ENGINEERING REPORT

M DAVIS & Z GILSON
PORT UNDERWOOD

Our Ref: 25544
Date: April 2014

davidson group
PROJECT PLANNERS
RESOURCE MANAGERS
CIVIL & STRUCTURAL ENGINEERS
BUILDING DESIGNERS
ENVIRONMENTAL ENGINEERS

Our Ref: 25544

11 April 2014

ENGINEERING REPORT FOR M DAVIS & Z GILSON

LOCATION DETAILS: Port Underwood

LEGAL DESCRIPTION: Lot 1 DP 8003

DATE OF SITE VISIT: 21 March 2014

ZONING: Rural One Zone (Marlborough Sounds Resource Management Plan)

CONTENTS

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A SYNOPSIS

A1 Scope of the Investigation

The property is presently undeveloped except for some tracking from the foreshore which was carried out some years ago.

We have been engaged to investigate and confirm a house site on this property free from instability, an area suitable for the land application of treated wastewater, water supply, access and provide general development guidelines.

A2 Summary and Conclusions

A2.1 Stability

The steep side slopes have signs of instability but the building envelope identified has a Low risk low risk of instability.

A2.2 Building Foundations

Founding depths are at least 1 m depth and the site will suit pole type foundations.

A2.3 Earthworks

Excavations should generally be discouraged due to the steep side slopes and/or uncompacted colluvium material. However, if carried out, they should be retained over 1.5 m height.

A2.4 Stormwater Control

Stormwater from the road culvert above, the new access way and the roof and/or water storage tank overflow should not be discharged over the slopes. It should be collected and discharged to the sea in a controlled manner to reduce the risk of initiating slope instability.

A2. 5 Wastewater Management

A suitable land application area is available to the south of the proposed building site. The best practicable option for on-site wastewater management is considered to be drip irrigation.

A2.6 Access

Vehicle access can be constructed at grades and side cuts which comply with current Permitted Activity rules.

Steep side slopes will have to be traversed to achieve acceptable grades and significant earthworks will be required. Good stormwater control will be required.

A2.7 Vegetation Clearance

Vegetation clearance should be limited to that required for access and construction purposes only. Maintenance of vegetative cover and additional planting of the slopes around the building site with suitable species is recommended.

A2.8 Water Supply

Rainfall in this area is considered sufficient for the use of a roof water supply if adequate storage and water saving devices are used.

A3 Recommendations

The building site shown on the plans is suitable for house construction provided that:

(a) A pole type foundation is constructed. It shall be designed by a Chartered Professional Engineer who shall also certify foundation depths before placement of poles.

(b) Water from the road culvert above, the new access way, the roof and storage overflow be collected and piped to the foreshore.

(c) The wastewater system is reviewed at Building Consent stage to take account of the loading from the proposed development and current methods and guidelines, using the site characteristics and design data described in this Wastewater Management Report.

B REPORT

B1 Introduction

Our investigation to confirm a suitable house site on this property included;

- a general visual inspection;
- geomorphological walkover;
- penetrometer tests;
- test pits and/or geological logging of outcrops where available;
- assessment of wastewater management including potential effects on the stability of the site;
- inspection of aerial photographs and
- site survey work

B2 Site Description

The property (Lot 1 DP 8003) is located in Port Underwood, just north of Tumbledown Bay. It is approximately 1.1 Ha in size and comprises of a gully and steep side slopes. The slopes are covered in regenerating native bush.

Tumbledown Bay Road traverses around the eastern boundary.

View looking east towards the site

B3 Geotechnical Investigations

The Marlborough Sounds Resource Management Plan indicates that the site is not in a Natural Hazards Zone for instability.

The Institute of Geological & Nuclear Sciences, Map 10, describes the underlying rock in this area as Marlborough Schist, consisting of weakly metamorphosed, undifferentiated well bedded grey/green sandstone/siltstone dipping 60 - 70° to the south east.

A cutting in the road above the property shows weathered schist/sandstone dipping at about 35° to the south east.

A significant amount of side cast material from the construction of the road has been placed on the steep (~40°) side slopes on the property, some of which has slumped. Also, debris from failures in the cut batters has been disposed onto the site.

A road culvert presently discharges to the centre of the site and meanders its way to the sea.

The slopes to the north are very steep and consist of a series of gully and narrow ridge features. The gully heads show historic instability with debris runout into the valley floor.

The proposed site for the dwelling is on a moderate, west facing slope just back from the Sounds Foreshore Reserve. There is some side cast material from the formation of the track from the foreshore but there are no signs of instability.

The ground rises steeply to the south of the building site to Tumbledown Bay Road and there has been historic instability on this face. However, there were no signs of debris runout onto the proposed building site.

Six scala penetrometer tests (P1-P6) were undertaken from the foreshore reserve, through the building site and up through the formed flat area above.

- P1, at the back of the flat area, showed soft and variable material to about 1.5 m and firm to hard to 3 m.
- P2, in the sidecast from the flat area, confirmed very soft to about 2 m and weak to firm to 3.4 m.
- P3 confirms soft and variable material to about 1.5 m and firm to 3 m.
- P4 was soft to 700 mm and firm to 3 m.
- P5 was firm from 200 mm to 3 m and
- P6 was soft and variable material to about 800 mm and firm to 3 m.

Bedrock was not found at the test depths (3 m).

A moderate sloping terrace (22°) on the southern face to Tumbledown Bay Road was inspected for potential use as a land application area for treated wastewater. The area is well vegetated and shows no sign of instability. However, where it steepens to the formed flat area below, a tension cracks and significant movement was found.

B4 Geotechnical Assessment

B4.1 Stability

The site is typical of a colluvium filled gully from slip material on steep side slopes which has accumulated over a long time.

The steep side slopes do show signs of instability but there were no signs on the proposed building site identified.

However, there is potential for further slippage on the steep slopes rising to the north, east and south and a 'no build' margin from the toe of these slopes should be allowed to mitigate against the possibility of reactivation of these faces as follows;

- Northern and southern slopes, 5 m
- Eastern slope, 10 m.

We consider that the building site proposed is sound and has a Low Risk from future instability as defined in Council's "Geotechnical Risk Matrix " (refer appendix).

B4.2 Building Foundations

A suitable building envelope has been identified and is shown on the drawings. The site and the soft soils will suit pole type foundations designed by a Chartered Professional Engineer and founded at 1.0 - 1.5 m below ground level (at least 2 blows/50 mm from the scala results). The founding depths should be confirmed by a Chartered Professional Engineer.

B4.3 Earthworks

Excavations into the steep side slopes, apart from what is necessary for the construction of the access, should be discouraged due to the possibility of activating a slip.

Cuts over 1.5 m in height around any dwelling will be in uncompacted moist to wet colluvium material and must be retained by a wall designed and supervised by a suitably qualified Chartered Professional Engineer. However, we recommend that cuts or benching be minimised.

B4.4 Stormwater Control

The stormwater from the road culvert above should be better captured and discharged in a controlled manner, probably through the access way water tables and culverts and open ditches, past the building site to the sea.

Suitable secondary overflow paths, activated when culverts or water tables are blocked by debris, should also be in place to safely direct flows past buildings.

The road culvert may be able to be repositioned further south to a more suitable discharge location but this will require the permission of both Marlborough Roads, a private landowner and possibly also DOC.

The stormwater from the roof or water storage tank overflows should also be collected and piped directly to the foreshore. In no circumstances should a concentrated discharge be allowed over the side slopes. This could increase the risk of a shallow slide.

B4.5 Wastewater Land Application Area

The proposed land application area shows no signs of instability but there is instability on the steeper downhill slope.

Land application methods shall therefore be restricted to low-rate drip irrigation.

B4.6 Access

No vehicle access is available onto the property from Tumbledown Bay Road.

Vehicle access to the site can be formed to Marlborough District Council standards. The excavations will be reasonably significant and will involve sidling cuts across steep faces. Cuts are expected to be in side cast material overlying weathered schist.

Some dropouts / small slips can be expected over the first two to three winters and will require maintenance but they are expected to stand well in the long term.

It will be important to ensure that a well designed stormwater runoff, collection and disposal system is put in place to ensure that runoff is not indiscriminately directed to side slopes or potentially unstable areas.

B4.7 Vegetation Clearance

The maintenance of vegetation is not considered essential for long term stability of the building site identified. However, we consider it prudent to limit vegetation clearance on the steep side slopes to benefit from the assistance that vegetation provides to the stability of surface soils and control of soil moisture.

B5 Wastewater Assessment

An investigation was carried out in accordance with AS/NZS 1547:2000 "On-Site Domestic Wastewater Management" and the Marlborough District Council "Guidelines for New On-Site Wastewater Management Systems". A Wastewater Management Report has been prepared separately.

The report recommends drip irrigation to a land application area on a moderate sloping terrace on the southern area of the property.

B6 Water Supply

The annual rainfall in this area is about of 1200mm and is considered marginal for a roof water supply. We recommend at least 30,000 litres of storage and low water use fixtures.

B7 Access

Vehicle access can be constructed to the building site at grades which comply with current Council rules.

It is proposed to exit Tumbledown Bay Road at the southern side of the property. This will require cutting into the uphill side of Tumbledown Bay Road to create both an adequate turning radius and win fill to form the transition onto the property. This will require permission from Marlborough Roads.

Cuts 5 – 6 m high will be required, much of which can be side casted where it is not uphill of buildings, stormwater ditches or access ways.

Stormwater controls, as described in B4.4 above, will be essential, especially an allowance for secondary overflow paths as a result of sudden events of minimal maintenance, due to intermittent occupation.

B8 Resource Consent Issues

A Resource Consent will be required for the following building activities:

- Earthworks
- Driveways
- Wastewater
- Side yard encroachment

B9 Disclaimer

B9.1 This report has been prepared solely for the benefit of you as our client and the relevant Local Authority with respect to the particular brief given to us, and data or opinions contained in it may not be used in other contexts or for any other purpose without our prior review and agreement.

B9.2 This disclaimer shall apply notwithstanding that the report may be made available to any other person in connection with any application for permission or approval, or pursuant to any requirement of law.

This report is based on conditions presently found on site and is consistent with standards currently being applied.

B10 References

Marlborough District Council 'Marlborough Sounds Resource Management Plan'.

Rainfall Contours (Isohyets) for Marlborough Sounds – Source Unknown.

Institute of Geological & Nuclear Science, Geological Map 10, 'Geology of the Wellington Area' by M R Johnston and J G Begg

NZ Geotechnical Society Inc, Dec 2005, 'Field Description of Soil and Rock'.

Davidson Group Ltd April 2014 'Wastewater Management Report for M Davis and Z Gilson'

DAVIDSON GROUP LTD

W L McGlynn

LM:LW

C APPENDIX

C1. Professional Opinion

C2. Geotechnical Risk Matrix

C3. Scala Penetrometer Tests

C4. Plan 25544 sheets;

C1 'A' Locality and Site Plans
C2 'A' Section

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Our Ref: 25544

11 April 2014

STATEMENT OF PROFESSIONAL
OPINION AS TO LAND STABILITY

DESCRIPTION: **Lot 1 DP 8003, Port Underwood**

FOR: **M Davis and Z Gilson**

I, **William Leigh McGlynn,** of Davidson Group Ltd, P O Box 256, Blenheim,

hereby confirm that:

1. I am experienced in the field of soils engineering and more particularly land and foundation stability and am formally recognised by the Marlborough District Council. I am familiar with and understand the purpose of the Marlborough District Council's geotechnical reporting standards. This professional opinion is furnished to the Marlborough District Council alone, on the express condition that it will not be communicated to or be relied upon by any other person. It is based on conditions presently found on site and is consistent with standards currently being applied.

2. Site investigations have been carried out under my direction and are described in our site investigation report dated , 11 April 2014 attached. The following professional opinion is based on the assumption that the data obtained from these investigations is representative of the whole area under consideration. In my professional opinion having examined the site it is reasonable for Council to assume that the data referred to above is representative of the whole area under consideration.

3. Detailed residential building and engineering drawings and specifications have yet to be prepared for this site.

4. In my professional opinion, not to be construed as a guarantee, and having regard to the specifics of the site which I have investigated to the extent that acceptable engineering practices require giving due regard to acceptable engineering principles and practices for land and foundation stability then the site shown on the plans is suitable for the a dwelling, providing that the following recommendations described in our accompanying report (Engineering Report for M Davis and Z Gilson) are adhered to:

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(a) A pole type foundation is constructed. It shall be designed by a Chartered Professional Engineer who shall also certify foundation depths before placement of poles.

(b) Water from the road culvert above, the new access way, the roof and storage overflow be collected and piped to the foreshore.

5. This professional opinion shall remain current for a maximum of two years.

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W L McGlynn
LM:LW

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GEOTECHNICAL RISK MATRIX

(ex MDC "Geotechnical Reporting Requirements 2005")

Likelihood \ Consequence		No risk to life, minor financial loss (<$5k). Potential for small-scale instability only.	No risk to life, minor financial loss (<$50k). Potential for small-scale instability only.	Very low risk to life, moderate damage and financial loss (<$150k). Potential for moderate scale instability.	Low risk for loss of life, significant damage and financial loss (<$500k). Potential for large-scale instability.	High risk for loss of life, extensive and significant damage and financial loss (>$500k). Potential for large-scale instability.
Almost Certain	Extensive evidence of active creep and active instability. Steep Slope.	M	H	H	E	E
Likely	Evidence of active creep and/or historic instability. Steep to Moderate Slopes.	M	M	H	H	E
Moderate	Evidence of historic soil creep and/or historic instability. Steep to Moderate Slopes.	L	M	M	H	H
Unlikely	No evidence of soil creep or historic instability, but evidence of instability on similar slopes. Moderate Slopes.	L	L	L	M	H

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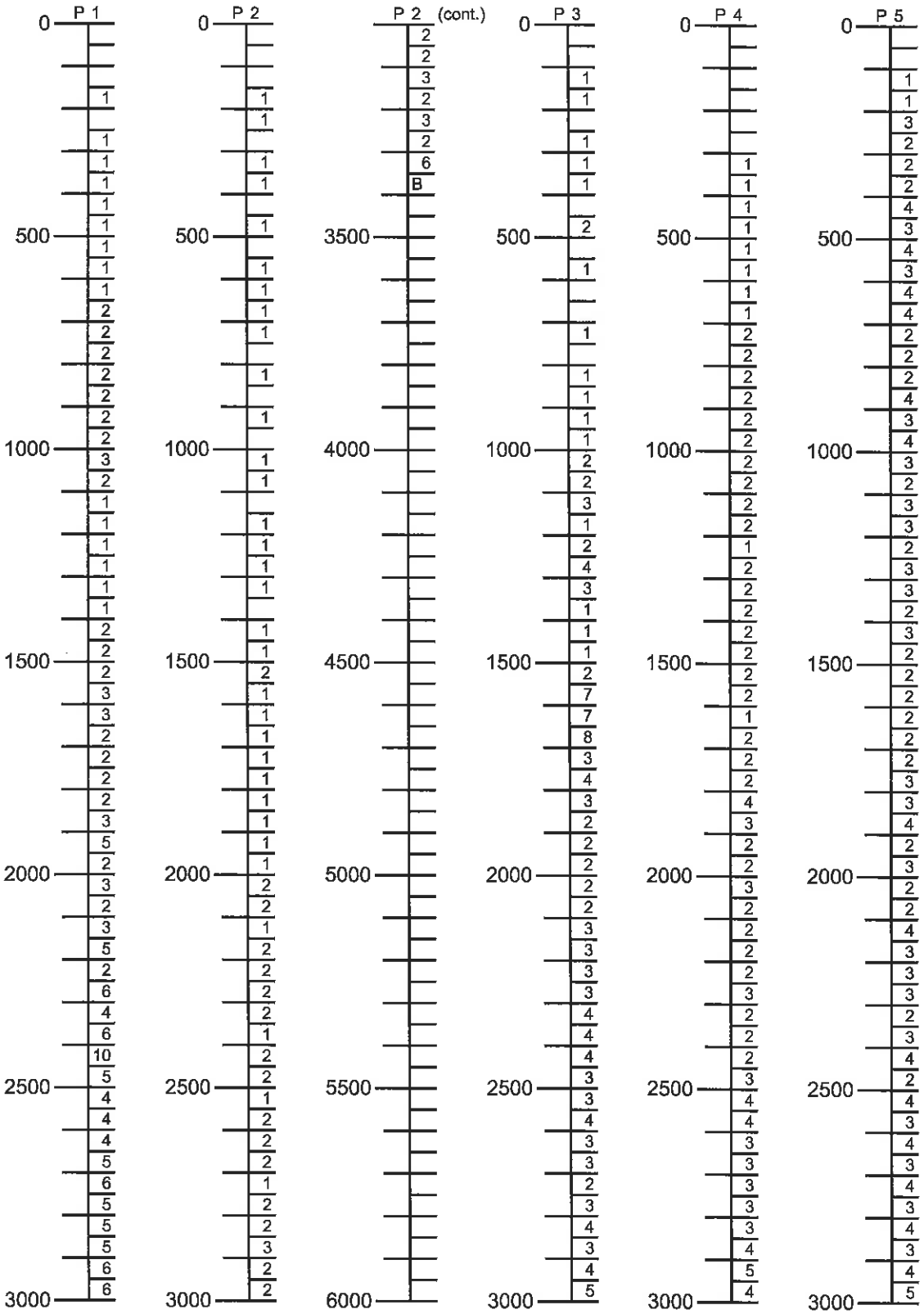
scala penetrometer results

Job No 25544
Sheet No 1
Name M.S/W.H
Date 21/03/14



PENETRATION IN BLOWS PER 50mm

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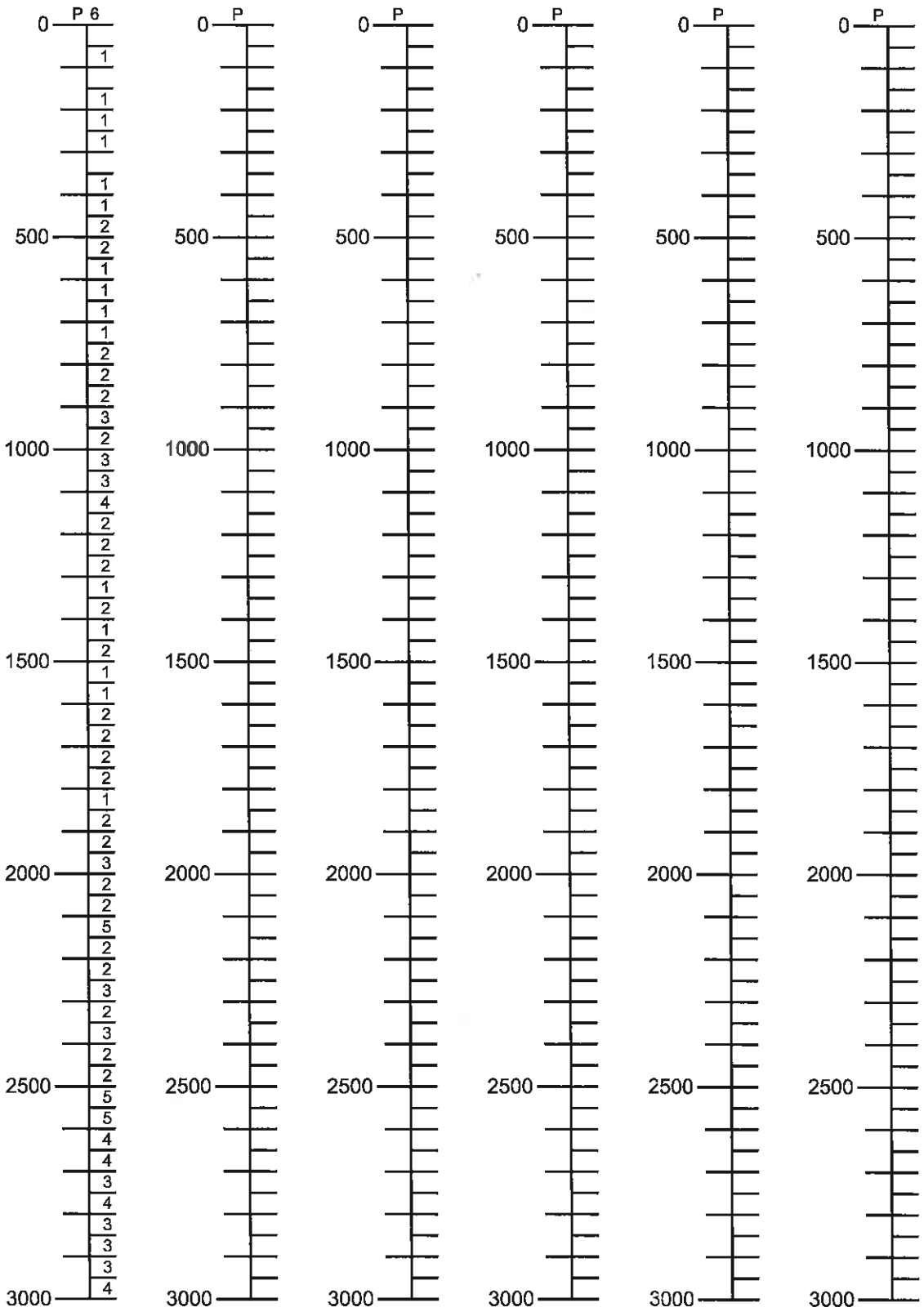
scala penetrometer results

Job No 25544
Sheet No 2
Name M.S/W.H
Date 21/03/14



PENETRATION IN BLOWS PER 50mm