEER
5. WHEN RESTORING BEACH SAND LEVELS AT THE COMPLETION OF THE SEAWALL WORKS, SCREENING IS TO BE UNDERTAKEN TO REMOVE RUBBLE, ROCK FRAGMENTS AND OTHER MATERIALS THAT WOULD BE UNSUITABLE ON A BEACH
6. ANY WASTE MATERIALS SHALL BE DISPOSED OF AT AN APPROPRIATE WASTE MANAGEMENT FACILITY OFF SITE
7. WASTE AND RUBBLE MATERIALS MAY BE BURIED LANDWARD OF THE WALL AS AGREED BY GEOTECHNICAL ENGINEER, SUBJECT TO A WASTE CLASSIFICATION UNDERTAKEN BY A SUITABLY QUALIFIED ENVIRONMENTAL CONSULTANT (WHO IS A MEMBER OF THE AUSTRALIAN CONTAMINATED LAND CONSULTANTS ASSOCIATION INC)
8. WHERE DEWATERING IS UNDERTAKEN, WATER SHALL BE PUMPED INTO A SAND ‘SUMP’ AND NOT DISCHARGED DIRECTLY TO THE SEA
9. EXISTING ROCK BOULDERS ENCOUNTERED IN EXCAVATION (AND NOT CRUSHED TO USE AS BACKFILL, OR REMOVED FROM THE SITE) MAY BE PLACED AT A STABLE SLOPE AND IN A SAFE AND INTERLOCKED MANNER IN THIS STOCKPILE AREA UNDER THE DIRECTION OF A COASTAL ENGINEER. ANY MATERIALS ENCOUNTERED THAT WOULD BE INAPPROPRIATE TO LEAVE STOCKPILED ON THE BEACH WOULD BE PLACED AS BACKFILL LANDWARD OF THE SEAWALL (IF APPROPRIATE) OR TAKEN TO A LICENSED WASTE MANAGEMENT FACILITY. WHEN RESTORING SAND LEVELS OVER ANY REMAINING BOULDERS IN THE STOCKPILE AREA, SCREEN AS PER NOTE 5
10. SAND SIZED MATERIAL FOR BACKFILL (IF REQUIRED) SHALL NOT BE SOURCED FROM THE BEACH SEAWARD OF THE CLUBHOUSE. BACKFILL MATERIAL IMPORTED TO THE SITE SHALL BE CLASSIFIED AS VIRGIN EXCAVATED NATURAL MATERIAL (VENM), EXCAVATED NATURAL MATERIAL (ENM), OR RECYCLED MATERIALS OBTAINED FROM AN EPA LICENSED FACILITY. FOR ENM AND RECYCLED MATERIALS, SUPPORTING DOCUMENTATION SHOULD BE REVIEWED BY A SUITABLY QUALIFIED ENVIRONMENTAL CONSULTANT WHO IS A MEMBER OF THE AUSTRALIAN CONTAMINATED LAND CONSULTANTS ASSOCIATION INC. ALL BACKFILL SHALL BE TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER

NOT FOR CONSTRUCTION

BY	CHKD	DESCRIPTION	DATE	REV
P.P.	R.Y.	REVISED AFTER CONSULTATION	24.08.21	D
P.P.	R.Y.	REVISED FOR DA	20.11.20	C
P.P.	R.Y.	REVISED FOR DA	12.11.20	B
P.P.	R.Y.	FOR DA	09.11.20	A

BURIED COASTAL PROTECTION WORKS
AT NEWPORT SLSC, NEWPORT NSW

EROSION AND SEDIMENT CONTROL PLAN AND WASTE MANAGEMENT PLAN

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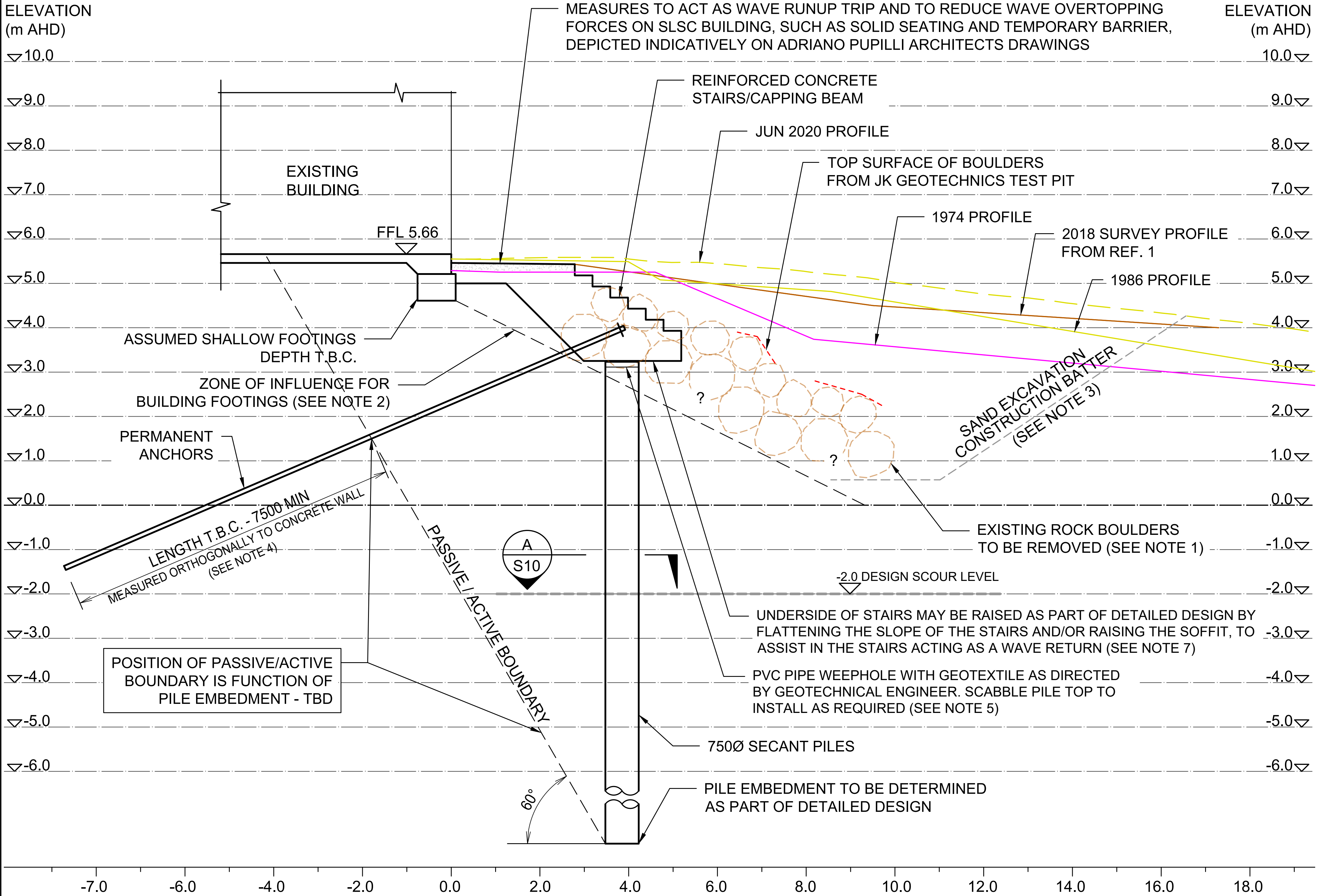
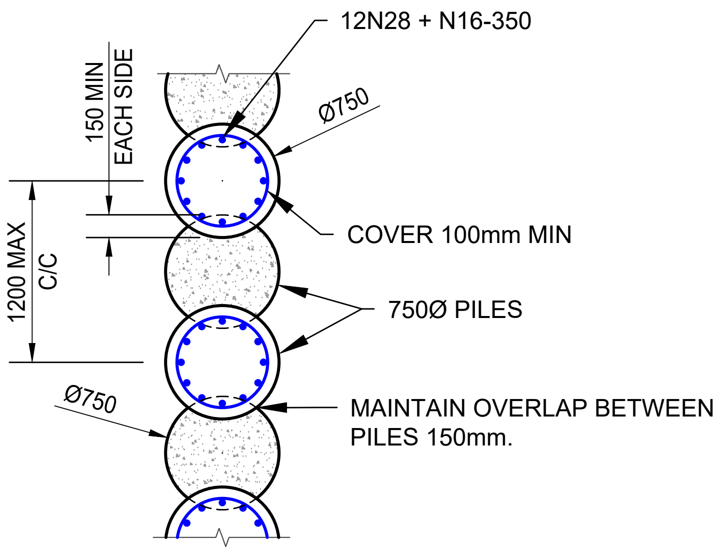
DESIGN	P.H.	DRAWN	P.P.
CHKD.	R.Y.		
APPRD.	P.H.		
SCALE	1 : 400	DATE	

PROJECT NO. 6268
DRAWING NO. S05
REV D
A3





A **Section A**
Scale: 1:50

1. EXTENT OF ROCK BOULDERS DEPICTED IS APPROXIMATE. ALLOW TO EXCAVATE AND LOCALLY REMOVE ROCKS PRIOR TO PILING
2. CARE SHALL BE TAKEN WITH EXCAVATION OF BOULDERS, AND EXCAVATION TO FORM THE PILING WORKING PLATFORM, IN THE VICINITY OF THE ZONE OF INFLUENCE. THIS IS TO ENSURE THAT THE EXISTING CLUBHOUSE FOOTINGS ARE NOT COMPROMISED
3. SLOPE OF BATTER TO BE 1V:1.5H OR FLATTER. IT WOULD BE DIFFICULT TO MAINTAIN A TEMPORARY EXCAVATION BATTER AT 1V:1.5H IN SAND BELOW THE GROUNDWATER LEVEL. THEREFORE, TEMPORARY SUPPORT OF THE EXCAVATION (SUCH AS WITH SAND BAGS) AND/OR USE OF SUITABLE ROCK TO FORM A BATTER OF APPROXIMATELY 1V:2.5H MAY BE REQUIRED BELOW THE GROUNDWATER LEVEL (BAGS AND ROCK TO BE REMOVED OFF BEACH AT COMPLETION OF EXCAVATION WORKS)
4. ANCHOR DESIGN LIFE MIN 100 YEARS. DETAIL ANCHOR DESIGN BY ANCHORING CONTRACTOR, SUBJECT TO APPROVAL OF STRUCTURAL AND GEOTECHNICAL ENGINEERS.
5. ENSURE ADEQUATE COVER IS MAINTAINED TO REINFORCEMENT IN PILES AFTER SCABBLING, AS DIRECTED BY STRUCTURAL ENGINEER. PVC PIPE WEEPHOLES COULD ALTERNATIVELY BE TIED TO BASE OF CONCRETE STAIRS (PILE CAPPING BEAM) REINFORCEMENT IF AGREED BY CONTRACTOR AND STRUCTURAL ENGINEER
6. 1974, 1986 AND 2020 BEACH PROFILES DERIVED FROM NSW BEACH PROFILE DATABASE
7. THE SEAWARD EDGE OF THE PROMENADE AND/OR SEAWARD EDGE OF STAIRS MAY ALSO BE EXTENDED UP TO 2m SEAWARD TOTAL (COMBINED), IF REQUIRED AS PART OF DETAILED DESIGN TO REDUCE WAVE FORCES ON THE CLUBHOUSE

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BURIED COASTAL PROTECTION WORKS
AT NEWPORT SLSC, NEWPORT NSW

SECTION 1

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SCALE	1 : 100	DATE	

PROJECT NO. 6268
DRAWING NO. S10
REV D
A3