325 Whale Beach Road, Palm Beach

Updated Plans

Proposed Changes

We have reviewed the existing geotechnical report, the original plans, and the 3 amended plans by Landart, drawing numbered SE03 is Revision A, dated 20/3/20, drawing numbered SE02 is Revision B, dated 18/3/20, and drawings numbered LMP01 and SE01 are Revision D, also dated 18/3/20.

The changes are as follows:

- Alter the layout of the proposed pool.

The changes to the plans are minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the report carried out by this firm numbered J2412 and dated the 9th December, 2019.

Council have requested additional information on the proposed retaining walls that reach a maximum height of ~1.3m on the downhill side of the property. They are shown on LMP01. As such we would add the following advice to the existing report, where the advice contradicts that in the existing report, it supersedes it:

Fill

Two fills will be placed on the downhill side of the property for landscaping. No fills are to be laid until retaining walls are in place. The fills will reach a maximum depth of ~1.3m. The surface is to be prepared before any fills are laid by removing any organic matter and topsoil. Fills are to be laid in a loose thickness not exceeding 0.3m before being moderately compacted. Tracking the machine over the loose fill in 1 to 2 passes should be sufficient. Immediately behind the retaining walls (say to 1.5m), the fills are to be compacted with light weight equipment such as a hand-held plate compactor so as not to damage the retaining

walls. Where light weight equipment is used, fills are to be laid in a loose thickness not exceeding 0.2m before being compacted. No structures are to be supported on fill.

Retaining Walls

For cantilever or singly-propped retaining walls, it is suggested the design be based on a triangular pressure distribution of lateral pressures using the parameters shown in Table 1.

Table 1 – Likely Earth Pressures for Retaining Walls

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill	20	0.4	0.55

For rock classes refer to Pells et al "Design Loadings for Foundations on Shale and Sandstone in the Sydney Region". Australian Geomechanics Journal 1978.

It is to be noted that the earth pressures in Table 1 assume a level surface above the wall, do not account for any surcharge loads, and assume retaining walls are fully drained. Ground materials and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining walls are to have sufficient back-wall drainage and be backfilled immediately behind the wall with free-draining material (such as gravel). This material is to be wrapped in a non-woven Geotextile fabric (i.e. Bidim A34 or similar), to prevent the drainage from becoming clogged with silt and clay. If no back-wall drainage is installed in retaining walls, the likely hydrostatic pressures are to be accounted for in the structural design.

Foundations

Retaining wall footings for terracing can be supported on the firm to stiff clays of the natural profile. A maximum allowable bearing pressure of 200kPa can be assumed for footings on firm to stiff clays.

Following these recommendations, the proposed retaining walls are considered to be suitable for the site and do not change the risk assessment in the original report.

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist.

325 Whale Beach Road, Palm Beach

Comments on Updates to Plans

We have reviewed the existing geotechnical report, the plans used to carry out the report, the updated coastal report by Horton Coastal Engineering, referenced "IrJ0304 - 325 Whale Beach Road Palm Beach-v3", dated 20/12/19, and the updated plans for DA shown on 3 drawings prepared by Landart, Revision C, drawings numbered LMP 01 and LPP 01 are dated 9/12/19, and drawing numbered SE 01 is dated 11/12/19.

The changes include:

- Removing the proposed built-in bench seat.

The changes to the plans are minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the report carried out by this firm numbered J2412 and dated the 9th December, 2019.

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist.

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for _____
Name of Applicant

Address of site 325 Whale Beach Road, Palm Beach

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk ***Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report***

I, Ben White *on behalf of* White Geotechnical Group Pty Ltd
(Insert Name) (Trading or Company Name)

on this the 9/12/19 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $10million.

I:
Please mark appropriate box

☒ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☒ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: Geotechnical Report **325 Whale Beach Road, Palm Beach**

Report Date: 9/12/19

Author: BEN WHITE

Author's Company/Organisation: **WHITE GEOTECHNICAL GROUP PTY LTD**

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

Australian Geomechanics Society Landslide Risk Management March 2007.

White Geotechnical Group company archives.

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

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group Pty Ltd

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1(a) - Checklist of Requirements for Geotechnical Risk Management Report for Development Application

Development Application for _____
Name of Applicant

Address of site 325 Whale Beach Road, Palm Beach

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

Geotechnical Report Details:

Report Title: Geotechnical Report **325 Whale Beach Road, Palm Beach**

Report Date: 9/12/19

Author: BEN WHITE

Author's Company/Organisation: WHITE GEOTECHNICAL GROUP PTY LTD

Please mark appropriate box

☒ Comprehensive site mapping conducted **2/10/19**
(date)

☒ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)

☒ Subsurface investigation required
- ☐ No Justification _____
- ☒ Yes Date conducted **2/10/19**

☒ Geotechnical model developed and reported as an inferred subsurface type-section

☒ Geotechnical hazards identified
- ☒ Above the site
- ☒ On the site
- ☒ Below the site
- ☐ Beside the site

☒ Geotechnical hazards described and reported

☒ Risk assessment conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☒ Consequence analysis
- ☒ Frequency analysis

☒ Risk calculation

☒ Risk assessment for property conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Risk assessment for loss of life conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the specified conditions are achieved.

☒ Design Life Adopted:
- ☒ 100 years
- ☐ Other _____
specify

☒ Geotechnical Conditions to be applied to all four phases as described in the Geotechnical Risk Management Policy for Pittwater - 2009 have been specified

☒ Additional action to remove risk where reasonable and practical have been identified and included in the report.

☐ Risk assessment within Bushfire Asset Protection Zone.

I am aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ensuring that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group Pty Ltd

GEOTECHNICAL INVESTIGATION:

New Pool at **325 Whale Beach Road, Palm Beach**

1. Proposed Development

1.1 Construct a new pool and deck on the downhill side of the property.

1.2 Various other external alterations.

1.3 Details of the proposed development are shown on 2 drawings by Landart, drawings numbered LMP01 and SE01, Revision B, dated 19/11/19.

1.4 The Coastal Engineering Report attached to the end of this report was completed by Horton Coastal Engineering and is referenced "IrJ0304 - 325 Whale Beach Road Palm Beach-v2", dated 9/12/19

2. Site Description

2.1 The site was inspected on the 2nd October, 2019.

2.2 This waterfront residential property is on the low side of the road and has a NE aspect. The block is located on the moderately graded lower reaches of a hillslope. The natural surface falls across the property at an average angle of ~13°. The slope above the property gradually increases in grade. A ~15m high sea cliff falls to a ~50m wide rock platform below the property at the waterfront.

2.3 At the road frontage, a tile-paved driveway runs down and across the slope to a parking area on the uphill side of the property and to a garage attached to the uphill side of the house (Photo 1). The slope between the road frontage and the house is garden and lawn-covered (Photo 2). The single-storey rendered brick house is supported on brick walls and brick piers (Photo 3). No significant signs of movement were observed in the supporting brick walls and the supporting brick piers stand vertical. A moderately sloping lawn extends off the downhill side of the house to a

well-vegetated garden at the cliff-top (Photos 4 & 5). A ~15m high sea cliff falls from near the lower boundary to a rock platform below (Photo 6). It consists of competent Medium Strength Sandstone. The cliff face displays no significant undercutting or serious geological defects that could affect its stability. The rock platform has a covering of dislodged sandstone boulders at the cliff base. Some of the boulders were observed to be greater than 3m in diameter and effectively armour the cliff base from the erosional forces of storm surf.

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by the Newport Formation of the Narrabeen Group. It is described as interbedded laminite, shale and quartz to lithic quartz sandstone.

4. Subsurface Investigation

Three Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to weathered rock. The locations of the tests are shown on the site plan. It should be noted that a level of caution should be applied when interpreting DCP test results. The test will not pass through hard buried objects so in some instances it can be difficult to determine whether refusal has occurred on an obstruction in the profile or on the natural rock surface. This is expected to have occurred in DCP1:

DCP TEST RESULTS – Dynamic Cone Penetrometer			
Equipment: 9kg hammer, 510mm drop, conical tip.			Standard: AS1289.6.3.2 - 1997
Depth(m) Blows/0.3m	**DCP 1** (~RL27.5)	**DCP 2** (~RL27.7)	**DCP 3** (~RL25.7)
0.0 to 0.3	5	1	4
0.3 to 0.6	1	6	13
0.6 to 0.9	#	9	17
0.9 to 1.2		23	35
1.2 to 1.5		30	#
1.5 to 1.8		#	
	Refusal @ 0.4m	End of Test @ 1.4m	End of Test @ 1.1m

#refusal/end of test. F=DCP fell after being struck showing little resistance through all or part of the interval.

DCP Notes:

DCP1 – Refusal @ 0.4m on likely obstruction in profile, DCP bouncing, wet muddy tip.
DCP2 – End of test @ 1.4m, DCP still very slowly going down, maroon shale fragments on dry tip, grey and maroon clay in collar above tip.
DCP3 – End of test @ 1.1m, DCP still very slowly going down, maroon shale on dry tip, maroon clay in collar above tip, and maroon shale streaking up rod.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the location of the proposed works they consist of a thin silty soil over firm to stiff clays. In the test locations, the clays merge into the weathered zone of the underlying shale at an average depth of ~0.9m below the current surface. DCP1 likely refused on an obstruction in the profile. The weathered zone is interpreted as Extremely Low Strength Shale. It is to be noted that this material can appear as a mottled stiff clay when it is cut up by excavation equipment. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the clay and rock and through the cracks in the rock. Due to the slope and elevation of the block, the water table in the location is expected to be many metres below the base of the proposed works.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours. Whale Beach Road above will provide only limited drainage diversion from surface flows as the road is not guttered above the subject property.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The moderately graded slope that falls across the property and continues above is a potential hazard (**Hazard One**). The sea cliff that falls below the lower boundary is a potential hazard (**Hazard Two**).

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The moderate slope that falls across the property and continues above failing and impacting on the property.	The long-term stability of the cliff below the property impacting on the property taking into consideration the allowance for erosion/weathering of the cliff as calculated by Horton Coastal Engineering in the next 100 years (Photo 6).
LIKELIHOOD	'Unlikely' (10^{-4})	'Rare' (10^{-5})
CONSEQUENCES TO PROPERTY	'Medium' (20%)	'Major' (40%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Low' (6×10^{-5})
RISK TO LIFE	8.3×10^{-7}/annum	9.96×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	The base of the cliff is <5m seaward of the property. However, the rock platform continues seaward at the base of the cliff over a distance of ~70m and Horton Coastal Engineering has provided an 18mm/year allowance for erosion of the cliff. Thus, the cliff is not a significant risk to the property for well over 100 years. This level of risk is 'ACCEPTABLE'.

(See Aust. Geomech. Jnl. Mar 2007 Vol. 42 No 1, for full explanation of terms)

9. Suitability of the Proposed Development for the Site

The proposed development is suitable for the site. No geotechnical hazards will be created by the completion of the proposed development provided it is carried out in accordance with the requirements of this report and good engineering and building practice.

10. Stormwater

There is fall to the waterfront below. All stormwater or drainage runoff from the proposed development is to be piped to the waterfront.

11. Excavations

Apart from those for footings, no excavations are required.

12. Foundations

The proposed pool and deck can be supported on piers taken to and embedded ~0.6m into Extremely Low Strength Shale. This ground material is expected at an average depth of ~0.9m below the current surface so the required depth of the piered foundations is ~1.5m from the downhill side of the pier hole. A maximum allowable bearing pressure of 600kPa can be assumed for footings on Extremely Low Strength Shale. It should be noted that this material is a soft rock and a rock auger will cut through it so the builders should not be looking for refusal to end the footings.

It is recommended the footings be dug, inspected, and poured in quick succession (ideally the same day if possible). If the footings get wet, they will have to be drained and the soft wet layer of shale on the footing surface will have to be removed before concrete is poured.

If a rapid turnaround from footing excavation to the concrete pour is not possible, a sealing layer of concrete may be added to the footing surface after it has been cleaned.

NOTE: If the contractor is unsure of the footing material required, it is more cost-effective to get the geotechnical consultant on site at the start of the footing excavation to advise on

footing depth and material. This mostly prevents unnecessary over-excavation in clay-like shaly-rock but can be valuable in all types of geology.

13. Inspections

The client and builder are to familiarise themselves with the following required inspection as well as council geotechnical policy. We cannot provide geotechnical certification for the owners and Occupation Certificate if the following inspection has not been carried out during the construction process.

- All footings are to be inspected and approved by the geotechnical consultant while the excavation equipment is still onsite and before steel reinforcing is placed or concrete is poured.

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist

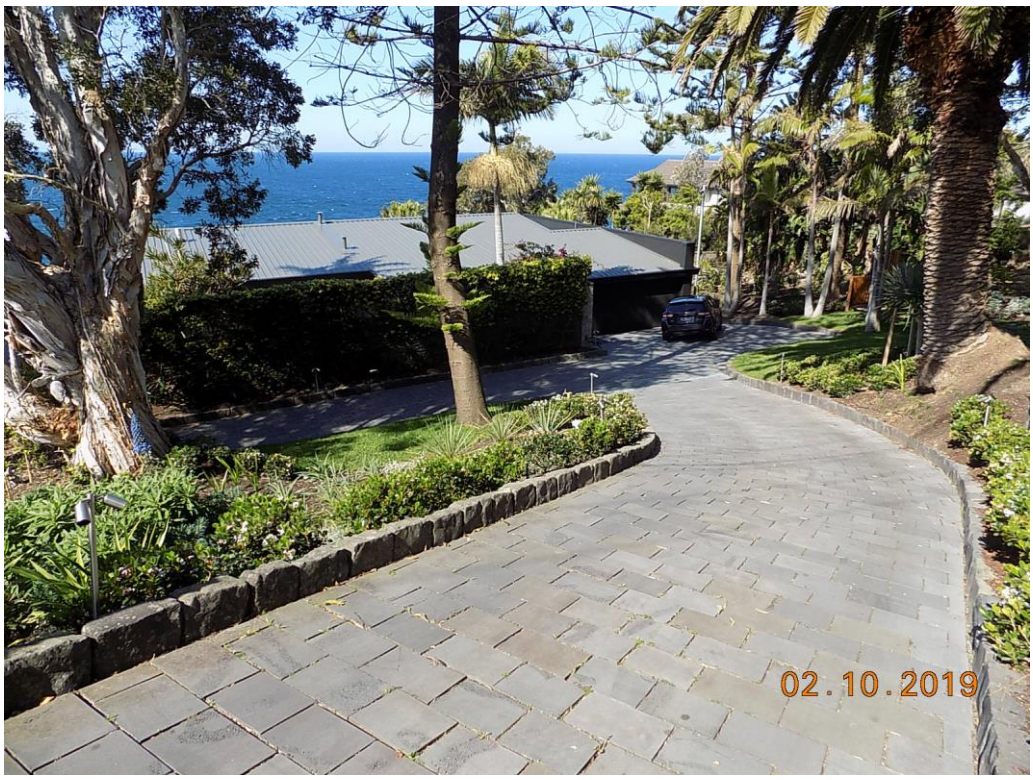


Photo 1

Photo 2

Photo 3

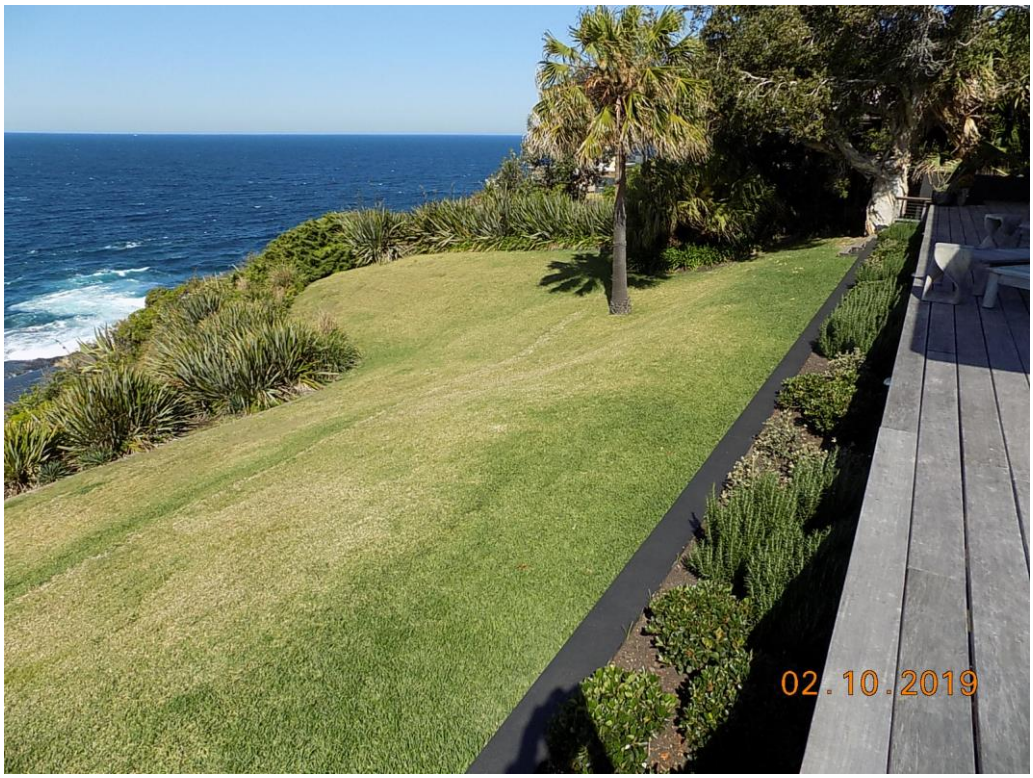


Photo 4

Photo 5

Photo 6

Important Information about Your Report

It should be noted that Geotechnical Reports are documents that build a picture of the subsurface conditions from the observation of surface features and testing carried out at specific points on the site. The spacing and location of the test points can be limited by the location of existing structures on the site or by budget and time constraints of the client. Additionally, the test themselves, although chosen for their suitability for the particular project, have their own limiting factors. The testing gives accurate information at the location of the test, within the confines of the test's capability. A geological interpretation or model is developed by joining these test points using all available data and drawing on previous experience of the geotechnical consultant. Even the most experienced practitioners cannot determine every possible feature or change that may lie below the earth. All of the subsurface features can only be known when they are revealed by excavation. As such, a Geotechnical report can be considered an interpretive document. It is based on factual data but also on opinion and judgement that comes with a level of uncertainty. This information is provided to help explain the nature and limitations of your report.

With this in mind, the following points are to be noted:

- If upon the commencement of the works the subsurface ground or ground water conditions prove different from those described in this report, it is advisable to contact White Geotechnical Group immediately, as problems relating to the ground works phase of construction are far easier and less costly to overcome if they are addressed early.

- If this report is used by other professionals during the design or construction process, any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

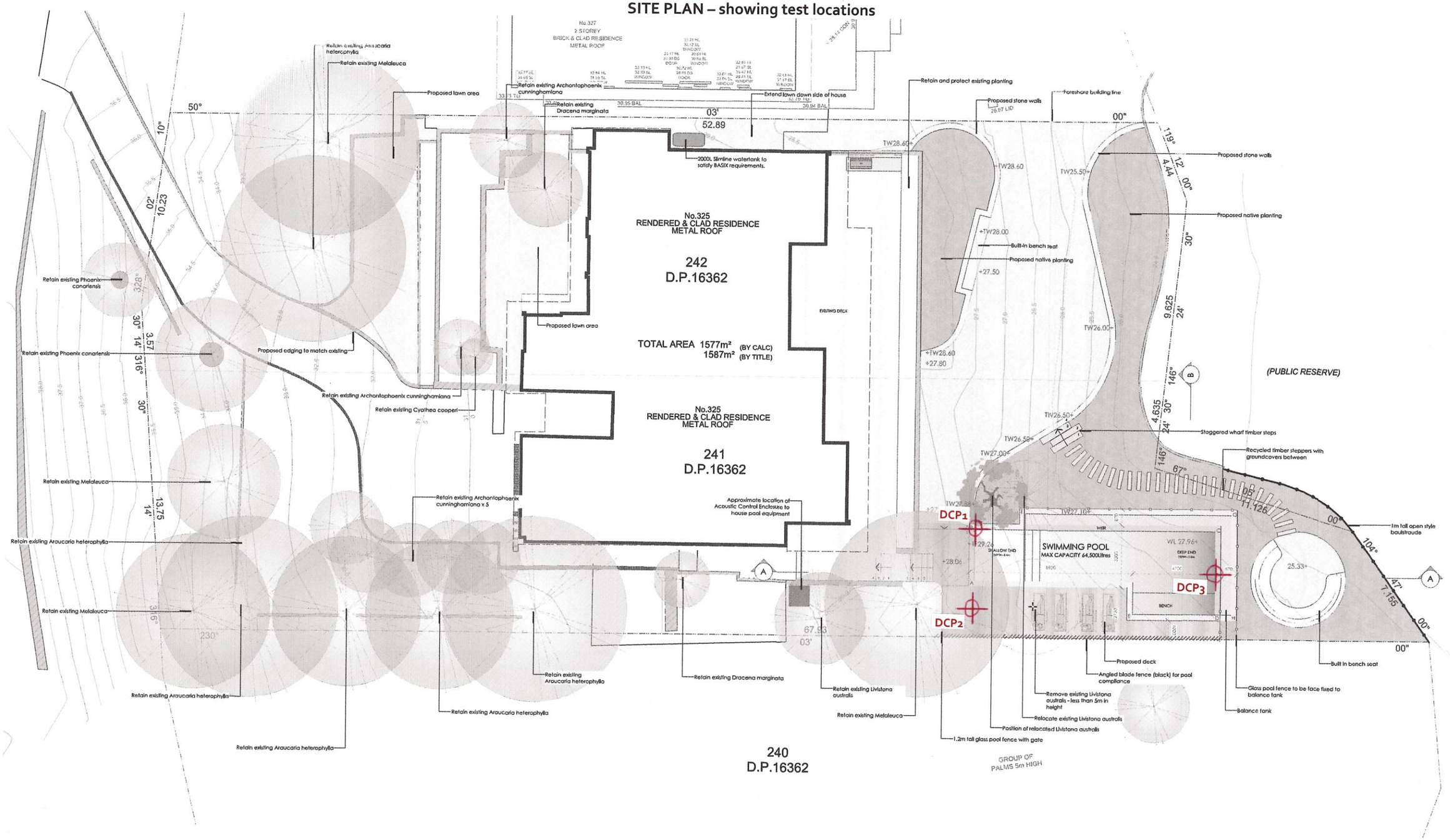
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- This report should not be applied to any other project other than that outlined in section 1.0.

- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar with a variety of techniques to reduce risk and can advise if your proposed methods are suitable for the site conditions.

SITE PLAN – showing test locations



LEGEND

- BENCHMARK ON KERB RL 93.95
- EXISTING SPOT LEVEL / PROPOSED SPOT LEVEL (+ 96.68)
- BOUNDARY LINE (APPROX LOCATION)
- FORESHORE BUILDING LINE (APPROX LOCATION)
- EXISTING WALLING TO BE RETAINED (TW=TOP OF WALL)
- PROPOSED MASONRY WALLING (TW= TOP OF WALL)
- POOL SAFETY FENCING (NOM 1200MM HIGH)
- POST BAULSTRAUDE (NOM 1000MM HIGH)
- PROPOSED TIMBER DECKING
- PROPOSED STEPPING STONES WITH PLANTING
- LAWN AREA
- GARDEN AREA
- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED
- PROPOSED TREE

GENERAL NOTES

- All civil, structural and hydraulic work associated with this project shall be to consulting engineer's details.

- All levels have been taken from the survey prepared by C.M.S Surveyors on 25 September 18.

- Exact location of site boundaries are to be confirmed on site by client or client's surveyor prior to commencement of work.

- This pool has not been designed for diving. Children should not be allowed in pool enclosure without adequate adult supervision.

- The design of this project is Copyright and shall not be copied or reproduced in any way without the prior written permission of Landart Landscapes Pty. Ltd.

CONSTRUCTION NOTES

Note 1: All materials and workmanship shall be in accordance with the latest relevant australian standard and building code of australia. All plumbing and drainage works shall also be in accordance with the by-laws of Sydney Water.

Note 2: Written dimensions shall take precedence over scaled measurements. all dimensions and levels shall be verified by contractor on site, and initial setout approved by construction manager prior to commencement of work. If in doubt, contact Landscape Architect / Designer.

Note 3: Contractor shall confirm extent of existing vegetation to be removed / transplanted on site, prior to commencement of works.

Note 4: Excavator shall strip approved topsoil from all areas to be excavated and shall store material in an approved location on site. All excavation shall be carried out as necessary, including over-excavation in lawn areas (as required) to ensure min. 200mm depth of topsoil is able to be provided and for garden areas (as required) to ensure that min. 350mm topsoil depth is able to be provided. Topsoil depths refer to depth over subsoil, not over rock or concrete.

Note 5: Contractor shall ensure that damp proof courses on buildings are not breached and that air vents are not blocked or restricted.

Note 6: Retaining walls shall be constructed to heights as necessary to retain existing/proposed ground levels, with final extent of all walling to be as required and to construction manager's on-site approval.

Note 7: Waterproofing and drainage line in gravel filled trench, or other approved drainage layer, shall be installed to rear of all walls where retaining.

Comparative levels

Approx height of pool surrounds relative to existing ground levels at points A - F are as follows:

A: + 0.25
B: + 0.36
C: + 2.81
D: + 2.06
E: + 1.56
F: + 0.35
G: + 2.1
H: + 1.1

0 1 2 5 10

SCALE 1:100

B	19/11/19	For DA submission
A	28/8/19	For external consultants review

Landart.
HOME + GARDEN + BEYOND
Unit 2/68 Tullah St Willoughby NSW 2068
PO Box 705 Crows Nest NSW 1585
T: (02) 9958 0462
F: (02) 9958 5426

PROJECT NORTH TRUE NORTH

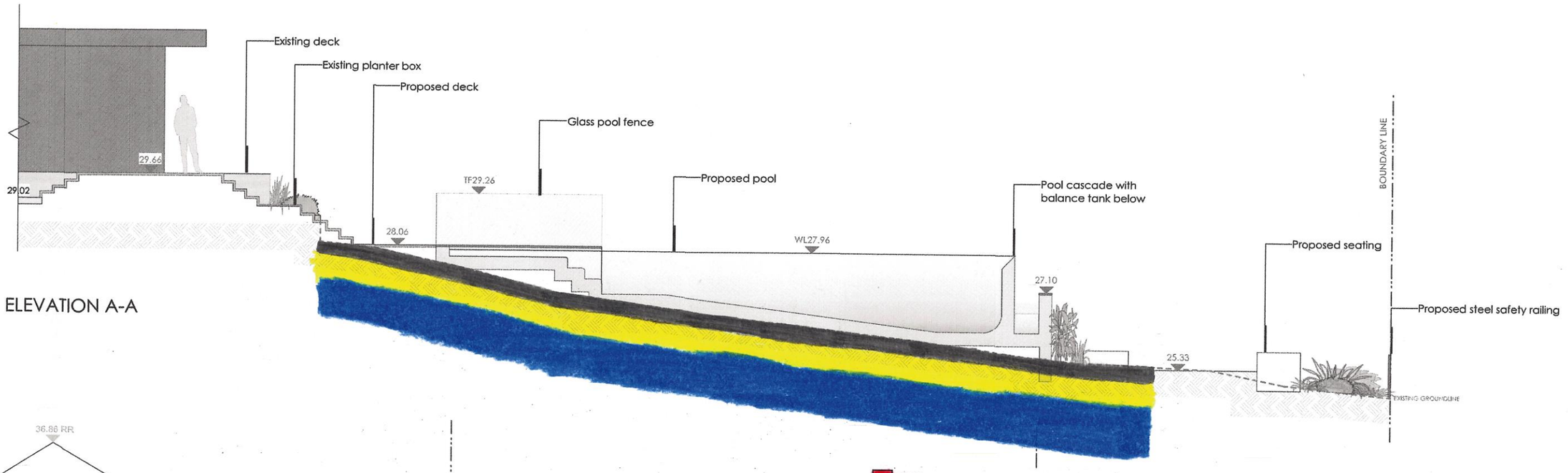
CLIENT
Blampied & Webster Residence

PROJECT
323-325 Whale Beach Road, Palm Beach
Lots 241 & 242 D.P. 16362

LANDSCAPE MASTER PLAN
(LANDSCAPE AND POOL)

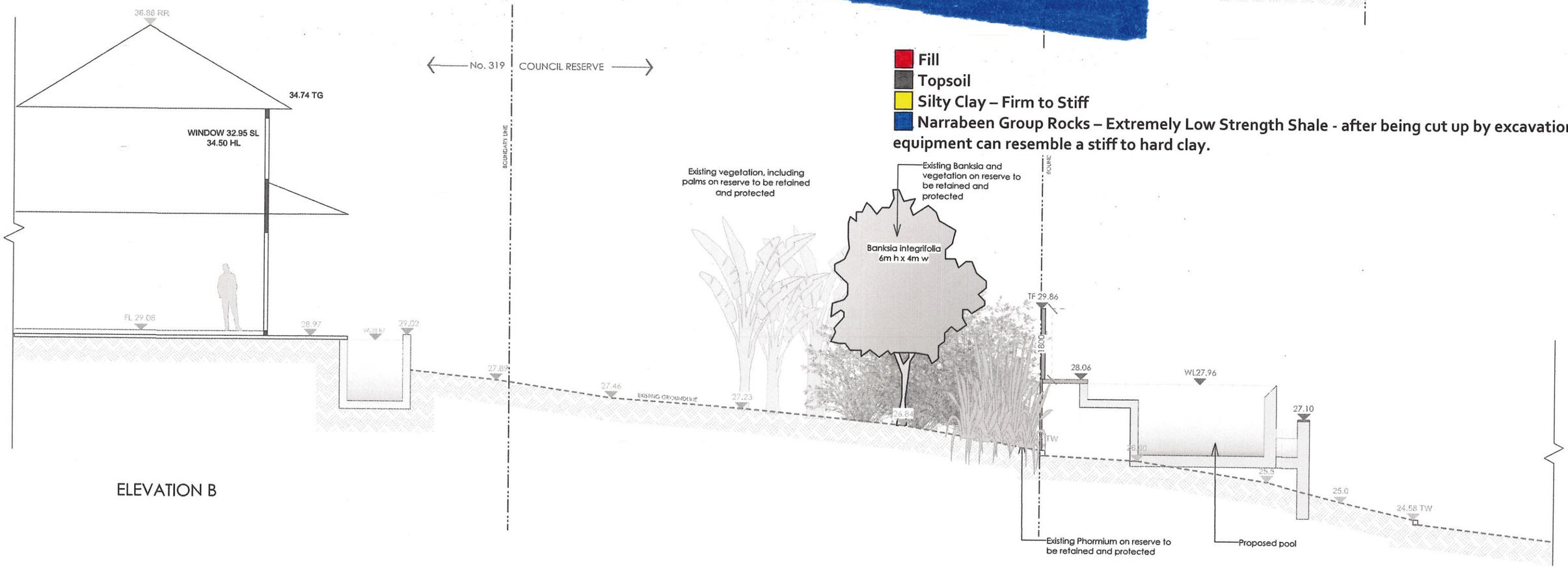
DRAWN	SCALE	DWG NO	REVISION
28/08/2019 KB	1:100@A1	LMP 01	B

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



ELEVATION A-A

Fill
Topsoil
Silty Clay – Firm to Stiff
Narrabeen Group Rocks – Extremely Low Strength Shale - after being cut up by excavation equipment can resemble a stiff to hard clay.



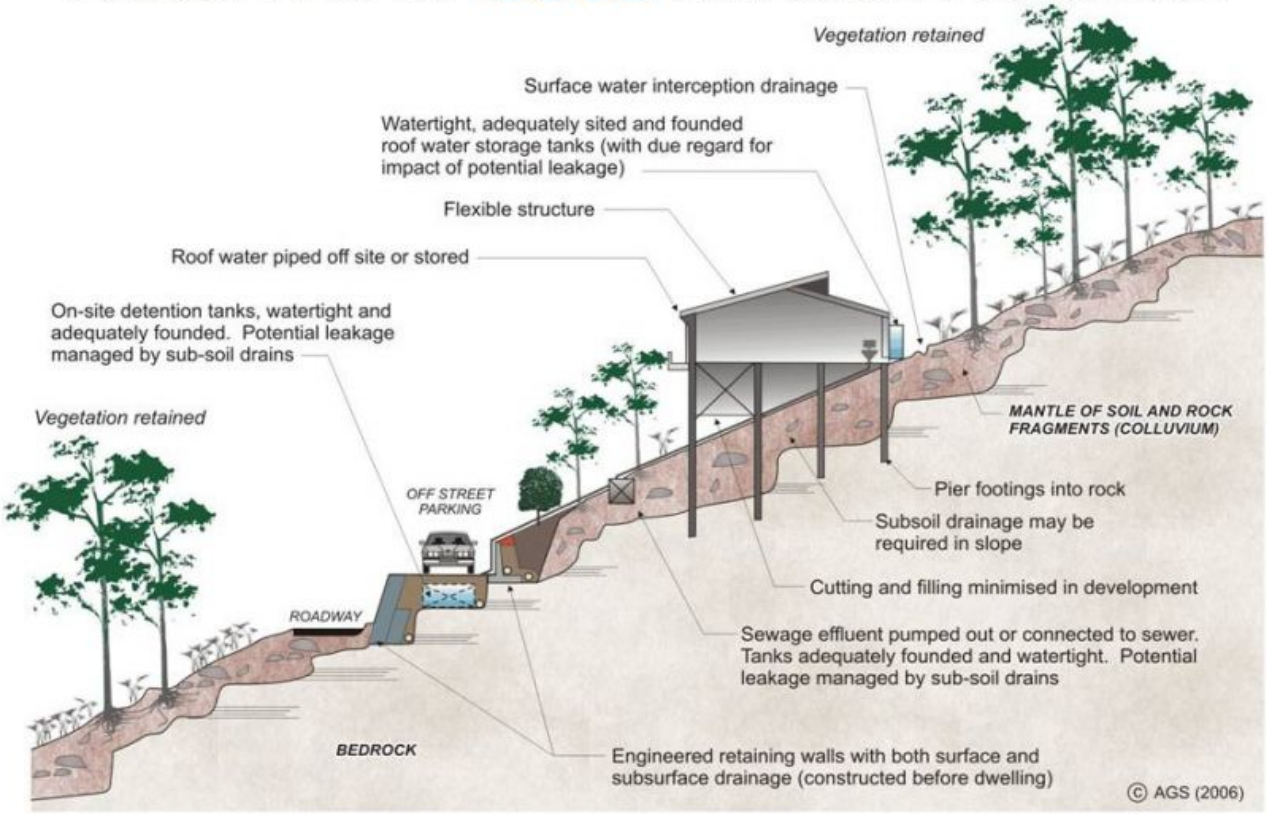
ELEVATION B

Landart.
HOME+GARDEN+BEYOND
Unit 2/68 Tullich St Willoughby NSW 2068
PO Box 705 Crows Nest NSW 1585
T: (02) 9958 0462
F: (02) 9958 5426

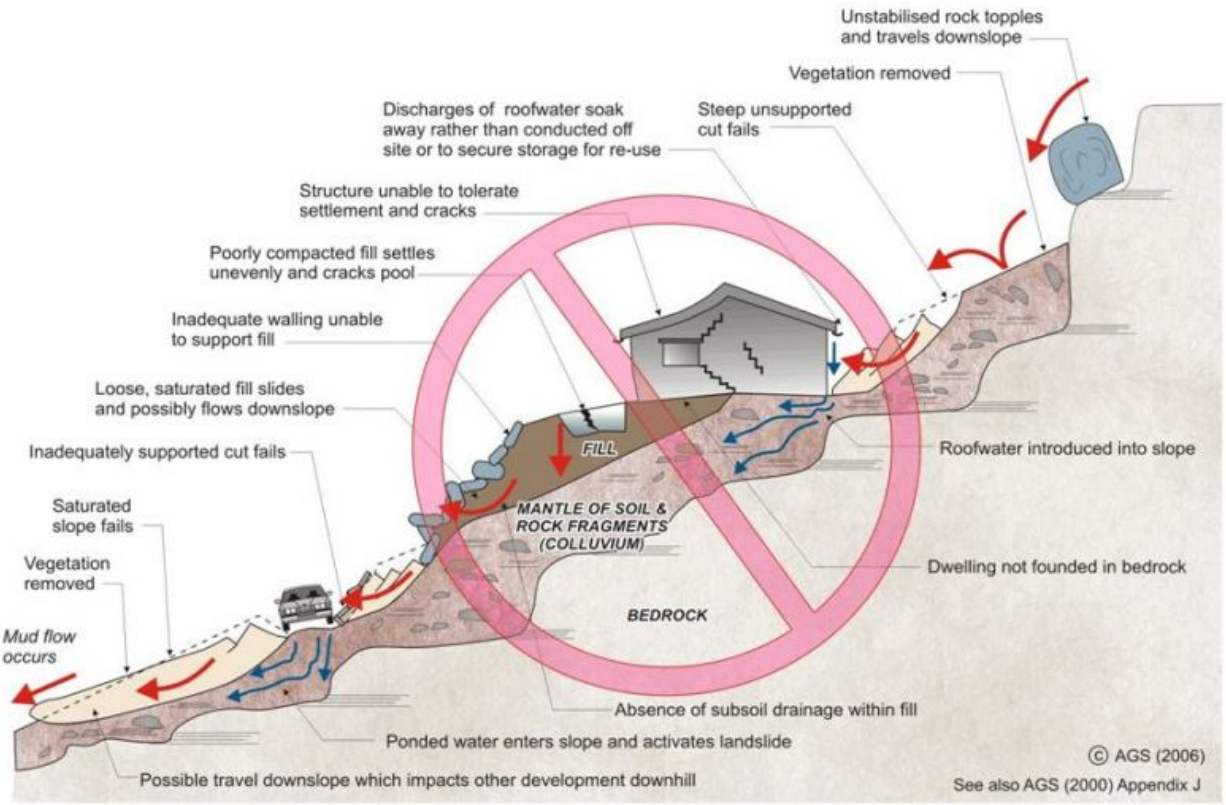
CLIENT: Blampied & Webster Residence	ELEVATIONS			DWG NO	REVISION
PROJECT: 323-325 Whale Beach Road, Palm Beach Lots 241 & 242 D.P. 16362	28/08/2019	DRAWN: KB	SCALE: 1:100@A3	SE 01	B

B	19/11/19	For DA submission
A	24/9/19	For external consultants review

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE



Horton Coastal Engineering
Coastal & Water Consulting

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

David Webster & Christine Blampied
C/ - Landart Landscapes
Attention: Katie Budd
2/68 Tulloh Street
Willoughby NSW 2068
(sent by email only to katie@landart.com.au)

9 December 2019

Coastal Engineering Advice on 325 Whale Beach Road Palm Beach

1. INTRODUCTION AND BACKGROUND

It is proposed to construct a pool at 325 Whale Beach Road Palm Beach, for which a Development Application (DA) is to be submitted to Northern Beaches Council. The property is located within a "Bluff/Cliff Instability" area designated on the *Coastal Risk Planning Map* (Sheet CHZ_015) that is referenced in *Pittwater Local Environmental Plan 2014*. Therefore, the property is subject to Chapter B3.4 of *Pittwater 21 Development Control Plan* (DCP)[1], and the *Geotechnical Risk Management Policy for Development in Pittwater*. Based on Chapter 6.5(i) of this policy, "a coastal engineer's report on the impact of coastal processes on the site and the coastal forces prevailing on the bluff must be incorporated into the geotechnical assessment as an appendix and the Coastal Engineer's assessment must be addressed through the Geotechnical Report and structural specification". Accordingly, this coastal engineering report is set out herein.

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 27 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia (MIEAust) and Chartered Professional Engineer (CPEng) registered on the National Engineering Register (NER). He is also a member of the National Committee on Coastal and Ocean Engineering (NCCOE) and NSW Coastal, Ocean and Port Engineering Panel (COPEP) of Engineers Australia.

Peter has completed coastal engineering reports for numerous cliff/bluff properties in the Palm Beach area, and has inspected the area in the vicinity of the subject property on several occasions in the last few years, including a specific recent inspection of cliff face and rock platform adjacent to the subject property on 28 September 2019.

Note that all levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present. Completed Form No. 1 as given in the *Geotechnical Risk Management Policy for Pittwater* is attached at the end of the document herein.

[1] The Pittwater 21 DCP up to Amendment No. 24, which came into effect on 20 October 2018, was considered herein.

2. INFORMATION PROVIDED

Horton Coastal Engineering was provided with 2 drawings of the proposed development prepared by Landart, namely Dwg Nos LMP 01 and SE 01 (both Revision B and dated 19 November 2019).

3. EXISTING SITE DESCRIPTION

The subject property is located on a rocky cliff headland known as Little Head, which extends north of the sandy Whale Beach. A photograph of the property from the rock platform seaward of the property is provided in Figure 1. An aerial view of the property is provided in Figure 2, along with a section location (denoted as Section A) and the location of the proposed pool[2].

Based on 2011 Airborne Laser Scanning (ALS) data held by Horton Coastal Engineering, Section A is as depicted in Figure 3. It is evident that the subject property falls from a level of about 38m AHD at Whale Beach Road, 35m AHD at the landward boundary, 25m to 28m AHD over the proposed pool area, 24m AHD at the seaward property boundary, and 21.4m AHD at the top of the near-vertical cliff about 12.4m seaward of the proposed pool. Note that based on 2007 ALS data held by Horton Coastal Engineering, the rock platform continues seaward of the extent depicted in Figure 3 down to an elevation of 0m AHD over a distance of about 70m.

Figure 1: View of cliff face at subject property (approximate extent between arrows) from rock platform on 28 September 2019, looking SSW

[2] Note that the property boundary depicted in Figure 2 is not survey accurate, being derived from approximate NSW Government GIS cadastral data.

Figure 2: Aerial view of subject property (black) on 30 August 2018, with Section A location (red) and proposed pool location (blue) shown

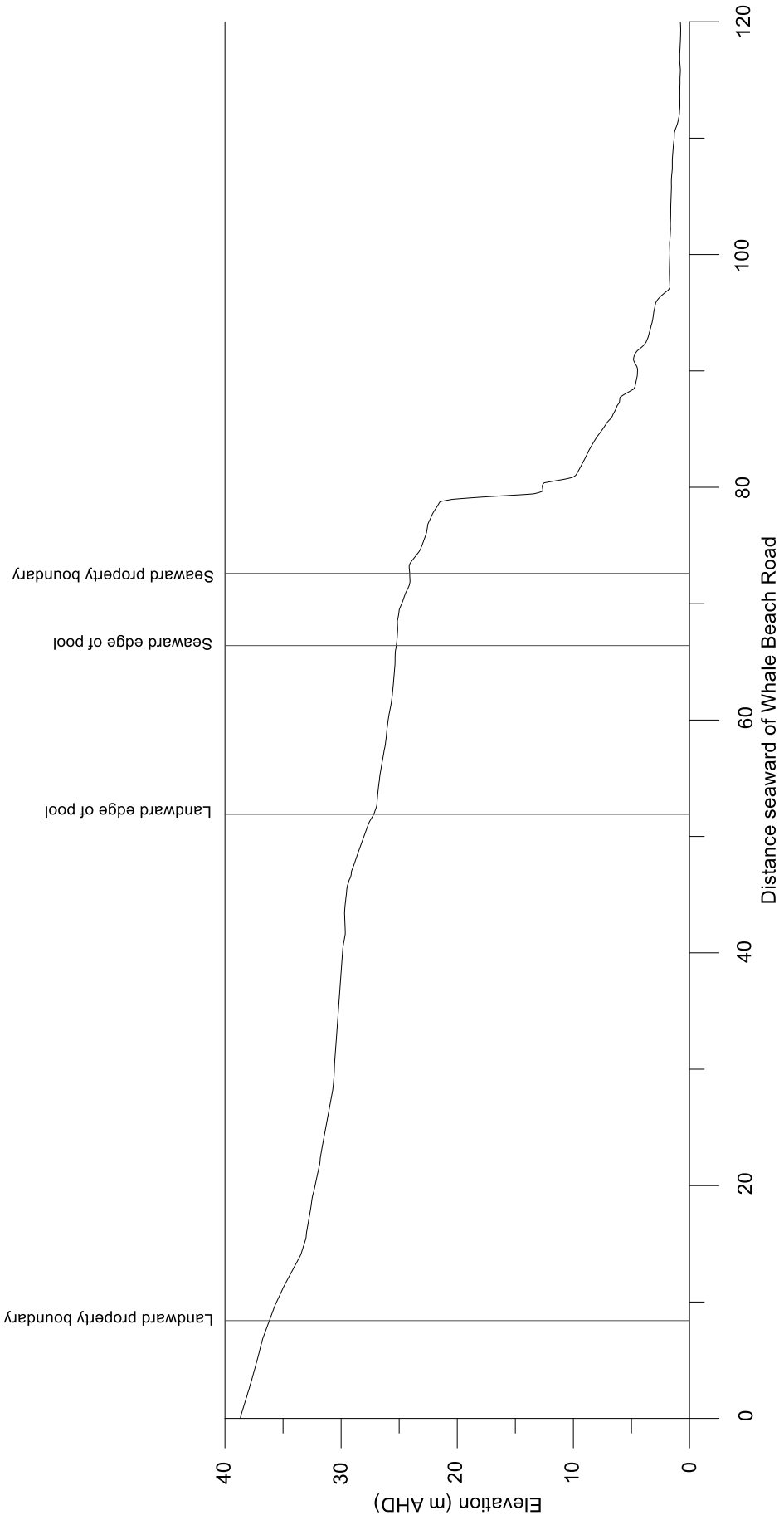


Figure 3: Section A through subject property

The average slope from Whale Beach Road to the top of the cliff at 21.4m AHD is 12°. The average slope of the fully exposed cliff face below 21.4m AHD is 80° down to 10.1m AHD. Below this, the slope is vegetated and covered with large boulders, with a slope of 27° down to 1.7m AHD. Seaward of the boulders, the rock platform has an average slope down of about 2°.

Coffey & Partners (1987) noted that the cliff at Little Head was formed by an interbedded sequence of sandstone and interbedded siltstone/sandstone, with the interbedded siltstone/sandstone (over the lower 4m to 5m) undercutting the upper sandstone. The boulders at the base of the cliff have fallen from the cliff over the last few thousand years due to this weathering and undercutting process.

4. PROPOSED DEVELOPMENT

It is proposed to construct a pool at the location shown in Figure 2, and undertake landscaping in surrounding areas. As noted in Section 3, the seaward edge of the proposed pool is located about 12.4m from the top of cliff.

5. MECHANISMS FOR CLIFF EROSION

5.1 Preamble

Erosion of sheer cliffs can occur in two forms (Public Works Department, 1985), either:

- a slow, relatively gradual attrition of cliff material due to the effects of weathering; or
- relatively infrequent but sudden collapse of large portions of cliff face, due to undercutting, wave impact forces, changed groundwater conditions, rock shattering or increased loadings related to construction, and other processes.

Weathering may induce undercutting and toppling failure of overhanging blocks if the rate of weathering is highest near the base of the cliff or at other levels below the top of the cliff. Erosion of steep slopes tends to occur suddenly in association with heavy rainfall or changes to drainage patterns, slope undercutting, and increases in load on the slope.

5.2 Weathering and Erosion

Both chemical and mechanical weathering can reduce the strength of cliff material (Sunamura, 1983). Chemical weathering includes hydration and solution, caused by the interaction between cliff material and sea water. Mechanical weathering comprises:

- the wetting and drying process in the intertidal zone;
- generation of repeated stresses in cliff material by periodic wave action (particularly waves that break on the cliff); and
- frost effects in cold latitudes.

The base of the cliff seaward of the subject property would be occasionally impacted by wave runup, particularly during coastal storms with large waves and elevated water levels. This wave runup could extend up to levels of about 8m AHD at present in a 100 year Average Recurrence Interval (ARI) storm, increasing to around 9m AHD in 100 years if projected sea level rise is realised. That stated, the boulder slope seaward of the cliff base would be expected to provide significant protection to the cliff from wave-induced mechanical weathering.

An average rate of recession for Sydney Northern Beaches coastline mudstone cliffs (as applies at the subject property over the lower portion, with interbedded siltstone/sandstone) subject to chemical and mechanical weathering of 6mm per year was determined by Crozier and Braybrooke (1992), with a maximum of 18mm/year. An approximate 100m of cliff recession (observed in aerial photography) seaward of the subject property over the last 6,400 years (since sea levels stabilised around their present levels) represents an average rate of 16mm/year, consistent with these values.

An allowance for recession/weathering of the cliff face (up to 9m AHD) of 18mm per year is considered to be reasonable, but for planning purposes could be applied over the entire cliff face. This rate is considered to be reasonable to apply over a design life of 100 years, including allowance for projected sea level rise. This rate of 18mm/year should be considered and assessed by the geotechnical engineer.

The geotechnical engineer should consider this rate in conjunction with an understanding of the particular nature of the cliff materials east of the subject property, their resistance to erosion, and potential failure planes related to geotechnical issues such as the joint spacing[3].

This should be confirmed by the geotechnical engineer, but it is expected that the erosion/weathering described above would lead to undercutting and collapse of blocks on the cliff face over the long term, with failure planes at the joints.

6. COASTAL INUNDATION

With the pool level above 25m AHD, coastal inundation is not a significant risk to the proposed pool (or pool equipment such as the pool pump) over a planning period of well over 100 years.

7. MERIT ASSESSMENT

7.1 Preamble

This merit assessment has been undertaken assuming that the geotechnical engineer for this DA will determine that there will be acceptably low risk to life and low risk to property for the proposed development, if their recommendations are adhered to.

7.2 State Environmental Planning Policy (Coastal Management) 2018

7.2.1 Preamble

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

7.2.2 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:

[3] Coffey & Partners (1987) noted that the controlling feature of interbedded sandstone/siltstone cliffs (as per the subject property) was the bedding spacing and relative proportion of sandstone/siltstone.

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

This is not a coastal engineering matter, but it can be noted that with regard to (a), the proposed development would not be expected to adversely affect the biophysical, hydrological (surface and groundwater) and ecological environments, being in an existing developed area and not altering the present surface drainage arrangements.

With regard to (b), the proposed development would not be expected to adversely affect coastal environmental values or natural coastal processes over an acceptably long design life, as it would be founded on a cliff well above wave action for an acceptably rare storm.

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

With regard to (d), the proposed development would not impact marine vegetation, native vegetation and fauna and their habitats (of significance, which are not known to exist at the property), undeveloped headlands and rock platforms, with none of these items assumed to be in proximity to the development (and being on an already developed headland, and being well above and landward of the adjacent rock platform for an acceptably rare storm and acceptably long life). No significant impacts on marine fauna and flora would be expected as a result of the proposed development, as the development would not interact with subaqueous areas for an acceptably rare storm and acceptably long life.

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

With regard to (f), a search of the Office of Environment and Heritage "Aboriginal Heritage Information Management System" (AHIMS) was undertaken on 11 November 2019. This indicated that there were no particular Aboriginal sites recorded or Aboriginal places declared within at least 200m of the subject property.

With regard to (g), the proposed development would not interact with the surf zone for an acceptably rare storm occurring over an acceptably long life, so would not impact on use of the surf zone.

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 development has been designed and sited to avoid any potential adverse impacts referred to in Clause 13(1).

7.2.3 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 development is entirely on private property and will not affect public foreshore, beach, headland or rock platform access.

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

With regard to (a)(iv), as noted in Section 7.2.2, there are no particular Aboriginal sites recorded or Aboriginal places declared within at least 200m of the subject property.

With regard to (a)(v), the nearest environmental heritage item to the subject property listed in Schedule 5 of *Pittwater Local Environmental Plan 2014* is the house "Orcades" at 309-311 Whale Beach Road. The proposed development is 80m from this house and would not be expected to impact on it.

With regard to (b), the proposed development has 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.

7.2.4 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".

Assuming that the proposed development is at an acceptably low risk of damage from projected coastal erosion/recession for a planning period of 100 years based on the DA geotechnical report, and given that it is well above projected wave runup to 2100, the proposed development would not even be expected to interact with coastal processes over its design life, let alone affect any other land. That is, the proposed development is unlikely to cause increased risk of coastal hazards on that land or other land over its design life.

7.2.5 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 property.

7.2.6 Synthesis

The proposed development satisfies the requirements of *State Environmental Planning Policy (Coastal Management) 2018* for the matters considered herein.

7.3 *Pittwater Local Environmental Plan 2014*

Clause 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014) applies at the subject property, as the property is identified as "Bluff/Cliff Instability" on the Coastal Risk Planning Map Sheet CHZ_015. 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 development would not increase coastal risks nor alter coastal processes and the impacts of coastal hazards, as it would not affect the wave impact process on the base of the cliff.

Items (c), (d) and (g) are for the geotechnical engineer to assess, with consideration of the findings herein. Assuming that they find that the proposed development is at an acceptably low risk of damage over a 100 year planning period with appropriate measures incorporated in the design and construction, this would meet (c), (d) and (g). On this basis, (e) should not be necessary, noting that this would be more applicable in a sandy beach environment.

With regard to (f), sea level rise has been considered herein.

8. FORM

Completed *Geotechnical Risk Management Policy for Pittwater* Form No. 1 is attached at the end of the document herein. Note that the declaration on Form No. 1 is not appropriate for a coastal report, with the revised declaration below:

> "I am aware that the above Coastal Report, prepared for the abovementioned site is to be submitted to assist with a geotechnical investigation for a Development Application for this site, with that geotechnical investigation relied on by Northern Beaches Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed. No declaration can be made on the geotechnical investigation as this has not been prepared nor reviewed by me, and nor do I have geotechnical engineering expertise".

9. CONCLUSIONS

An allowance for erosion/weathering of 18mm/year of the cliff seaward of 325 Whale Beach Road Palm Beach should be considered and assessed by the geotechnical engineer.

The geotechnical engineer should consider this estimated rate in conjunction with an understanding of the particular nature of the cliff materials seaward of the subject property, their resistance to erosion, and potential failure planes related to geotechnical issues such as the joint spacing.

Coastal inundation is not a significant risk for the proposed development over a planning period of well over 100 years. Given this, and assuming that the geotechnical engineer finds that the development is at an acceptably low risk of damage from coastal/geotechnical hazards over a 100 year design life, the proposed development satisfies the requirements of *State Environmental Planning Policy (Coastal Management) 2018* (Clauses 13, 14, 15 and 16) and Clause 7.5 of *Pittwater Local Environmental Plan 2014* for the matters considered herein.

10. REFERENCES

Coffey & Partners (1987), "Coastal Management Study, Assessment of Bluff Areas", *Report No. S8002/1-AA*, March, for Warringah Shire Council

Crozier, PJ and JC Braybrooke (1992), "The morphology of Northern Sydney's rocky headlands, their rates and styles of regression and implications for coastal development", *26th Newcastle Symposium on Advances in the Study of the Sydney Basin*, University of Newcastle

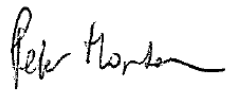
Public Works Department (1985), "Coastal Management Strategy, Warringah Shire, Report to Working Party", *PWD Report 85016*, June, prepared by AD Gordon, JG Hoffman and MT Kelly, for Warringah Shire Council

Sunamura, Tsuguo (1983), "Processes of Sea Cliff and Platform Erosion", Chapter 12 in *CRC Handbook of Coastal Processes and Erosion*, editor Paul D Komar, CRC Press Inc, Boca Raton, Florida, ISBN 0-8493-0208-0

11. SALUTATION

If you have any further queries, please do not hesitate to contact Peter Horton via email at peter@hortoncoastal.com.au or via mobile on +61 407 012 538.

Yours faithfully
HORTON COASTAL ENGINEERING PTY LTD



Peter Horton
Director and Principal Coastal Engineer

Geotechnical Risk Management Policy for Pittwater Form No. 1 is attached overleaf

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1 – To be submitted with Development Application

Development Application for David Webster & Christine Blampied
Name of Applicant

Address of site 325 Whale Beach Road Whale Beach

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

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

on this the 9 December 2019 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $2million.
I:

Please mark appropriate box

☐ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☑ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Coastal
~~Geotechnical~~ Report Details:

Report Title: Coastal Engineering Advice on 325 Whale Beach Road Whale Beach

Report Date: 9 December 2019

Author: Peter Horton

Author's Company/Organisation: Horton Coastal Engineering Pty Ltd

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

See Section 2 and Section 10 of coastal report

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

See revised declaration in Section 8 of report

Signature ……

Name Peter Horton

Chartered Professional Status MIEAust CPEng NER

Membership No. 452980

Company Horton Coastal Engineering Pty Ltd