

**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>34 COASTERS RETREAT, COASTERS RETREAT</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 14/12/15 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

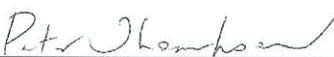
Geotechnical Report Details:

Report Title: RISK ANALYSIS & MANAGEMENT FOR PROPOSED NEW RESIDENCE AT 34 COASTERS RETREAT, COASTERS RETREAT
 Report Date: 14/12/15
 Author : PETER THOMPSON
 Author's Company/Organisation : JACK HODGSON CONSULTANTS PTY LTD

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

Drawings prepared by Troppo, sheets 00 to 17 and dated 29th October, 2015.

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 34 COASTERS RETREAT, COASTERS RETREAT	

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 NEW RESIDENCE AT 34 COASTERS RETREAT, COASTERS RETREAT
Report Date: 14/12/15
Author: PETER THOMPSON
Author's Company/Organisation: JACK HODGSON CONSULTANTS PTY LTD

Please mark appropriate box

- ☒ Comprehensive site mapping conducted 08/12/15
(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 08/12/15
- ☒ 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	Peter Thompson
Chartered Professional Status	MIE Aust CPEng
Membership No.	146800
Company	Jack Hodgson Consultants Pty Ltd



**RISK ANALYSIS & MANAGEMENT
FOR
PROPOSED NEW RESIDENCE
AT
34 COASTERS RETREAT, COASTERS RETREAT**

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 Construction of new pavilion-style residence towards the south-eastern portion of the property.

2.2 Details of the proposed development are shown on a series of Architectural drawings prepared by Troppo, sheets 00 to 17 and dated 29th October, 2015.

3. DESCRIPTION OF SITE & SURROUNDING AREA.

3.1 The site was inspected on the 8th December, 2015.

3.2 The site is a battle axe shaped block located on the high side of the Coasters Retreat public thoroughfare. The proposed new residence will have a north-westerly aspect. The site has a land surface that rises at maximum average angles of 30 degrees before rising sharply beyond the south-eastern boundary. The property is located towards the middle of a moderate to steep slope that rises to the crest of a north-east trending ridge some 100m from the upper boundary.



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ABN: 94 053 405 011

MQ 30371

14th December, 2015

Page 2

3.3 The block is only accessible by boat. From the Coasters Retreat public thoroughfare, a lawn covered access handle provides access to the bulk of the property, situated to the south-east of the neighbouring residences (Photos 1 & 2). The middle portion of the block is roughly rectangular in shape with several sandstone blocks and floaters present in stable positions on the slope (Photo 3). The slope is sparsely vegetated with several vertical standing medium to large trees. A sandstone escarpment runs approximately north-east to south-west beyond the south-eastern boundary of the property (Photo 4). No significant undercutting or any other geological defects were observed at the time of our inspection.

4. GEOLOGY OF THE SITE.

4.1 The site is underlain by interbedded sandstones, siltstones and shales of the Narrabeen Group. The Narrabeen Group Rocks are Late Permian to Middle Triassic in age with the early rocks not outcropping in the area under discussion. The materials from which the rocks were formed consist of gravels, coarse to fine sands, silts and clays. They were deposited in a riverine type environment with larger floods causing fans of finer materials. The direction of deposition changed during the period of formation. The lower beds are very variable with the variations decreasing as the junction with the Hawkesbury Sandstones is approached. This is marked by the highest of persistent shale beds over thicker sandstone beds which are similar in composition to the Hawkesbury Sandstones. The escarpment above the block marks the transition between the Narrabeen Group rocks and the capping Hawkesbury Sandstones of which the escarpment is comprised.

4.2 The slope materials are colluvial at the surface and residual at depth. They consist of sandy loam topsoil over sandy clays. The clay merges into the weathered zone of the under lying rocks at depths expected to be within the range of 0.6 to 1.5 metres.

5. SUBSURFACE INVESTIGATION.

One Auger hand sample was undertaken to determine the natural soil profile. The results of this test are as follows:

AUGER HOLE 1

Depth (m)

0.0 to 0.4

0.4 to 0.5

0.5 to 0.8

(Photo 5)

Material Encountered

Dark brown/grey fine to medium grained sandy topsoil.

Grey fine grained sandy topsoil. Orange clay present.

Light brown/grey fine grained sandy clay with coarse red fragments abundant.

Refusal on rock @ 0.80m maroon/white impact dust on dry tip.

Comments: No water table encountered.

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ABN: 94 053 405 011

MQ 30371
14th December, 2015
Page 3

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.

The sandstone escarpment above is considered as part of **HAZARD ONE**.

7.2 ON THE SITE.

The slope of the land surface that rises across the property and extends above 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 adjoining properties 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.

The sandstone escarpment above the property will be included in **HAZARD ONE's** Risk Assessment.



8.2 ON THE SITE.

8.2.1 HAZARD ONE Qualitative Risk Assessment on Property

The slope of the land surface rises across the property at average maximum angles of 30 degrees. No signs of movement due to slope instability were identified. No significant undercutting or any other geological defects were identified in the sandstone escarpment above the block at the time of our inspection. The likelihood of the slope failing and impacting on the house is assessed as 'Unlikely' (10^{-4}). The consequences to property of such a failure are assessed as 'Low' (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:

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

8.2.2.1 Annual Probability

No evidence of significant slope instability was identified on or above the site at the time of inspection.

$P_{(H)} = 0.0001/\text{annum}$

8.2.2.2 Probability of Spatial Impact

The work site is located in the middle of a moderate to steep slope.

$P_{(SH)} = 0.2$

8.2.2.3 Possibility of the Location Being Occupied During Failure

The average worksite is taken to be occupied by 6 people. It is estimated that 1 person is below the cut for 8 hours a day, 6 days a week. It is estimated 5 people are below the cut 5 hours a day, 5 days a week.

For the person most at risk:

$$\frac{8}{24} \times \frac{6}{7} = 0.29$$

$P_{(TS)} = 0.29$

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 fails, it is estimated that the vulnerability of a person to being killed in the work site when a landslide occurs is 0.02

$V_{(DT)} = 0.02$

8.2.2.5 Risk Estimation

$R_{(Lol)} = 0.0001 \times 0.2 \times 0.29 \times 0.02$



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ABN: 94 053 405 011

MQ 30371

14th December, 2015

Page 5

= 0.000000116

$R_{(LoI)} = 1.6 \times 10^{-7}/\text{annum}$ NOTE: This level of risk is 'ACCEPTABLE' provided the recommendations provided in **Section 10** are followed.

8.3 BELOW THE SITE.

As no geotechnical hazards likely to adversely affect the subject property were observed below the site no Risk Assessment is required.

8.4 BESIDE THE SITE.

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

9. SUITABILITY OF DEVELOPMENT FOR SITE.

9.1 GENERAL COMMENTS.

The proposed developments are considered suitable for the site.

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 as published by the Australian Geomechanics Society in the March 2007, 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 footings and pad levels, no significant excavations are required for the proposed works.



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ABN: 94 053 405 011

MQ 30371
14th December, 2015
Page 6

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 all footings be supported on the underlying weathered rock. The design ultimate bearing pressures are 800kPa for spread footings or shallow piers. It is expected that weathered rock will be encountered between 0.5m and 1.5m from current surface levels.

10.5. STORM WATER DRAINAGE.

All storm water runoff from the development is to be managed on site using water tanks or onsite detention systems in accordance with all relevant council requirements and Australian Standards.

10.6. SUBSURFACE DRAINAGE.

Any retaining walls are to be back filled with non-cohesive free draining material and slotted 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 30371 dated 14th December, 2015.

The Geotechnical Engineer is to inspect and approve the foundation material of all footing excavations.



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ABN: 94 053 405 011

MQ 30371

14th December, 2015

Page 7

12. GEOTECHNICAL CONDITIONS FOR ISSUE OF OCCUPATION CERTIFICATE.

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

The work has been carried out in accordance with the Risk Management Report MQ 30371 dated 14th December, 2015.

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

13. RISK ANALYSIS SUMMARY.

HAZARDS	Hazard One
TYPE	The slope that rises across and extends above the property is considered a potential risk.
LIKELIHOOD	'Unlikely' (10^{-4})
CONSEQUENCES TO PROPERTY	Minor (5%)
RISK TO PROPERTY	'Low' (5×10^{-6})
RISK TO LIFE	1.66×10^{-7} /annum
COMMENTS	This is an 'Acceptable' level of risk provided the recommendations in Section 10 are followed.

JACK HODGSON CONSULTANTS PTY. LIMITED.

Peter Thompson MIE Aust CPEng

Member No. 146800

Civil/Geotechnical Engineer

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Photo 1



Photo 2



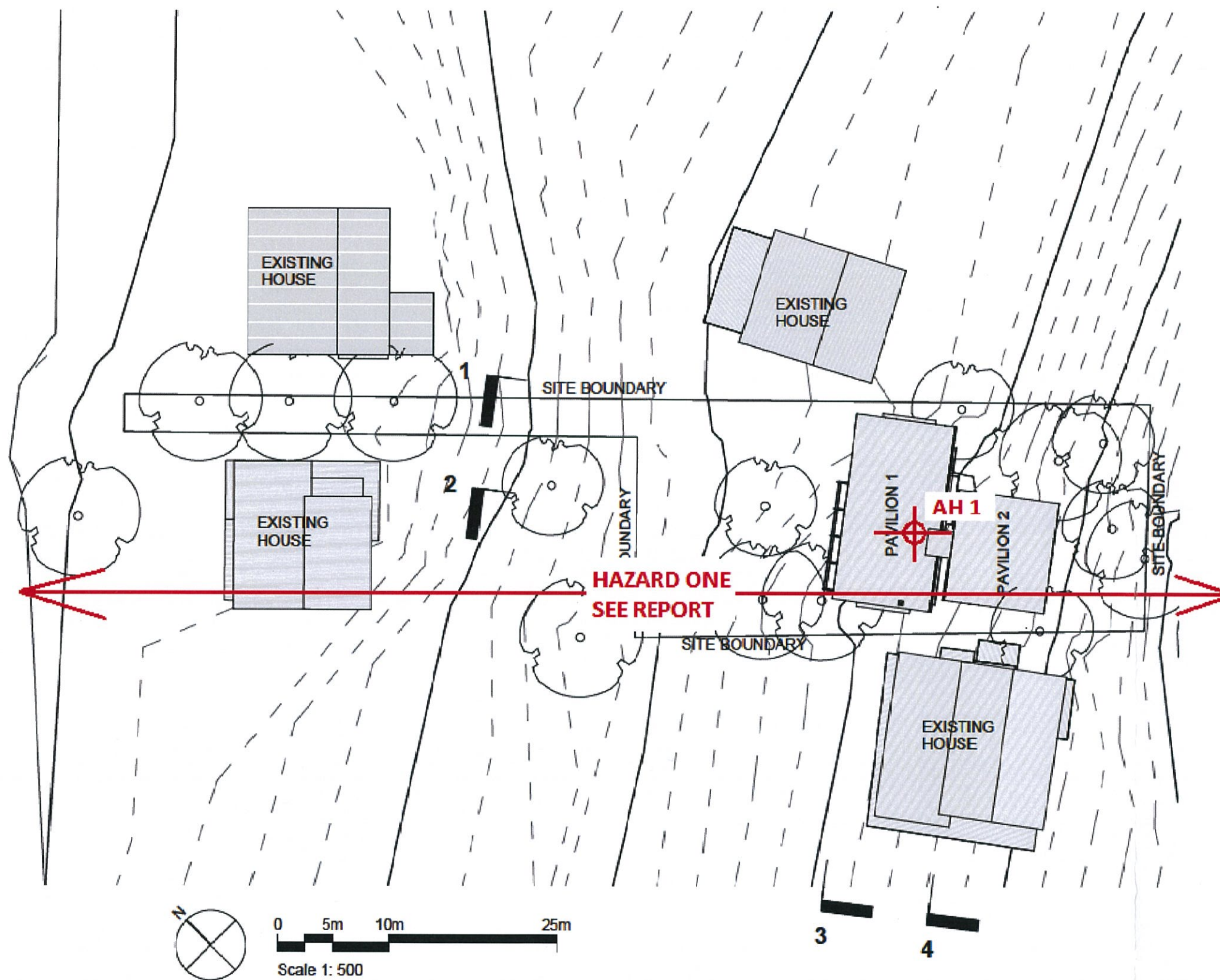
Photo 3



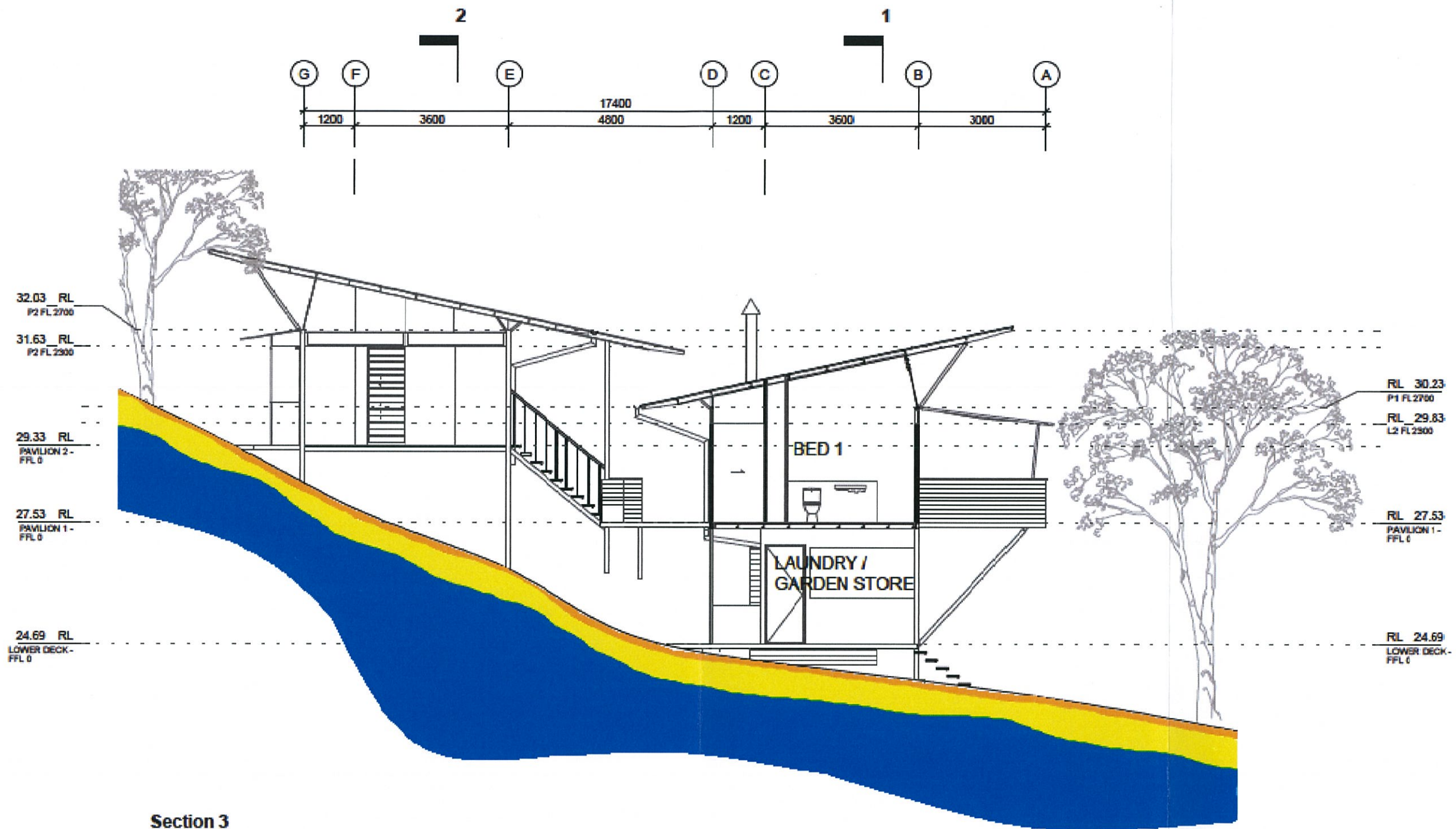
Photo 4



Photo 5



⊕ = AUGER LOCATION



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TYPE SECTION

Job No
MQ 30371
Scale
NTS

Address
34 COASTERS RETREAT
COASTERS RETREAT
NSW

Strata Profile Legend

Sandy Topsoil
Sandy Clay
Narrabeen Group Rocks

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 $0 < P_{(T:S)} < 1.0$.

$V_{(Prop:S)}$ 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'.