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# Site Classification:

Additions and Alterations at 34 Mary Street, Beacon Hill

#### 1. Scope

The aim of this assessment is to determine the underlying ground materials in the location of the proposed works, classify the site in accordance with AS2870-2011 and provide excavation support and foundation recommendations.

The site was inspected on the 2<sup>nd</sup> August, 2021.

2. Table Summary: Site Classification as per AS2870-2011						
Existing Subsurface Condition Summary	0.0 to 0.7m Fill, Topsoil and Clayey Sand,					
	0.3 to 1.8m Clay,					
	0.7 to 1.8m & below Medium Strength Sandstone.					
Slope	Gently Sloping ~8°					
Proposed Earthworks	~0.5m excavation for garage alteration					
Site Classification	<b>Class S</b> for foundations supported on Natural Clay					
	<b>Class A</b> for foundations supported on Medium Strength Sandstone					
Ys Range	Class S 0-20mm					
	Class A No ground movement					
Maximum Allowable Bearing	Natural Firm to Stiff Clay 200kPa					
Pressures	Medium Strength Sandstone 1000kPa					



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#### 3. Important Notes for Site Classification

#### **Reactive Sites**

Reactive sites are sites consisting of clay soils that swell on wetting and shrink on drying, resulting in ground movements that can damage lightly loaded structures (Sites classified as S, M, H1, H2, E or P).

#### The Australian Residential Slabs and Footings Standard AS2870

The Australian Residential Slabs and Footings Standard AS2870 provides simple and efficient classification/design procedures, which assume that the moisture condition around the buildings will remain within reasonable limits.

This means the classification must be reassessed should the soil profile be changed either by adding fill or removing soil from the block or other changes on site that will alter soil moisture conditions.

#### Maintenance is required

It also means that owners should be aware of the need to make sure extreme soil moisture changes are avoided over the life of the house; maintenance of site drainage, prompt repair of leaking pipes and avoidance of excessive watering are three actions which will help to achieve this aim. See CSIRO Sheet BTF 18 'Foundation Maintenance & Footing Performance' attached.

# Higher probability of damage – if abnormal moisture conditions develop

AS 2870 points out a higher probability of damage can occur on reactive sites where abnormal moisture conditions occur defined as:

• Presence of trees on the building site or adjacent site, removal of trees prior to or after construction, and the growth of trees too close to a footing. The proximity of

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mature trees and their effect on foundations should be considered when determining building areas within each allotment (refer to AS 2870);

- Failure to provide adequate site drainage or lack of maintenance of site drainage, failure to repair plumbing leaks and excessive or irregular watering of gardens;
- Unusual moisture conditions caused by removal of structures, ground covers (such as pavements), drains, dams, swimming pools, tanks etc.

#### Some cracking can still occur

We point out that even if the original classification remains valid and abnormal moisture conditions do not develop on site, AS 2870 designed foundation systems "are expected to experience usually no damage, a low incidence of damage category 1 and an occasional incidence of damage category 2." according to the standard. So, it is important to realise that Footing systems designed and constructed in accordance with AS 2870 are not intended to prevent cracking of the walls constructed on them due to possible foundation movement, but merely to limit cracks to a generally acceptable width and number, at an 'acceptable' cost.

# 4. Proposed Development

- **4.1** Demolish part of the existing house, leaving most of the house intact. Rebuild the house.
- **4.2** Add a new first floor addition to the existing house.
- 4.3 Lower the level of the existing garage by excavating to a maximum depth of ~0.5m.
- **4.4** Alterations to the existing deck on the uphill side of the house.



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4.5 Details of the proposed development are shown on 15 drawings prepared by Bent Patterson Design. Drawings numbered 0001, 1000, 1001, 1100, 1101, 1111, 2001 to 2003, 3001 to 4004 and 5000 are dated 26/5/21. Drawing number 1200 is dated 19/3/21.

# 5. 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.

#### 6. Subsurface Investigation

One hand auger hole (AH) was put down to identify the soil materials. Four 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. 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 (~RL115.6) – AH1 (photo 1)

Depth (m)	Material Encountered	
0.0 to 0.3	FILL, soil and clay, dark brown and orange, moist.	
0.3 to 0.5	<b>CLAY</b> , orange, firm to stiff, moist.	

End of Hole @ 0.5m in firm to stiff clay. No watertable encountered.



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DCP TEST RESULTS – Dynamic Cone Penetrometer								
Equipment: 9kg hammer, 510mm drop, conical tip.			Standard: AS1289.6.3.2 - 1997					
Depth(m)	DCP 1	DCP 2	DCP 3 DCP 4					
Blows/0.3m	(~RL114.5)	(~RL115.6)	(~RL115.1)	(~RL116.8)				
0.0 to 0.3	5	9	14	16				
0.3 to 0.6	10	10	5	9				
0.6 to 0.9	8	3	11	7				
0.9 to 1.2	14	#	20	12				
1.2 to 1.5	52		#	21				
1.5 to 1.8	#			42				
1.8 to 2.1				#				
	Refusal @ 1.5m	Refusal @ 0.7m	Refusal @ 1.0m	Refusal @ 1.8m				

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

#### DCP Notes:

DCP1 – Refusal on rock @ 1.5m, DCP bouncing off rock surface, light grey clayey sand on damp tip.

DCP2 – Refusal on rock @ 0.7m, DCP bouncing off rock surface, white sandstone fragments on dry tip.

DCP3 – Refusal on rock @ 1.0m, DCP bouncing off rock surface, white sandstone fragments on dry tip.

DCP4 – Refusal on rock @ 1.8m, DCP bouncing off rock surface, brown soil on wet tip.

# 7. Geological Observations and Interpretation

The surface features of the block are controlled by the 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, topsoil, clayey sand and clays that fill the bench step formation. Fill to a maximum depth of ~0.7m provides level platforms for garden and lawn areas across the property. In the test locations, the depth to rock ranged from between 0.7m to 1.8m below the current surface. The sandstone underlying the property is estimated to be Medium Strength or better.



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#### 8. Site Classification

The site classification in accordance with AS2870-2011 for footings supported on the underlying firm to stiff natural clay is Class S. For footings supported on Medium Strength Sandstone assume a site classification of Class A.

#### 9. Excavations Support Requirements

An excavation to a maximum depth of ~0.5m is required to lower the level of the existing garage. The excavation comes flush with the existing brick walls supporting the garage and house above.

The E and S walls will be demolished as part of the proposed works.

Given the depth to rock shown by the test results (DCP 2 & 3), the existing garage is cut into rock on the uphill side and therefore the N garage wall will not require underpinning. It is expected that the W wall is supported on rock. However, to be sure, 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 found to be supported on rock, the excavation may commence. If they are not, the wall will need to be underpinned prior to the excavation commencing.

#### 10. Foundations

The proposed garage is expected to be seated in Medium Strength Sandstone. This is a suitable foundation material. Any new foundations that may be required for the house additions are to be supported on piers taken to rock to maintain a uniform bearing material across the structure. A maximum allowable bearing pressure of 1000kPa can be assumed for footings supported on Medium Strength Sandstone.

The foundations of the existing house are currently unknown. Given the depth to rock shown by the test results (DCP 2 & 3), the existing garage is cut into rock on the uphill side and it is expected that the house is supported on rock. Footings should be founded on the same



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footing material across 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.

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 consultant on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over-excavation in clay-like shaly-rock but can be valuable in all types of geology.

# 11. Inspections

The following inspections are recommended and if geotechnical certification is desired they are a requirement.

- The geotechnical consultant is to inspect any exploration pits that may be required to expose the foundation materials of the existing W garage wall.
- 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.



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White Geotechnical Group Pty Ltd.

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Photo 1: AH1 – Downhole is from left to right.



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# 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.

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Client HAYDEN KEGG	datum	referenc	* 51	233 001DT
Drawing file PLAN OF DETAIL AND LEVELS OVER LOT 21 SEC D IN	AHD site Area 464.5m <sup>2</sup>	scale 1:100	@A1	date of survey 12/01/2021
DP 18253 KNOWN AS 34 MARY STREET, BEACON HILL	LGA NORTHERN BE	ACHES	SHE	<sup>ET</sup>   ]

THIS IS THE PLAN REP TO IN MY LETTER TATED:

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