32 The Strand, Whale Beach

Geotechnical Comments for Section 4.55.

We have reviewed the existing geotechnical report, the original plans, and the 13 amended plans by Shaun Lockyer Architects. Drawings numbered 100.01, 200.01 and 400.01 to 400.03 are Revision C, dated 26/6/19. Drawings numbered 200.01 to 200.03 and 400.04 are Revision B, dated 18/4/19. Drawings numbered 300.01 and 300.02 are Revision D, dated 4.9.19. Drawing number 100.10 is Revision A, dated 26.6.19. Drawing number 020.03 is Revision A, dated 18.4.19.

The changes are as follows:

- Plant and equipment store area on the S side of the house increased by moving the W wall further W.
- Various other minor modifications to the house and external areas.

The proposed changes are considered minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the original report carried out by this firm numbered J2226 and dated the 17th June 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 32 The Strand, Whale 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 20/6/19 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 **32 The Strand, Whale Beach**

Report Date: 17/6/19

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 32 The Strand, Whale 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 **32 The Strand, Whale Beach**

Report Date: 17/6/19

Author: BEN WHITE

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

Please mark appropriate box

☒ Comprehensive site mapping conducted **14/6/19**
(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 **14/6/19**

☒ 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 House at **32 The Strand, Whale Beach.**

1. Proposed Development

1.1 Demolish the existing house and construct a new part three-storey house by excavating to a maximum depth of ~6.5m into the slope.

1.2 Details of the proposed development are shown on 38 drawings prepared by Shaun Lockyer Architects, Project number 0255, drawings numbered 000.01, 020.03, 100.03, 100.05 to 07, 110.01, 110.02, 400.04, 700.00 to 04, and 720.00 to 02 are Revision A and drawings numbered 000.00, 020.01, 020.02, 050.01 to 07, 100.01, 100.02, 200.01 to 03, 210.01, 300.01, 300.02, and 400.01 to 03 are Revision B, all drawings dated 18/4/19.

2. Site Description

2.1 The site was inspected on the 14th June, 2019.

2.2 This residential property has dual access. It is on the low side of Whale Beach Road and the high side of The Strand. It has an E aspect. The block is located on the near level to steeply graded lower reaches and toe of a hillslope that falls to Whale Beach. The slope falls from the road frontage to roughly the midpoint of the property at an average angle of ~22°. The midpoint of the property approximates the toe of the slope and the remainder of the property continues at near-level angles before rising slightly to The Strand below. The slope gradually increases in grade above the property.

2.3 At the road frontage to Whale Beach Road, a concrete driveway runs to a concrete parking area on the uphill side of the property (Photo 1). Between the road frontage and the house is a gently sloping lawn (Photo 2). A gently sloping lawn-

covered fill extends off the downhill side of the house and is supported by a timber retaining wall (Photo 3). The slope below the wall is terraced with a series of similar walls (Photo 4). The house (Photo 5) and all retaining walls will be demolished and the site will be cleared as part of the proposed works. Competent Medium Strength Sandstone bedrock outcrops near the toe of the slope (Photo 6). A near-level lawn extends from the toe of the slope to the road frontage with The Strand with the beach beyond (Photo 7).

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by the Narrabeen Group of Rocks with the contact point of the coarse quartz beach sand further seaward. Ground testing indicates the Narrabeen Group of Rocks underlies the upper half of the property. Sand is expected to underlie the property from the toe of the slope to the lower boundary and beyond. The Narrabeen Group of Rocks are described as interbedded laminite, shale and quartz to lithic quartz sandstone.

4. Subsurface Investigation

One auger hole was put down to identify the soil materials. Seven 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 not expected to be an issue for the testing on this site and the results are as follows:

GROUND TEST RESULTS ON NEXT PAGE

AUGER HOLE 1 (~RL18.0) **–** AH1 (Photo 8)

Depth (m)	Material Encountered
0.0 to 0.2	**TOPSOIL**, sandy soil, dark brown, loose, dry, fine to medium grained with fine trace organic matter.
0.2 to 0.7	**SAND**, grey, loose to medium dense, damp, coarse grained.
0.7 to 0.9	**SAND**, grey, loose, wet, coarse grained.
0.9 to 1.5	**SANDY CLAY**, grey and mottled brown, stiff to hard, damp, fine grained.
1.5 to 1.8	**SANDY CLAY**, weathered shale, red and mottled grey, stiff to hard, dry, fine grained.
1.8 to 1.9	**CLAY**, weathered shale, grey and mottled maroon, very stiff to hard, dry, fine grained.

End of hole @ 1.9m in weathered shale. No watertable 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 (~RL17.0)	DCP 2 (~RL17.2)	DCP 3 (~RL16.8)	DCP 4 (~RL14.3)	DCP 5 (~RL14.4)	DCP 6 (~RL9.0)	DCP 7 (~RL8.0)
0.0 to 0.3	3	8	9	3	2F	6	Rock Exposed at Surface
0.3 to 0.6	15	6	9	4	1F	11	
0.6 to 0.9	9	8	5	7	2	12	
0.9 to 1.2	10	14	12	15	9	20	
1.2 to 1.5	12	32	22	33	18	#	
1.5 to 1.8	11	30	30	#	23		
1.8 to 2.1	16	#	#		9		
2.1 to 2.4	#				#		
	Refusal on Rock @ 2.0m	End of Test @ 1.7m	End of Test @ 1.8m	End of Test @ 1.5m	Refusal on Rock @ 1.9m	Refusal on Rock @ 1.2m	

#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 @ 2.0m, DCP bouncing off rock surface, white impact dust on dry tip, grey and maroon clay in collar above tip.
DCP2 – End of test @ 1.7m, DCP still very slowly going down, white impact dust on dry tip, grey and maroon clay in collar above tip.
DCP3 – End of test @ 1.8m, DCP still very slowly going down, grey shale fragments on dry tip.
DCP4 – End of test @ 1.5m, DCP still very slowly going down, grey sand on wet tip, grey clay in collar above tip.
DCP5 – Refusal on rock @ 1.9m, DCP bouncing off rock surface, grey sand on wet tip, grey clay in collar above tip.
DCP6 – Refusal on rock @ 1.2m, DCP bouncing off rock surface, white impact dust on dry tip, grey clay in collar above tip.
DCP7 – Rock exposed at surface.

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 sandy topsoil over stiff to hard clays. The clays merge into the underlying weathered rock at an depths of between 1.2 to 2.1m below the current surface. As the DCP bounced at the end of 3 of the 7 tests, and as Medium Strength Sandstone was observed to be outcropping near the toe of the slope, it is interpreted that the upper half of the property is underlain by alternating bands of Extremely Low to Very Low Strength Shale and thicker bands of Low to Medium Strength Sandstone. We expect the lower half of the property to be underlain by the upper reaches of the coarse beach sand of Whale Beach. 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 a couple of metres below the base of the proposed excavation.

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 Whale Beach Road above.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed below or beside the property. The gentle to steeply graded land surface that falls across the property and continues above is a potential hazard (**Hazard One**). The vibrations from the proposed excavation are a potential hazard (**Hazard Two**). The excavation for the proposed house is a potential hazard until the retaining walls are in place (**Hazard Three**).

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The gentle to steep slope that falls across the property and continues above failing and impacting on the proposed works.	The vibrations produced during the proposed excavation impacting on the surrounding structures.	The excavation for the proposed house (up to a depth of ~6.5m) collapsing onto the work site before retaining walls are in place.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Likely' (10^{-2})
CONSEQUENCES TO PROPERTY	'Medium' (15%)	'Medium' (15%)	'Medium' (30%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	5.5×10^{-7}/annum	5.3×10^{-7}/annum	7.6×10^{-4}/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 the 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

A spreader/dispersion trench is suitable for this site as the lower half of the property is underlain by beach sand. All stormwater is to be piped through any tanks that may be required by the regulating authorities.

11. Excavations

An excavation to a maximum depth of ~6.5m will be required to construct the proposed house. The excavation will step down the slope in multiple terraces. It is expected to be through a sandy topsoil over stiff to hard clays with alternating bands of Extremely Low to Very Low Strength Shale and thicker bands of Low to Medium Strength Sandstone expected at depths of between 1.2 to 2.1m below the surface.

It is envisaged that excavations through soil, clay, and Extremely Low to Very Low Strength Shale can be carried out with a bucket and excavations through Low to Medium Strength Sandstone will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations through soil, clay, and Extremely Low to Very Low Strength Shale will be below the threshold limit for building damage.

Bands of Medium Strength Sandstone may be encountered during the excavation. Excavations through Medium Strength Rock or better are to be carried out to minimise the potential to cause vibration damage to the neighbouring houses to the N and S. The N neighbouring house will be as close as ~3.0m, and the S neighbouring house will be as close

as ~2.0m from the edges of the excavation. 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 10mm/sec at the property boundaries. Vibration monitoring will be required to verify this is achieved.

If a milling head is used to grind the rock, vibration monitoring will not be required. Alternatively, if rock sawing is carried out around the perimeter of the excavation boundaries in not less than 1.0m lifts (where Medium Strength Rock or better is encountered), a rock hammer up to 300kg could be used to break the rock without vibration monitoring. Peak particle velocity will be less than 10mm/sec at the property boundaries using this method provided the saw cuts are kept well below the rock to broken.

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

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 8.5m 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.

On steep sites such as this one, to help maintain excavation stability, it is critical upslope runoff be diverted from the proposed excavations with temporary or permanent drainage measures. Temporary measures may be trenches and sandbag mounds and permanent measures could be a wide diameter dish drain or similar. These are to be installed before any excavation work commences.

The excavation for the proposed house will reach a maximum depth of ~6.5m. Allowing for over-excavation, it will be taken close to flush with the N common boundary, set back ~1.0m from the upper boundary, and ~1.8m from the S boundary. The excavation will step down the slope in multiple terraces. The N and S neighbouring houses and the road reserve will all be within the zone of influence of the excavation. Thus, all sides of the excavation will require ground support installed prior to the commencement of the excavation.

Due to the depth of the excavation and its proximity to the common boundaries, we recommend heavy ground support be installed around the excavation perimeter prior to the commencement of the excavation to ensure the safety of any workers below the cut and integrity of the neighbouring properties.

As there is relatively thick surface sand over the site, a Secant or Contiguous Pile Wall is one of the suitable methods of support around the perimeter of the excavation. Secant piles are the preferred option but if contiguous piles are used, the gaps between the piles are to be grouted closed as the excavation is lowered so no sand/sediment moves through the wall. The piers can be supported by embedment, propping, temporary, or permanent rock anchors installed as the excavation is lowered. The upslope piers will need to be taken to below the zone of influence of the stepped portions of the proposed excavation.

To drill the pier holes for the walls, a powerful excavator or small pilling rig that can excavate through Medium Strength Rock will be required. We recommend the excavation contractor assess the drill core to ensure the equipment is capable of reaching the required depths. The

walls are to be tied into the concrete floor and ceiling slabs of the house to provide permanent wall support.

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.

The internal steps of the excavation inside the perimeter of the excavation are expected to stand unsupported at near-vertical angles for short periods of time until the retaining walls are installed provided the cut batters are kept from becoming saturated.

Unsupported cut batters through soil and clay 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. Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. The materials and labour to construct the retaining structures 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.

Excavation spoil is to be removed from site.

14. 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 IS ON THE NEXT PAGE

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
Sandy Soil and Residual Clays	20	0.40	0.55	N/A
Very Low Strength Rock	24	0.25	0.35	K_p = 4.6
Low Strength Rock	24	0.20	0.30	400kPa "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 do not account for any surcharge loads, assume the surface above the wall is near level and 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. Rock strength 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.

15. Foundations

The proposed house can be supported on a concrete slab and shallow piers taken to Low Strength Rock. This ground material is expected to be exposed across most of the base of the excavation, and is expected at depths of between 1.2 to 2.1m below the current surface where the weathered rock falls away on the downhill side and where the house does not fall

over the footprint of the excavation. A maximum allowable bearing pressure of 600kPa can be assumed for footings on Low Strength Rock.

As the bearing capacity of 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. 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 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 piled wall/excavations for 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 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

Photo 7

Photo 8: AH1 – Downhole is from left to right.

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.

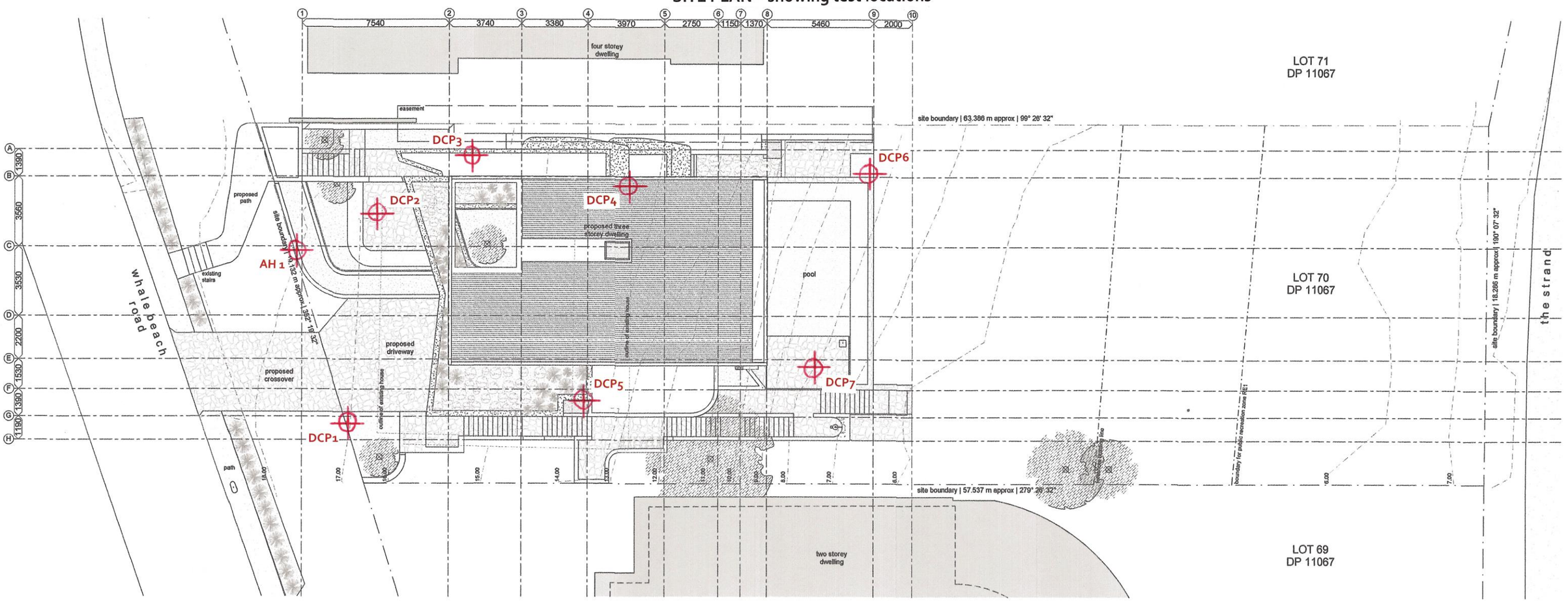
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

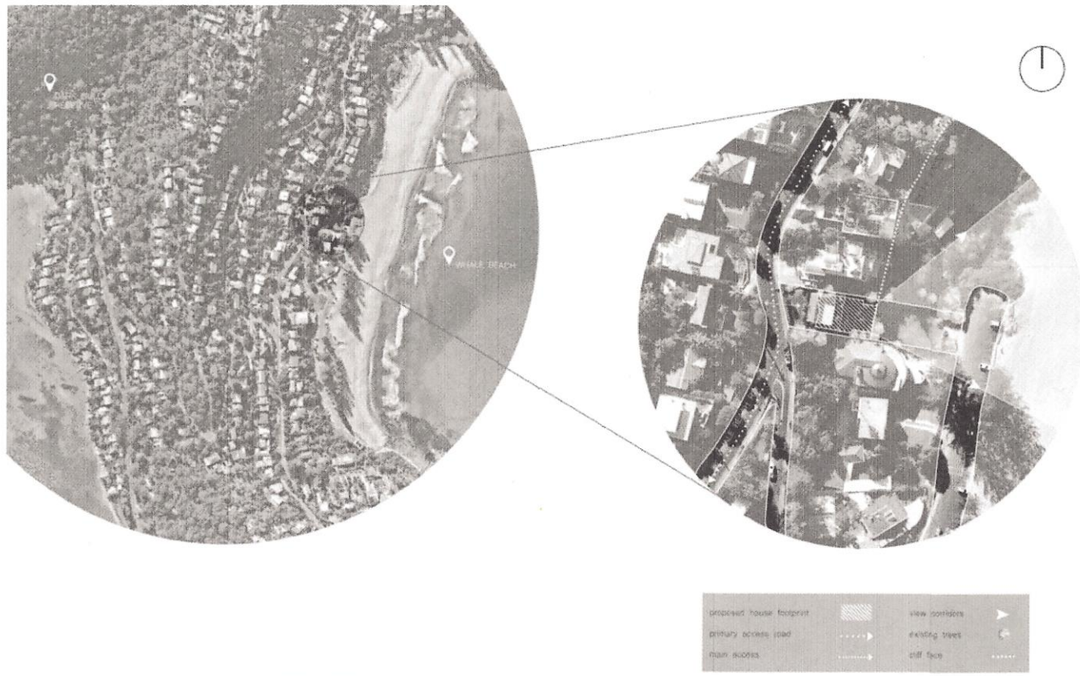
- This report should not be applied to any other project other than that outlined in section 1.0.

- 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





PLANNING CONTROL COMPLIANCE TABLE			
LOT DESCRIPTION ADDRESS ZONING COUNCIL CONTROL	LOT 70 DP 11067 32 THE STRAND, WHALE BEACH E4 ENVIRONMENTAL LIVING & RE1 PUBLIC RECREATION NORTHERN BEACHES PITTWATER LEP & PALM BEACH LOCALITY DCP		
CONTROL	OBJECTIVE	PROPOSED	COMPLIANCE
Height	8.5m (merit based assesement for heights exceeding 8.5m but not more than 10m for sites in excess of 30% slope)	Height < 10.0m	Compliant. see drawings 100.02, 210.01, 300.01, 300.02 for extent exceeding 8.5m but not exceeding 10.0m. Satisfaction of the objectives of LEP clause 4.3 (2D) and all subclauses.
Front setback	The greater of 6.5m or average of adjacent dwelling setbacks	6.5m to house - 5.1m to garage outter most projection	Partly compliantly. Note proposed setbacks are a minimum of 2.6m greater than existing house at the closest point of outter most projection.
Side setback	2.5m to at least one side 1.0m to other side	3.35m 1.25m	Compliant Compliant
Rear setback	6.5m	29.4m	Compliant
Building envelope	3.5m at 45° measured at side boundary (merit based assessment for sites in excess of 30% slope)	varies	Compliant. see drawings 100.02, 210.01, 300.01, 300.02 for extent exceeding 8.5m but not exceeding 10.0m.
Landscaped area	60% min	64%	Compliant. Note calculation includes RE1 Public Recreation Zone.
Private open space	60m2 at ground level	589m2	Compliant
Solar access	3hrs min (to private open space of proposed and neighbouring properties)	varies	Compliant
Views	Provide reasonable access	NA	Compliant
Privacy	Design to minimise impacts (on the privacy of proposed and neighbouring properties)	NA	Compliant
Car parking	2 spaces per 2 or more bedrooms	2 x covered	Compliant
Driveway	1 per 30m of frontage	1 x (off west body)	Compliant
Character (as viewed from a public place)	Design elements compatible with locale	Roof forms, materials, landscaping, terracing, scale and architectural form in keeping with local character.	Compliant
Scenic protection	landscaping the dominant feature and built form the secondary component	Built form recedes from western street front behind landscaped verge and roof	Compliant
Building colours and materials	Visual prominence minimised, and colours and materials to harmonise with native vegetation and character of the area	proposed natural material (timber and stone predominatly) along with deep planted terraces and roofs of scale that is minised to the street and public appearance	Compliant

studio 2 . 22 wyandra street (w22) . newstead . qld . 4006
p 07 3257 7288 | m 0409541462 | w www.lockyerarchitects.com.au
shaunlockyerarchitects pty ltd

DRAWN	REV	DATE	ISSUE
MF	A	13.11.18	Pre DA set reissued for information
MF	B	18.04.19	preliminary issue

PROJECT
32 The Strand
Whale Beach, NSW, 2107
Lot 70 on DP11067

CLIENT
Robert & Susie Nugan

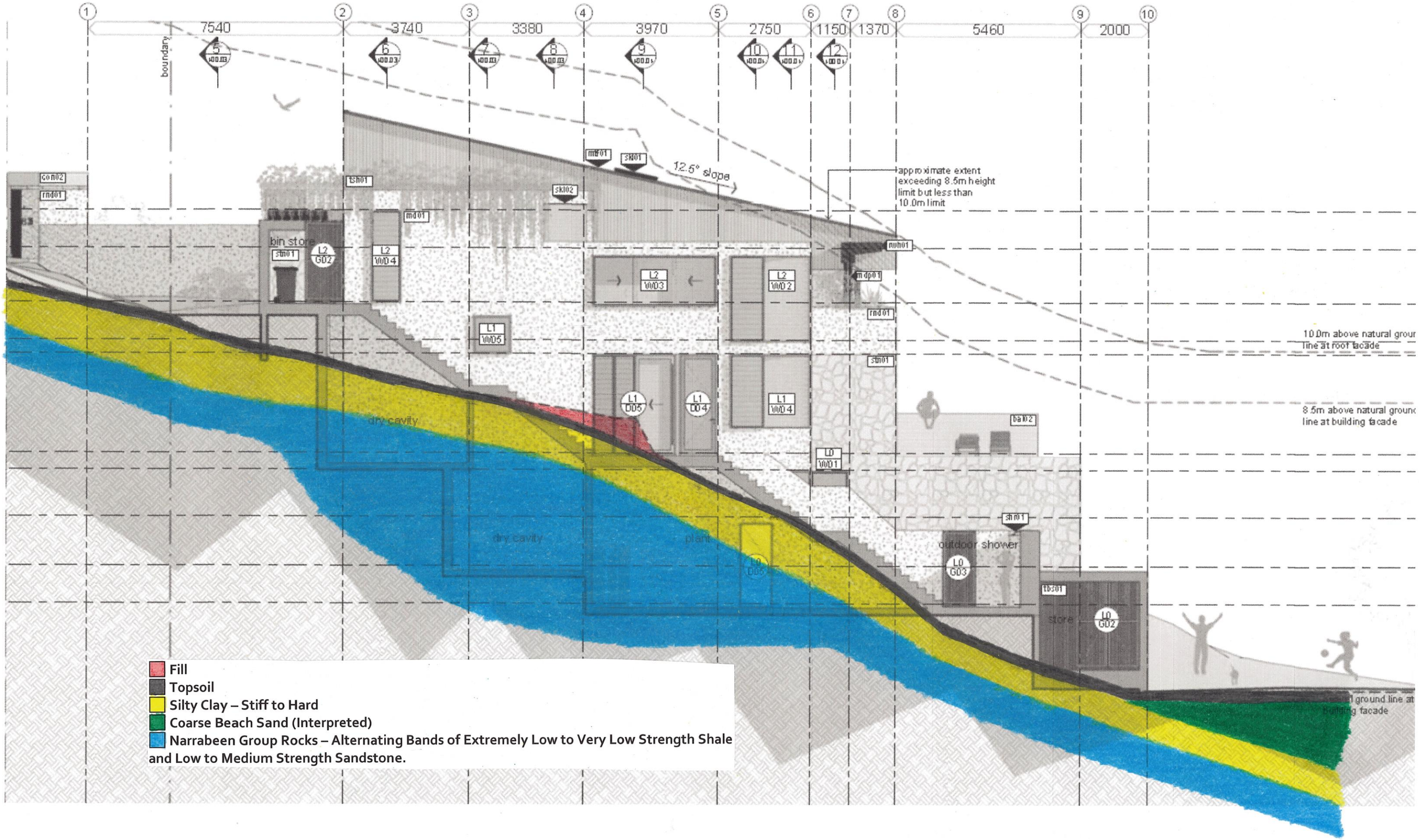
DRAWING NAME
site analysis
site & locality plans

PHASE	DWG NO	REV
DA	100.01	B

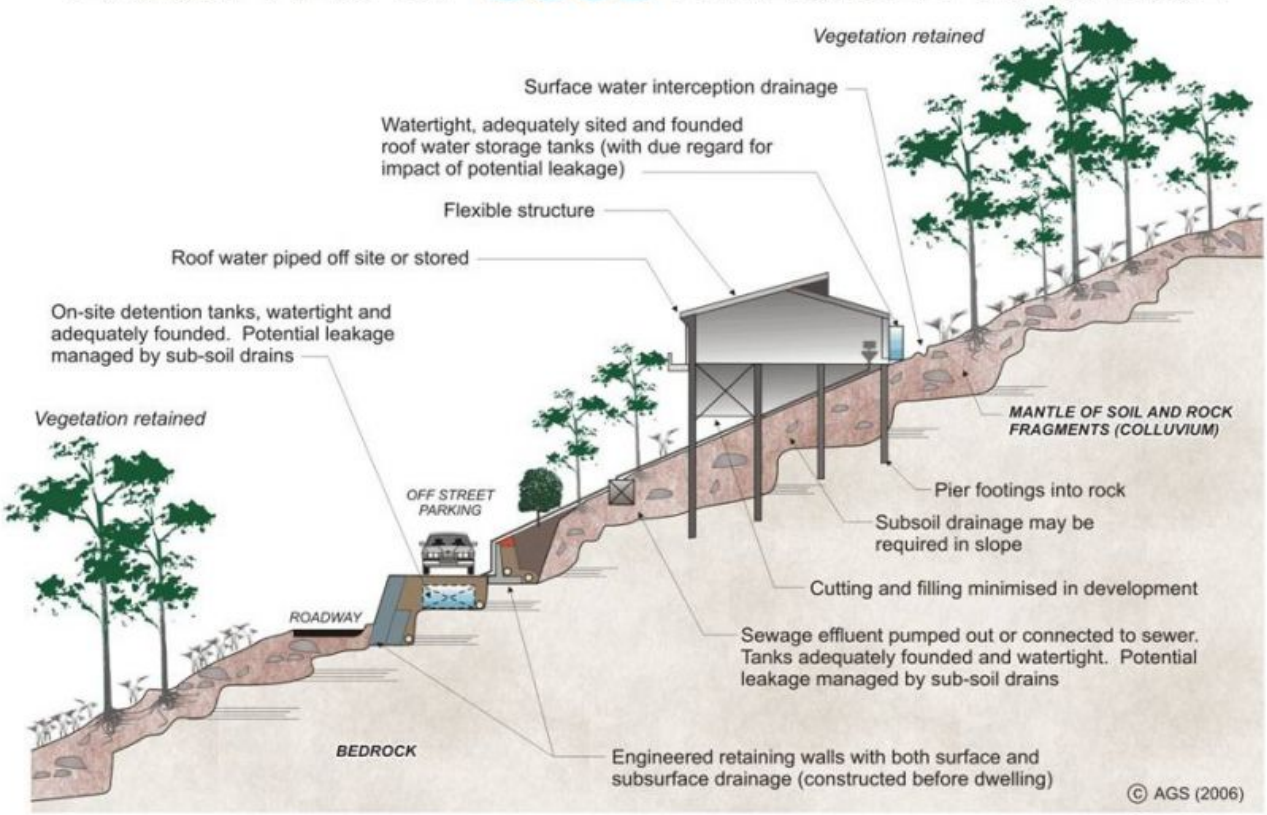
schematic design

PROJECT NO 0255
SCALE 1:100
1:1 @ A1

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE