

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

Development Application for	_____
	Name of Applicant
Address of site	<u>179 PLATEAU ROAD BILGOLA PLATEAU</u>

Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report

I, Peter Thompson on behalf of Jack Hodgson Consultants Pty Ltd
(insert name) (Trading or Company Name)

on this the 25/10/16 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.

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.
- ☐ Have examined the site and the proposed development/alteration is separate form and 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
- ☐ Provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: RISK ANALYSIS & MANAGEMENT FOR PROPOSED ALTERATIONS, ADDITIONS AND SECONDARY DWELLING AT 179 PLATEAU ROAD BILGOLA PLATEAU Report Date: 25/10/16
Author : PETER THOMPSON
Author's Company/Organisation : JACK HODGSON CONSULTANTS PTY LTD

Documentation which relate to or are relied upon in report preparation:

Architectural drawings prepared by MO Design, drawing numbers A-001 – A-014, dated 2nd September 2016.

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 Peter Thompson

Chartered Professional Status MIE Aust CPEng

Membership No. 146800

Company Jack Hodgson Consultants 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 179 PLATEAU ROAD BILGOLA PLATEAU

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: RISK ANALYSIS & MANAGEMENT FOR PROPOSED ALTERATIONS, ADDITIONS AND SECONDARY DWELLING AT 179 PLATEAU ROAD BILGOLA PLATEAU

Report Date: 25/10/16

Author: PETER THOMPSON

Author's Company/Organisation: JACK HODGSON CONSULTANTS PTY LTD

Please mark appropriate box

- ☒ Comprehensive site mapping conducted 19/10/16
 (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 SEE REPORT
 - ☒ Yes Date conducted 19/10/16
- ☒ 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 Peter Thompson
 Name Peter Thompson
 Chartered Professional Status MIE Aust CPEng
 Membership No. 146800
 Company Jack Hodgson Consultants Pty Ltd



**RISK ANALYSIS & MANAGEMENT
FOR
PROPOSED ALTERATIONS, ADDITIONS AND SECONDARY
DWELLING
AT
179 PLATEAU ROAD BILGOLA PLATEAU**

1. INTRODUCTION.

1.1 This assessment has been prepared to accompany an application for development approval. The requirements of the Geotechnical Risk Management Policy for Pittwater, 2009 have been met.

1.2 The definitions used in this Report are those used in the Geotechnical Risk Management Policy for Pittwater, 2009.

1.3 The methods used in this Assessment are based on those described in Landslide Risk Management March 2007, published by the Australian Geomechanics Society and as modified by the Geotechnical Risk Management Policy for Pittwater, 2009.

1.4 The experience of Jack Hodgson Consultants spans a time period over 40 years in the Pittwater area and greater Sydney region.

2. PROPOSED DEVELOPMENT.

2.1 Construct new secondary dwelling near north-eastern corner of property.

2.2 Construct new parking platform.

2.3 Landscaping of eastern side of property to repair failed retaining walls.

2.4 Details of the proposed development are shown on a set of architectural drawings prepared by MO Design, drawing numbers A-001 – A-014, dated 2nd September 2016.



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ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 2

3. DESCRIPTION OF SITE & SURROUNDING AREA.

3.1 The site was inspected on the 19th October, 2016, and previously by this firm on the 20th of July, 2015.

3.2 The property is situated on the low side of the road and has an easterly aspect. The land surface drops moderately across the block at an average angle of some 15 degrees from the road frontage.

3.3 From the road frontage a short concrete vehicle crossing provides access to a long moderately sloping driveway which terminates in a single vehicle hardstand (Photo 1). Pedestrian access to the residence is via a paved moderately sloping footpath which terminates at the front of the residence (Photo 2). A largely open, terraced garden is located at the front of the block. These terraces are supported by stable non engineered mortared sandstone, brick and masonry structures (Photos 3 & 4). A paved patio area is located in a cut at the front of the house. The cut is supported by a stable well-constructed timber wall (Photo 5). Pedestrian access to the rear of the property is via an access corridor on the southern boundary of the block (Photo 6). A series of terraces are located at the rear of the house (Photo 7). The upper most terrace is supported by a partially dilapidated masonry block wall which shows signs of movement (Photos 8 & 9). At the time of inspection it appeared stable however we recommend that the wall be periodically monitored for further movement or instability. Should further movement be detected, we recommend a structural engineer or licenced builder be consulted to discuss potential remediation works. A small paved patio area is located on the middle terrace which is supported by stable timber soldier pile walls (Photo 10). A small timber deck is located on the lower most terrace which is supported by stable timber piers and a timber soldier pile wall (Photo 7).

3.4 The two storey timber and masonry house is in average condition for its age and is supported by masonry walls. Stepped cracking was detected on the northern side of the house. Cracks were approximately 0.5cm in width. Part of a timber veranda on the northern side of the house shows signs of warping and potential rot. We recommend that it be monitored for any progression of rot and movement.

4. GEOLOGY OF THE SITE.

4.1 The Sydney geological series sheet, at a scale of 1:100,000 indicates the site is underlain by Hawkesbury Sandstones of the Wianamatta Group which can be seen outcropping on site. These sandstones are of Middle Triassic age and were probably laid down in braided streams. The sand grains are mainly quartz with some sand grade claystone fragments. There are lenticular deposits of mudstones and laminates which are thought to have been deposited in abandoned channels of the main streams. The sandstones generally have widely spaced sub vertical joints with some current

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ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 3

bedding. The joint directions are approximately north/south and east/west. The beds vary in thickness from 0.5 to in excess of 5 metres.

4.2 The slope materials are colluvial at the surface and residual at depth. They consist of sandy loams over sandy clays that merge into the weathered zone of the underlying rocks at depths expected to be in the range of 1.3 to 2.8 metres.

5. SUBSURFACE INVESTIGATION.

5.1 Two Dynamic Cone Penetrometer (DCP) tests were conducted by this firm on 20th July 2015 and the location of these tests can be seen on the site plan. The tests were conducted to the Australian Standard for ground testing: AS 1289.6.3.2 – 1997. The results of these tests are as follows:

DEPTH (m)	NUMBER OF BLOWS - conducted with Pointed Tip	
	DCP1	DCP2
0.0 to 0.3	3	2
0.3 to 0.6	12	4
0.6 to 0.9	12	5
0.9 to 1.2	41/	8
1.2 to 1.5	#	10
1.5 to 1.8	#	10
1.8 to 2.1	#	18
2.1 to 2.4	#	40
2.4 to 2.7	#	60
2.7 to 3.0	#	5/
	Refusal @ 1.3m bouncing on rock.	Refusal @ 2.75m bouncing on rock.

NOTES:

DCP 1: Refusal @ 1.30m bouncing on rock. Dry tip with white impact dust.

DCP 2: Refusal @ 2.75m bouncing on rock. Dry tip with white impact dust.

Two Dynamic Cone Penetrometer (DCP) tests were conducted by this firm on 19th October 2016 and the location of these tests can be seen on the site plan. The tests were conducted to the Australian Standard for ground testing: AS 1289.6.3.2 – 1997. The results of these tests are as follows:



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CONSULTING CIVIL, GEOTECHNICAL AND STRUCTURAL ENGINEERS

ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 4

DEPTH (m)	NUMBER OF BLOWS - Conducted using a 9kg hammer, 510mm drop and conical tip.	
	DCP3	DCP4
0.0 to 0.3	10	12/
0.3 to 0.6	4	#
0.6 to 0.9	16	#
0.9 to 1.2	13/	#
	Refusal @ 1.05m bouncing on rock.	Refusal @ 0.30m bouncing on rock or floater.

Notes:

DCP 3: Refusal @ 1.00m, bouncing on rock. Fine grained red impact dust on wet tip. Evidence of groundwater at 0.65m

DCP 4: Refusal @ 0.30m, bouncing on rock or floater. Fine grained red impact dust on dry tip. No water table encountered.

5.2 The equipment chosen to undertake ground investigations provides the most cost effective method for understanding the subsurface conditions. Our interpretation of the subsurface conditions is limited to the results of testing undertaken and the known geology in the area. While every care is taken to identify the subsurface conditions on-site, variation between the interpreted model herein, and the actual conditions onsite may vary.

5.3 Should actual ground conditions vary from those anticipated, we would recommend the geotechnical engineer be informed as soon as possible to advise if modifications to our recommendations are required.

6. DRAINAGE OF THE SITE.

6.1 ON THE SITE.

The block is naturally well drained.

6.2 SURROUNDING AREA.

Overland stormwater flow entering the site from the adjoining properties was not evident. Normal overland runoff could enter the site from above during heavy or extended rainfall.

7. GEOTECHNICAL HAZARDS.

7.1 ABOVE THE SITE.

No geotechnical hazards likely to adversely affect the subject property were observed above the site.



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ABN: 94 053 405 011

MQ 30164
25th October, 2016
Page 5

7.2 ON THE SITE.

7.2.1 The site is classed slip affected under Council's Policy and H1 hazard. A failure of the slope across the property is considered a potential hazard (**HAZARD ONE**).

7.3 BELOW THE SITE.

No geotechnical hazards likely to adversely affect the subject property were observed below the site.

7.4 BESIDE THE SITE.

The areas beside the site are also classed slip affected hazard areas. These blocks have similar elevation and geomorphology to the subject property. No geotechnical hazards likely to adversely affect the subject property were observed beside the site.

8. RISK ASSESSMENT.

8.1 ABOVE THE SITE.

As no geotechnical hazards likely to adversely impact upon the subject site were observed above the site, no risk analysis is required.

8.2 ON THE SITE.

8.2.1 HAZARD ONE Qualitative Risk Assessment on Property

From the road frontage the slope of the land drops moderately across the property at average angles of some 15 degrees. No significant evidence of slope instability was identified on site. The likelihood of the slope failing is assessed as 'Unlikely' (10^{-4}). The consequences to property of such a failure are assessed as 'Minor' (5%). The risk to property is 'Low' (5×10^{-6}).

8.2.2 HAZARD ONE Quantitative Risk Assessment on Life

For loss of life risk can be calculated as follows:

$$R_{(LoI)} = P_{(H)} \times P_{(SH)} \times P_{(TS)} \times V_{(DT)} \text{ (See Appendix for full explanation of terms)}$$

8.2.2.1 Annual Probability

No evidence of significant movement was observed on the site.

$$P_{(H)} = 0.00001/\text{annum}$$



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ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 6

8.2.2.2 Probability of Spatial Impact

The house is situated towards the crest of a steep slope.

$$P_{(SH)} = 0.3$$

8.2.2.3 Possibility of the Location Being Occupied During Failure

The average household is taken to be occupied by 4 people. It is estimated that 1 person is in the house for 20 hours a day, 7 days a week. It is estimated 3 people are in the house 12 hours a day, 5 days a week.

For the person most at risk:

$$\frac{20}{24} \times \frac{7}{7} = 0.83$$

$$P_{(TS)} = 0.83$$

8.2.2.4 Probability of Loss of Life on Impact of Failure

Based on the volume of land sliding and its likely velocity when it hits the house, it is estimated that the vulnerability of a person to being killed in the house when a landslide hits is 0.01

$$V_{(DT)} = 0.01$$

8.2.2.5 Risk Estimation

$$R_{(LoI)} = 0.00001 \times 0.3 \times 0.83 \times 0.01 \\ = 0.0000000249$$

$$R_{(LoI)} = 2.49 \times 10^{-8}/\text{annum}$$

NOTE: This level of risk is 'ACCEPTABLE', provided the recommendations in Section 10 are followed.

8.3 BELOW THE SITE.

As no geotechnical hazards likely to adversely impact upon the subject site were observed below the site, no risk analysis is required.

8.4 BESIDE THE SITE.

As no geotechnical hazards likely to adversely impact upon the subject site were observed beside the site, no risk analysis is required.

9. SUITABILITY OF DEVELOPMENT FOR SITE.

9.1 GENERAL COMMENTS.

The proposed developments are considered suitable for the site.



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CONSULTING CIVIL, GEOTECHNICAL AND STRUCTURAL ENGINEERS

ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 7

9.2 GEOTECHNICAL COMMENTS.

No geotechnical hazards will be created by the completion of the proposed development in accordance with the requirements of this Report and good engineering and building practice.

9.3 CONCLUSIONS.

The site and the proposed development can achieve the Acceptable Risk Management criteria outlined in the Pittwater Geotechnical Risk Policy provided the recommendations given in **Section 10** are undertaken.

10. RISK MANAGEMENT.

10.1. TYPE OF STRUCTURE.

The proposed structures are considered suitable.

10.2. EXCAVATIONS.

With the exception of those required for pad levels and footings, no significant excavations are required for the proposed development.

10.3. FILLS.

10.3.1 If minor filling is required all fills are to be placed in layers not more than 250 mm thick and compacted to not less than 95% of Standard Optimum Dry Density at plus or minus 2% of Standard Optimum Moisture Content.

10.3.2 The fill batters are to be not steeper than 1 vertical to 1.7 horizontal or they are to be supported by properly designed and constructed retaining walls.

10.4. FOUNDATION MATERIALS AND FOOTINGS.

It is recommended that the footings for the proposed development be taken to the underlying stiff clays of the natural profile. The design allowable bearing pressure is 300kPa for spread footings or shallow piers. All pier excavations are to be taken to material of a similar consistency to minimise the potential for differential settlement.

10.5. STORM WATER DRAINAGE.

Storm water generated from any new works is to be piped to the street drainage system through any water tanks or onsite detention systems that may be required by the regulating authorities.

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CONSULTING CIVIL, GEOTECHNICAL AND STRUCTURAL ENGINEERS

ABN: 94 053 405 011

MQ 30164
25th October, 2016
Page 8

10.6. SUBSURFACE DRAINAGE.

Any retaining walls are to be back filled with non-cohesive free draining material and pipe to provide a drainage layer immediately behind the wall. The free draining material is to be separated from the ground materials by geotextile fabric.

10.7. INSPECTIONS.

It is essential that the foundation materials of all footing excavations be inspected and approved before concrete is placed.

11. GEOTECHNICAL CONDITIONS FOR ISSUE OF CONSTRUCTION CERTIFICATE.

It is recommended that the following geotechnical conditions be applied to the Development Approval:-

The work is to be carried out in accordance with the Risk Management Report MQ 30164 dated 25th October, 2016.

The Geotechnical Engineer is to inspect and approve the foundation materials of any additional footing excavations before concrete is placed.

12. GEOTECHNICAL CONDITIONS FOR ISSUE OF OCCUPATION CERTIFICATE.

The Geotechnical Engineer is to certify the following geotechnical aspects of the development:-

The work was carried out in accordance with the Risk Management Report MQ 30164 dated 25th October, 2016.

The Geotechnical Engineer inspected and approved the foundation material of all footing excavations.



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CONSULTING CIVIL, GEOTECHNICAL AND STRUCTURAL ENGINEERS

ABN: 94 053 405 011

MQ 30164

25th October, 2016

Page 9

13. RISK ANALYSIS SUMMARY.

HAZARDS TYPE	Hazard One
	By reference to Pittwater Councils Geotechnical Hazard mapping, the block is identified as an H1 Hazard Zone. The slope of the land surface that falls across the property is considered a potential hazard.
LIKELIHOOD	'Unlikely' (10^{-4})
CONSEQUENCES TO PROPERTY	'Minor' (5%)
RISK TO PROPERTY	'Low' (5×10^{-6})
RISK TO LIFE	2.49×10^{-8} /annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the conditions in Section 10 are followed.

JACK HODGSON CONSULTANTS PTY. LIMITED.

Peter Thompson MIE Aust CPEng

Member No. 146800

Civil/Geotechnical Engineer



Photo 1

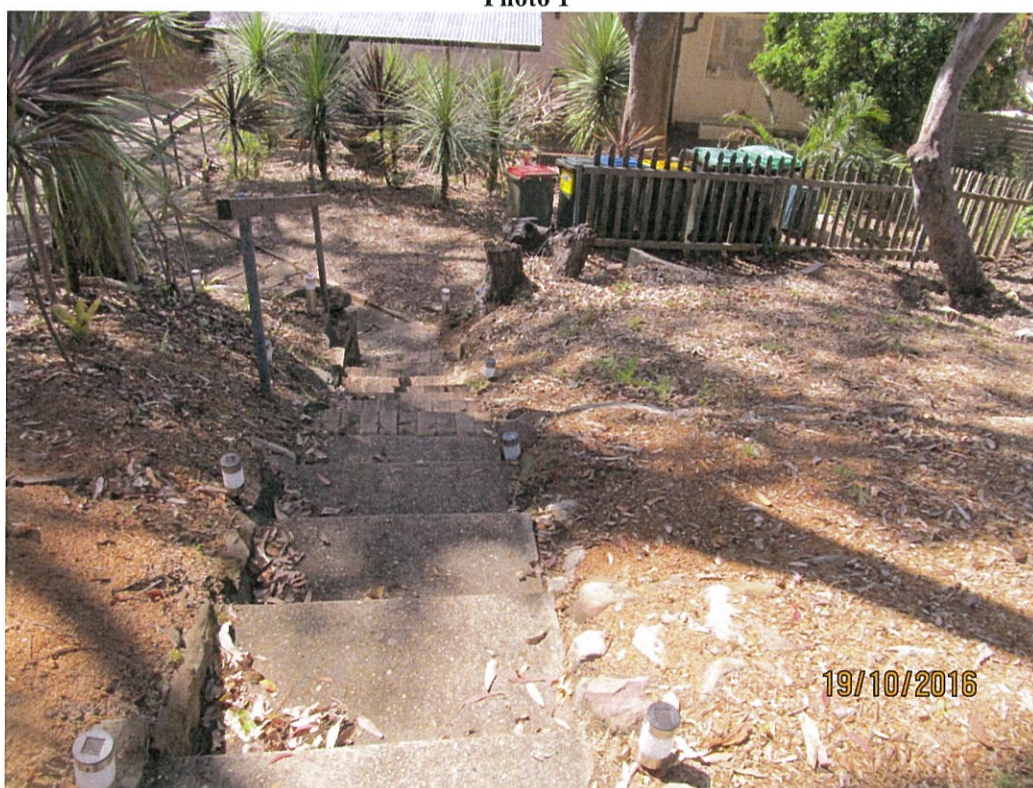


Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



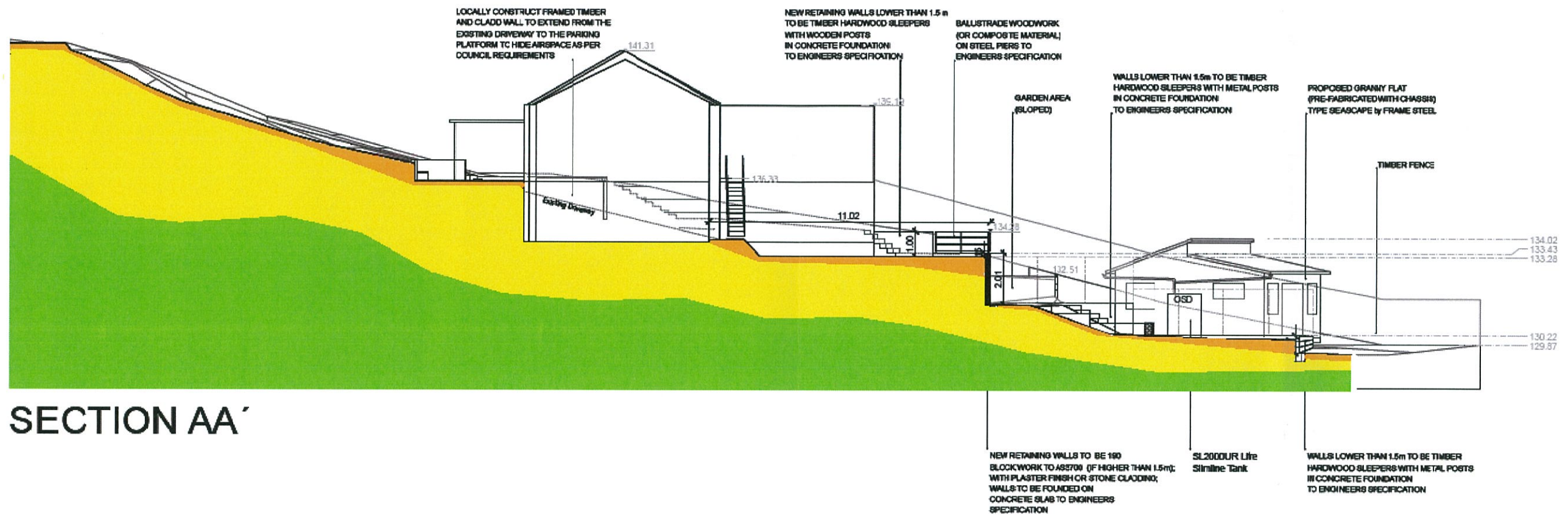
Photo 8



Photo 9



Photo 10



SECTION AA'

NOTE
INTERPRETED SUB SURFACE SECTION ONLY.
ACTUAL GROUND CONDITIONS MAY VARY.



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TYPE SECTION

Job No
MQ 30164
Scale
NTS

Address
179 PLATEAU ROAD
BILGOLA PLATEAU
NSW

Strata Profile Legend

- Sandy Topsoil
- Sandy Clay
- Hawkesbury Sandstone

7 RISK ESTIMATION

7.1 QUANTITATIVE RISK ESTIMATION

Quantitative risk estimation involves integration of the frequency analysis and the consequences.

For property, the risk can be calculated from:

$$R_{(Prop)} = P_{(H)} \times P_{(S:H)} \times P_{(T:S)} \times V_{(Prop:S)} \times E \quad (1)$$

Where

$R_{(Prop)}$ is the risk (annual loss of property value).

$P_{(H)}$ is the annual probability of the landslide.

$P_{(S:H)}$ is the probability of spatial impact by the landslide on the property, taking into account the travel distance and travel direction.

$P_{(T:S)}$ is the temporal spatial probability. For houses and other buildings $P_{(T:S)} = 1.0$. For Vehicles and other moving elements at risk $1.0 > P_{(T:S)} > 0$.

$V_{(Prop:S)}$ is the vulnerability of the property to the spatial impact (proportion of property value lost).

E is the element at risk (e.g. the value or net present value of the property).

For loss of life, the individual risk can be calculated from:

$$R_{(LoL)} = P_{(H)} \times P_{(S:H)} \times P_{(T:S)} \times V_{(D:T)} \quad (2)$$

Where

$R_{(LoL)}$ is the risk (annual probability of loss of life (death) of an individual).

$P_{(H)}$ is the annual probability of the landslide.

$P_{(S:H)}$ is the probability of spatial impact of the landslide impacting a building (location) taking into account the travel distance and travel direction given the event.

$P_{(T:S)}$ is the temporal spatial probability (e.g. of the building or location being occupied by the individual) given the spatial impact and allowing for the possibility of evacuation given there is warning of the landslide occurrence.

$V_{(D:T)}$ is the vulnerability of the individual (probability of loss of life of the individual given the impact).

A full risk analysis involves consideration of all landslide hazards for the site (e.g. large, deep seated landsliding, smaller slides, boulder falls, debris flows) and all the elements at risk.

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

For comparison with tolerable risk criteria, the individual risk from all the landslide hazards affecting the person most at risk, or the property, should be summed.

The assessment must clearly state whether it pertains to 'as existing' conditions or following implementation of recommended risk mitigation measures, thereby giving the 'residual risk'.