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AG-400_101
15th May 2019

Rawson Homes Pty Ltd
C/o- Residential Engineering Pty Ltd

RE: Preliminary Site Investigation (PSI) and Waste Classification Report
Lot 14 Bubalo Street, Warriewood, NSW

This letter presents an environmental desktop associated with the geotechnical investigation undertaken at the above project.

Should you have any questions related to this report please do not hesitate to contact the undersigned.

For and on behalf of
Australian Geotechnical Pty Ltd

N. Smith
Principal

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Executive summary

This executive summary presents a synopsis of the Preliminary Site Investigation (PSI) and Waste Classification for Lot 14 Bubalo Street, Warriewood, NSW.

The object of this report is to assess current and previous site conditions in order to determine whether soil and material proposed for excavation from site during the construction phase of the project is suitable for application to land for the purposes of engineering fill, used in earthworks or disposed of at an appropriate waste facility.

Based on historical information reviewed, the potential for the site to be contaminated from on-site sources and off-site sources was considered by Australian Geotechnical Pty Ltd (AG). Based on the findings of our site inspection and site history review this office concludes the following:

- The fill soil horizon encountered across the site within the upper 500mm to 900mm can potentially contain contaminants of concern presented in section 10.0 of this report. Where material or spoil from the fill soil horizon is excavated and removed from site, a waste and material classification report will be required in accordance Part 1: Classifying Waste, Waste Classification Guidelines (2014) published by the Environment Protection Authority NSW. If the waste generator does not undertake chemical assessment of the waste, the waste must be classified as hazardous waste. Waste classified as hazardous waste cannot be disposed of in NSW and must be treated prior to disposal;

- Address data gaps presented in section 11.0 of this report, if required; and

- The natural soil horizon (not including the fill layer – up to 500mm to 900mm thick that may be contaminated with the contaminants of concern presented in section 10.0 of this report) is free from foreign material and no suspicious odours or obvious signs of contamination were observed. However, the residential subdivision is potentially affected by acid sulfate soils, therefore, review of an acid sulfate assessment must be carried out in order to classify the natural soil horizon as Virgin Excavated Natural Material (VENM).

1.0 INTRODUCTION

1.1 Overview

AG have undertaken a Preliminary Site Investigation (PSI) in-conjunction with a waste and material classification as requested by Rawson Homes Pty Ltd on behalf of Residential Engineering Pty Ltd at the site: Lot 14 Bubalo Street, Warriewood, NSW. We understand that the site is proposed for construction of a residential dwelling.

2.0 SCOPE OF WORK

This PSI has been prepared in general accordance with the following regulatory framework:

- Part 1: Classifying Waste, Waste Classification Guidelines (2014) published by the Environment Protection Authority NSW. for off-site disposal. This document classify wastes into groups that pose similar risk to the environment and human health;
- NSW Sampling Design Guidelines prepared by the Environment Protection Authority NSW;
- "The Excavated Natural Material Order 2014" prepared by the Environment Protection Authority NSW; and
- National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 2013.

The scope of works required to complete the PSI are as follows:

- Review of the current site conditions based on a site inspection, including the location of sewers, drains, spills, patches of discoloured vegetation and bare patches of soil, etc;
- Review of available information, including previous environmental and geotechnical investigations, past and current title information, aerial photographs, geological/topographical/hydrogeological data and mapping, soil landscapes, desktop search, salinity and acid sulfate mapping, EPA and council records, anecdotal evidence, site survey and site records;
- Provide a waste classification for off-site disposal;
- Recommendations for supplementary investigations or possible management strategies, should any data gaps be identified.

3.0 ASSESSMENT CRITERIA

Off-site disposal of fill, contaminated material, stockpiled soil, natural soil, rock excavated as part of the proposed development works is regulated by the Protection of the Environment Operations Act (1997) and associated regulations and guidelines including Part 1 of the Waste Classification Guidelines and the Excavated Natural Material Order 2014. Soils classified into the following categories:

- Excavated Natural Material;
- Virgin Excavated Natural Material;
- Special waste;
- Liquid waste;
- Hazardous waste;
- Restricted solid waste;
- General solid waste (putrescible); and
- General solid waste (non-putrescible).

4.0 SITE DESCRIPTION AND AESTHETICS

The subject site is approximately rectangular in shape, legally defined as Lot 14. The site is a rectangular shape land parcel measuring up to approximately 9m wide along and up to 30m deep, encompassing a total area of 270m^2.

5.0 SITE GEOLOGY AND HYDROGEOLOGY

The Soil Landscape Map of Sydney (soil Landscape Series Sheet 9130wa and 9130er, Scale 1:100,000, 2002), prepared by the Soil Conservation Service of NSW, indicates that the site is located at the border of Warriewood and Erina Soil landscape which generally comprises of *Holocene silty to peaty quartz sand. Medium to fine marine sand with podzols and the Terrigal Formation of the Narrabeen Group consisting of lithic and quartz sandstone and siltstone, minor sedimentary breccia, claystone and conglomerate (Herbert, 1983). Some sandstones are highly weathered and friable.*

A search of the NSW Department of Primary Industries Office of Water registered groundwater bores was undertaken. The search indicates three (3) sites within 500m of the site however, none of the groundwater bores indicated standing water level.

6.0 ACID SULFATE SOIL

To determine whether there is a potential for acid sulfate soils to be present at the site, reference was made to the NSW Office of Environment and Heritage (OEH), eSPADE map viewer. A review of the map indicated that the site is nearing the border of a “Low to High Probability” in regards to Acid Sulfate Soil with acid sulfate soils potentially encountered between 1m and 3m below existing surface level. The site is considered low risk with regards to acid sulfate soil, however, considering that the depth of excavation is unknown for the proposed development and sediments of recent geological age were potentially encountered at the time of writing this report, this office recommends further assessment for the presence/absence of acid sulfate soil warranted.

7.0 SALINITY MAPPING

The 1:100,000 Salinity Potential in Western Sydney Sheet indicates that the site in not affected by potential salinity issues.

8.0 SITE HISTORY

In order to ascertain the site history, a documentary review of past and present land use at the subject site and the surrounding area has been undertaken as follows.

8.1 Previous Land Use and Review of Historical Photographs

Aerial Photographs were obtained by this office from the NSW Department of Lands Office and Six Maps Viewer. The aerial photographs were reviewed to assess the likely past uses of the site with the findings summarised below;

1943 – No images available;

Current – The site appears be located within a new residential subdivision and south-east of a market gardening area. Mainly low density residential development can be seen within the immediate vicinity of the site, no obvious sources of contamination observed.

8.2 Search of Contaminated Land Management Register (NSW EPA)

A summary of the contaminated land register for the area can be found. No notices have been issued to the subject site. Furthermore, the listed sites on the register are situated at such a distance (greater than 200m), that they are not believed to have provided a potential contamination risk to the subject property.

8.3 Search of Protection of the Environment Operations Public Register (POEO) of Licensed and Delicensed Premises

A search of the POEO public register of licensed and delicensed premises (DECC) indicated that no licensed or delicensed premises within the immediate surrounding area of the site (within 200m).

8.4 Work Cover NSW Records

At the time of reporting, this office had not been given authorisation to request a search of the Stored Chemical Information Database (SCID) for licenses to keep dangerous goods at the site from Work Cover NSW.

8.5 Product Spill & Loss History

No external information was provided for any product spill and loss. However, based on the site inspection, no major signs chemical staining were observed.

8.6 Section 149 Certificates

At the time of reporting, this office could not access The Planning Certificate – Section 149 of the Environmental Planning & Assessment Act 1979.

9.0 SITE CONDITION AND SURROUNDING ENVIRONMENT

A site investigation was conducted on 1st May 2019 by a representative from Residential Engineering Pty Ltd. The field observations and borehole logs are summarized below and in sections 9.1 and 9.2.

Table 1 – Summary of Field Observations

Parameter	Observation
Presence of fill	500mm to 900mm of fill material observed.
Asbestos	Not visually evident within upper soil horizon.

9.1 Borehole Log Summary

Borehole logs revealed the following subsurface conditions;

- Between 0 – 900mm; FILL; Silty Gravelly Clayey Sand, some Gravel (crushed sandstone), brown mottled white, moist and hard.

- Between 500mm – 1800mm; NATURAL, Silty Clayey Sand, pale brown, moist, dense.

9.2 Steps 1 – 4 of the Waste Classification Guidelines Part 1: Classifying Waste

The waste classification guidelines outline steps to determine which of the aforementioned classifications in section 3.0 of this report, applies to the waste being assessed.

Table 2 - Review of Steps 1 – 4 of the Waste Classification Guidelines (2014).

Parameter	Observation
Step 1 – Is the waste special waste?	No.
Step 2 – Is the waste liquid waste?	No.
Step 3 – Is the waste pre-classified?	No. fill material cannot be pre-classified. Move to step 5 of the Waste Classification Guidelines Part 1: Classifying Waste (2014): Determining a waste's classification using chemical assessment.
Step 4 – Does the waste possess hazardous characteristics?	No.
Can the natural soil horizon be classified has Virgin Excavated Natural Material	No. Acid sulfate soil and sulfidic ores may be present on-site below existing surface levels.

10.0 AREAS OF ENVIRONMENTAL CONCERN

Based on historical information reviewed, the site has always been utilised for residential purposes. The potential for the site to be contaminated from on-site sources and off-site sources was considered by AG. Based on the findings of our site inspection and site history review actual or potential contamination sources were identified as low. Based on the site inspection, site history, previous reporting and review of available information from the desktop study, the potential Areas of Environmental Concern (AEC) and their associated Contaminants of Concern (CoCs) for the site were identified. These are summarised in the conceptual site model in table 3 below;

Table 3 – Contaminants of Concern

Potential AEC	Potentially contaminating activity	Likelihood of Site Impact	Potential CoCs	Comments
Entire site within upper 500mm to 900mm soil horizon	Importation of fill material from unknown origin	Low	Metals, TPH, BTEX, PAH, OCP, OPP, PCB, Phenols, Asbestos	Based on observations and site topography, the presence of imported fill material is likely have been placed and compacted during the earthworks phase of the subdivision
Entire Site	Acid Sulfate Soil	Low	Acid Sulfate Soil	The site is within a Class 5 acid sulfate area which is considered low risk of acid sulfate soil. However, considering that the depth of excavation is unknown for the proposed development and sediments of recent geological age were potentially encountered at the time of writing this report, this office recommends further assessment for the presence/absence of acid sulfate soil warranted.

11.0 DATA GAPS

Based on the CoCs derived for the site, the following data gaps were identified, which may be considered to warrant closure by further limited investigation:

- Whether the upper fill soil horizon contains the contaminants of concern presented in section 10.0 of this report;

- The site in an area of low to high probability with regards to acid sulfate soil, an acid sulfate and/or desktop assessment report is recommended to assess the potential environmental impact of the proposed work planned for the site. Further, an assessment should also be made with regards to aggressiveness or erosion potential of the environment and the impact to building materials. Particularly concrete and steel which is dependent on the levels of pH and types of salts present in order to determine the degree of aggressiveness.

12.0 CONCLUSION AND RECOMMENDATIONS

- The fill soil horizon encountered across the site within the upper 500mm to 900mm can potentially contain contaminants of concern presented in section 10.0 of this report. Where material or spoil from the fill soil horizon is excavated and removed from site, a waste and material classification report will be required in accordance Part 1: Classifying Waste, Waste Classification Guidelines (2014) published by the Environment Protection Authority NSW. If the waste generator does not undertake chemical assessment of the waste, the waste must be classified as hazardous waste. Waste classified as hazardous waste cannot be disposed of in NSW and must be treated prior to disposal;

- Address data gaps presented in section 11.0 of this report, if required; and

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13.0 STATEMENT OF LIMITATIONS

The adopted investigation scope was limited at the time of our investigation and by the investigation intent.

Your attention is drawn to the document “Limitations”, which is included in Appendix B of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Australian Geotechnical Pty Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

References

- Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites. NSW Environment Protection Authority (EPA) 2011;
- Part 1: Classifying Waste, Waste Classification Guidelines (2014) published by the Environment Protection Authority NSW. for off-site disposal. This document classify wastes into groups that pose similar risk to the environment and human health;
- NSW Sampling Design Guidelines prepared by the Environment Protection Authority NSW;
- "The Excavated Natural Material Order 2014" prepared by the Environment Protection Authority NSW;
- Contaminated Sites – Sampling Design Guidelines. NSW Environment Protection Authority (EPA) 1995;
- National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 2013;
- The 1:250,000 scale Geological Series Map of the Sydney;
- SIX Maps Viewer;
- NSW Office of Environment and Heritage (OEH), eSPADE map viewer; and
- Protection of the Environment Operations Act (1997)

APPENDIX A

SUPPORTING DOCUMENTATION

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SOIL CLASSIFICATION REPORT

Client:	**RAWSON HOMES**	**Job No:**	46721
Site Address:	Lot 14 Bubalo Street, Warriewood. NSW	**Client Job No:**	RW5172
		Date of Report:	01-May-2019

Site Photo

Site Classification	Soil Classification	Wind Classification:
P	M	W28N/N1

Allowable Bearing Capacity

	Load	Depth
BH1	50kPa	0mm
	100kPa	0mm
	150kPa	0mm
	250kPa	N/A

	Load	Depth
BH2	50kPa	0mm
	100kPa	100mm
	150kPa	100mm
	250kPa	500mm

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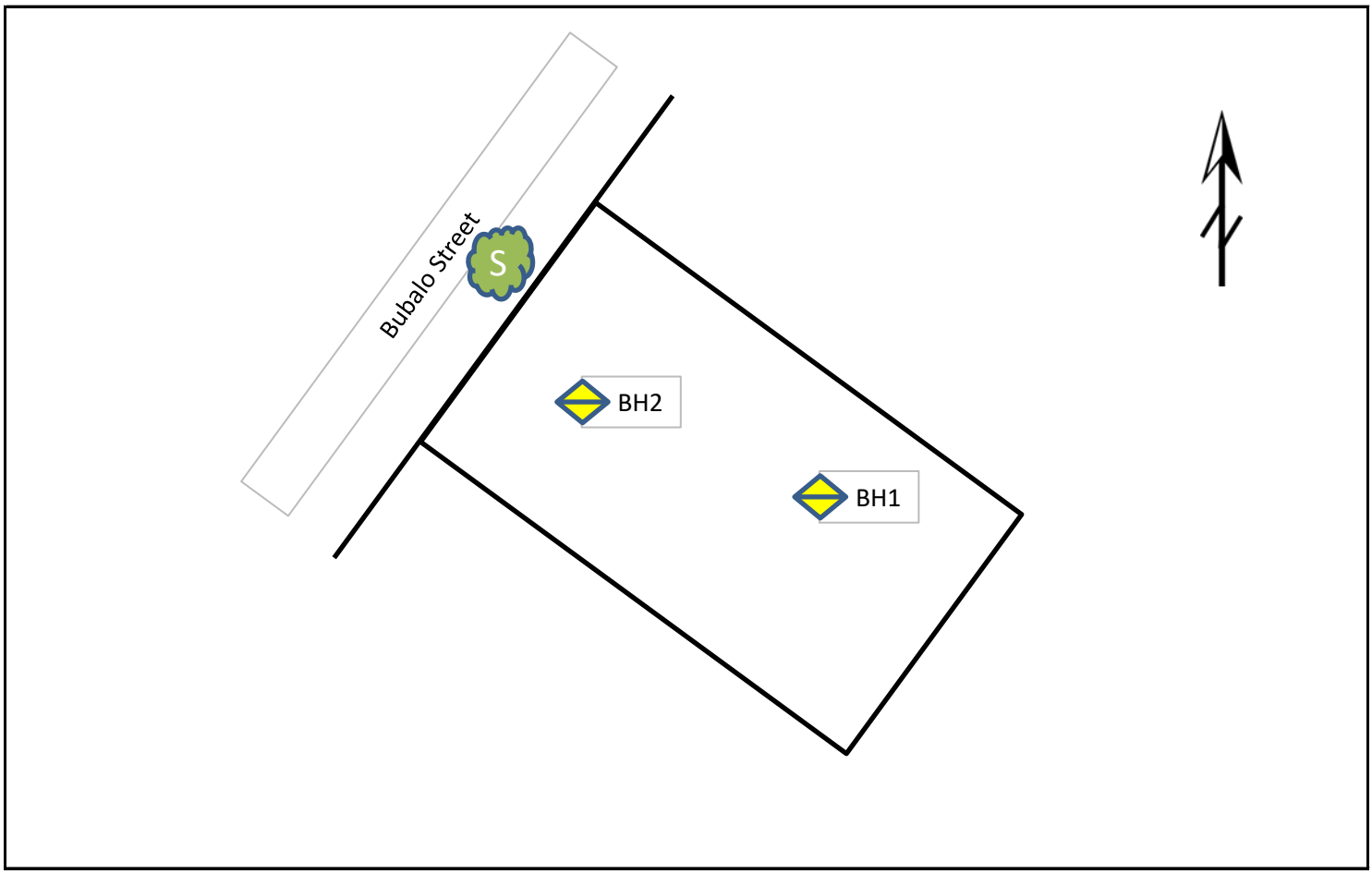
1. P-CLASS INDICATORS

1.1	Soft & Collapsing Soil:	No	
1.2	Trees Onsite:	Yes	Notes: **An immature tree on the footpath**
1.3	Boulders In Fill Present:	No	
1.4	Fill Containing Wood, Metal, Plastic or other Harmful Materials:	No	
1.5	Deep Fill (Over 400mm):	Yes	
1.6	Knockdown / Rebuild	No	

2. OTHER CONDITIONS PRESENT

2.1	Rock Within 1 metre of the Surface:	No
2.2	Marine Environment:	Within 1km
2.3	Water Table/Purged Water Table Encountered	No

TESTING LOCATION



BORE LOGS/BEARING

BH1

Depth (m)	DCP	Soil Profile
0.1	9	Fill. Silty Clayey Gravelly Sand (SM)
	15	Grey mottled brown,Moist-dry,Dense-very dense
	18	
	12	
0.5	15	
	23	
	25	Grades brown mottled orange grey
	39	
	36	
1.0	7	Natural. Silty Sand (SM)
	7	Grey mottled brown,Moist-dry,Medium dense-dense
	7	
	5	
	9	
1.5	6	
		End Bore 1.5m
2.0		
2.5		
3.0		
3.5		
4.0		
4.5		
5.0		
5.5		
6.0		

BH2

Depth (m)	DCP	Soil Profile
0.1	2	Fill. Clayey Silty Gravelly Sand (SC)
	9	Grey mottled brown,Moist,Loose-medium dense
	7	
	4	
0.5	6	
	18	Natural. Silty Sand (SM)
	23	Light grey,Dry,Very dense
	22	
	22	
1.0	23	Grades brown mottled orange
	17	Becomes moist-dry
	11	Clayey Sand (SC)
	12	Grey,Moist,Dense
	11	
1.5	10	
		End Bore 1.5m
2.0		
2.5		
3.0		
3.5		
4.0		
4.5		
5.0		
5.5		
6.0		

SAND			SILTS & CLAY		
Density Term	**Density Index (%)**	**Approx. DCP Blow Count**	**Consistency Term**	**Undrained Shear Strength (kPa)**	**Approx. DCP Blow Count**
Very Loose	<15	< 1	Very Soft	0 - 12	< 1
Loose	15 - 35	1 - 3	Soft	12 - 25	1 - 2
Medium Dense	35 - 65	3 - 9	Firm	25 - 50	2 - 3
Dense	65 - 85	9 - 15	Stiff	50 - 100	3 - 5
Very Dense	> 85	> 15	Very Stiff	100 - 200	5 - 8
			Hard	> 200	> 8

Note: DCP = Dynamic Cone Penetrometer blow counts (blows/100mm);UTP = Unable to penetrate.

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PURPOSE

This report is based on our field and laboratory test results and site construction information (if any) supplied to us by the client. Should any proposed construction vary from those advised, this office should be notified as we may need to undertake additional soil testing. It should also be noted that the test results may not be relevant if the location of a proposed structure varies from that originally advised.

This report relates to the ground conditions on the property at the time of the site investigation. If so advised by the client, this report has considered the proposed site preparation. If unadvised cutting or filling is proposed or carried out, additional testing may be required to reclassify the site as indicated in Clause 2.3.2 (B) and Clause 2.5.3 of AS2870-2011.

This site has been classified in accordance with Section 2 of AS2870-2011. The characteristic surface movement, ys, has been determined either by shrink and swell tests as specified in AS1289.7.1.1-1992 in accordance with Clause 2.3.2 (i) of AS2870-2011, or by visual-tactile identification of the soil with assistance of Atterberg Limits in accordance with Clause 2.3.2 (iii) of AS2870-2011. Results of our site investigation are indicated in the attached Soil Test Results Page.

SITE CLASSIFICATIONS

(in accordance with Clause 2.1.1, Clause 2.1.3, Table 2.1 and Table 2.3 of AS2870-2011)

A Most sand and rock sites with little or no ground movement from moisture changes.

S Slightly reactive clay sites, which may experience only slight ground movement from moisture changes. Estimated characteristic surface movement, 0 < ys < 20mm.

M Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes, 20 < ys < 40mm.

H1 Highly reactive clay sites, which may experience high ground movement from moisture changes, 40 < ys < 60 mm.

H2 Highly reactive clay sites, which may experience very high ground movement from moisture changes, 60 < ys < 75 mm.

E Extremely reactive sites, which may experience extreme ground movement from moisture changes, ys > 75 mm.

P Problem sites, due to either: low bearing strength, potential excessive foundation settlement, fill, mine subsidence, landslip, collapse activity, coastal erosion, abnormal moisture changes or sites which cannot be classified otherwise.

For sites with deep-seated moisture changes characteristic of dry climates and corresponding to a designed depth of suction change, Hs, equal to or greater than 3.0m, classifications M, H1, H2 and E shall include the suffix ‘D’, as appropriate (eg H1-D).

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CONTROLLED AND CERTIFIED FILL – AS2870-2011

If our site investigation indicates that fill is present on site, and we have been provided with documentation from the **COMPANY**, reference **REFERENCE**, dated **DATE**, certifying that this fill has been "controlled" to requirements of the specification and AS2870-2011 with Level 1 supervision in accordance with AS3798-2007. Based upon this we would be able to reclassified the site from Class P in accordance with Clause 2.5.3 (c) of AS28702-11.

UNCONTROLLED FILL

If the investigation indicates that "uncontrolled" fill is present on this site. Any construction on such fill shall be founded in suitable material beneath.

The site shall be given a **P** classification in accordance with Clause 2.5.3 (b) of AS2870-2011.

BEARING CAPACITY

The site shall be given a P classification in accordance with Clause 2.1.3 (a) and Clause 2.4.5 of AS2870-2011, if our investigation indicates that the founding soils have a bearing capacity of less than 50kPa, which is the minimum to support a residential slab on ground.

SUB-SOIL SEEPAGE OR WATER TABLE

When Sub-soil seepage is encountered in the boreholes at the time of testing. Problems with footing constructions including softening of footing bases and potential collapse of piers is possible. Provisions should be made for fluctuations in the water table and sub-soil seepage entering foundations during constructions.

INFLUENCE OF TREES

Trees onsite or on adjoining sites will be given a **P** classification in accordance with Clause 1.3.3, Clause 2.1.3(e), Appendix H and Appendix CH of AS2870-2011. Trees remove moisture from the soil and result in abnormal moisture conditions occurring on site. On removal of these trees, or if they remain in place, damage to a proposed building may occur without additional treatment.

The design engineer is to be informed of the proposed work in order to provide an appropriate design to address the influence of the trees. This may include one of the following:

1) Provisions of piers and stiffening the footing system.
2) Provision of a root barrier system acceptable to the design engineer.
3) Stiffening the entire slab and footing system to take into consideration the total yt = (ys+ yt / 0.7).
4) Provision of piers with a suspended slab solution.

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INFLUENCE OF PREVIOUS TREES

When recent tree removal is present on this site as indicated by a research of the estate or aerial photographs. The effect of the tree removal can have an affect on the performance the foundation material due to abnormal moisture conditions will be given a P classification in accordance with Clause 1.3.3 of AS2870-2011. It is recommended the design engineer confirms the time frame and location of the tree removal to determine the effect on the footing and slab design.

HOUSE REMOVAL

The removal of the slab and footings or any structure may result in an affect on the moisture condition of the foundation material. The designer is to take into consideration the effect of possible abnormal moisture conditions in accordance with Clause 1.3.3 of AS2870-2011.

DISCLAIMER

This report has been prepared on the behalf of and for the exclusive use of the client stated on page 1.

Residential Engineering accepts no liability or responsibility what so ever for the use of this report by any third party.

The purpose of this document is specifically to provide a site classification suitable to be used for residential structures only. Any preliminary recommendations are based upon the site investigation and site classification only. This is to enable the design engineers to determine their own professional opinion for the final design of the product.

LIMITS OF OUR INVESTIGATION

The recommendations made in this report are based on the assumption that the test results are representative of the overall subsurface conditions. Should excavations reveal variations from the soil conditions indicated in this report, our office should be notified before proceeding as the site classification may need revising and modifications to the design may be required. Also, should we be provided with additional information that affects the site classification, after the report has been issued, an additional fee may be charged to revise and reissue our report.

For and on behalf of
RESIDENTIAL ENGINEERING

Gervase Purich
FIEAust. CPEng, NER, BPB, RBP, RPEQ,

APPENDIX B

LIMITATIONS

It should be noted that these materials were visually inspected and no laboratory analysis was conducted. If materials or conditions are encountered other than those that have been described, further assessment will be required. At the time of our inspection, no information was given on the acceptance criteria or chemical testing requirements at the recipient site. If this information becomes available, we can review this and organise the appropriate testing required at your request.

Australian Geotechnical Pty Ltd (AG) has prepared this report for Rawson Homes Pty Ltd The report is provided for the exclusive use of Rawson Homes Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of AG, does so entirely at its own risk and without recourse to AG for any loss or damage. In preparing this report AG has necessarily relied upon information provided by the client and/or their agents.

AG's contamination assessment is necessarily based on the result of a desktop site historical search and site inspection only and did not include surface or subsurface sample screening and/or chemical testing. AG's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by AG in this report may be affected by undetected variations in ground conditions across the site. It is noted that this assessment does not constitute a hazardous material building assessment. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. AG cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report. This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by AG. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of AG. AG may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to AG. Any such risk assessment would, however, be necessarily restricted to the environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.