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

Development Application for ______________________________
Name of Applicant

Address of site 133 Riverview Road, Avalon 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 28/5/25 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 **133 Riverview Road, Avalon Beach**

Report Date: 23/5/25

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 MScGEOL AIG., RPGeo

Membership No. 10306

Company **White Geotechnical Group Pty Ltd**

REGISTERED PROFESSIONAL GEOSCIENTIST
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
BENJAMIN WHITE
RPGeo No:
10306

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 133 Riverview Road, Avalon 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 **133 Riverview Road, Avalon Beach**

Report Date: 23/5/25

Author: BEN WHITE

Author's Company/Organisation: White Geotechnical Group Pty Ltd

Please mark appropriate box

☒ Comprehensive site mapping conducted 24/5/24
(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 24/5/24

☒ 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 MScGEOL AIG., RPGeo

Membership No. 222757

Company **White Geotechnical Group Pty Ltd**

REGISTERED PROFESSIONAL GEOSCIENTIST
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
BENJAMIN WHITE
RPGeo No: 10306

GEOTECHNICAL INVESTIGATION:

Alterations and Additions and New House and Garage at **133 Riverview Road, Avalon Beach**

1. Proposed Development

1.1 Demolish the existing house and construct a new house by excavating to a maximum depth of ~4.2m.

1.2 Construct a two-storey garage with lift by excavating to a maximum depth of ~4.3m.

1.3 Construct a boatshed, jetty and decking at the waterfront.

1.4 Construct an inclined lift between the house and the boatshed.

1.5 Details of the proposed development are shown on 27 drawings prepared by Rise Projects, drawings numbered A000, A101 to 103, A201 to 208, A301 to 303, A401 to 402, A501, A600, A605, A801 to 802, A901 to 902, A1001 to 1003. All revision A. All dated 22.05.25.

2. Site Description

2.1 The site was inspected on the 24th May, 2024.

2.2 This waterfront residential property is on the low side of the road and has a W aspect. It is located on the moderate to very steeply graded middle and lower reaches of a hillslope. The natural slope falls across the upper two-thirds of the property at an average angle of ~21° before increasing to very steep angles of ~30° to the waterfront. The slope above the property continues at similar steep angles.

2.3 At the road frontage, a concrete and bitumen driveway runs to a compacted fill parking area on the uphill side of the property (Photo 1). The fill for the parking area is supported by a stable low formed concrete and brick retaining wall. Fill for

Riverview Road is supported by a low stable timber retaining wall (Photo 2), or is battered at stable angles (Photo 3). Between the parking space and the house is a moderately graded lawn (Photo 4). The cut for the house is battered at stable angles, has a covering of dense vegetation (Photo 5), and is partially supported by a mortared rock retaining wall (Photo 6). The retaining wall exhibited cracking in the mortar, however it will be demolished as part of the proposed works. The single-story fibreboard house is supported on sandstone block walls and sandstone piers. The house will also be demolished for the proposed works. Sandstone boulders are scattered across the steep slope below the house (Photo 7), and were observed to be sufficiently embedded in stable positions. This slope continues for some ~20m before increasing to very steep angles (Photo 8). The very steep slope in this location consists of alternating bands of thinly-bedded Very Low Strength Shale and thicker bands of Low Strength Sandstone (Photo 9). The majority of the slope consists of thin sandstone beds. The weathering process of the bedrock is that the softer beds undercut the harder beds. Because the bedding is thin and tightly jointed, the resulting failures are very small in scale. There is evidence of these failures occurring in the past and they are expected into the future, particularly during and immediately after heavy rainfall. Additionally, the weathering process is slow and the failures are not considered a threat to life or property. A near level shelf of Low to Medium strength sandstone extends from the base of this cliff to the waterfront (Photo 10).

3. Geology

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

4. Subsurface Investigation

One hand Auger Hole (AH) was put down to identify the soil materials. Eleven 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 attached. 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. As such, due to the possibility that the actual ground conditions vary from our interpretation there should be allowances in the excavation and foundation budget to account for this. We refer to the appended "Important Information about Your Report" to further clarify. The results are as follows:

AUGER HOLE 1 (~RL38.5) **–** AH1 (Photo 11)

Depth (m)	Material Encountered
0.0 to 0.3	**TOPSOIL**, dark brown, medium dense, dry, medium grained, rock fragments included.
0.3 to 0.7	**SANDY CLAYEY COLLUVIUM**, orange to brown, stiff, fine to coarse grained, rock fragments included.

Refusal @ 0.7m. Auger grinding in clayey colluvium. No water table encountered.

DCP TEST RESULTS ON THE NEXT PAGE

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** (~RL16.0)	**DCP 2** (~RL1.0)	**DCP 3** (~RL7.5)	**DCP 4** (~RL21.5)	**DCP 5** (~RL22.0)	**DCP 6** (~RL27.0)
0.0 to 0.3	2	Rock Exposed at Surface	17	5	9	15
0.3 to 0.6	7		#	10	10	9
0.6 to 0.9	8			#	6	8
0.9 to 1.2	#				#	15
1.2 to 1.5						21
1.5 to 1.8						24
1.8 to 2.1						10
2.1 to 2.4						#
	Refusal on Rock @ 0.7m		Refusal on Rock @ 0.3m	Refusal on Rock @ 0.6m	Refusal on Rock @ 0.7m	Refusal on Rock @ 2.0m

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

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 7** (~RL30.5)	**DCP 8** (~RL33.0)	**DCP 9** (~RL36.5)	**DCP 10** (~RL38.5)	**DCP 11** (~RL39.5)
0.0 to 0.3	7	9	10	7	7
0.3 to 0.6	20	10	14	15	21
0.6 to 0.9	15	24	#	38	22
0.9 to 1.2	46	#		22	46
1.2 to 1.5	#			#	#
	Refusal on Rock @ 1.2m	Refusal on Rock @ 0.9m	Refusal on Rock @ 0.6m	Refusal on Rock @ 1.1m	Refusal on Rock @ 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 on Rock @ 0.7m, DCP bouncing off rock surface, maroon and white impact dust, and maroon shale on dry tip.

DCP2 – Medium Strength Sandstone exposed at waterfront.

DCP3 – Refusal on Rock @ 0.3m, DCP thudding on rock surface, orange and maroon shale on dry tip, brown clay in collar above tip.
DCP4 – Refusal on Rock @ 0.6m, DCP bouncing off rock surface, white and orange impact dust, and orange shale on dry tip.
DCP5 – Refusal on Rock @ 0.7m, DCP bouncing off rock surface, white orange and yellow sandy clay on dry tip, yellow sandy clay in collar above tip.
DCP6 – Refusal on Rock @ 2.0m, DCP bouncing off rock surface, white impact dust and maroon shale on dry tip, orange clay in collar above tip.
DCP7 – Refusal on Rock @ 1.2m, DCP thudding on rock surface, yellow and white impact dust on dry tip.
DCP8 – Refusal on Rock @ 0.9m, DCP thudding on rock surface, white yellow and maroon impact dust on dry tip.
DCP9 – Refusal on Rock @ 0.6m, DCP bouncing off rock surface, yellow and maroon shale on dry tip.
DCP10 – Refusal on Rock @ 1.1m, DCP bouncing off rock surface, clean dry tip, orange clay in collar above tip.
DCP11 – Refusal on Rock @ 1.1m, DCP thudding on rock surface, maroon and orange clay in collar above.

5. Geological Observations/Interpretation

The natural slope materials are colluvial at the near surface and residual at depth. Filling has been placed across the uphill side of the property for landscaping. The very steep slope at the waterfront exposes the underlying bedrock (Photo 9). The slope consists of alternating bands of thinly-bedded Very Low Strength Shale and thicker bands of Low Strength Sandstone. The majority of the face consists of thin sandstone beds. This ground profile is expected to extend under the proposed works for the boatshed and inclined lift. In the test locations, where rock was not exposed at the surface, it was encountered at depths of between 0.3m to 2.0m below the current surface, being deeper due to the presence of filling and a variable weathering profile. 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 rock and through the cracks. The water table was not encountered during the testing but is expected to sit just above the waterline. As such, it is expected to be many metres below the base of the proposed excavations on the uphill side of the property.

7. Surface Water

No evidence of significant surface flows were observed on the property during the inspection. Normal sheet wash from the slope above will be intercepted by the street drainage system for Riverview Road above.

It is recommended as part of the development a cut off drain be installed immediately above the proposed house to catch surface flows generated between the proposed garage and the house. The captured flows from this drain should be piped to waterfront. All drains, pits and associated plumbing are to be oversized and designed to cope with extreme prolonged rainfall events. The drain is to be designed by a stormwater/civil engineer in consultation with the geotechnical consultant. It is a condition of the slope stability assessment in Section 8 (**Hazard One**) that this be done.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed below or beside the property. The moderate to steeply graded slope that falls across the upper two thirds of the property and continues above at steep angles is a potential hazard (**Hazard One**). The Very Steeply graded portion of the slope is a potential hazard. (**Hazard Two**). The vibrations from the proposed excavations are a potential hazard (**Hazard Three**). The proposed excavations are a potential hazard until retaining walls are in place (**Hazard Four**).

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The moderate to steep slope that falls across the property and continues steeply above, failing and impacting on the property/proposed works.	Small scale surface failures occurring across the Very Steep portion of the slope (Photos 8 & 9) immediately above the waterfront.
LIKELIHOOD	'Unlikely' (10^{-4})	'Likely (10^{-2})
CONSEQUENCES TO PROPERTY	'Medium' (35%)	'Minor' (1.0%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (5×10^{-4})
RISK TO LIFE	9.1×10^{-7}/annum	9.96×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE', provided the recommendations in **Section 7 & 16** are followed.	This level of risk to life and property is 'TOLERABLE', provided the recommendations in **Section 16.1 & 16.2** are followed.

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

HAZARDS	Hazard Three	Hazard Four
TYPE	The vibrations produced during the proposed excavation impacting on the surrounding structures.	The excavation collapsing onto the work site before retaining walls are in place.
LIKELIHOOD	'Possible' (10^{-3})	'Likely' (10^{-2})
CONSEQUENCES TO PROPERTY	'Minor' (5%)	'Medium' (30%)
RISK TO PROPERTY	'Moderate' (5×10^{-5})	'Moderate' (2×10^{-4})
RISK TO LIFE	5.3×10^{-7}/annum	5.3×10^{-4}/annum
COMMENTS	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 12** are to be followed.	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 13 and 14** are to be followed.

(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 works is to be piped to the waterfront through any tanks that may be required by the regulating authorities.

11. Excavations

Two excavations are required for the proposed development:

A stepped excavation into the slope is required to construct the proposed Garage and Lift.

- The lower step for the lift will reach a maximum depth of ~4.3m.
- The upper step for the garage guest room will reach a maximum depth of ~2.2m.
- The width of the bench between the two excavations is ~3.7m

An additional stepped excavation into the slope is required to construct the house.

- The lower step will reach a maximum depth of ~4.2m at the location of the cut for the stairs.
- The upper step for the lower ground floor will reach a maximum depth of ~4.2m.
- The benches between the two steps are of variable widths apart.

The excavations are expected to be through fill and shallow soil over colluvium and clay with Very Low to Low Strength Rock expected at depths of between ~0.3m and ~2.0m. It is envisaged that excavations through fill, soil, clay, and shale can be carried out with an excavator and toothed bucket, and excavations through rock will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations through fill, soil, colluvium, clay, shale, and jointed Low Strength Rock will be below the threshold limit for building damage utilising a domestic-sized excavator up to 16 tonnes. Where excavations are through Medium Strength Rock, they should be carried out to minimise the potential to cause vibration damage to the N and S neighbouring houses. Allowing ~0.5m for backwall drainage, the setbacks from the proposed excavations to the existing structures are as follows:

The garage and lift excavation will be set back.

- ~1.0m from the N neighbouring house.
- ~7.0m from the S neighbouring house.

The excavation for the house will be set back.

- ~1.0m from the N neighbouring house.
- ~1.2m from the S neighbouring house.

Dilapidation reporting carried out on the N and S neighbouring properties is recommended prior to the excavation works commencing to minimise the potential for spurious building damage claims.

Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the house walls. Vibration monitoring will be required to verify this is achieved. Vibration monitoring must include a light/alarm so the operator knows if vibration limits have been exceeded. The equipment is to log and record vibrations throughout the excavation works.

In Medium Strength rock or better techniques to minimise vibration transmission will be required. These include:

- Rock sawing the excavation perimeter to at least 1.0m deep prior to any rock breaking with hammers, keeping the saw cuts below the rock to be broken throughout the excavation process.
- Limiting rock hammer size.
- Rock hammering in short bursts so vibrations do not amplify.
- Rock breaking with the hammer angled away from the nearby sensitive structures.
- Creating additional saw breaks in the rock where vibration limits are exceeded, as well as reducing hammer size as necessary.
- Use of rock grinders (milling head).

Should excavation induced vibrations exceed vibration limits after the recommendations above have been implemented, excavation works are to cease immediately and our office is to be contacted.

It is worth noting that vibrations that are below thresholds for building damage may be felt by the occupants of the subject and neighbouring houses.

13. Excavation Support Requirements

It is recommended, before the structural design commences for the project, exploration core drilling is to be carried out on the site to confirm to the rock quality and strength. This is to be arranged and supervised by the geotechnical consultant and should consist of a minimum of two cored bore holes taken to a depth of not less than 8.0m each. The following ground support advice can be considered preliminary and will be reviewed on recovery of the drill core. It may change as a result of the assessment of the drill core.

As this job is considered technically complex and due to the depth of the excavation, we recommend it be carried out by builders and contractors who are well experienced in similar work and can provide a proven history of completed work. We recommend a pre-construction meeting between the structural engineer, the builder, and the geotechnical consultant to discuss and confirm the excavation plan and to ensure suitable excavation equipment will be on site.

Bulk Excavation for Garage and Lift

The excavation for the proposed garage and lift will reach a maximum depth of ~4.3m in the location of the lift, and ~2.2m on the uphill side of the cut for the guest room level. Allowing for 0.5m of back wall drainage, the setbacks from the proposed excavation to the existing structures/boundaries are as follows:

- ~Flush with the N common boundary.
- ~1.0m from the road reserve.
- ~1.0m from the N neighbouring house.

As such, the road reserve, N common boundary, and N neighbouring house will lie within the zone of influence of the proposed excavation. In this instance, the zone of influence is the area above a theoretical 45° line from the base of the excavation towards the surrounding structures and boundaries. This line reduces to 30° through the fill and soil.

Due to the steep grade of the slope, depth of the excavation and its proximity to the surrounding boundaries and structures, we recommend heavy ground support be installed prior to the commencement of the excavation to ensure the safety of any workers below the cut and integrity of the neighbouring properties. As the excavation will be stepped, both the upper and lower stepped portion will need to be supported with a piled shoring wall around all sides of the excavation. The support for the upper portion will need to be installed before the excavation commences following the advice below. After the excavation has been lowered to the level of the guest room, the support for the lift portion of the excavation is to be installed. See the site plan attached for the minimum required extent of the shoring shown in blue.

Spaced piled retaining walls are one suitable method of support. Pier spacing for the wall is typically ~2.0m but can vary between 1.6 to 2.4m depending on the design. To drill the pier holes for the wall, a mini piling rig or similar that can excavate through Medium to High Strength Rock is recommended as the ground testing did not extend to the likely required depth of the piles. As the excavation is lowered in 1.5m lifts, infill sprayed concrete panels or similar are added between the piers to form the spaced wall. Drainage is installed behind the panels. The piers can be temporarily supported by embedment below the base of the excavation, or by a combination of embedment and temporary propping. We note the structural engineer will need to calculate the required embedment of the piles using the parameters in **Table 1** of **Section 14** and these depths are to be noted on the structural plans. Upon completion of the excavation, the piled walls are to be tied into the concrete floor and ceiling slabs of the garage and lift shaft to provide permanent bracing.

The geotechnical consultant is to inspect the drilling process of the entire first pile and the ground materials at the base of all pier holes/excavations for ground support purposes.

Bulk Excavation for House

The excavation for the proposed house will reach a maximum depth of ~4.2m in the location of the stairwell at the level of the cellar, and ~4.2m at the NE side of the cut for the Lower Ground Floor Level. Allowing for 0.5m of back wall drainage, the setbacks from the proposed excavation to the existing structures/boundaries are as follows:

- ~Flush with the N common boundary.
- ~0.7m from the S common boundary.
- ~1.0m from the N neighbouring house.

Due to the steep grade of the slope, depth of the excavation and its proximity to the surrounding boundaries and structures, we recommend heavy ground support be installed following the above advice, prior to the commencement of the excavation to ensure the safety of any workers below the cut and integrity of the neighbouring properties.

As the excavation will be stepped, both the upper and lower stepped portion will need to be supported with a piled shoring wall around all sides of the excavation. The support for the

Lower Ground Floor will need to be installed before the excavation commences following the methodology outlined above. After the excavation has been lowered to the level of the Lower Ground Floor, the support for the cellar level portion of the excavation is to be installed. See the site plan attached for the minimum required extent of the shoring shown in blue.

Advice Applying to All Excavations

The excavations are to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast.

All excavation spoil is to be removed from site following the current Environmental Protection Agency (EPA) waste classification guidelines.

14. Retaining Walls

For cantilever or singly propped retaining walls it is suggested the design be based on a triangular 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	Passive
Fill and Topsoil	20	0.40	0.55	N/A
Clay	20	0.35	0.45	Kp = 2.0 'ultimate'
Very Low Strength Rock	22	0.22	0.35	400kPa 'ultimate'
Low Strength Rock	24	0.20	0.35	1000kPa 'ultimate'

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 and do not account for any surcharge loads, noting that surcharge loads from the structures/road above will be acting on the wall. It also assumes retaining walls are fully drained. It should be noted that passive pressure is an ultimate value and should have an appropriate safety factor applied. No passive resistance should be assumed for the top 0.4m to account for any disturbance from the excavation. 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 structure 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 wall, the likely hydrostatic pressures are to be accounted for in the structural design.

15. Foundations

15.1 The proposed garage excavation is expected to be partially seated in Very Low to Low Strength Rock. This is a suitable foundation material. It is expected to be exposed across the uphill side of the excavation at the level of the guest room. Where it is not exposed, due to the steep to very steep grade of the slope across the property, piers taken to and embedded ~0.4m into rock will be required to maintain a uniform foundation material across the structure. The piers for the downhill side of the garage are expected to encounter this material at depths of between ~0.6m to ~1.1m below the current surface.

15.2 The proposed lift excavation is expected to be entirely seated in Very Low to Low strength rock. This is a suitable foundation material.

15.3 The proposed house excavation is expected to be partially seated on Very Low to Low Strength rock. This is a suitable foundation material. This material is expected to be exposed across the uphill side of the excavation. Where it is not exposed, and where the footprint of the proposed house does not fall over the excavations, piers taken to and embedded ~0.5m into this rock will be required to maintain a uniform foundation material across the structure. The piers for the downhill side of the house are expected to encounter this material at depths of between ~1.0m to ~2.0m below the current surface.

15.4 Piers socketed at least ~0.4m into Very Low to Low Strength Rock are suitable footings for the proposed inclined lift. This material is expected to be encountered at depths of between ~0.3m to ~0.7m below the current surface where it is not exposed across the location of the proposed inclined lift.

15.5 The proposed boat shed and decking can be supported on concrete piers supported directly off the Low to Medium Strength Rock exposed at the waterfront.

it is recommended a catch fence/barrier be constructed on the uphill side of the proposed boat shed to stop any boulders or loose joint blocks that may move down the Very Steep portion of the slope over the life of the boatshed. The catch fence or barrier is to be designed and approved by the structural engineer.

No temporary or permanent excavation works are currently proposed across the Very Steep portion of the slope on the downhill side of the property. The project Geotechnical engineer is to be consulted if any excavations in this area are required.

15.6 It is envisaged the jetty will be supported on driven piles as is typical of jetties in the Pittwater area. Estimating the depth of the river sediment below the waterline is beyond the scope of this report. However, we expect the sediment to get progressively deeper with an increase in the depth of water as it drops away from the Low to Medium Strength Rock shelf at the waterfront.

The piling contractor is responsible for certifying these foundations but should inform the geotechnical consultant of the pile embedment depths as they are installed.

15.7 Due to the grade of the slope on the uphill side of the property, piers socketed at least ~0.4m into Very Low to Low Strength Rock are suitable footings for the proposed driveway.

15.8 A maximum allowable bearing pressure of 600kPa can be assumed for footings on Very Low to Low Strength Rock or better.

As the bearing capacity of clay and shale reduces when it is wet, we recommend 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 layer of wet clay or 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 and inspected by the geotechnical consultant.

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.

16. Site Maintenance/Remedial Works

16.1 Where slopes approach or exceed 20°, such as on this site, it is prudent for the owners to occasionally inspect the slope (say annually or after heavy rainfall events, whichever occurs first). Should any of the following be observed: movement or cracking in retaining walls, cracking in any structures, cracking or movement in the slope surface, tilting or movement in established trees, leaking pipes, or newly observed flowing water, or changes in the erosional process or drainage regime, then a geotechnical consultant should be engaged to assess the slope. We can carry out these inspections upon request. The risk assessment in **Section 8** is subject to this site maintenance being carried out.

16.2 To reduce risk, during heavy and prolonged rainfall events, the Very Steep portion of the slope that drops to the waterfront (Photos 8 & 9) should not be approached until the slope materials are fully dry, as small-scale failures are expected to occur while the slope is saturated. The risk assessment in **Section 8** is subject to this advice being followed.

17. Geotechnical Review

The structural plans are to be checked and certified by the geotechnical engineer as being in accordance with the geotechnical recommendations. On completion, a Form 2B will be issued. This form is required for the Construction Certificate to proceed.

18. Inspections

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

- The geotechnical consultant is to inspect the ground materials while the first pier for the ground support is being dug to assess the ground strength and to ensure it is in line with our expectations.

- All finished pier holes for shoring walls, for excavation ground support are to be inspected and measured before concrete is placed.

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

White Geotechnical Group Pty Ltd.

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No. 10307
Engineering Geologist & Environmental Scientist.

Reviewed By:

Ben White M.Sc. Geol.,
AIG., RPGeo Geotechnical & Engineering.
No. 10306
Engineering Geologist.

Photo 1

Photo 2

Photo 3

Photo 4

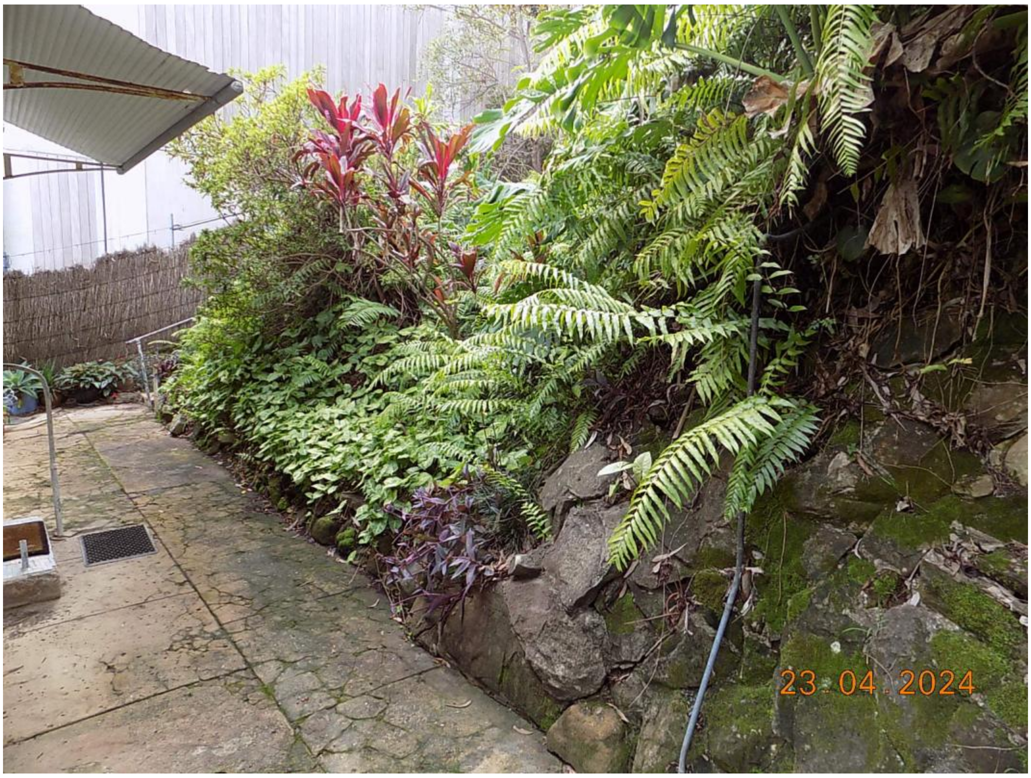


Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11 – Ah1 – Downhole is top to bottom

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.

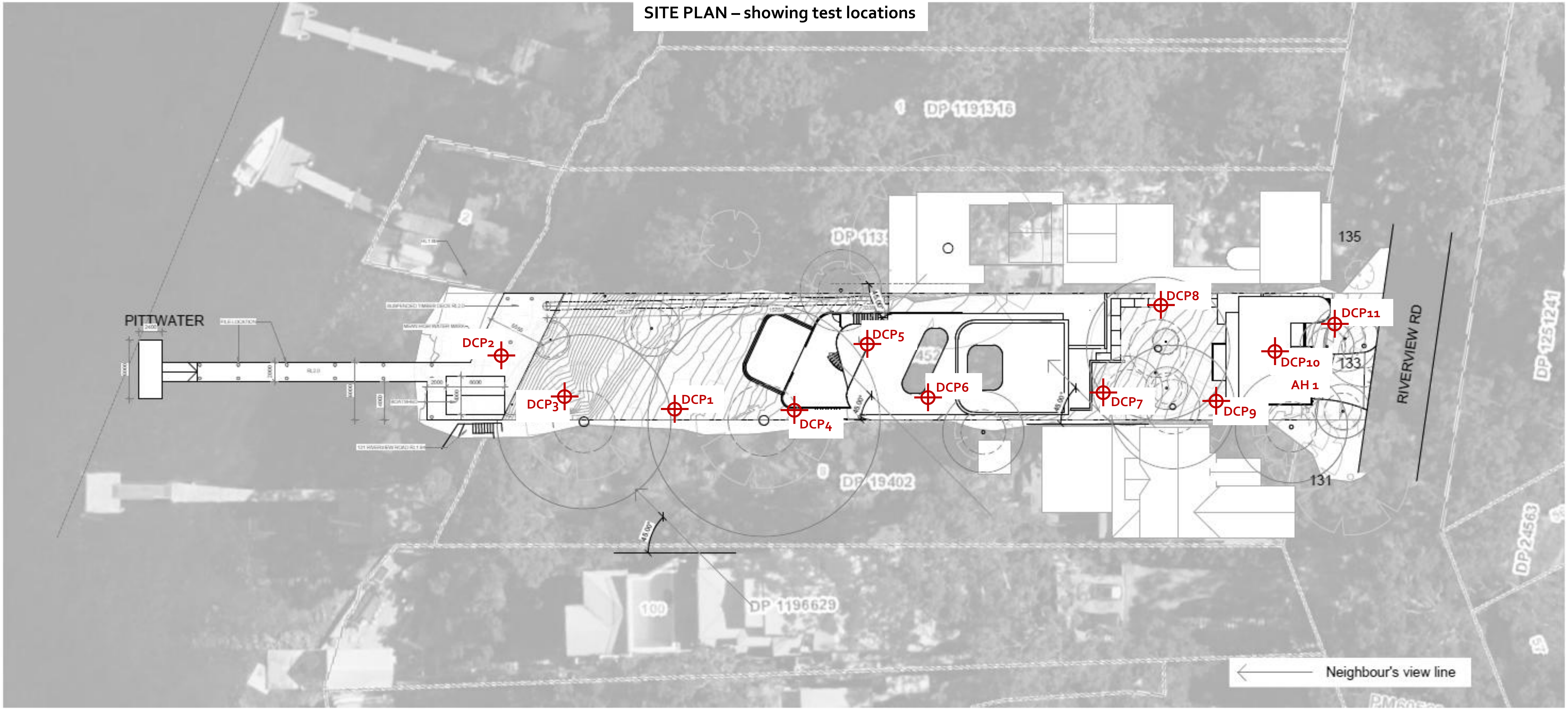
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



DRAWN BY: AS CHECKED BY: DP

ADDRESS:

133 Riverview Rd, Avalon Beach NSW

VIEW:

SITE PLAN

SCALE: A1/1:200

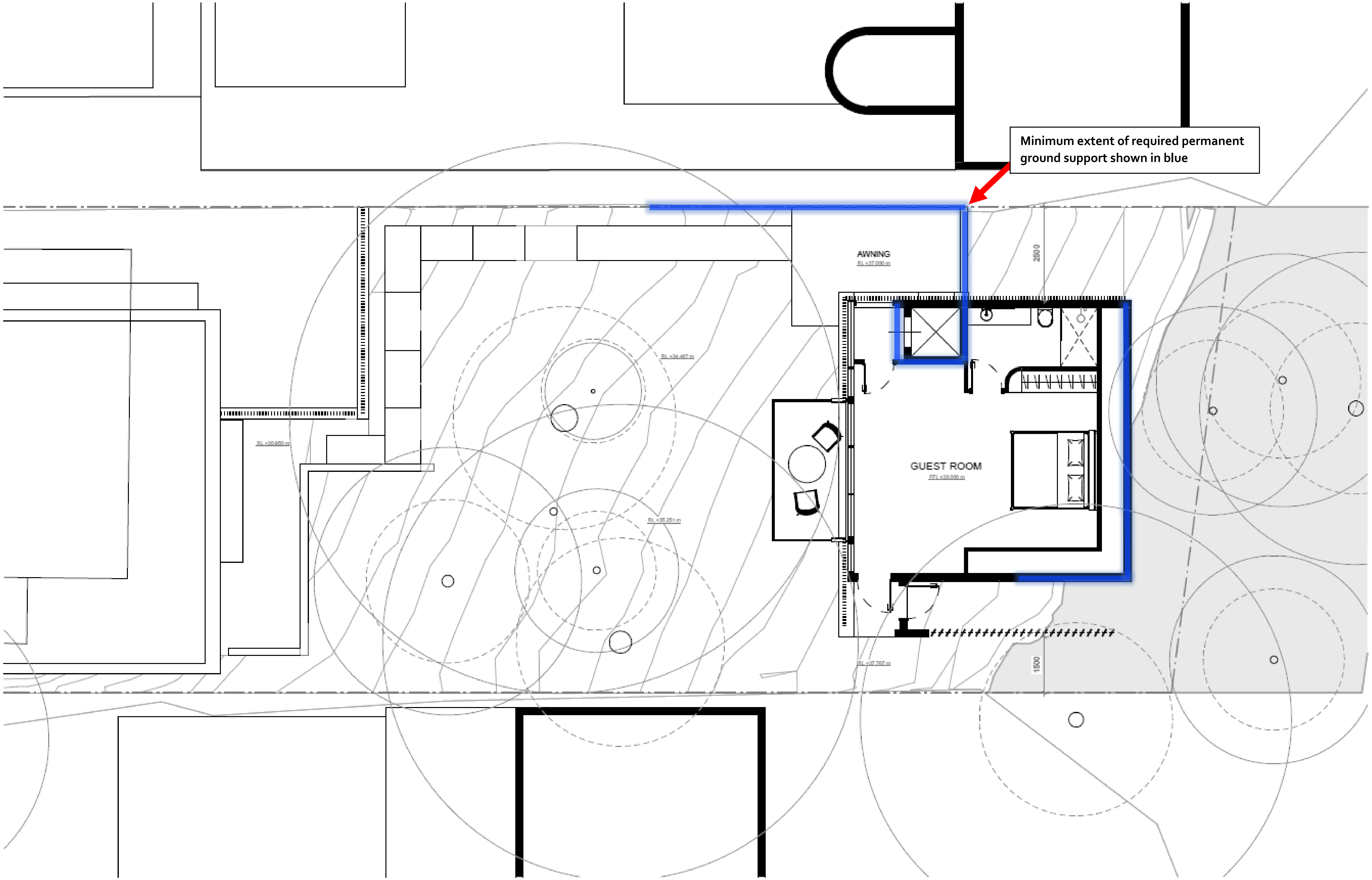
DATE: 22.05.25

DW No. A103

REV: A

FOR INFORMATION

GUEST ROOM – showing minimum extent of required shoring



FOR INFORMATION

REV	Date	Description
A		For DA Lodgement

RISE PROJECTS

DRAWN BY: AS
CHECKED BY: DP

ADDRESS:

133 Riverview Rd, Avalon Beach NSW

VIEW:

GUEST ROOM

JOB No :

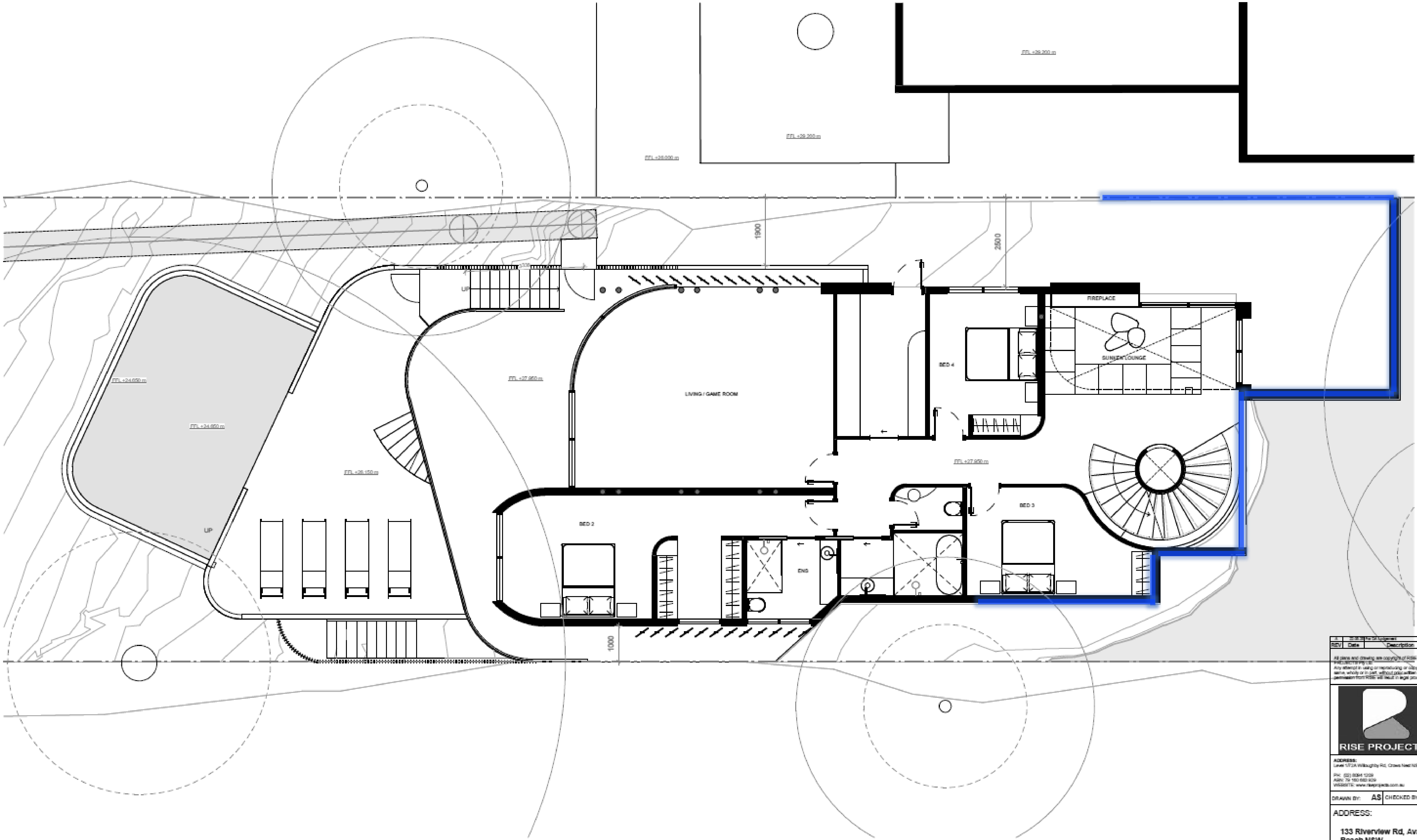
SCALE : A1 / 1 : 50

DATE: 22.05.25

DW No. A202

REV: A

LOWER GROUND FLOOR – showing minimum extent of required shoring



REV	Date	Description

RISE PROJECTS

ADDRESS:

DRAWN BY: AS | CHECKED BY: DP

ADDRESS:

133 Riverview Rd, Avalon Beach NSW

VIEW:

LOWER GROUND FLOOR

JOB No :

SCALE :

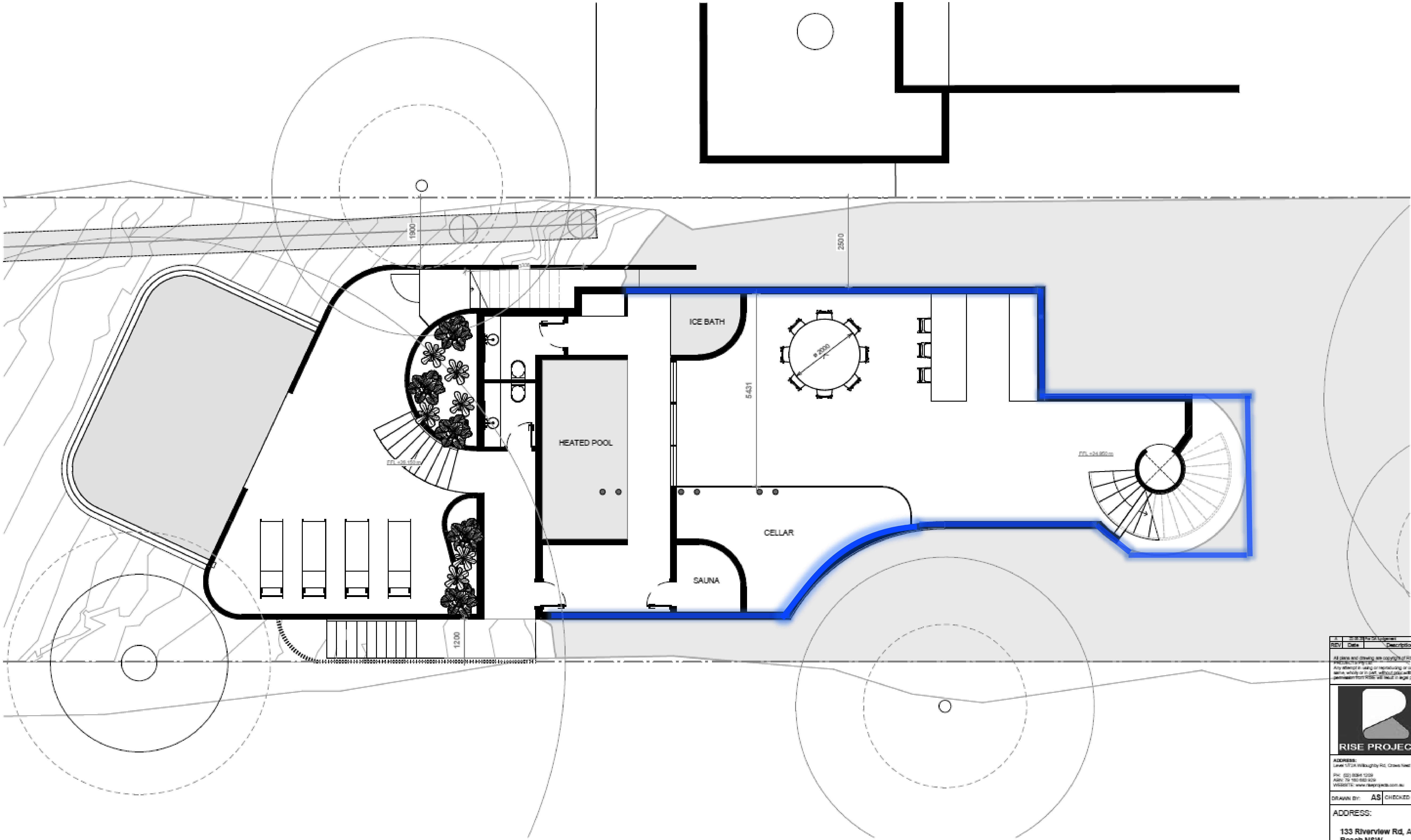
DATE:

DW No. A206

REV: A

FOR INFORMATION

CELLAR/POOL – showing minimum extent of required shoring



FOR INFORMATION

REV	Date	Description

RISE PROJECTS

DRAWN BY: AS	CHECKED BY: DP

ADDRESS:

133 Riverview Rd, Avalon Beach NSW

VIEW:

CELLAR / POOL

JOB No :

SCALE : A1 / 1 : 50

DATE: 22.05.25

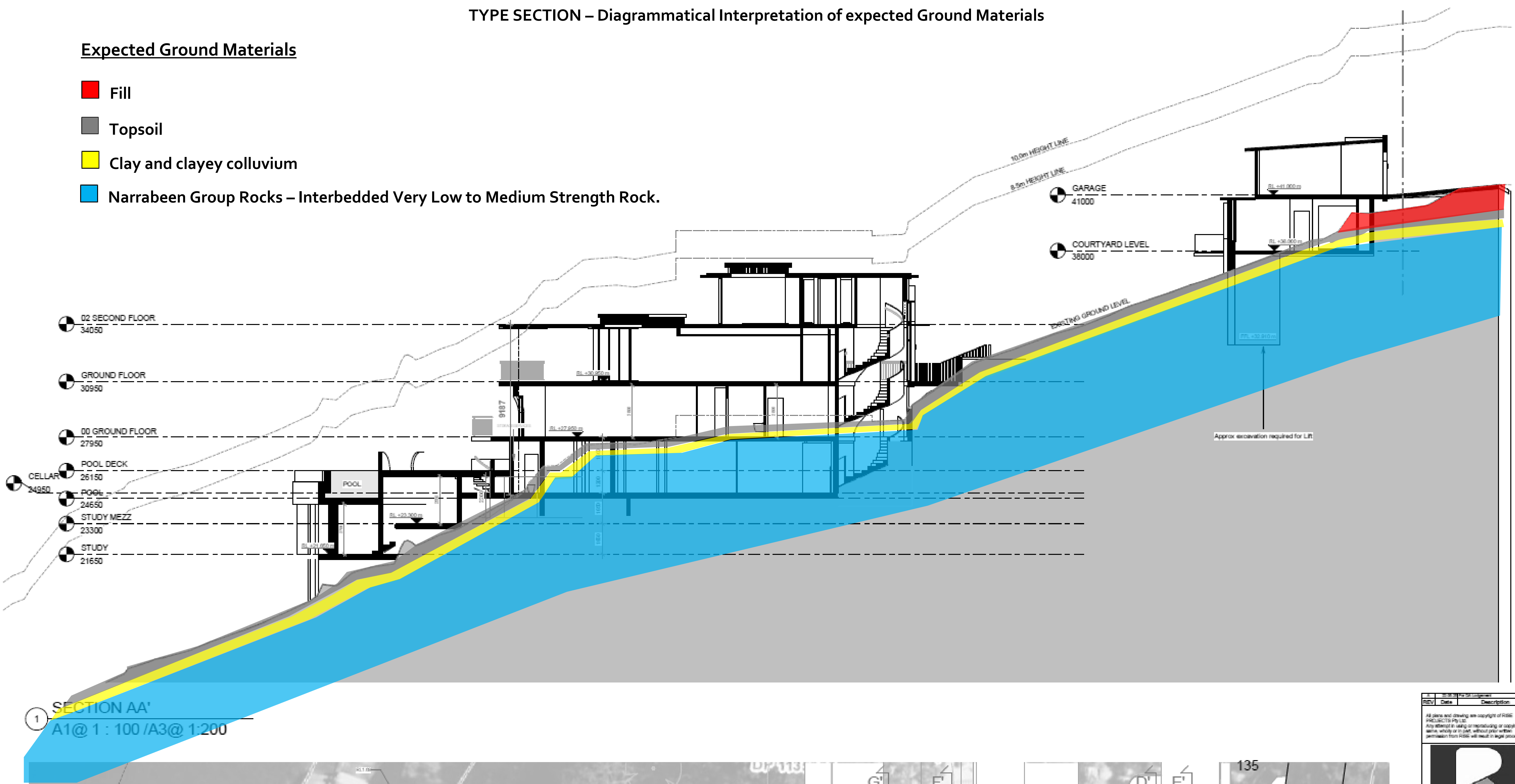
DW No. A207

REV: A

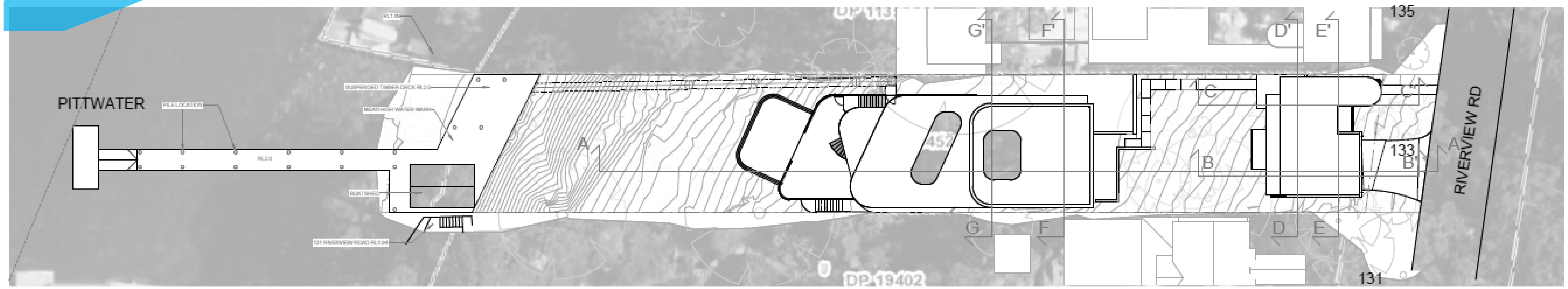
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

Expected Ground Materials

- Fill
- Topsoil
- Clay and clayey colluvium
- Narrabeen Group Rocks – Interbedded Very Low to Medium Strength Rock.



1 SECTION AA'
A1@ 1 : 100 /A3@ 1:200



KEYPLAN

FOR INFORMATION

REV	Date	Description

RISE PROJECTS

DRAWN BY: AS CHECKED BY: DP

ADDRESS:

133 Riverview Rd, Avalon Beach NSW

VIEW:

SECTIONS - LONG SECTION

JOB No :

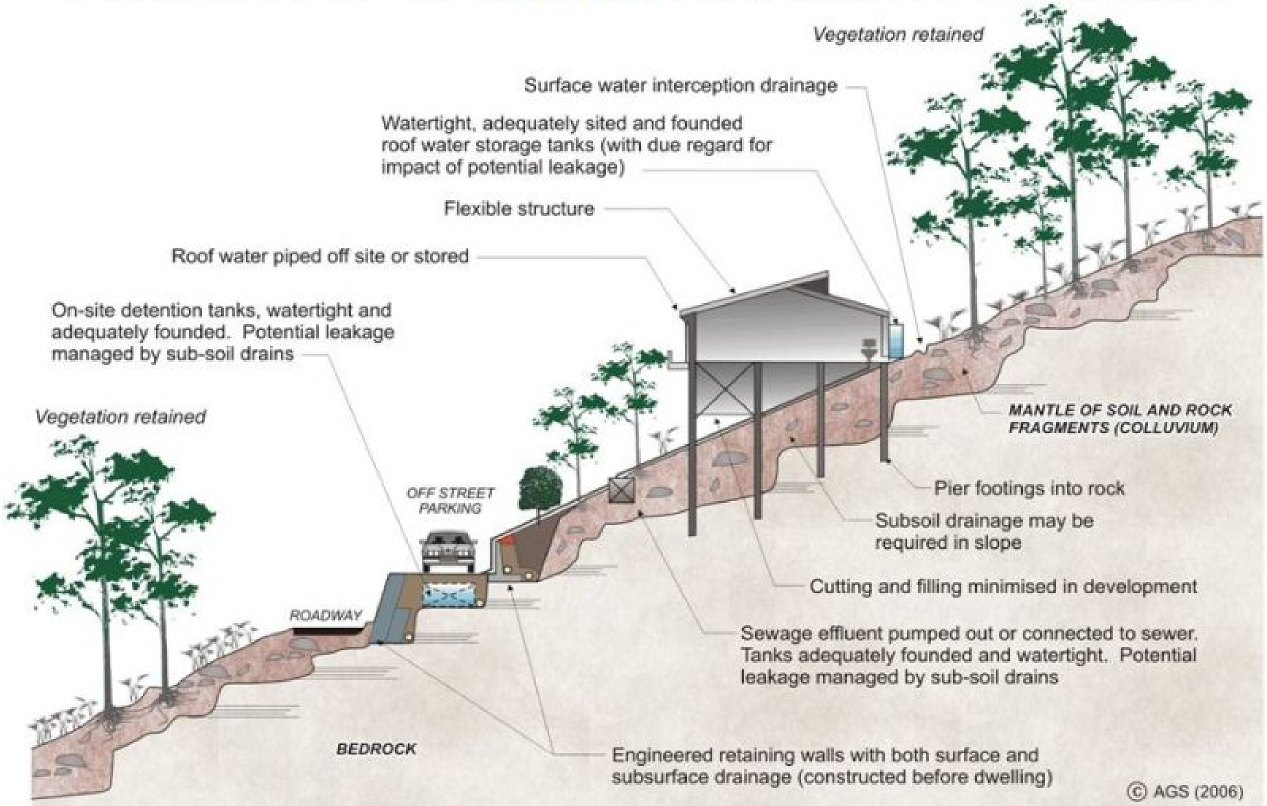
SCALE : A1/As Indicated

DATE: 22.05.25

DW No. A301

REV: A

EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE