35 Norma Road, Palm Beach

Comments on Updates to Plans

We have reviewed the existing geotechnical report, the plans used to carry out the report, and the updated plans shown on 8 architectural drawings prepared by J.D. Evans and Company, drawings numbered 1995-1, 1995-1A, and 1995-2 to 1995-7, Issue C, dated 30/7/24.

The changes include:

- Various minor internal and external alterations and additions.

The changes to the plans are minor from a geotechnical perspective and do not alter the recommendations or the risk assessment in the report carried out by this firm numbered J2695A and dated the 8th September, 2023.

White Geotechnical Group Pty Ltd.

Reviewed By:

Dion Sheldon
BEng(Civil)(Hons),
Geotechnical Engineer.

Nathan Gardner B.Sc. (Geol. & Geophys. & Env. Stud.)
AIG., RPGeo Geotechnical & Engineering.
No. 10307
Engineering Geologist & Environmental Scientist.

REGISTERED PROFESSIONAL GEOSCIENTIST
AUSTRALIAN INSTITUTE OF GEOSCIENTISTS
NATHAN GARDNER
RPGeo No: 10307

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

Development Application for _____
Name of Applicant

Address of site 35 Norma Road, Palm Beach

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

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

on this the 8/9/23 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 **35 Norma Road, Palm Beach**
Report Date: 8/9/23

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 35 Norma Road, Palm Beach

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

Geotechnical Report Details:

Report Title: Geotechnical Report **35 Norma Road, Palm Beach**

Report Date: 8/9/23

Author: BEN WHITE

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

Please mark appropriate box

☒ Comprehensive site mapping conducted **11/05/20**
(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 **11/05/20**

☒ 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:

Alterations and Additions at **35 Norma Road, Palm Beach**

1. Proposed Development

1.1 Extend the lower ground floor and ground floor of the existing house on the uphill side by excavating to a maximum depth of ~3.2m.

1.2 Add a new first floor to the existing house.

1.3 Construct a new patio, verandah and deck on the downhill side of the house.

1.4 Various other internal and external alterations to the existing house.

1.5 Landscape a new lawn area on the downhill side of the property by filling to a maximum height of ~1.8m.

1.6 Details of the proposed development are shown on 7 drawings prepared by J.D. Evans and Company. Drawing number 1995-1 is dated 8/10/19. Drawings numbered 1995-2 to 1995-7 are Revision A, dated 30th August (no year shown on plans, assumed to be 2023).

2. Site Description

2.1 The site was inspected on the 6th September, 2023 and previously on the 11th of May, 2020.

2.2 This residential property is on the low side of the road and has a S aspect. It is located on the gentle to steeply graded upper reaches and crest of a hillslope. The natural slope falls at an angle of ~6° from the uphill boundary of the property to the downhill side of the house. The slope quickly increases in grade to a steep angle of ~24° on the downhill side of the property. The slope above the property eases to near level angles at the crest of the hill and the slope below the property increases in grade.

2.3 At the road frontage, a concrete driveway runs to a garage on the upper ground floor of the existing house (Photo 1). Between the road frontage and the house is a gently sloping lawn (Photo 2). E of the lawn is a concrete driveway and fibro garage that will be demolished as part of the proposed works (Photo 3). The cut for the driveway/garage is supported by a stable ~1.0m high sandstone dressed concrete retaining wall. The part two storey brick house is supported on brick walls (Photos 2 & 4). The external brick walls show no significant signs of movement.

A sandstone pavement extends off the downhill side of the house. A stable sandstone block retaining wall up to ~1.6m high supports the fill underneath the pavement (Photo 5). A moderately sloping lawn extends downhill from the retaining wall. Fill at the SE corner of the lawn is supported by a ~1.3m high brick retaining wall in good condition. Sandstone bedrock is outcropping at the SW corner of the lawn (Photo 6). A portion of the rock is undercut ~1.5m (Photo 7). Given the thickness of the cantilever arm and no visible presence of defects in the arm, the undercut is considered to be stable. The outcropping sandstone bedrock steps down the property (Photos 8 & 9). A lawn extends from the bottom of the outcropping rock to a concrete block retaining wall (Photo 10). The retaining wall supports the lawn fill and is in good condition. Sandstone boulders around and on the lawn are considered to have come to rest in their current positions before the lawn area was developed. They are considered to be in stable positions. The overall slope across the property is considered stable.

3. Geology

The Sydney 1:100 000 Geological Sheet indicates the site is underlain by Hawkesbury Sandstone. It is described as a medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

4. Subsurface Investigation

One auger hole (AH) was put down to identify the soil materials. Five Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. 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. But 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 (~RL72.8) **–** AH1 (photo 11)

Depth (m)	Material Encountered
0.0 to 0.3	**TOPSOIL**, sandy soil, brown, damp, fine to medium grained with fine trace organic matter.
0.3 to 0.4	**CLAYEY SAND**, grey, damp, fine to medium grained.
0.4 to 0.6	**CLAY**, orange brown, firm to stiff, moist.

End of Test @ 0.6m in firm to stiff clay. No watertable encountered.

DCP TEST RESULTS 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 1** (~RL74.3)	**DCP 2** (~RL72.8)	**DCP 3** (~RL69.8)	**DCP 4** (~RL70.3)	**DCP 5** (~RL68.7)
0.0 to 0.3	5	5	3	6	#
0.3 to 0.6	6	7	7	5	
0.6 to 0.9	10	10	10	#	
0.9 to 1.2	34	3	30		
1.2 to 1.5	40	#	#		
1.5 to 1.8	#				
	End of Test @ 1.4m	Refusal @ 1.0m	End of Test @ 1.2m	Refusal @ 0.5m	Rock Exposed at Surface

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

DCP Notes:

DCP1 – End of Test @ 1.4m, DCP still very slowing going down, white impact dust on dry tip.
DCP2 – Refusal on Rock @ 1.0m, DCP bouncing off rock surface, orange and white sandstone fragments on dry tip.
DCP3 – End of Test @ 1.2m, DCP still very slowing going down, brown clayey soil on damp tip.
DCP4 – Refusal on Rock @ 0.5m, DCP bouncing off rock surface, orange sandstone fragments on damp tip.
DCP5 – Medium Strength Sandstone exposed at the surface.

5. Geological Observations/Interpretation

The surface features of the block are controlled by the outcropping and underlying sandstone bedrock that steps down the property forming sub-horizontal benches between the steps. Where the grade is steeper, the steps are larger and the benches narrower. Where the slope eases, the opposite is true. The rock is overlain by fill, soil, clayey sand and clay that fills the bench step formation. Fill is used for landscaping purposes on the downhill side of the property. In the test locations, where rock was not exposed, it was encountered at depths of between ~0.5m to ~1.2m below the current surface. The sandstone underlying the property

is estimated to be Low to Medium Strength. 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 in the location is expected to be many metres below the proposed excavation.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

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

RISK ANALYSIS SUMMARY ON NEXT PAGE

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 below failing and impacting on the property.	The vibrations produced during the proposed excavation impacting on the surrounding structures.	The proposed excavation collapsing onto the worksite, undercutting the existing house and impacting the neighbouring properties before retaining walls are in place.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (15%)	'Medium' (15%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	5.3×10^{-7}/annum	3.7×10^{-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 **Sections 11 & 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

The fall is away from the street. The stormwater engineer is to refer to council stormwater policy for suitable options.

11. Excavations

An excavation to a maximum depth of ~3.2m will be required to extend the lower ground floor of the existing house. The excavation is expected to be through soil and clayey sand to a depth of ~0.4m over clay, with Low to Medium Strength Sandstone expected at depths of between ~0.9m to ~1.2m below the current surface.

It is envisaged that excavations through soil, clayey sand, clay and Sandstone up to Low Strength can be carried out with a machine and toothed bucket and excavations through Medium Strength Sandstone or better will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations soil, clayey sand, clay and sandstone up to low strength will be below the threshold limit for building damage utilising a domestic sized excavator up to 20 tonne.

Excavations through Medium Strength Rock or better should be carried out to minimise the potential to cause vibration damage to the subject house and E and W neighbouring properties. Allowing for backwall drainage, the excavation comes flush with the subject house and is set back ~2.0m from the E neighbouring house and ~2.7m from the W neighbouring house.

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

Excavation methods are to be used that limit peak particle velocity to 5mm/sec at the neighbouring houses. 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 house and neighbouring houses.

13. Excavation Support Requirements

An excavation to a maximum depth of ~3.2m will be required to extend the lower ground floor of the existing house. Allowing for back wall drainage, the excavation will come underneath and flush with the existing house, flush with the E common boundary and will be set back ~0.9m from the W common boundary.

The existing house and E and W common boundaries will be within the zone of influence of the excavation. In this instance, the zone of influence is the area above a theoretical 30° line (from horizontal) through fill/soil/sand and a 45° line through clay/weathered rock from the base of the excavation or the top of Medium Strength Rock, whichever comes first, towards the surrounding structures and boundaries.

The walls and piers supporting the existing house that are within the zone of influence of the excavation are to be propped and supported with beams if they are to be removed. The supports for any beams are to be beyond the zone of influence of the excavation.

Where the existing house walls that are within the zone of influence are to remain, exploration pits along the wall will need to be put down by the builder to determine the foundation depth and material. These are to be inspected by the geotechnical consultant.

If the foundations are confirmed to be supported on Medium Strength Rock, the excavation may commence. If they are not, the walls will need to be underpinned prior to the excavation commencing.

Underpinning is to follow the underpinning sequence 'hit one miss two'. Under no circumstances is the bulk excavation to be taken to the edge of the wall and then underpinned. Underpins are to be constructed from drives that should not exceed 0.6m in width along strip footings and should be proportioned according to footing size for other foundation types. Allowances are to be made for drainage through the underpinning to prevent a build-up of hydrostatic pressure. Underpins that are not designed as retaining walls are to be supported by retaining walls. The void between the retaining walls and the underpinning is to be filled with free-draining material such as gravel.

Due to the proximity of the excavation to the E and W common boundaries, the E and W sides of the cut (outside the footprint of the existing house) through soil, clayey sand, clay and Sandstone up to Low Strength will need to be temporarily or permanently supported prior to the commencement of the excavation through Medium Strength rock, or during the

excavation process in a staged manner, so cut batters through soil, sand, clay and rock up to Low Strength are not left unsupported. The support will need to be designed by the structural engineer. See the site plan attached for the minimum extent of the required shoring shown in blue.

Where underpinning/shoring is not required and where space permits, the soil and clayey sand portion of the excavation is to be battered temporarily at 1.0 Vertical to 2.0 Horizontal (26°) until the retaining walls are in place. Excavations through clay and Sandstone up to Low Strength are expected to stand unsupported for a short period of time until the retaining walls are in place, provided the cut batters are kept from becoming saturated.

Medium Strength Sandstone or better is expected to stand at vertical angles unsupported subject to approval by the geotechnical consultant.

During the excavation process, the geotechnical consultant is to inspect the excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support. If additional ground support is required this will likely involve the use of mesh, rock bolts and sprayed concrete.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters through soil, sand, clay and rock up to Low Strength 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 cannot blow off in a storm. The materials and labour to construct the retaining walls are to be organised so shoring walls can be installed as required. The excavation is to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast. If the cut batters remain unsupported for more than a few days before the construction of the retaining walls they are to be temporarily supported until the retaining walls are in place.

Upon completion of the excavation it is recommended the cut faces be supported with retaining walls to prevent any potential future movement of joint blocks in the cut face that can occur over time, when unfavourable jointing is obscured behind the excavation face. Additionally, retaining walls will help control seepage and to prevent minor erosion and sediment movement.

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

14. Fill

Fill will be placed on the slope on the downhill side of the property to form a level lawn area. No fills are to be laid until the retaining walls are in place. Excavation spoil may be used as fill but it is to be stored well back and outside the zone of influence of the excavation faces.

The fill will reach a maximum depth of ~1.8m. The surface is to be prepared before any fills are laid by removing any organic matter and topsoil. Fills for landscaping purposes are to be laid in a loose thickness not exceeding 0.3m before being moderately compacted. Tracking the machine over the loose fill in 1 to 2 passes should be sufficient. Filling within ~1.5m behind retaining walls should be compacted with light weight equipment such as a hand operated plate compacter or similar so as to not damage the wall. Where light weight equipment is used, fills are to be laid in a loose thickness not exceeding 0.15m before being compacted. No structures are to be supported on fill.

15. Retaining Structures

There is an existing ~1.3m high brick retaining wall in the line of a proposed retaining wall that will be ~1.6m higher than the existing. The existing wall will need to be demolished as it is not designed to support such loads. Alternatively the existing can be left in place with the new wall constructed immediately downslope.

For cantilever or singly propped retaining structures 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 Structures

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Soil, Clayey Sand and Fill	20	0.40	0.55
Residual Clays	20	0.35	0.45
Low Strength Sandstone	24	0.20	0.34
Medium Strength Sandstone	24	0.00	0.01

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

It is to be noted that the earth pressures in Table 1 assume a level surface above the wall, do not account for any surcharge loads and assume retaining walls are fully drained. 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 full hydrostatic pressures are to be accounted for in the retaining structure design.

16. Foundations

The uphill portion of the excavation for the proposed storeroom is expected to be seated in Low to Medium Strength Sandstone. This is a suitable bearing material. Where the rock drops away with the slope on the downhill side, shallow piers will be required to maintain a uniform bearing material across the structure. A maximum allowable bearing pressure of 600kPa can be assumed for footings on Low to Medium Strength Sandstone or better. It is recommended any additional foundations that may be required be taken to the Low to Medium Strength Sandstone.

The foundations supporting the existing house are currently unknown. Ideally, footings should be founded on the same footing material across the old and new portions of the structure. Where the footing material does change across the structure construction joints or similar are to be installed to prevent differential settlement, where the structure cannot tolerate such movement in accordance with a 'Class S' site.

We estimate the foundations for the proposed retaining wall to support the fill on the downhill side of the property will be in the close vicinity to outcropping undercut rock immediately downslope (Photo 7). No foundations are to extend over undercut rock. If this can't be avoided the undercut rock is to be supported with blade walls designed by the structural engineer in consultation with the geotechnical consultant.

Naturally occurring vertical cracks (known as joints) commonly occur in sandstone. These are generally filled with soil and are the natural seepage paths through the rock. They can extend to depths of several metres and are usually relatively narrow but can range between 0.1 to 0.8m wide. If a footing falls over a joint in the rock, the construction process is simplified if with the approval of the structural engineer the joint can be spanned or alternatively the footing can be repositioned so it does not fall over the joint.

NOTE: If the contractor is unsure of the footing material required it is more cost effective to get the geotechnical professional 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.

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 Occupation Certificate if the following inspections have not been carried out during the construction process.

- During the excavation process, the geotechnical consultant is to inspect the excavation in 1.5m intervals as it is lowered to ensure ground materials are as expected and no wedges or other geological defects are present that could require additional support.

- 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.

Reviewed By:

Dion Sheldon
BEng(Civil)(Hons),
Geotechnical Engineer.

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

Photo 9

Photo 10

Photo 11: AH1 – Downhole is from 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.

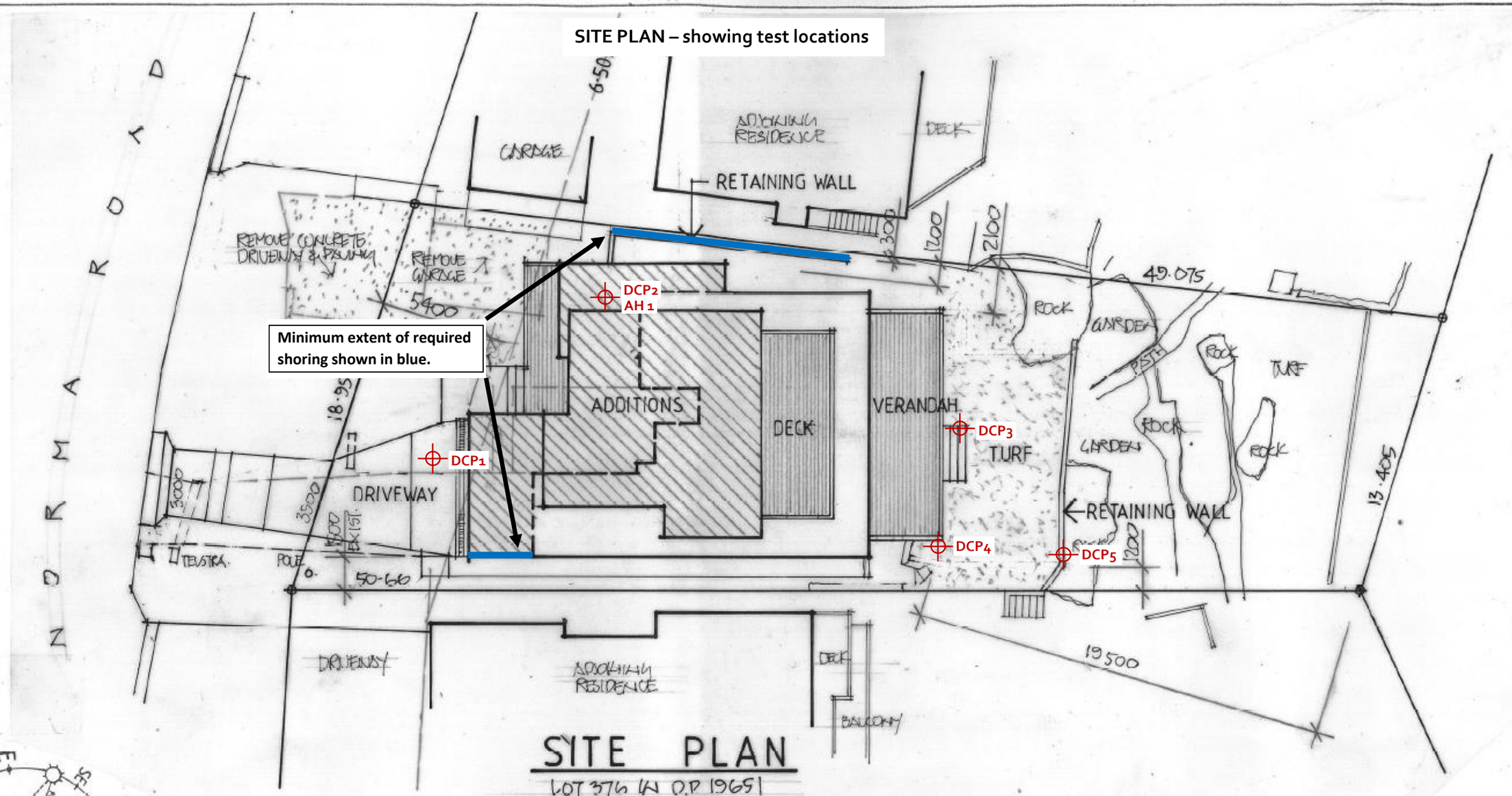
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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.

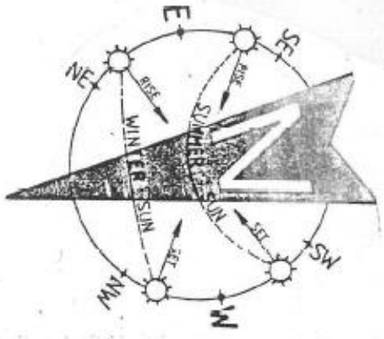
- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar 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



SITE PLAN

LOT 376 IN D.P 19651



NOTES:

1. THE BUILDER IS TO CHECK AND CONFIRM ALL NECESSARY DIMENSIONS AND LEVELS ON SITE PRIOR TO ORDERING MATERIALS AND COMMENCING CONSTRUCTION. **DO NOT SCALE OFF THE DRAWING.**
2. SHOULD ANY DEVELOPMENT OR CONSTRUCTION OCCUR ON OR NEAR BOUNDARIES, THE BOUNDARIES SHOULD BE CLEARLY MARKED ON SITE BY THE REGISTERED LAND SURVEYORS.

DEVELOPMENT CALCULATIONS

SITE AREA	782.50 SQUARE METRES	
DESCRIPTION	**EXISTING SQM**	**PROPOSED SQM**
FLOOR	185.57	387.22
ROOF	154.25	219.80
GARAGE	21.68	—
VERANDAH'S	—	67.76
DRIVEWAY	41.60	39.20
PAVING	86.72	
TOTAL HARD SURFACE	304.25 (38.88%)	326.76 (41.76%)

1 Builder to check and confirm all necessary dimensions on site prior to construction. Do not scale the drawing.
2 All dimensions that relate to site boundaries and easements are subject to verification by a site survey.
3 All work to be in accordance with BUILDING CODE of AUSTRALIA & to the satisfaction of local council requirements & other authorities.
4 All timber construction to be in accordance with the "TIMBER FRAMING" code.
5 Any detailing in addition to what is supplied shall be resolved between the owner and the builder to the owner's approval, except for any structural details or design which is to be supplied by a Structural Engineer.
6 Roof water & sub-soil drainage to be disposed of in the approved manner or as directed by local council inspectors.
7 All electrical power & light outlets to be determined by owner.
8 Make good any repair or existing finishes damaged by new work, leave existing materials where possible.

No.	AMENDMENT	DATE

J.D. EVANS and COMPANY
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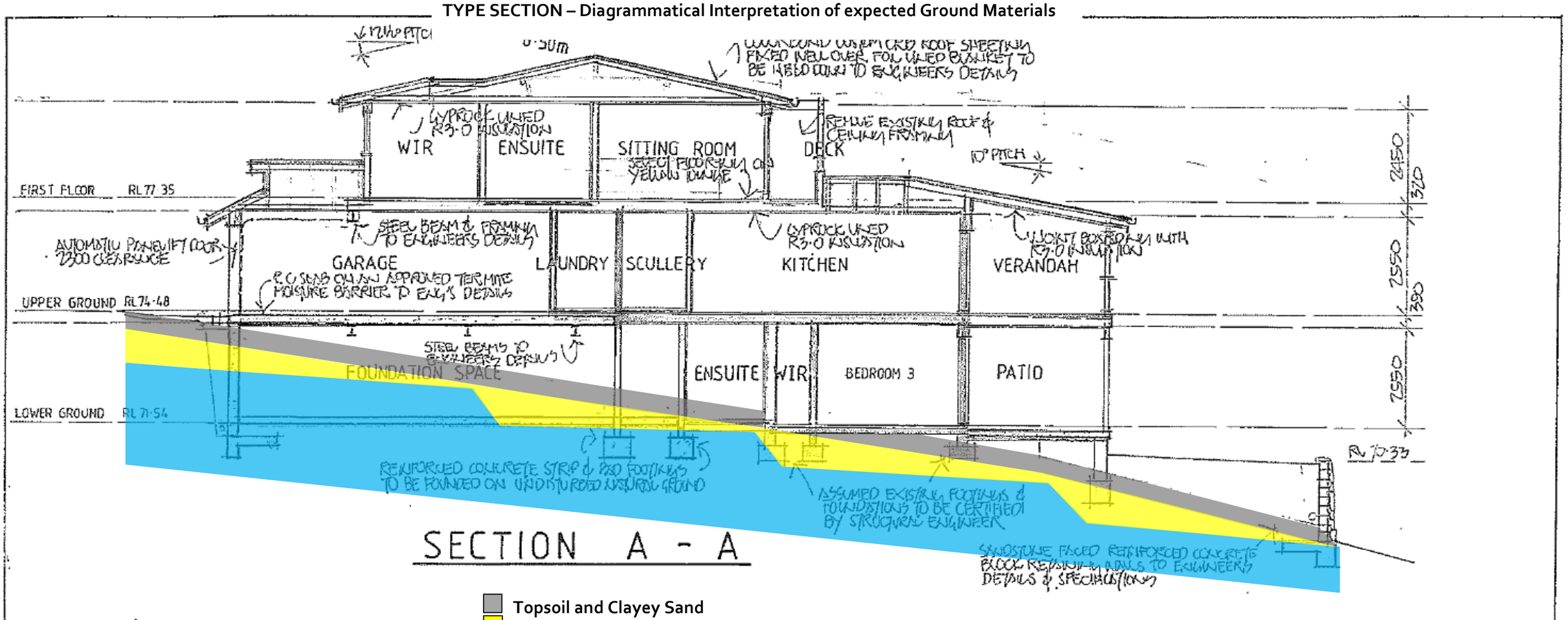
PROJECT
PROPOSED ALTERATIONS/ADDITIONS
No. 35 NORMA ROAD
PALM BEACH N. S. W. 2108
CLIENT
DAVID & ANNA BRACEY

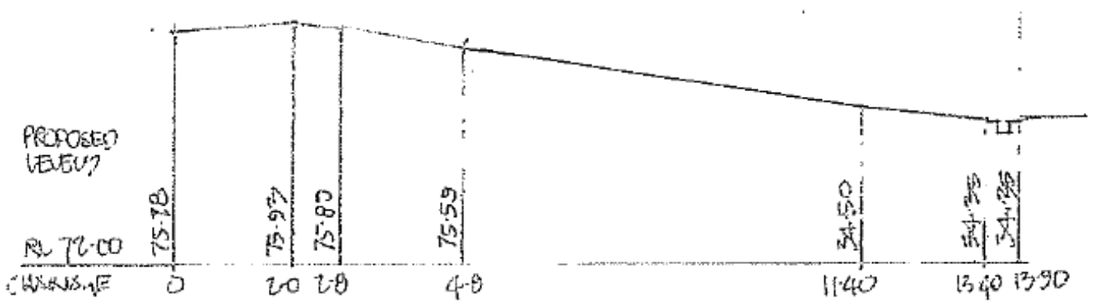
DATE 8/10/2019 SCALE 1:200
DRAWN JDE CHECKED
DRAWING No. 1995-1 ISSUE

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

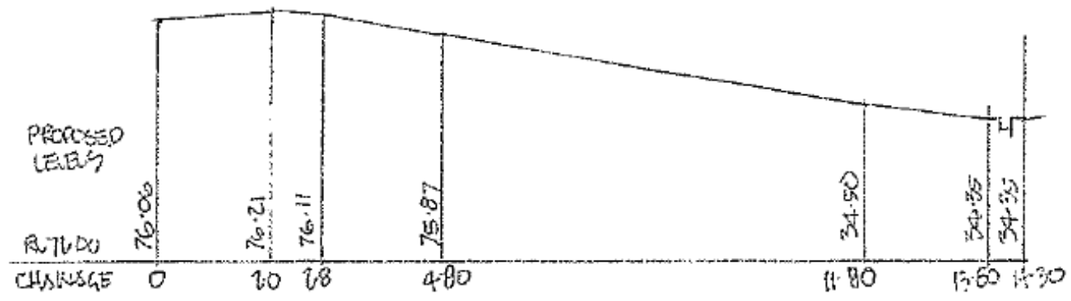


SECTION A - A

- Topsoil and Clayey Sand
- Clay – Firm to Stiff
- Hawkesbury Sandstone – Low to Medium Strength



EAST



WEST

LONGITUDINAL SECTION THROUGH DRIVEWAY

No.	AMENDMENT	DATE
	ARCHITECTURAL ANTHOLOGIES	89-98

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No. 35 NORMA ROAD
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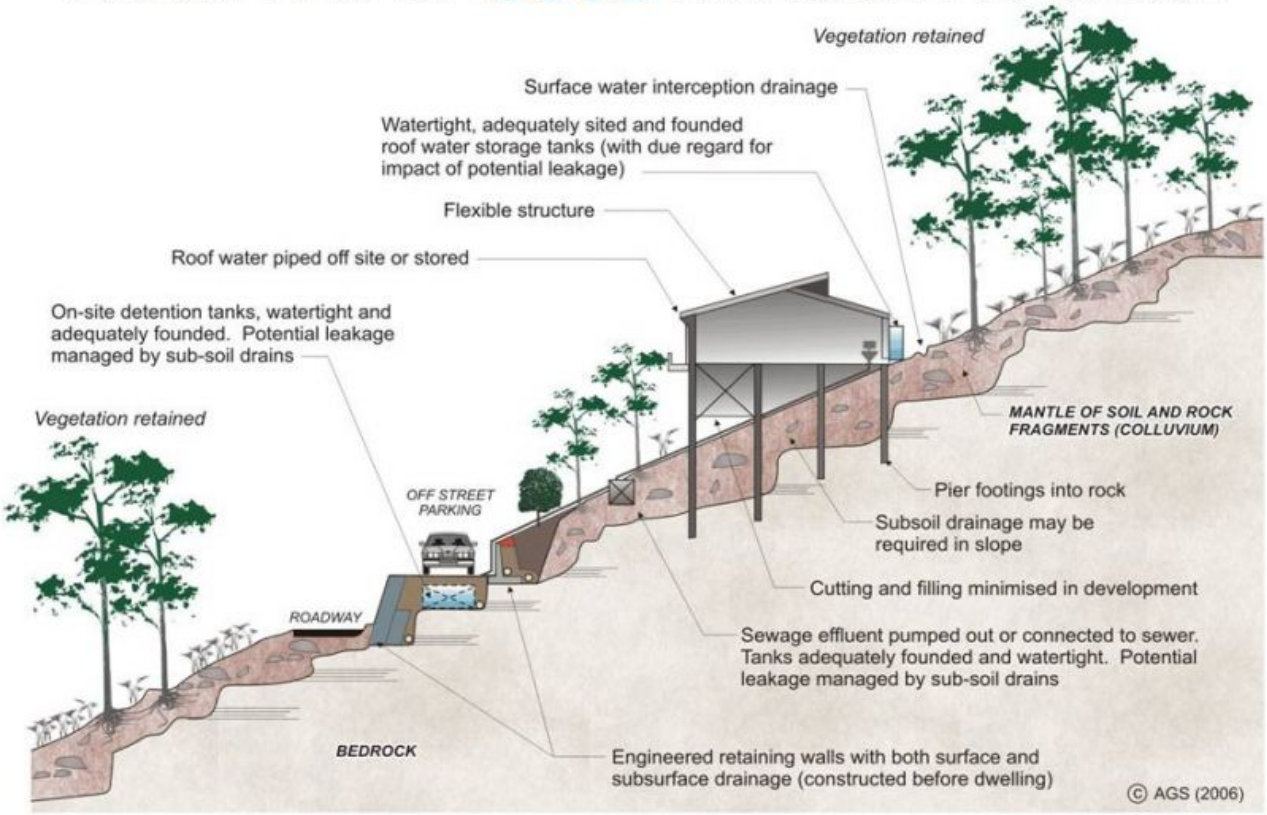
DATE 8/10/2019 SCALE 1:100
DRAWN JDE CHECKED
DRAWING No. 1995-7 ISSUE

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE