

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

<b>Development Application for</b> _____	Name of Applicant
<b>Address of site</b> _____	2 Old Barrenjoey Road, Avalon

**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 2/11/16 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least \$2million.  
I have:

**Please mark appropriate box**

- ☒ 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
- ☒ I 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 paragraph 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm 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 am of the opinion that the Development Application only involves Minor Development/Alterations that do not require a Detailed Geotechnical Risk Assessment and hence my report is in accordance with the Geotechnical Risk Management Policy for Pittwater – 2009 requirements for Minor Development/Alterations.
- ☐ Provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report


**Geotechnical Report Details:**

Report Title: Geotechnical Report <b>2 Old Barrenjoey Road, Avalon</b>
Report Date: 2/11/16
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	<b>2 Old Barrenjoey Road, Avalon</b>

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 <b>2 Old Barrenjoey Road, Avalon</b>
Report Date: 2/11/16
Author : BEN WHITE
Author's Company/Organisation : WHITE GEOTECHNICAL GROUP PTY LTD

**Please mark appropriate box**

- ☒ Comprehensive site mapping conducted 23/9/16 (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 23/9/16
- ☒ 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:**

### **Proposed Secondary Dwelling at 2 Old Barrenjoey Road, Avalon**

#### **1. Proposed Development**

- 1.1 Construct a secondary dwelling on the downhill side of the house.
- 1.2 Details of the proposed development are shown on 7 drawings prepared by Multidwell, drawings numbered 002, 003 & 006 are labelled revision A dated 14/10/16, drawing numbered 001 is labelled revision C & dated 14/10/16, drawing 004 is labelled revision D & dated 27/10/16, drawing number 005 is labelled revision B & dated 18/10/16 and drawing 007 is labelled revision B & dated 27/10/16.

#### **2. Site Description**

- 2.1 The site was inspected on the 23<sup>rd</sup> September, 2016.
- 2.2 This residential property is on the low side of the road and has a NW aspect. The block is located on the moderately graded lower middle reaches of a hillslope. From the road frontage the slope falls at a maximum angle of ~16° that gradually eases to an average angle of 10° and extends to the lower boundary. The slope above the property continues at increasing angles. The slope below eases as the toe of the slope is approached.
- 2.3 At the road frontage a concrete driveway runs downhill to a parking area above the house and a garage within the house (Photo 1 & 2). The fill batter for the road merges into the natural slope and no signs of movement were observed in this portion of the slope. The cut for the parking area and the E side of the house are supported by treated pine retaining walls that appear stable (Photo 3 & 4). The old, single storey brick and clad house displays significant cracking in its visible supporting brick walls. The most substantial cracking and movement surrounds the garage area on the lowest level of the house, on the NW corner and through the W and S wall (Photos 5, 6 & 7). It appears part of the W external wall has been rebuilt in the houses recent history but the brick work at the NW corner has since cracked and come apart to a maximum of ~30mm downslope (Photo 5). There was no lintel supporting an external window opening (Photo 8). The internal skin also appears to have been rebuilt and displays movement that has occurred since (Photo 7). Wide cracking is visible and the wall has settled and is not level

(Photo 9). The garage slab is also cracked to 20mm wide and shows heave up to 50mm towards the NW corner (Photos 10 & 11). Many of the brick piers in the foundation space have been replaced with steel posts (Photo 12). The owner informs us the brick piers were replaced as the piers were tilting so in some instances they were no longer supporting the bearers. The surrounding walls also have cracks that extend through the bricks and mortar but these are not as severe (Photo 13). The cracking appears to be the result of insufficient embedment of the footings but may also be due to the presence of fill that was not compacted during the initial construction of the house (around the NW corner to level the garage slab). Additionally the owner informs us the drainage above the garage is not sufficient and water flows through the garage during heavy downpours. We think it likely this water flow has exacerbated the movement around the garage significantly. Our recommendations to ensure the stability of the house into the future are outlined in **Section 14**.

In the yard below the house a cut and fill has been made into the slope for a level area below the house (Photo 14). The cut is supported by an old, mortared rock retaining wall that is slightly bulging but is currently considered stable. The fill is battered to stable angles and is vegetated with small shrubs. Avalon golf course is located below the lower boundary of 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.

### **4. Subsurface Investigation**

One Hand Auger Hole (AH) was put down to identify the soil materials. The location of the tests are shown on the site plan. Five Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to weathered rock. The location 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:

## AUGER HOLE 1 (~RL 36.4) – AH1 (Photo 15)

Depth (m)	Material Encountered
0.0 to 1.0	<b>FILL</b> , mixture of soil and clay, moist.
1.0 to 1.4	<b>CLAY</b> , yellow, firm to stiff, moist.

End of hole @ 1.4m in yellow, stiff clay.  
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 (~RL 36.5)	DCP 2 (~RL 38.4)	DCP 3 (~RL 36.8)	DCP 4 (~RL 38.3)	DCP 5 (~RL 37.5)
0.0 to 0.3	16	10	6	16	6
0.3 to 0.6	7F	4F	9	9	11
0.6 to 0.9	18	6F	14	13	18
0.9 to 1.2	9	31	21	29	38
1.2 to 1.5	16	11	36	40	#
1.5 to 1.8	35	16	#	#	
1.8 to 2.1	#	41			
2.1 to 2.4		#			
	End of Test @ 1.8m	End of Test @ 2.1m	End of Test @ 1.5m	End of Test @ 1.5m	End of Test @ 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 – End of test @ 1.8m, DCP still very slowly going down, red shale fragments on wet tip.  
DCP2 – End of test @ 2.1m, DCP still very slowly going down, red shale fragments on wet tip.  
DCP3 – End of test @ 1.5m, DCP still very slowly going down, red shale fragments on wet tip.  
DCP4 – End of test @ 1.5m, DCP still very slowly going down, clean dry tip.  
DCP5 – End of test @ 1.2m, DCP still very slowly going down, red shale fragments on dry tip.

## 5. Geological Interpretation

The slope materials are colluvial at the near surface and residual at depth. They consist of a thin sandy topsoil over sandy clays and clays with rock fragments throughout the profile. In the test locations the sandy clays and clays merge into the weathered zone of the under lying rocks at depths between 1.2 to 2.1m below the current surface, being variable due to cut and filling across the proposed works. The depth of the fill reaches a maximum depth of ~1.2m on the NW corner of the proposed secondary dwelling. The

weathered zone of the underlying rock is interpreted as extremely low strength shale. It is to be noted that this material is a soft rock and can appear as a mottled stiff clay when it is cut up by excavation equipment.

## 6. Groundwater

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

## 8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside or below the property. The moderately graded slope that falls across the property and continues above at increasing angles is a potential hazard (**Hazard One**). The stormwater from the roof of the house that is discharged on the uphill side of the garage is a potential hazard (**Hazard Two**).

### Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The moderately graded slope that falls across the property and continues above at increasing angles failing and impacting on the existing house and the proposed works.	The stormwater from the roof of the house that discharges on the uphill side of the garage causing further significant movement in the supporting footings of the house (Photos 16 & 17).
LIKELIHOOD	'Unlikely' ( $10^{-4}$ )	'Likely' ( $10^{-2}$ )
CONSEQUENCES TO PROPERTY	'Minor' (9%)	'Medium' (20%)
RISK TO PROPERTY	'Low' ( $5 \times 10^{-6}$ )	'High' ( $2 \times 10^{-3}$ )
RISK TO LIFE	$8.3 \times 10^{-7}$ /annum	$6.1 \times 10^{-7}$ /annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	This level of risk to property is 'UNACCEPTABLE'. To move the risk to acceptable levels the recommendations in <b>Section 14</b> 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.**

Stormwater from the existing house is either discharged around its perimeter or is piped underground and is discharged to a location that could not be visually identified. Obtaining a drainage easement is not expected to be a feasible option as Avalon golf course is located below the property and the nearest street drainage system is a significant distance away. It is recommended all stormwater or drainage runoff from the proposed development and the existing house be piped to an infiltration/dispersion trench. All stormwater is to be piped through any tanks that may be required by the regulating authorities.

## **11. Excavations.**

No excavations are shown on the plans.

## **12. Site Classification**

The site classification in accordance with AS2870-2011 is Class M.

## **13. Foundations**

The W side of the proposed secondary dwelling will be suspended above the slope and filling has been placed below. The upper E portion of the proposed works will be located above the natural ground materials. If the proposed secondary dwelling is a flexible structure and some movement in accordance with a 'Class M' site can be tolerated (i.e. timber framed and clad) it can be supported on piers or pads taken to the underlying natural firm to stiff clays. Where filling has been placed the maximum required pier depths to encounter this material are expected to be ~1.2m below the current surface. A maximum allowable bearing pressure of 200kPa can be assumed for footings on firm to stiff clay.

For better quality footings or where little movement (i.e. the secondary dwelling is of masonry construction) can be tolerated piers can be taken to extremely low strength shale. The required pier depth are expected to range from 1.2 to 2.0m below the current surface, being deeper where the filling has been placed. It should be noted that this material is a soft rock that a rock auger will cut through so the builders

should not be looking for refusal to end the footings. A maximum allowable pressure of 600kPa can be assumed for footings supported on extremely low strength shale.

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 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.

## 14. Remedial Works

The supporting brick walls of the house, concrete slab for the garage and the steel posts in the foundation space of the house are to be inspected by a structural engineer to assess their structural integrity and provide recommendations for remediation if necessary (Photos 5 to 13).

Roof water from two downpipes is currently directed to a grated drain that runs across the front of the garage (Photos 16 & 17). It appears during heavy downpours the grated drain overflows and water moves under and/or over the garage slab. We recommend this roof water be piped clear of the downhill side of the house and the proposed secondary dwelling to a spreader pipe.

**SEE THE REQUIRED INSPECTIONS OVER THE PAGE**



## 15. Inspections

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

- All footings are to be inspected and approved by the geotechnical professional 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

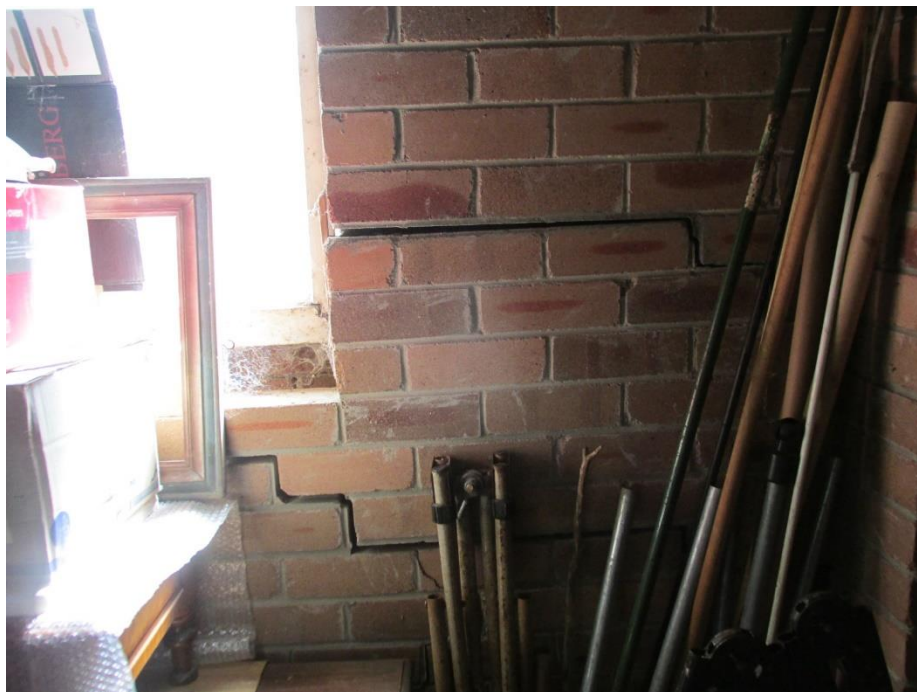


Photo 7



Photo 8





Photo 9



Photo 10



Photo 11



Photo 12





Photo 13



Photo 14





*Photo 15 – base of the auger is at the bottom of the picture*





Photo 16

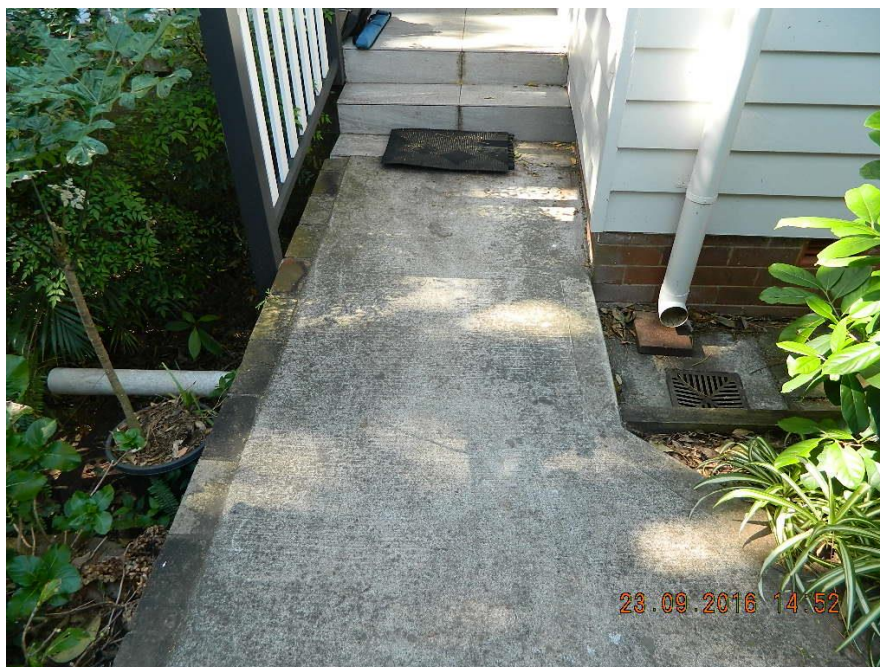


Photo 17

## 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 tests 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 professional. 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

## 01 SITE PLAN

1:200



0 1 2 3 4 5 10M

SCALE 1:200

### SEDIMENT CONTROL FENCE DETAILS

#### SEDIMENT CONTROL

- INSTALL SEDIMENT CONTROL STRUCTURES IN LOCATIONS INDICATED ON DRAWINGS AND AS OTHERWISE REQUIRED TO CONTROL SEDIMENT DURING ALL EXCAVATIONS AND WHILST AREAS OF THE SITE ARE EXPOSED TO EROSION.
- CONTROL STRUCTURES TO BE AS DETAILED OR OTHERWISE REQUIRED.
- REVIEW CONTROL MEASURES AND MAINTAIN STRUCTURES DURING CONSTRUCTION.
- IF ADDITIONAL MEASURES ARE REQUIRED FOR EROSION CONTROL OR BY COUNCIL REQUIREMENTS REFER TO 'URBAN EROSION AND SEDIMENT CONTROL' GUIDELINES PREPARED BY THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT.

#### NOTES:

- ALL GLAZING TO WINDOWS AND DOORS SHALL BE IN ACCORDANCE WITH THE BASIX REPORT.
- EXTERNAL WALL FABRIC SHALL BE PAINTED WITH A SELECTED COLOUR.
- AN APPROVAL RATED INSULATION TO ALL EXTERNAL STEEL FRAMED WALLS, AND INSULATION MATERIAL TO BE PLACED IN CEILING SPACE WITHIN THE PERIMETER TO ALL EXTERNAL WALLS TO BE IN COMPLIANCE WITH THE BASIX REPORT.
- ROOF FINISHES TO BE IN ACCORDANCE WITH THE BASIX REPORT.
- ALL WORK CARRIED OUT TO BE IN ACCORDANCE WITH THE BCA.
- ALL TIMBER FRAMING TO CODE AS1684.
- ALL WINDOWS & DOORS AS NOTED ON PLAN WITH SELECTED COLOUR FINISH.
- ALL GLAZING TO CODE AS1288.
- ALL WATERPROOFING TO WET AREAS TO CODE AS3740.
- ALL POWER OUTLETS & SWITCHES TO OWNERS REQUIREMENTS.
- ALL PEST TREATMENT TO CODE AS3660.1-2000.
- SMOKE DETECTOR DENOTED SD ON PLAN TO BCA/39.

#### COLOURS:

ROOF - GREY  
WALLS, GUTTERS - GREY  
WINDOWS - WHITE  
RAINWATER TANK - BASALT

NOTES - REV C  
- LOCATION OF GRANNY FLAT REVISED

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No:	AMENDMENT	DATE
C	ISSUED FOR APPROVAL	14.10.16
B	ISSUED FOR APPROVAL	21.09.16
A	ISSUED FOR APPROVAL	29.08.16

#### CLIENT'S NAME:

MR & MRS GEEVES

#### ADDRESS:

2 OLD BARRENJOEY ROAD  
AVALON

#### PROJECT NUMBER

0XX

#### DATE:

29.08.16

#### DRAWN BY:

AS

#### CHECKED BY:

PM

#### SCALE (A3):

1:200



PO Box 1245  
Dee Why NSW 2099  
info@multidwell.com.au  
T 1300 80 10 70  
www.multidwell.com.au

SITE PLAN

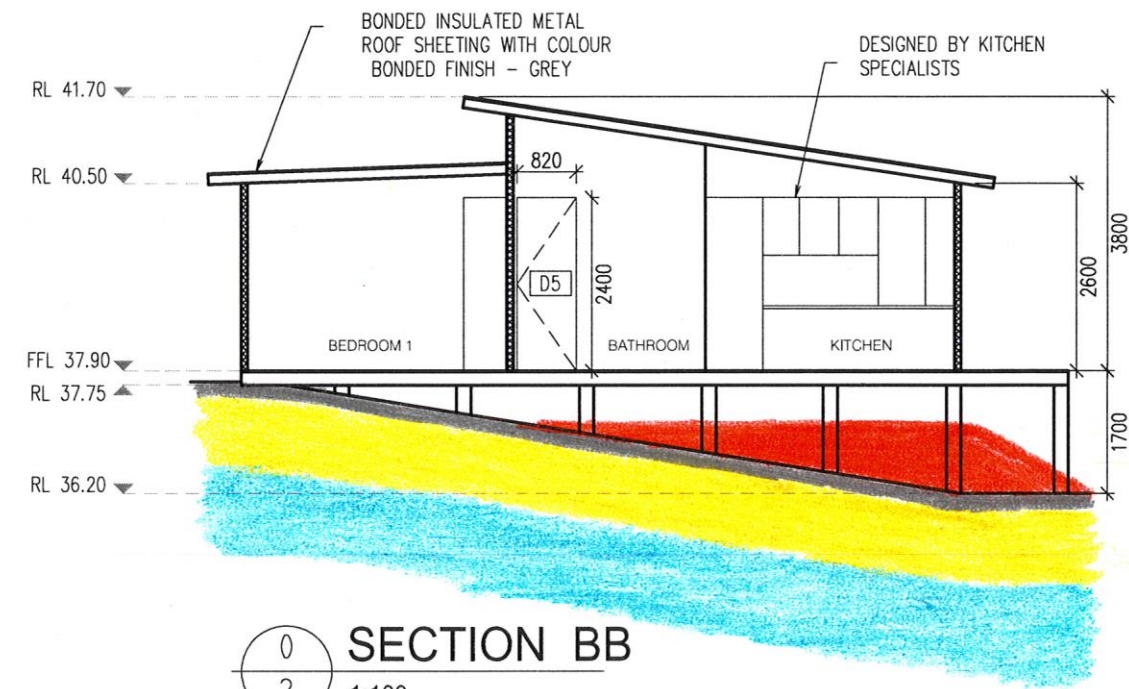
001



# TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

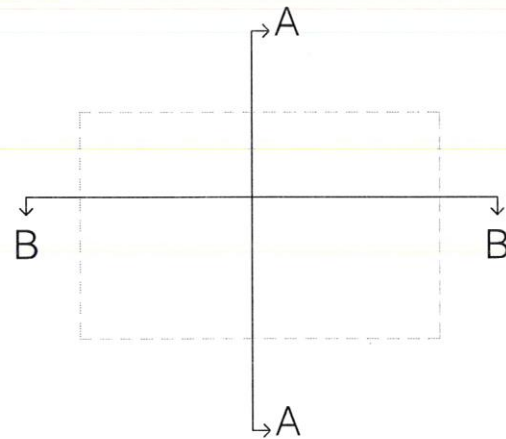


SECTION AA  
1:100



SECTION BB  
1:100

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



NOTES - REV A

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A	ISSUED FOR APPROVAL	14.10.16
No:	AMENDMENT	DATE

CLIENT'S NAME:  
MR & MRS GEEVES

ADDRESS:  
2 OLD BARRENJOEY ROAD  
AVALON

PROJECT NUMBER	XX
DATE:	29.08.16
DRAWN BY:	AS
CHECKED BY:	PM
SCALE (A3):	1:100



PO Box 1245  
Dee Why NSW 2099  
info@multidwell.com.au  
T 1300 80 10 70  
www.multidwell.com.au

SECTIONS 006