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

Development Application for _____
Name of Applicant

Address of site 1744 Pittwater Road, Bayview

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 23/2/22 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 **1744 Pittwater Road, Bayview**
Report Date: 23/2/22

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 1744 Pittwater Road, Bayview

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 **1744 Pittwater Road, Bayview**

Report Date: 23/2/22

Author: BEN WHITE

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

Please mark appropriate box

☒ Comprehensive site mapping conducted **1/11/21**
(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 **1/11/21**

☒ 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 House, Pool, and Boatshed at **1744 Pittwater Road, Bayview**

1. Proposed Development

1.1 Demolish the existing house and construct a new part three-storey house by excavating to a maximum depth of ~3.2m into the slope.

1.2 Install a new pool on the downhill side of the property by excavating to a maximum depth of ~3.0m.

1.3 Construct a new boatshed on the downhill side of the property by excavating to a maximum depth of ~2.5m.

1.4 Details of the proposed development are shown on 25 drawings prepared by Giles Tribe Architects, Job number 21091, drawings numbered DA00 to DA21 and SD01 to SD03, Revision A, dated 21/2/22.

2. Site Description

2.1 The site was inspected on the 1st November, 2021.

2.2 This residential property is on the low side of the road and has an E aspect. The block runs longways to the NE so the slope is a cross-fall. It encompasses the steep bank that rises at the waterfront ~6m and the gentle slope above that grades at angles of ~7°. The slope rises beyond the site at similar gentle angles for ~300m before the grade gradually increases in the slope to Bayview Plateau.

2.3 At the road frontage, a concrete driveway runs to a gravel parking area on the uphill side of the property and to a brick garage attached to the SE side of the house (Photos 1 & 2). Between the road frontage and the house is a gently sloping lawn (Photo 3). The part three-storey brick house is supported on stable brick walls and will be demolished as part of the proposed works (Photo 4). Another gently sloping lawn extends off the downhill side of the house to top of the steep bank that rises from the

waterfront (Photos 5 & 6). This bank is densely vegetated and terraced with a series of stable stack rock retaining walls. A near-level lawn-covered fill extends off the toe of the bank to the waterfront. The fill is supported by a low stack rock sea wall (Photo 7). No signs of slope instability were observed on the property.

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. Thin bands of Low to Medium Strength Sandstone extend through the otherwise shale-dominated profile.

4. Subsurface Investigation

The ground materials within an as-dug trench were recorded (TRENCH). Ten 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. This is not expected to be an issue for the testing on this site. However, excavation and foundation budgets should always allow for the possibility that the interpreted ground conditions in this report vary from those encountered during excavations. See the appended “Important information about your report” for a more comprehensive explanation. The results are as follows:

GROUND TEST RESULTS ON NEXT PAGE

TRENCH (~RL4.5) **–** (Photo 8)

Depth (m)	**Material Encountered**
0.0 to 0.7	**FILL**, gravel and disturbed clay, brown and mottled orange and maroon, medium dense to very dense, dry, fine to coarse grained with rocks through the profile.
0.7 to 0.9	**LOW STRENGTH SANDSTONE**, grey and yellow, dry, coarse grained.

Base of trench @ 0.9m in Low Strength Sandstone. No water table encountered.

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** (~RL2.9)	**DCP 2** (~RL3.6)	**DCP 3** (~RL6.8)	**DCP 4** (~RL8.1)	**DCP 5** (~RL8.8)
0.0 to 0.3	13	Rock Exposed at Base of Trench	9	10	4
0.3 to 0.6	30		17	14	11
0.6 to 0.9	6		15	20	13
0.9 to 1.2	#		40	#	14
1.2 to 1.5			#		18
1.5 to 1.8					11
1.8 to 2.1					#
	Refusal on Rock @ 0.7m		End of Test @ 1.2m	Refusal on Rock @ 0.9m	Refusal on Rock @ 1.7m

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

DCP RESULTS CONTINUED ON 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 6** (~RL9.6)	**DCP 7** (~RL11.5)	**DCP 8** (~RL12.6)	**DCP 9** (~RL11.8)	**DCP 10** (~RL10.7)
0.0 to 0.3	5	1	15	6	7
0.3 to 0.6	9	9	18	8	9
0.6 to 0.9	7	13	15	13	12
0.9 to 1.2	22	15	13	15	16
1.2 to 1.5	40	23	#	16	17
1.5 to 1.8	#	35		37	17
1.8 to 2.1		#		#	#
	Refusal on Rock @ 1.4m	End of Test @ 1.7m	Refusal on Rock @ 1.1m	Refusal on Rock @ 1.7m	Refusal on Rock @ 1.7m

#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, white impact dust on dry tip.
DCP2 – Low Strength Sandstone exposed at base of ~0.9m deep trench (TRENCH).
DCP3 – End of test @ 1.2m, DCP still very slowly going down, white and maroon impact dust on dry tip.
DCP4 – Refusal on rock @ 0.9m, DCP bouncing off rock surface, orange and maroon sandstone fragments on dry tip.
DCP5 – Refusal on rock @ 1.7m, DCP bouncing off rock surface, orange sandstone fragments on dry tip, light brown clay in collar above tip.
DCP6 – Refusal on rock @ 1.4m, DCP thudding, clean dry tip, brown and grey clay in collar above tip.
DCP7 – End of test @ 1.7m, DCP still very slowly going down, clean dry tip, brown and grey clay in collar above tip.
DCP8 – Refusal on rock @ 1.1m, DCP bouncing off rock surface, orange impact dust on dry tip.
DCP9 – Refusal on rock @ 1.7m, DCP bouncing off rock surface, clean dry tip, brown and grey clay in collar above tip.
DCP10 – Refusal on rock @ 1.7m, DCP bouncing off rock surface, maroon shale fragments on dry tip, grey clay in collar above tip.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the test locations, the ground materials consist of a thin topsoil over firm to hard clays. The clays merge into the underlying weathered rock at depths of between 0.9 to 1.8m below the current surface. The weathered zone is interpreted to be Extremely Low to Very Low Strength Shale. Thin bands of Low to Medium Strength Sandstone are present through the shale. These bands were observed by this firm during the excavation works on the SE neighbouring property (Photo 9). 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. Due to the slope and elevation of the block, the water table is expected to be metres below the base of the proposed excavations.

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 Pittwater Road above.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above, below, or beside the property. The steep bank that rises from the waterfront is a potential hazard (**Hazard One**). The vibrations from the proposed excavations are a potential hazard (**Hazard Two**). The proposed excavations are a potential hazard until retaining structures are in place (**Hazard Three**).

RISK ANALYSIS SUMMARY ON THE NEXT PAGE

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The steep bank that rises at the waterfront failing and impacting on the proposed works.	The vibrations produced during the proposed excavations impacting on the supporting walls of the neighbouring houses.	The excavations (up to a depth of ~3.2m) collapsing onto the work site before retaining structures are in place.
LIKELIHOOD	'Unlikely' (10^{-5})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Minor' (8%)	'Medium' (15%)	'Medium' (25%)
RISK TO PROPERTY	'Low' (5×10^{-6})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	5.3×10^{-7}/annum	6.8×10^{-5}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	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** 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

The fall of the property is to the Pittwater so any stormwater runoff from the proposed development can be piped to the waterfront through any tanks that may be required by the regulating authorities.

11. Excavations

An excavation to a maximum depth of ~3.2m is required to construct the house. Another excavation to a maximum depth of ~3.0m is required to install the proposed pool. A third excavation to a maximum depth of ~2.5m is required to construct the proposed boat shed. A final excavation to a maximum depth of ~1.5m is required to construct the proposed garage. The excavations are expected to be taken through a thin topsoil and fill over firm to hard clays with Extremely Low to Very Low Strength Shale expected at depths of between 0.9 to 1.8m below the current surface. Thin bands of Low to Medium Strength Sandstone are also expected to be encountered during the proposed excavations.

Excavations through fill, soil, clay, and Extremely Low to Very Low Strength Shale can be carried out with an excavator and bucket and excavations through rock will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations through fill, soil, clay, and Extremely Low to Very Low Strength Shale will be below the threshold limit for building damage. However, thin bands of Low to Medium Strength Sandstone are also expected to be encountered during the proposed excavations.

Excavations through Low to Medium Strength Sandstone or better that cannot be removed with a bucket or a ripper should be carried out to minimise the potential to cause vibration damage to the NW and SE neighbouring houses. The supporting walls of the NW neighbouring house will be as close as ~2.5m and the supporting walls of the SE neighbouring house will be as close as ~1.0m from the edges of the proposed excavations. Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Dilapidation reporting carried out on the NW and SE neighbouring properties is recommended prior to the excavation works commencing.

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the property boundaries. Vibration monitoring will be required to verify this is achieved. The vibration monitoring equipment must include a light/alarm so the operator knows if vibration limits have been exceeded. It also must 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.

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

13. Excavation Support Requirements

Bulk Excavation for Proposed House and Garage

The proposed excavation for the house will reach a maximum depth of ~3.2m along its NW side and ~2.2m along its SE side, and the excavation for the proposed garage will reach a maximum depth of ~1.5m along its NW side. Both excavations will taper away in height downslope along both sides. Allowing for back-wall drainage, they will come close to flush with the NW and SE common boundaries. The neighbouring houses are set back sufficiently from the proposed excavation. As such, only the NW and SE common boundaries will be within the zone of influence of the excavations and will require temporary support to

maintain the integrity of the NW and SE neighbouring properties until permanent retaining walls are in place.

The NW and SE common boundary fences are to be braced before the excavation commences.

The cut will require staged sacrificial temporary support such as braced form ply or similar support installed along the NW and SE sides as the excavation is progressed in spans not less than 2.0m horizontally. The support is to be designed by the structural engineer. The temporary support is to remain in place until the retaining walls are built. See the minimum extent of temporary shoring shown on the site plan attached.

The soil and clay portions along the uphill sides of the excavations that extend to a maximum depth of ~1.8m are to be battered at 1.0 Vertical to 1.0 Horizontal (45°) and cut batters through Extremely Low to Very Low Strength Shale or better are expected to stand unsupported at near-vertical angles for short periods of time until retaining walls are installed, provided they are kept from becoming saturated.

Bulk Excavation for Proposed Pool

The excavation for the proposed pool will reach a maximum depth of ~3.0m and will be sufficiently set back from any surrounding structures or boundaries.

The soil and clay portions of the excavation that extend to a depth of ~0.9m are to be battered at 1.0 Vertical to 1.0 Horizontal (45°) and cut batters through Extremely Low to Very Low Strength Shale or better are expected to stand unsupported at near-vertical angles for short periods of time until the pool structure is installed provided the cut batters are kept from becoming saturated. If the cut batters remain unsupported for more than a day before the pool construction commences, they are to be supported with typical pool shoring such as braced form ply, until the pool structure is in place.

Bulk Excavation for Proposed Boat Shed

The excavation for the proposed boatshed will reach a maximum depth of ~2.5m and will be sufficiently set back from any surrounding structures or boundaries.

The fill, soil, and clay portions of the excavation that extend to a maximum depth of ~0.9m are to be battered at 1.0 Vertical to 1.0 Horizontal (45°) and cut batters through Extremely Low to Very Low Strength Shale or better are expected to stand unsupported at near-vertical angles for short periods of time until retaining walls are installed, provided they are kept from becoming saturated.

Advice Applying to All Excavations

During the excavation process, the geotechnical consultant is to inspect the cuts in 1.5m intervals as they are lowered, while the machine/excavation equipment is on site, to ensure the ground materials are as expected and no additional temporary support is required.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. Unsupported cut batters through fill, soil, clay, and Extremely Low to Very Low Strength Shale are to be covered to prevent access of water in wet weather and loss of moisture in dry weather. The covers are to be tied down with metal pegs or other suitable fixtures so they can't blow off in a storm. The materials and labour to construct the retaining walls/pool structure are to be organised so on completion of the excavations they can be constructed as soon as possible. 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 Structures

For cantilever or singly-propped retaining structures, 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 Structures

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill, Soil, and Residual Clay	20	0.40	0.55
Rock up to Low Strength Rock - Jointed	24	0.25	0.35
Medium Strength Rock	24	0.00	0.10

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 structure, do not account for any surcharge loads, and assume retaining structures are fully drained. Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining structures 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 structures, the likely hydrostatic pressures are to be accounted for in the structural design.

15. Foundations

The proposed house, garage, and boatshed can be supported on raft concrete slabs and piers taken to Extremely Low to Very Low Strength Shale. This ground material is expected to be exposed across a portion of the base of the excavations. Where the slope falls away on the downhill side, this material is expected at depths of between 0.9 to 1.8m below the current surface.

The pool is expected to be mostly seated in Extremely Low to Very Low Strength Shale with areas in the firm to hard clays. To ensure a uniform bearing material, shallow/bucket piers may be required to ensure a uniform bearing material where weathered shale where it is not exposed.

A maximum allowable bearing pressure of 600kPa can be assumed for footings on Extremely Low to Very 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.

As the bearing capacity of Extremely Low to Very Low Strength 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.

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. Geotechnical Review

The structural plans are to be checked and certified by the geotechnical consultant 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.

17. Inspections

The client and builder are to familiarise themselves with the following required inspections as well as council geotechnical policy. We cannot provide certification for the regulating

authorities or the owner if the following inspections have not been carried out during the construction process.

- During the excavation process, the geotechnical consultant is to inspect the cuts in 1.5m intervals as they are lowered, while the machine/excavation equipment is on site, to ensure the ground materials are as expected and no temporary support is required.
- 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.

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

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8: TRENCH

Photo 9

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.

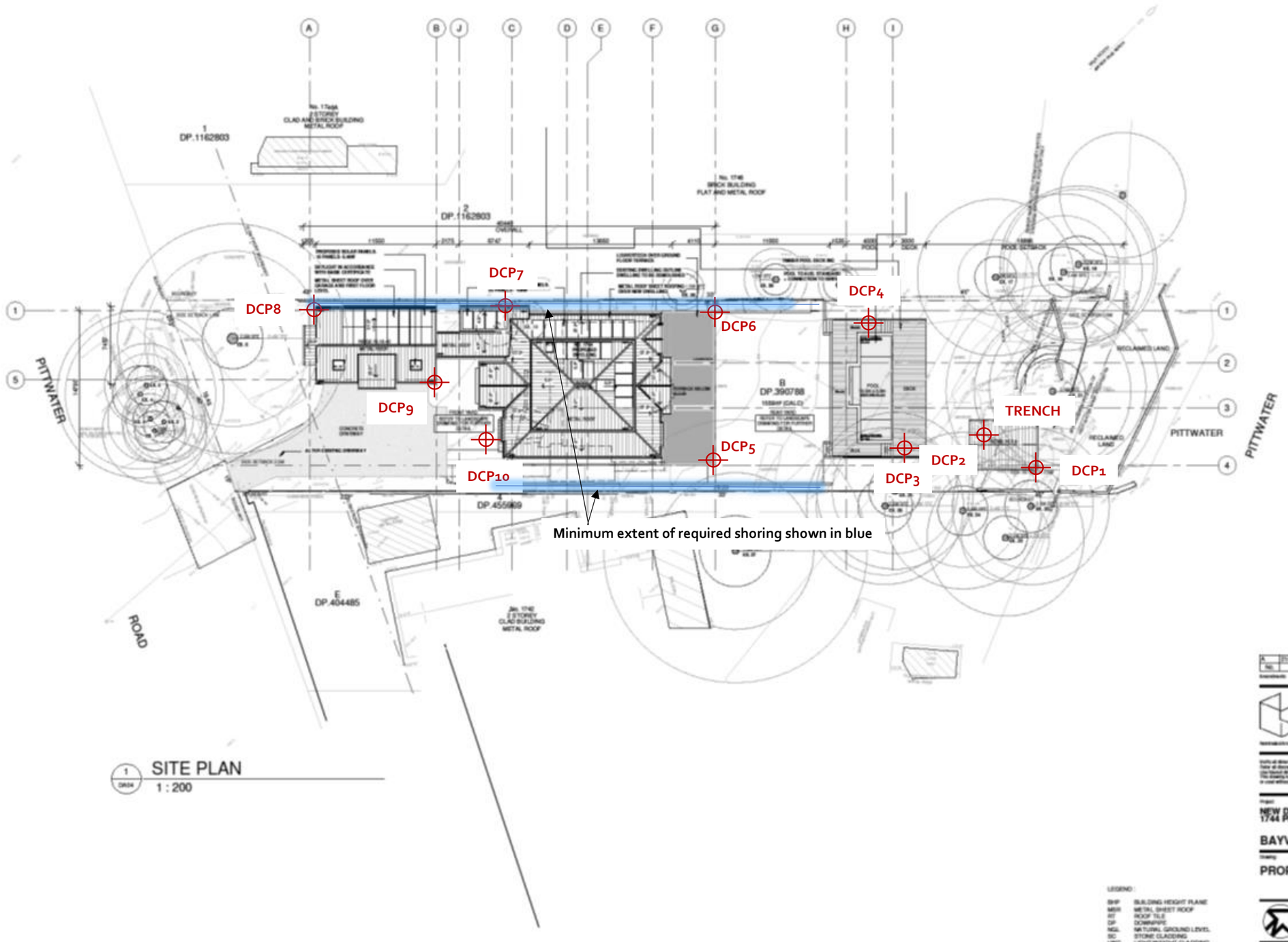
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



1 SITE PLAN
1 : 200

GILES TRIBE

NEW DWELLING
1744 PITTWATER ROAD,

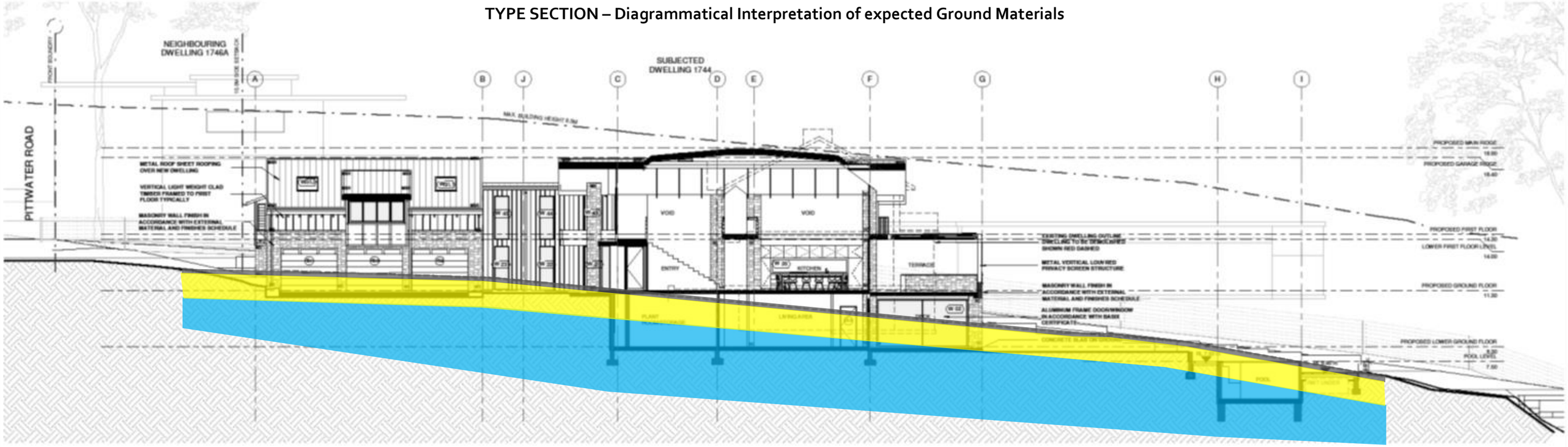
BAYVIEW

PROPOSED SITE PLAN

DA

As indicated | 21091 | DA04 | A

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



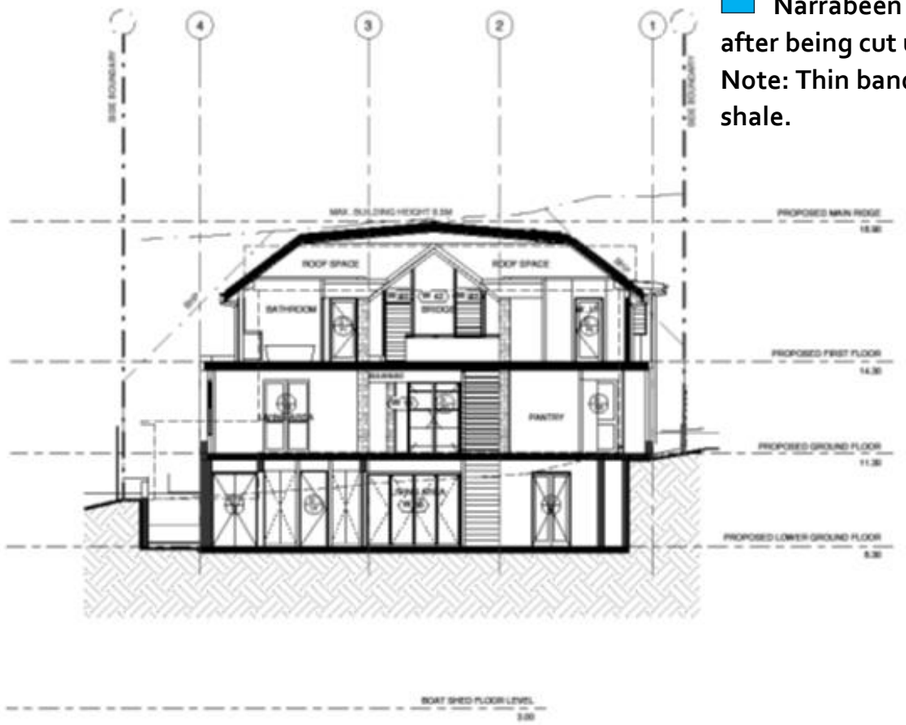
1 / DA10 SECTION A-A
1 : 100

Topsoil

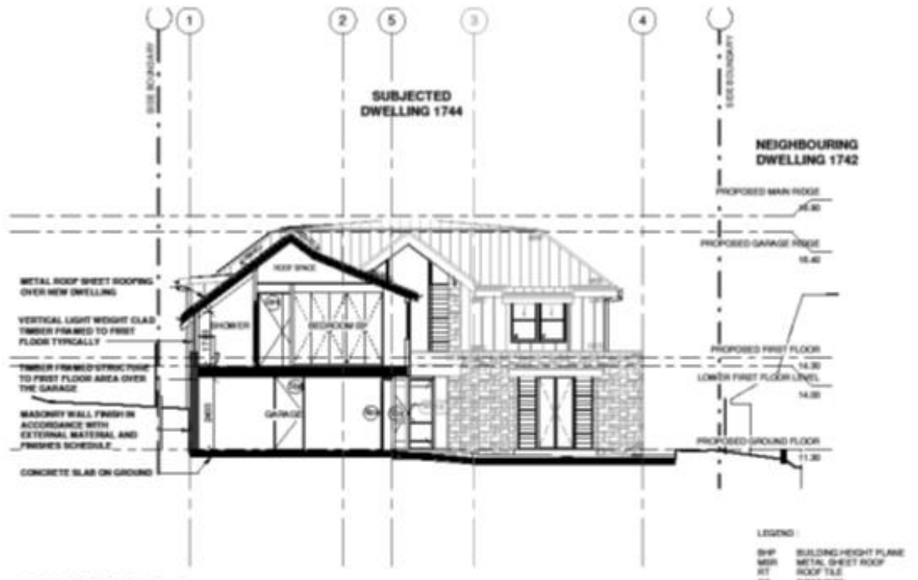
Clay – Firm to Hard

Narrabeen Group Rocks – Extremely Low to Very Low Strength Shale - after being cut up by excavation equipment can resemble a stiff to hard clay.

Note: Thin bands of Medium Strength Sandstone are present through the shale.



2 / DA10 SECTION B-B
1 : 100



3 / DA10 SECTION C-C
1 : 100

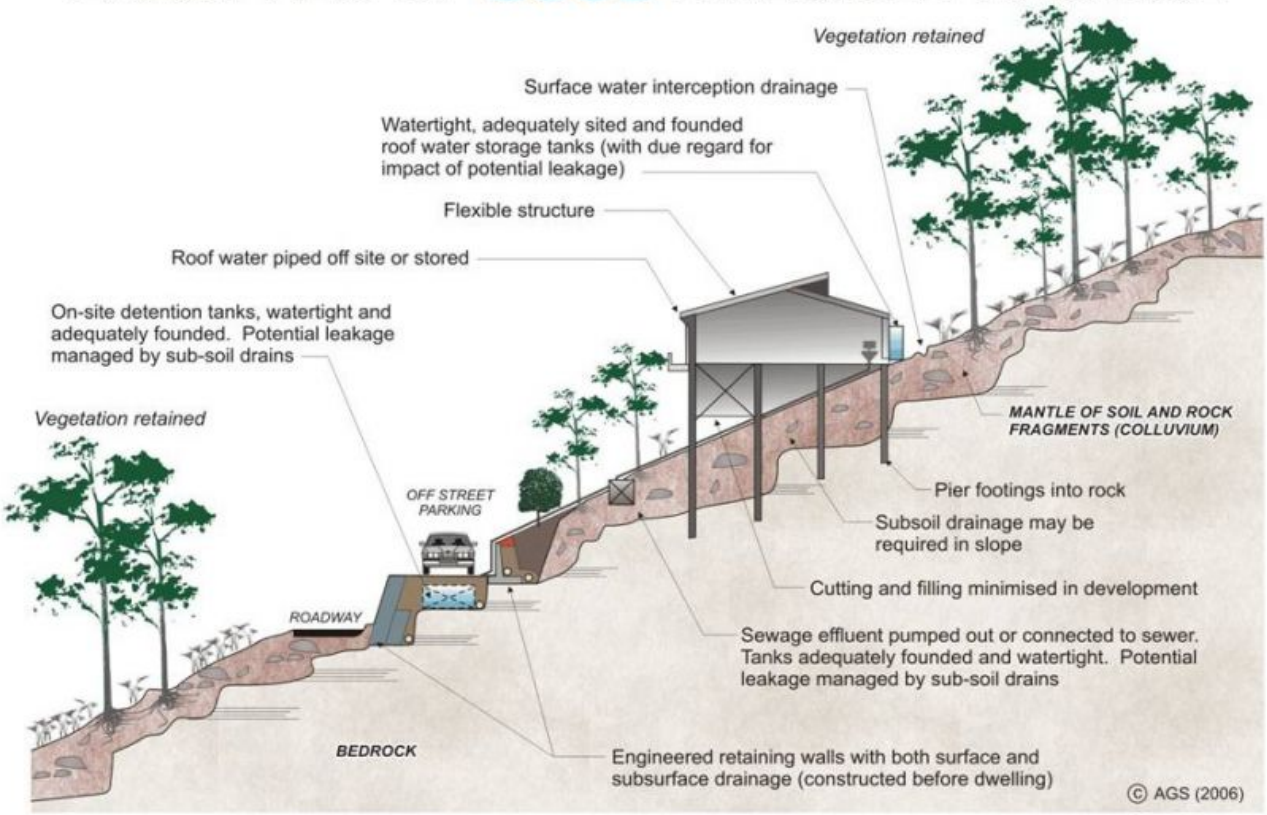
GILES TRIBE

NEW DWELLING
1744 PITTWATER ROAD,

PROPOSED SECTIONS

As indicated | 21091 | DA10 | A

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE