



**Douglas Partners**  
Geotechnics | Environment | Groundwater

Report on  
Geotechnical Investigation

Proposed Residential Subdivision  
32 Lovelle Street and 141 Yarrowa Road,  
Moss Vale

Prepared for  
Prime Moss Vale Pty Ltd

Project 40494.03  
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Integrated Practical Solutions



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## Table of Contents

	Page
1. Introduction.....	1
2. Background .....	1
3. Site Description .....	2
4. Regional Geology.....	2
5. Field Work Methods .....	4
6. Field Work Results .....	4
6.1 General .....	4
6.2 Geological Mapping .....	4
6.3 Subsurface Investigation .....	5
7. Groundwater .....	5
8. Laboratory Testing .....	6
9. Proposed Development.....	6
10. Comments .....	8
10.1 General .....	8
10.2 Geotechnical Site Model .....	8
10.3 Excavation Conditions .....	8
10.4 Excavation Equipment .....	9
10.5 Construction Related Vibration .....	10
11. Summary .....	12
12. References .....	12
13. Limitations .....	13
 Appendix A: About This Report	
Appendix B: Drawings 1 – 5	
Results of Current Field Work (Bores 101 – 124 and Pits 125 – 132)	
Results of Previous Field Work (Pits 1 – 26)	
Photos 1 – 16 (Plates 1 – 5)	

## **Report on Geotechnical Investigation**

### **Proposed Residential Subdivision**

### **32 Lovelle Street and 141 Yarrawa Road, Moss Vale**

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## **1. Introduction**

This report presents the results of a rock depth and rock quality assessment undertaken for a proposed residential subdivision at 32 Lovelle Street (Chelsea Gardens) and 141 Yarrawa Road (Coomungie), Moss Vale. The investigation was commissioned in an email dated 14 October 2019 by Prime Moss Vale Pty Ltd, the project developer, and was undertaken in accordance with Douglas Partners' Pty Ltd (DP) proposal WOL190315.P.001.Rev1 dated 4 October 2019.

Geotechnical investigation was carried out to determine the subsurface conditions at locations nominated by Orion Consulting Engineers Pty Ltd (OC) to provide information on the depth and strength of the bedrock for an assessment of excavatability for proposed bulk earthworks modelling. The field work included the drilling of eighteen cored boreholes followed by laboratory testing, engineering analysis and reporting. Details of the work undertaken and the results obtained are given in the report, together with comments relating to the above items, development potential and construction practice.

The investigation was undertaken concurrently with a stability assessment for the steep hillside in the northern part of the site, and a preliminary assessment of erosion and salinity potential. Both of these have been reported separately (Project 40494.03.R.001 and Project 40494.03.R.003 respectively).

Preliminary information on the field work was provided in a Memorandum C.001.Rev0 dated 4 December 2019. This report supersedes all previous written correspondence and verbal advice.

A draft report was provided dated 16 January 2020. This report supersedes all previous written correspondence and verbal advice.

## **2. Background**

In 2018 DP carried out a preliminary geotechnical investigation (DP, 2018) at the site for the same project. The field work included 26 test pits and geotechnical mapping by an experienced engineering geologist. In summary, the report included preliminary comment on site preparation, excavation and filling including the re-use of excavated materials and the treatment of farm dams, soil and water management planning and sediment basins.

Information provided by the client for the current assessment included:

- Orion Consulting '*Bulk Earth Works Strategy*', Project 19-34 Plans 000, 200 – 2023, 300 – 313, 401 and 501 – 508 Revision 1 dated 13 September 2019.



Information previously provided by the client included:

- Harvest Scientific Services (HSS) 'Soil, Groundwater, Agricultural Capability, Geotechnical Classification, Mineral Potential and Preliminary Contamination Report for the Proposed "Chelsea Gardens Development Site"', Job Reference 200677 dated 11 October 2006;

Relevant information from the DP's 2018 report, HSS's 2006 report and plans was used in the current assessment.

### 3. Site Description

The site comprises Lot 12 in DP 866036 and Lot 3 in DP 706194 (refer Drawing 1). It forms an irregular-shaped area of approximately 124 ha with maximum north-south and east-west dimensions of 1170 m and 770 m, respectively. It is accessed from Hill Road, Lovelle Street and Yarrawa Road and extends around the southern part of the Moss Vale Golf Course. With the exception of the golf course, areas to the north of the site typically comprise low-density residential and larger rural-residential lots. Land immediately to the west includes a large warehouse occupied by Harper Distribution Services. The remaining land to the south, east and west comprised generally undeveloped rural land with scattered dwellings.

The site is mostly contained between two generally north-south oriented ridgelines that form the upper catchment of Whites Creek. The higher of these ridge lines is located through the eastern part of the site and the lower is located to the west of the site. A relatively small portion at the eastern edge of the site is in the catchment of an unnamed tributary of the Wingecarribee River. Much of the slopes within the site are gentle (0 - 10°) with some moderately steep slopes (10 - 18°) on the sides of low ridgelines. The northern part of the site however is dominated by steep (18 - 27°) and very steep (27 - 45°) slopes.

Surface levels generally range from approximately RL 752 (relative to Australian Height Datum [AHD]) near the water reservoir in the northern part of the site to approximately RL 682 in the unnamed tributary of Whites Creek at the western boundary of the Moss Vale Golf Course.

At the time of the investigation, the majority of site was vacant and lightly grassed and a number of farm dams had been constructed in the existing drainage depressions. Existing dwellings were located at 32 Lovelle Street and 141 Yarrawa Road. Several sheds and associated farm infrastructure were located in the vicinity of the dwellings. A bridge had also been constructed across the unnamed tributary of Whites Creek located in the north-western part of the site.

The colour photoplates in Appendix B show the site conditions during DP's October 2018 investigation.

### 4. Regional Geology

Reference to the Moss Vale 1:100 000 Geological Series Sheet (NSW DISRD, 2016) indicates that the stratigraphy of the site comprises, in ascending stratigraphical order, rocks of the Bringelly

Shale (*Twib*), volcanics and igneous intrusives (*Jui\_b* & *Jui\_m*), and Quaternary colluvium and residuum (*Q\_ct* & *Q\_r*). The Robertson Basalt (*CZuce*) is also located close to the site. The published distribution of the stratigraphical units is shown in Figure 1 (following page).

The lithologies of the various formations are summarised (after NSW DISRD, 2016) as comprising:

**Bringelly Shale (*Twib*):** light to dark grey, sideritic claystone to siltstone, dark grey carbonaceous claystone, sandstone to siltstone, quartz-lithic very fine to medium-grained sandstone. Plant fragments abundant locally. Typically strongly weathered with extensive soil development.

**Syenite-monzanite-diortie (*Jui\_m*):** pale-grey porphyritic felsic rock. Chlorite after amphibole and pyroxene. Rare miarolitic cavities.

**Unnamed extrusive volcanics (*Jui\_b*):** dark, medium-grained dolerite.

**Robertson Basalt (*CZuce*):** grey to black, fine-grained alkali olivine basalt; basanite locally. Typically deeply weathered with extensive development of red-brown soils.

**Quaternary colluvium (*Q\_ct*):** talus deposits and poorly-sorted, weakly cemented to unconsolidated colluvial lenses of polymictic conglomerate interspersed with unconsolidated clay and silty sand layers.

**Quaternary residuum (*Q\_r*):** residual deposits of unconsolidated clayey coarse to fine grained sands to weakly consolidated sandy clay layers; poor to extensive soil development.

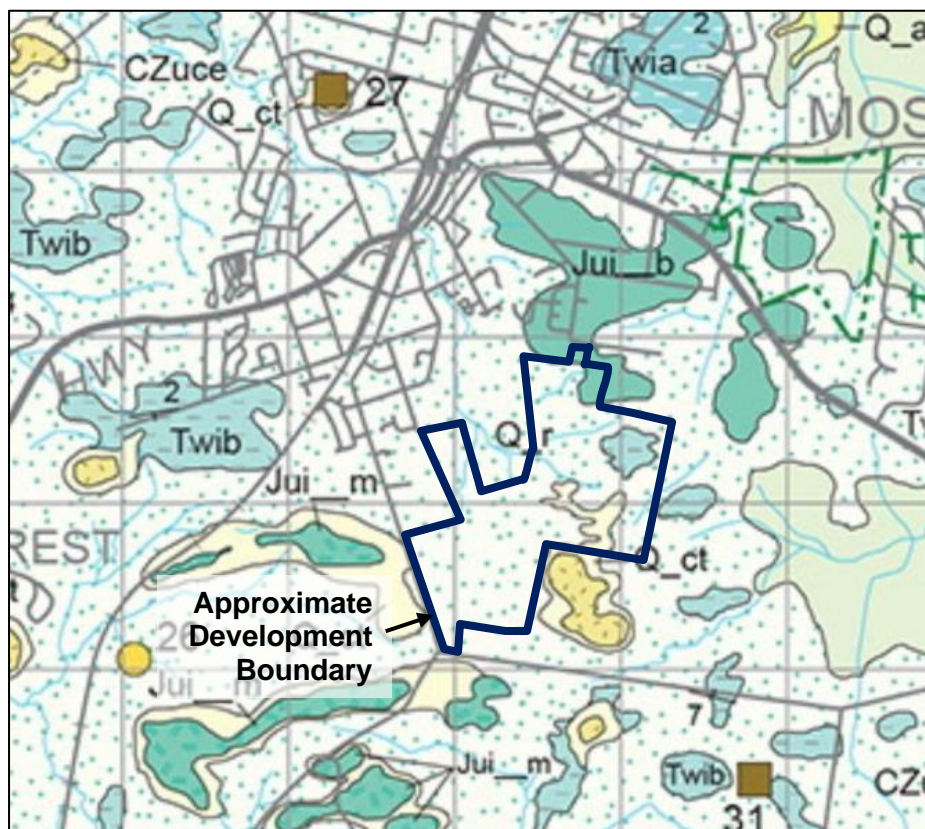


Figure 1: Distribution of Geological Units after Ref 1

## 5. Field Work Methods

The field work for the current investigation, to supplement and provide additional information on the subsurface conditions across the site, comprised the drilling of eighteen augered and diamond core drilled boreholes (Bores 107 – 124) to depths ranging from 2.5 m to 5.2 m. The boreholes included regular Standard Penetration Tests (SPTs) in the soil profile and were logged by a geotechnical engineer. At the completion of drilling, a piezometer was installed in Bore 107.

Previous and concurrent subsurface investigations and assessments used as part of the assessment described within comprised:

- Geological mapping (September 2018) by an experienced engineering geologist;
- The excavation (2018) of 26 test pits (Pits 1 – 26) to depths ranging from 0.5 m to 2.5 m;
- The drilling of six boreholes (Bores 101 – 106) to depths of 4.3 m to 10.9 m for the stability assessment of the steep hillside;
- The installation of six piezometers in Bores 101 – 106 for the stability assessment of the steep hillside; and
- The excavation of eight test pits (Pits 125 – 132) to depths ranging from 2.1 m to 3.2 m for the steep hillside and preliminary assessment of erosion and salinity.

The current and previous test locations are shown on Drawing 1 in Appendix B. The surface levels to Australian Height Datum (AHD) and coordinates to Map Grid of Australia (MGA) were determined on site using a differential GPS unit for which an accuracy of  $\pm 20$  mm is typical.

## 6. Field Work Results

### 6.1 General

The subsurface conditions encountered are given in the log sheets in Appendix B. The terms used to classify the strata are in Appendix A. Summary geological cross sections (Sections A – A', B – B' and C – C') are given on Drawings 2 – 4 in Appendix B.

### 6.2 Geological Mapping

The principal observations made are summarised below with selected items shown on in Photos 1 – 16 (refer Plates 1 – 5 in Appendix B).

- Bedrock comprising medium to high strength, slightly fracture dolerite at discrete locations in the steep to very steep hillside in the northern part of the site, below the existing water reservoirs (refer Photo 11).
- Bedrock comprising fine-grained sandstone in an excavated trench through the gently-sloping hillsides in the eastern part of the site (refer Photo 12).
- Numerous igneous cobbles on the surface of a gently sloping to moderately steep slope in the south-western part of the site (refer Photo 14).

### 6.3 Subsurface Investigation

The succession of strata is broadly summarised as follows:

**Uncontrolled Filling** – present in Pit 17 and observed in access roads around the dwelling off 32 Lovelle Street and in walls of farm dams. The type of material should be expected to vary significantly between different areas of filling and include building rubble, coal washery reject and natural soils sourced from the site (ie for farm dams).

**Topsoil** – clay, silty clay, sandy clay and clayey silt with root fibres to depths of 0.1 – 0.3 m;

**Alluvium** – stiff to hard silty clay overlying the residual soil profile in the lower reaches of the site, ranging in thickness from 0.9 m to in excess of 2.5 m, described in Pits 11, 13, 22, 24 and 25 but absent in the remaining pits.

**Colluvium** – present in Bores 101, 102, 104, 105 and 107, and Pits 1, 3 – 8, 126 and 127 comprising stiff to very stiff clay, silty clay and sandy clay with included gravel, cobbles and boulder-sized dolerite fragments to depths of up to 1.3 m in the middle and upper slopes and to depths of 4.4 m in the lower slopes at the test locations. The colluvium ranged in thickness from less than 0.4 m to 4.4 m, directly overlying (and probably, in part, grading to) residual soil or weathered bedrock. At Pit 1 in an area of seepage, colluvium was initially of soft consistency.

**Residual Soil** – stiff to hard clay, silty clay, sandy clay and shaly clay grading into extremely weathered siltstone, sandstone, shale, syenite and dolerite. The profile ranged in thickness from 0.1 m to in excess of 5.0 m, described in Bores 101 – 124 and Pits 1, 3, 4, 8, 10 – 16, 18 – 23, 25 and 26, and 125 – 132, but absent in the remaining pits.

**Bedrock** – comprising variously very low to very high strength, siltstone, sandstone, shale, syenite and dolerite in all boreholes and pits with the exception of Bore 120 and Pits 12, 20, 24, 26, 128, 131 and 132. Rock was intersected at depths ranging from 0.1 m (Pits 2 and 9) to 8.0 m (Bore 105).

## 7. Groundwater

The following groundwater observations were made during the current investigation:

- Groundwater was encountered during auger drilling at depths of 4.0 m (Bore 101), 7.7 m (Bore 107) and 2.8 m (Bore 119);
- Groundwater was measured in standpipe piezometers installed in the steep hillside in the northern part of the site at depths of 2.2 m (Bore 101), 5.6 m (Bore 102) and 7.9 m (Bore 105) on 6 November 2019. No groundwater was observed within the depth of the standpipe piezometers at the remaining locations (Bores 103, 104, 106 and 107).

Seepage was previously observed during DP's preliminary investigation in September 2018 in Pit 1 in an active area of slumping in the steep hillside. Seepage was also inferred during mapping and from a review of aerial photography:

- Between RL 694 to RL 709 in the lower hillside in the central and western parts of the site (refer Drawing 1); and
- About previous slumping near Pit 1.

Groundwater seepage was also previously observed by HSS (2006) in the vicinity of DP's Pit 1 in the northern hillside and also on both sides (ie east and west) along the lower and middle flanking slopes along the eastern ridgeline.

Groundwater levels are dependent on preceding climatic conditions and soil permeability, and can therefore vary with time. It is noted that the current field work was carried out following a below average period of rainfall.

## 8. Laboratory Testing

Point load strength index ( $I_{S[50]}$ ) testing was carried out on samples of rock core. The test results are shown on the borehole logs (Appendix B). The results indicate point load strengths of 0.3 – 1.9 MPa in the sedimentary rocks (ie sandstone, conglomerate, siltstone and shales) and 0.2 – 9.6 MPa in the igneous rocks (ie dolerite). Inferred values for uniaxial compressive strength (UCS), based on a correlation factor of 20, are in the range 6 - 38 MPa in the sedimentary rocks and 4 - 192 MPa in the igneous rocks.

## 9. Proposed Development

The Stage Bulk Earthworks Strategy Plan for the proposed development, dated September 2019 (refer Figure 2, following page) was provided for the current assessment. The plans indicated cut (in red) and fill (in blue) of up to about 3 m. The deepest area of cut are generally located within the ridgelines located in the eastern and south-western parts of the site, as well as for ponds and detention basins located in the central part of the site (ie around the southern part of the golf course). The approximate extent of cut and fill is also shown on Geotechnical Sections A – A', B – B' and C – C' on Drawings 2 – 4.

It is noted that the extent of potential excavation in the middle and upper slopes of the northern hillside had not been determined at the time of reporting and will be dependent on the results of DP's stability assessment for the steep hillside (Report 40494.03.R.001).



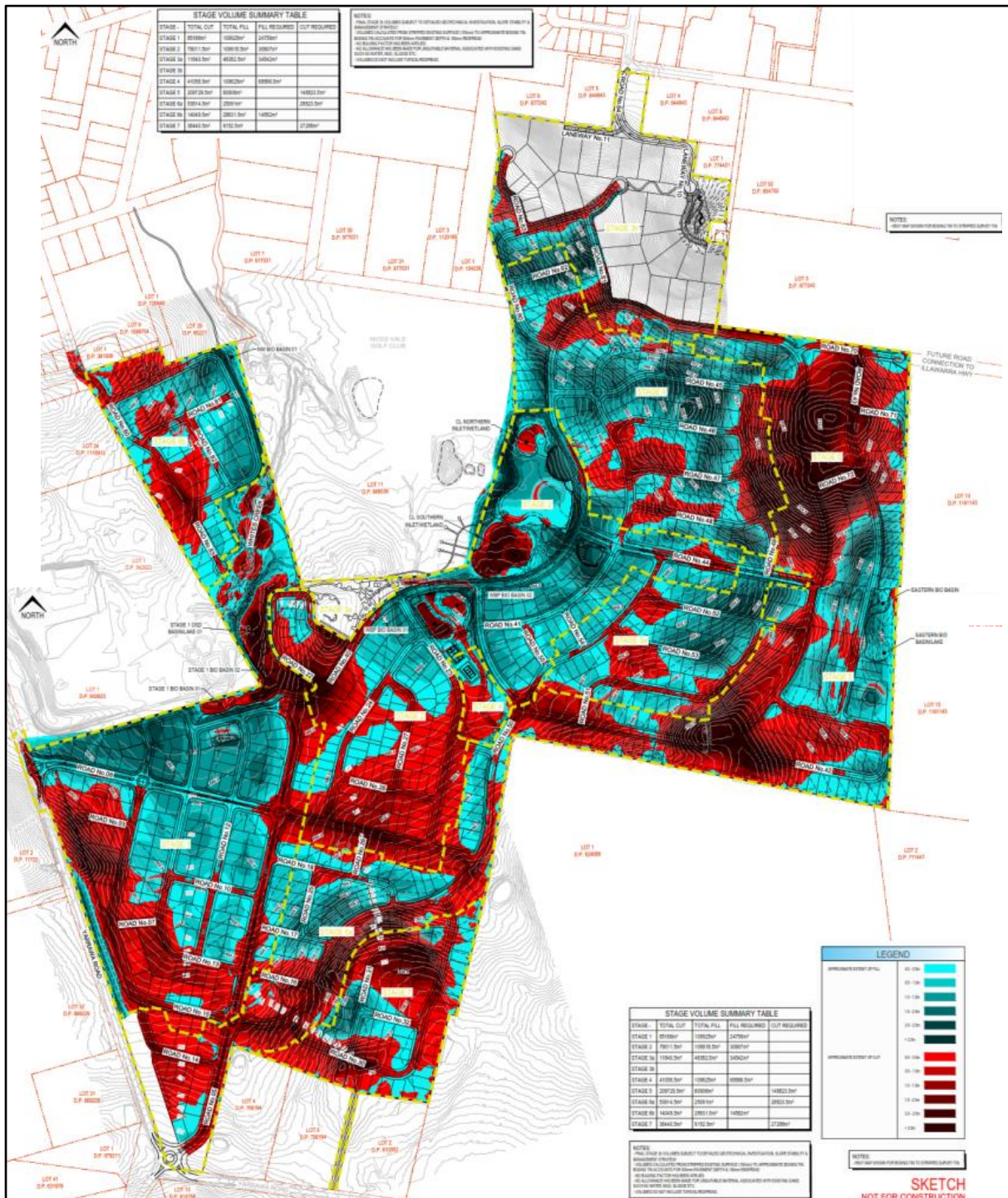


Figure 2: Bulk Earthworks Strategy Plan.

## 10. Comments

### 10.1 General

The following comments are based on the surface and subsurface profiles encountered during the DP's current and previous investigations and on the results of laboratory testing.

### 10.2 Geotechnical Site Model

The inferred geological model for the site includes:

- Extensive cover of the low-lying area of the Whites Creek catchment by alluvial materials to depths exceeding 3 m in some locations.
- Infilling of some drainage paths by water-logging susceptible colluvium and alluvium derived mainly from colluvial materials in the northern part of the site and possibly in areas adjacent to Park Leigh Hill, to the southeast of the site.
- A variable thickness of colluvial cover over most of the northern part of the site as the result of the combination of direct deposition by ancient landslide activity during slope retreat, historical landslide activity probably facilitated by land clearing and/or the transport of eroded debris (colluvium) downslope by sheet stormwater flow. It should be noted that the on-going erosion and/or deposition of colluvial materials may hide older (relict) landslide features within the lower elevations of the site.
- Residual soils, typically 1 – 2 m thick covering the ridgelines and increasing to up to 5 m thick in the lower reaches of the site, grading into the underlying weathered rock.
- Bedrock, of the Jurassic Volcanics, comprising dolerite, in the middle and upper slopes of the steep hillside in the northern part of the site.
- Bedrock, of unnamed intrusive igneous, comprising syenite, monzonite and diorite in the south-western part of the site.
- Bedrock, of the Bringelly Shale, comprising shales, claystone, siltstone and laminite with more resistant sandstone bands through the eastern, central and north-western parts of the site and in the lower and middle slopes of the steep hillside.
- Groundwater flow through thinner sandstone bands at lower elevations within the hillside in the northern part of the site and also in the low ridgeline in the eastern part of the site may also trigger slumping at both new and previous slump and flow debris locations.

### 10.3 Excavation Conditions

Based on the Stage Bulk Earthworks Strategy Plan, excavations to achieve the proposed design surface will necessitate cuts of up to approximately 3 m, with the depth of cuts typically increasing in the elevated areas of the site including the ridgeline in the eastern part of the site, the flanking slopes in the western and southern parts of the site, and also for ponds and detention basins in the central part of the site (ie around the southern part of the golf course). The approximate proposed excavation levels (PEL) are shown on borehole and test pit logs at individual locations.

Within the proposed depth of excavation, a wide range of materials will be encountered (refer Sections A – A', B – B' and C – C', Drawings 2 – 4). The profiles expected in the lower reaches of the site will generally comprise alluvial and residual soils to the full depth of proposed excavations. In the elevated areas mentioned above, the thickness of the soil profile generally decreases and excavations will include residual clays grading into very low to low strength rock typically at depths of 0.3 – 2.0 m however increasing to depths of 3 m or at some locations. Medium strength or stronger rock, or refusal on medium strength rock, was encountered or is expected within the proposed depth of cut at or in the vicinity of:

- Pits 9 and Bores 121 and 122 in the southern part of the site;
- Pits 17 and 21 and Bore 115 in the southern part of the eastern ridgeline in the eastern part of the site; and
- Pits 18 and Bores 110 and 111 in the eastern part of the site

The approximate extent of rock expected to be exposed at the proposed design surface is shown on Drawing 5 in Appendix B.

## 10.4 Excavation Equipment

It is expected that excavation within the site soils in the lower reaches of the site and in the upper profile in the elevated areas of the site could be readily carried out using conventional hydraulic equipment. Excavation into the underlying bedrock will be required at some of elevated locations (refer Drawing 5) to achieve the nominated design surface levels. The excavatability of rock primarily depends on the rock strength and jointing characteristics. As a guide, excavator bucket refusal and TC auger bit refusal for drilling on the test pit and borehole logs has been assessed for the equipment used as equivalent to approximately the top of medium strength rock. A general excavatability versus equipment type and methods are shown in Table 1.

**Table 1: Generalised Excavatability versus Equipment Type and Methods**

Soil/Rock Type	Typical Equipment Used for Bulk Excavation	Typical Equipment Used for Localised Excavations for Footings and Trenches
Soil	Any hydraulic plant	Any hydraulic plant
Very low to low strength rock	Light to medium ripping (eg D6 Class Bulldozer)	Excavator (possibly with pneumatic or hydraulic hammer for trimming and trenching)
Medium strength and fractured rock	Heavy ripping (eg D8 or D9 Class Bulldozer)	Pneumatic or hydraulic hammer, trenching machines
High strength rock and fractured rock	Very heavy ripping (eg D9 or D10 Class Bulldozer)	Pneumatic or hydraulic hammer, trenching machines
Medium or stronger, slightly fractured to massive rock	Blasting	Pneumatic or hydraulic hammer



Where the depth of excavation extends into the underlying rock of very low to low strength for both the sedimentary and igneous rocks, which is anticipated within (as a minimum) the yellow hatched areas on Drawing 5, light to medium ripping should be expected probably at reduced production rates. Rock of medium strength was encountered or is anticipated within the depth of excavation is shown within the red hatched areas shown on Drawing 5. At these locations, heavy or very heavy ripping should be expected at very low production rates. It is noted that slightly fractured, medium strength conglomerate was encountered in Bore 111 of which the removal of the upper 0.2 m is proposed. Due to the relatively shallow depth of this material at the borehole location, allowance should be made for the use of medium to heavy rock hammering in combination with ripping equipment.

While slightly fractured or massive igneous rock was not encountered within the depth of the investigation in the southern and western parts of the site, the use of blasting or pneumatic and/or hydraulic hammers at very low production rates should be expected if this material is encountered during earthworks. Slightly fractured volcanic rock was encountered at depths of 2.4 – 3.5 m in the steep hillside in the northern part of the site, however concept plans for excavation is that area had not been prepared at the time of reporting.

Detailed excavation works in the medium strength or stronger rock (ie in and possibly adjacent to the red hatched red in Drawing 5) for trenching or foundations will probably require rock hammering or rock sawing equipment at very low production rates. It is further noted that underboring, if proposed, in massive high strength sandstone or volcanic rocks should also expect construction difficulties and very low production rates.

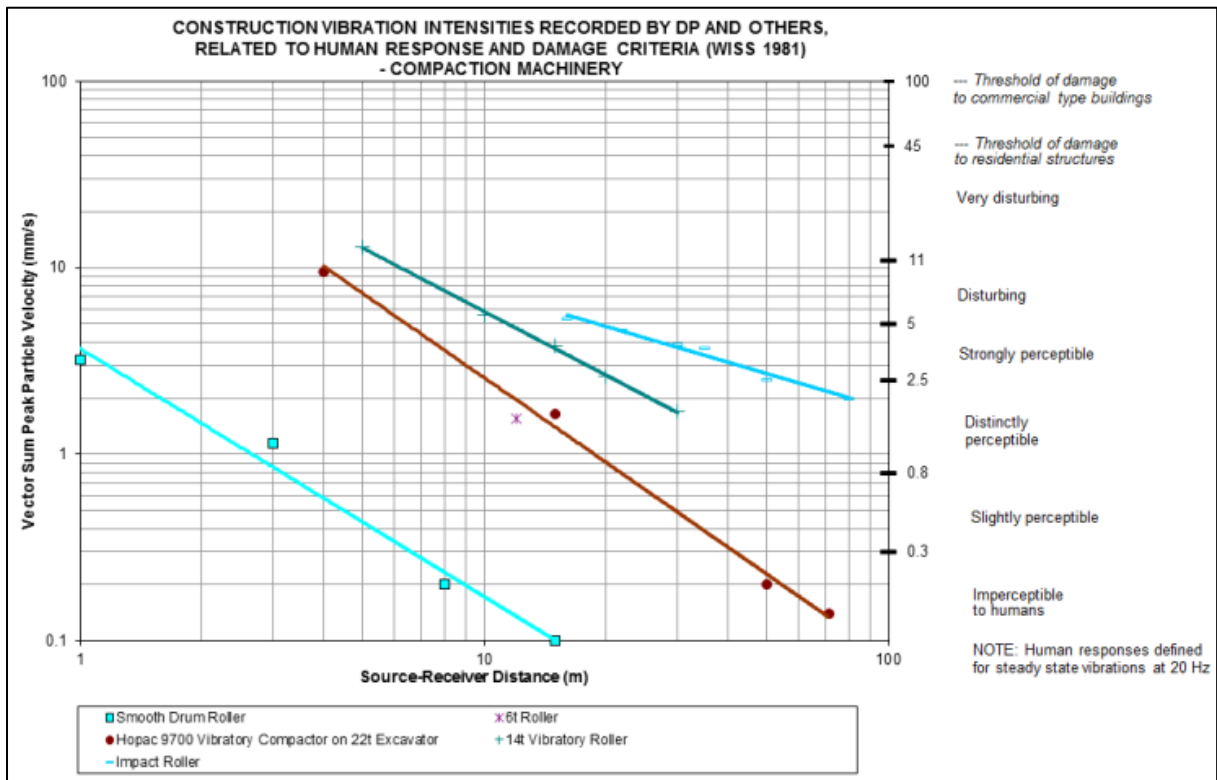
It is noted that the areas shown on Drawing 5 of the approximate extent of various rock strengths has been assessed using limited and widely spaced data points. Therefore it should be expected and allowance should be made for the extent of these materials to vary from that shown.

Equipment suitability for the ground conditions and the experience of their operators for the site conditions is best determined by intending tenderers. It is recommended that intending tenderers make their own assessment of ground conditions, excavation difficulties and appropriate equipment based on inspections of the site and core samples held by DP.

## 10.5 Construction Related Vibration

Staged bulk earthworks are proposed for the development. There is potential for construction activities to be adjacent to previously completed and developed stages. Construction activities, particularly vibratory compaction or rock excavation using hydraulic rock breakers, may result in significant ground vibration. Monitoring of a limited range of compaction plant by DP has indicated the general vibration attenuation curves (Vector sum peak particle velocity [VSPPV] versus separation distance) as shown in Figure 3.

The German Standard for *Structural Vibration – Effects of Vibrations on Structures* (DIN4150-3:1999) recommends that ground vibrations at the foundation level of residential buildings in good condition, bearing on “sound” rock foundations, be limited to a peak particle velocity ranging in a continuum, from 5 mm/s to 15 mm/s to 20 mm/s for any orthogonal direction (PPVi) at vibration frequencies of 10 Hz to 50 Hz to 100 Hz which are typical of excavation plant, in order to reduce the potential for structural damage.



**Figure 3: Compaction Plant Vibration Levels**

Residential structures adjacent to active sections of the site can most likely withstand vibration levels higher than those required to maintain the comfort of their occupants. A human comfort criterion is therefore indicated and the peak particle velocity in any orthogonal direction  $i$  (PPVi), is proposed as the control parameter. It is recommended that a Provisional Allowed Vibration Limit of 8.0 mm/sec PPVi be set during normal working hours, measured at foundation level of the potentially affected residence/s. This limit is based on AS2670.2:1990 *Evaluation of Human Exposure to Whole-Body Vibrations – Continuous and Shock Induced Vibrations in Buildings (1 – 80 Hz)* but extended from only the vertical component to any directional component for conservative vibration management.

Reference to Figure 3 indicates that ground vibration levels in excess of the guidelines for human comfort (8.0 mm/sec PPVi) are likely to be exceeded by heavy (14 tonne) vibratory compaction plant at separation distances less than about 10 m. It is however noted that while vibration levels for human comfort are significantly less than those required for structural damage, complaints are likely at lower vibration levels. To minimise the potential for disruptions due to complaints, it is suggested that heavy rollers not be used in vibratory mode within 15 m of a residence. This may need to be confirmed on site by field trials with the equipment to be used during construction.

It is anticipated that detailed excavation of rock will be required for trenching (ie for the installation of services) and for foundations in the areas hatched in red and possibly into the adjacent areas on Drawing 5.

Vibration monitoring carried out by Douglas Partners at various excavation sites in a variety of rock types has indicated a general relationship (refer Table 3) between of peak particle velocity (any component) versus distance for various hammer sizes, ripping tyne and rock saw attachments.

**Table 2: Approximate Buffer Distances for Excavation Plant**

<b>Provisional Allowed Vibration Limit:</b>	<b>8 mm/s PPVi</b>
<b>Likely equivalent maximum vector sum:</b>	<b>11 mm/s VSPPV*</b>
<b>Excavation Plant</b>	<b>Buffer Distance</b>
Rock Saw on Excavator	0.5 m
Ripper on 20 t Excavator	0.8 m
Rock Hammer <500 kg operating weight	5.0 m
Rock Hammer 501 – 2000 kg operating weight	7.6 m

\* Assumes no more than two vibration components are in-phase.

While Table 2 indicates that the use of rock hammers for excavation in active sections of the site is unlikely to have a detrimental effect on the structural or architectural finishes of the adjacent structures or to exceed human comfort levels in previously completed stages, site specific works for individual allotments adjacent to existing development will probably require rock sawing of detailed excavations to limit vibrations.

## 11. Summary

A geotechnical investigation has been carried out to determine rock depth and quality to assess the excavatability of the rock, where expected to be encountered. The investigation comprised borehole drilling and test pit excavations.

The results of the field work indicated that the depth of rock in the lower reaches of the site is in excess of proposed cuts (ie excavation to design level will be within the soil profile) and no difficulties are anticipated. The depth of soil decreases towards the elevated parts of the site (eg ridgelines and flanking slopes) and rock is expected to be within the proposed cut depths in these areas, particularly in the deeper areas of cut.

It is expected that excavation within the site soils could be readily carried out using hydraulic equipment. The excavation of very low to low strength (eg weathered rock), which is expected at some elevated areas in the ridgelines and flanking slopes will require light to medium ripping for bulk excavation and hydraulic hammering for trenching at reduced production rates. The excavation of medium strength or stronger rock, which is also expected at a few locations with require heavy or very heavy ripping and hydraulic hammering for trenching at very low productions rates. The locations of the more difficult excavation areas are shown on Drawing 5.

The staging of earthworks should also consider the effects of vibrations of previously completed stages. Nominal buffer zones for equipment types have been provided in the report.

## 12. References

AS 2670.2:1990, *Evaluation of Human Exposure to Whole-Body Vibration, Part 2: Continuous and Shock-Induced Vibration in Buildings (1 to 80 Hz)*, Standards Australia.

DIN 4150-3:1999, *Structural Vibration, Part 3: Effects of Vibrations on Structures*, Deutsche Norm.

DP (2018), Report on Preliminary Geotechnical Investigation, Proposed Residential Subdivision, 141 Yarrowa Road and 32 Lovelle Street, Moss Vale, Douglas Partners Pty Ltd, Project 40494.01.R.001.Rev1.

HSS (2006), Soil, Groundwater, Agricultural Capability, Geotechnical Classification, Mineral Potential and Preliminary Contamination Report for the Proposed "Chelsea Gardens Development Site", Harvest Scientific Services, Job Reference 200677.

NSW DISRD (2016) *Moss Vale 1:100 000 Geological Sheet 8928*, Geological Survey, NSW Department of Industry, Skills and Regional Development.

### 13. Limitations

Douglas Partners (DP) has prepared this report for this project at 32 Lovelle Street and 141 Yarrowa Road, Moss Vale in accordance with DP's proposal WOL190315.P.001.Rev0 dated 4 October 2019 and acceptance received from Prime Moss Vale Pty Ltd dated 14 October 2019. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Prime Moss Vale Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or be relied upon for other projects or purposes on the same or another site 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 DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations.

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. DP 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 DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition

materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

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 a 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 DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

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**Douglas Partners Pty Ltd**

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## Appendix A

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About This Report

# About this Report

# Douglas Partners



## Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

## Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

## Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

## Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

## Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

# *About this Report*

## **Site Anomalies**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

## **Information for Contractual Purposes**

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

## **Site Inspection**

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.





## Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

## Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

## Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

## Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

## Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

## Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

## Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:  
4,6,7  
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:  
15, 30/40 mm

# *Sampling Methods*

The results of the SPT tests can be related empirically to the engineering properties of the soils.

## **Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests**

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.



## Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

## Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

## Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 - 5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

# *Soil Descriptions*

## **Soil Origin**

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.



## Rock Strength

Rock strength is defined by the Point Load Strength Index ( $Is_{(50)}$ ) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approximate Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

\* Assumes a ratio of 20:1 for UCS to  $Is_{(50)}$ . It should be noted that the UCS to  $Is_{(50)}$  ratio varies significantly for different rock types and specific ratios should be determined for each site.

## Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

## Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

# Rock Descriptions

## Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

## Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

# Symbols & Abbreviations

## Douglas Partners



### Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

### Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

### Water

▷	Water seep
▽	Water level

### Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U <sub>50</sub>	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

### Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

### Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

### Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

### Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

### Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

### Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

### Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

### Other

fg	fragmented
bnd	band
qtz	quartz

# Symbols & Abbreviations

## Graphic Symbols for Soil and Rock

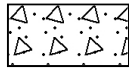
### General



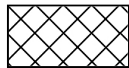
Asphalt



Road base



Concrete



Filling

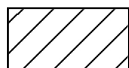
### Soils



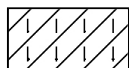
Topsoil



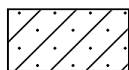
Peat



Clay



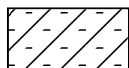
Silty clay



Sandy clay



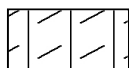
Gravelly clay



Shaly clay



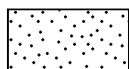
Silt



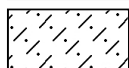
Clayey silt



Sandy silt



Sand



Clayey sand



Silty sand



Gravel



Sandy gravel



Cobbles, boulders



Talus

### Sedimentary Rocks



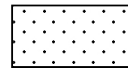
Boulder conglomerate



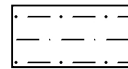
Conglomerate



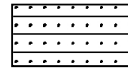
Conglomeratic sandstone



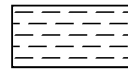
Sandstone



Siltstone



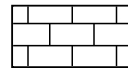
Laminite



Mudstone, claystone, shale

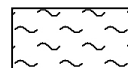


Coal

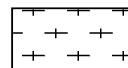


Limestone

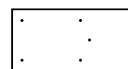
### Metamorphic Rocks



Slate, phyllite, schist

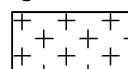


Gneiss

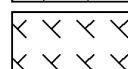


Quartzite

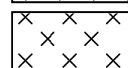
### Igneous Rocks



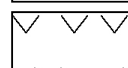
Granite



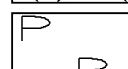
Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry



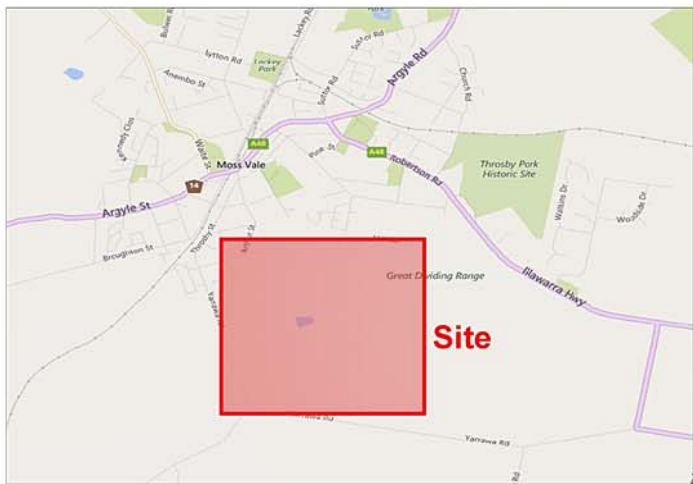
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## **Appendix B**

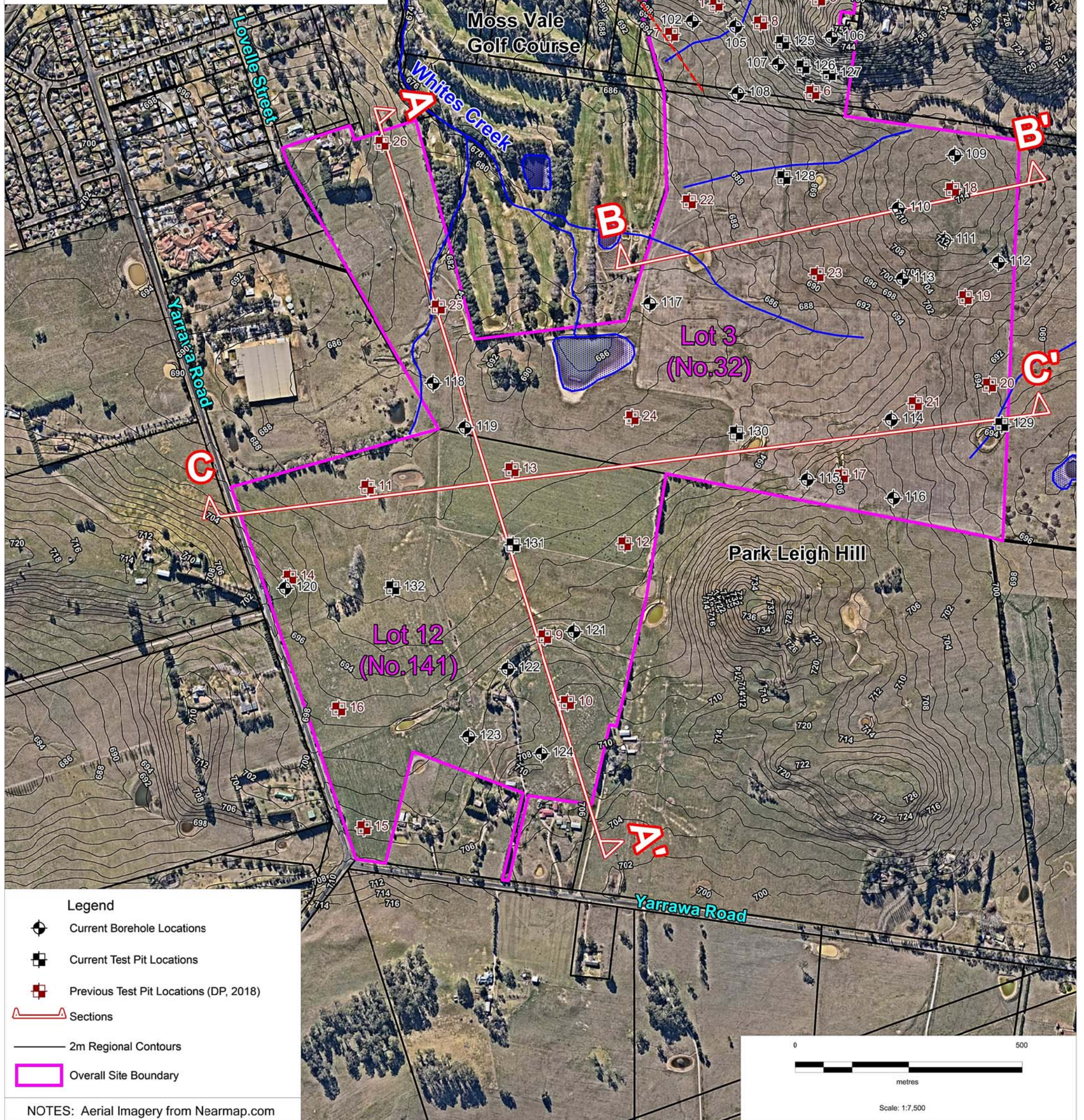
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Drawing 1 - 5  
Results of Current Field Work (Bores 101 – 124 & Pits 125 – 132)  
Results of Previous Field Work (Pits 1 – 26)  
Photos 1 – 16 (Plates 1 – 5)



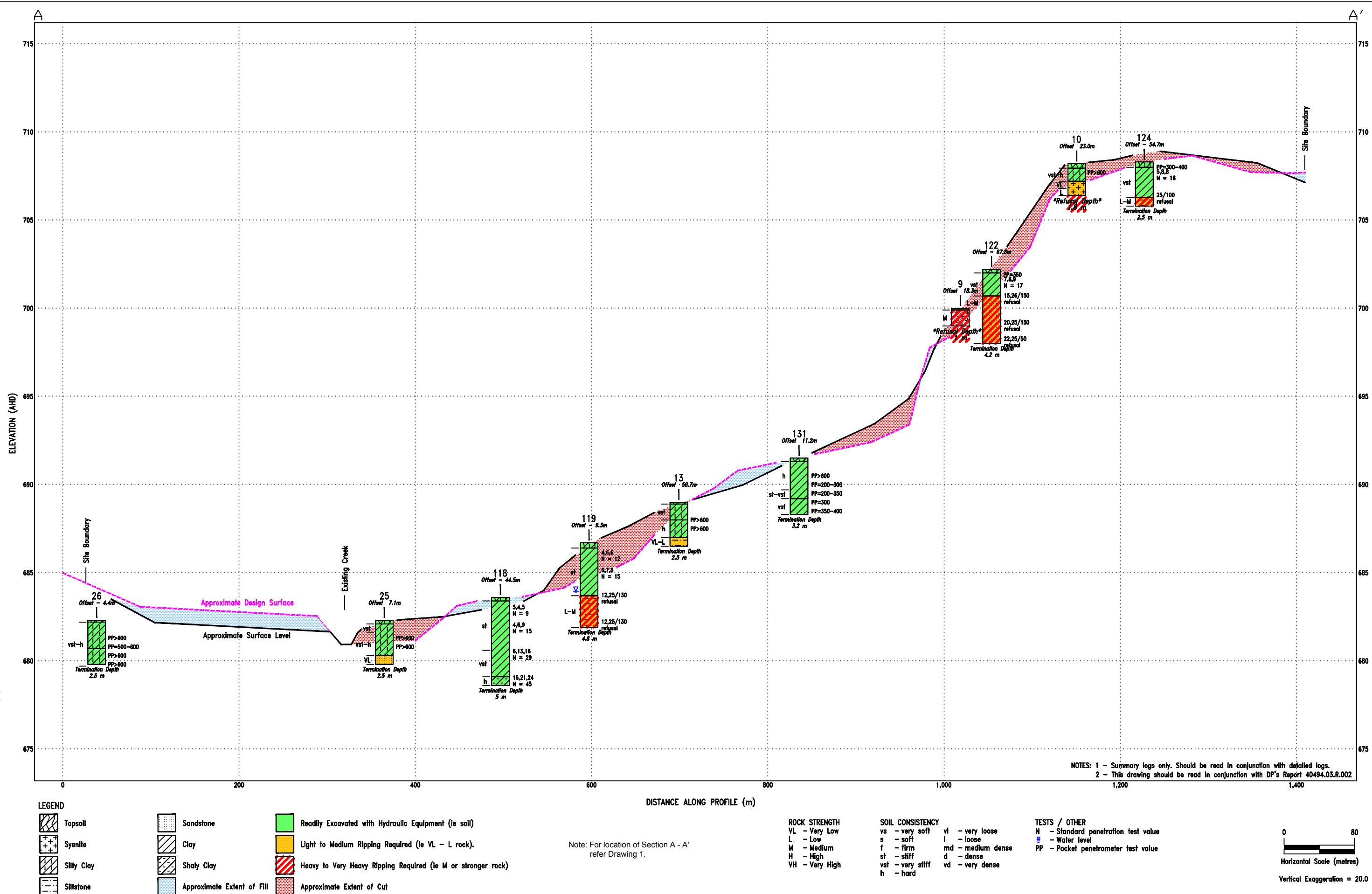


Locality Plan

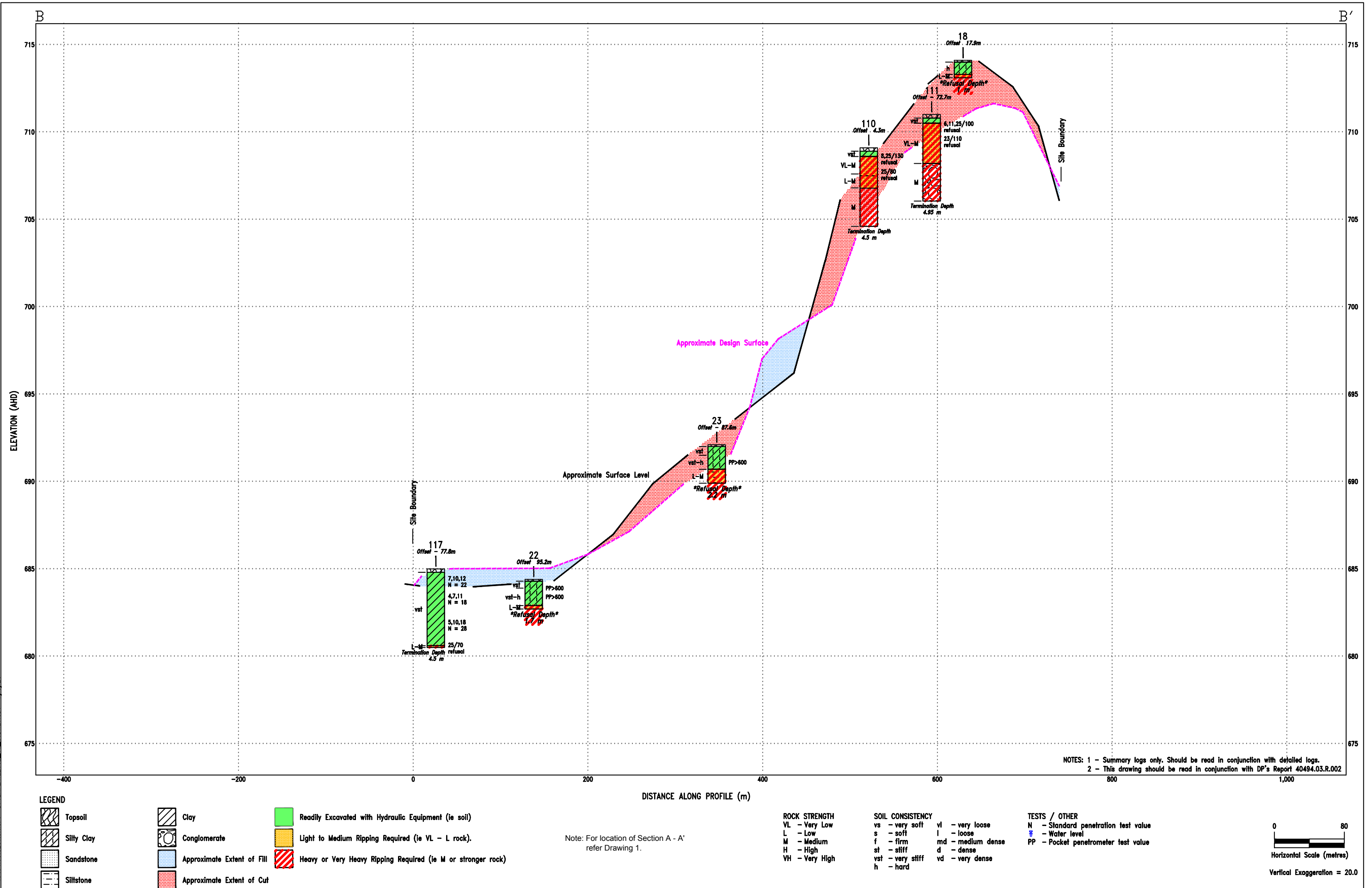


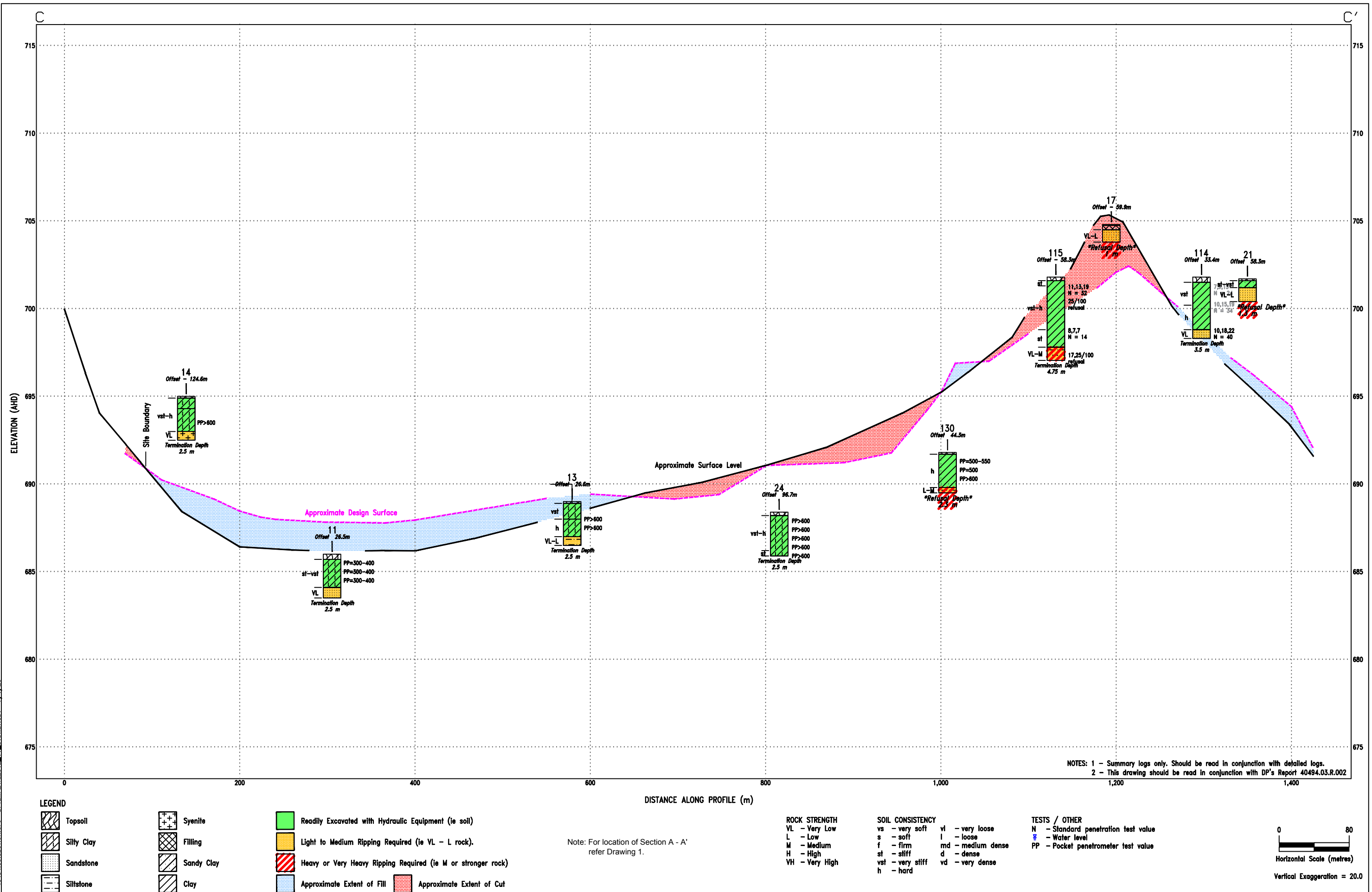


STANDARD CROSS-SECTION 40494.03.SECTION.GPJ D:\TEMPLATE\2012\_V1\_SYDNET.GDT 7/11/20

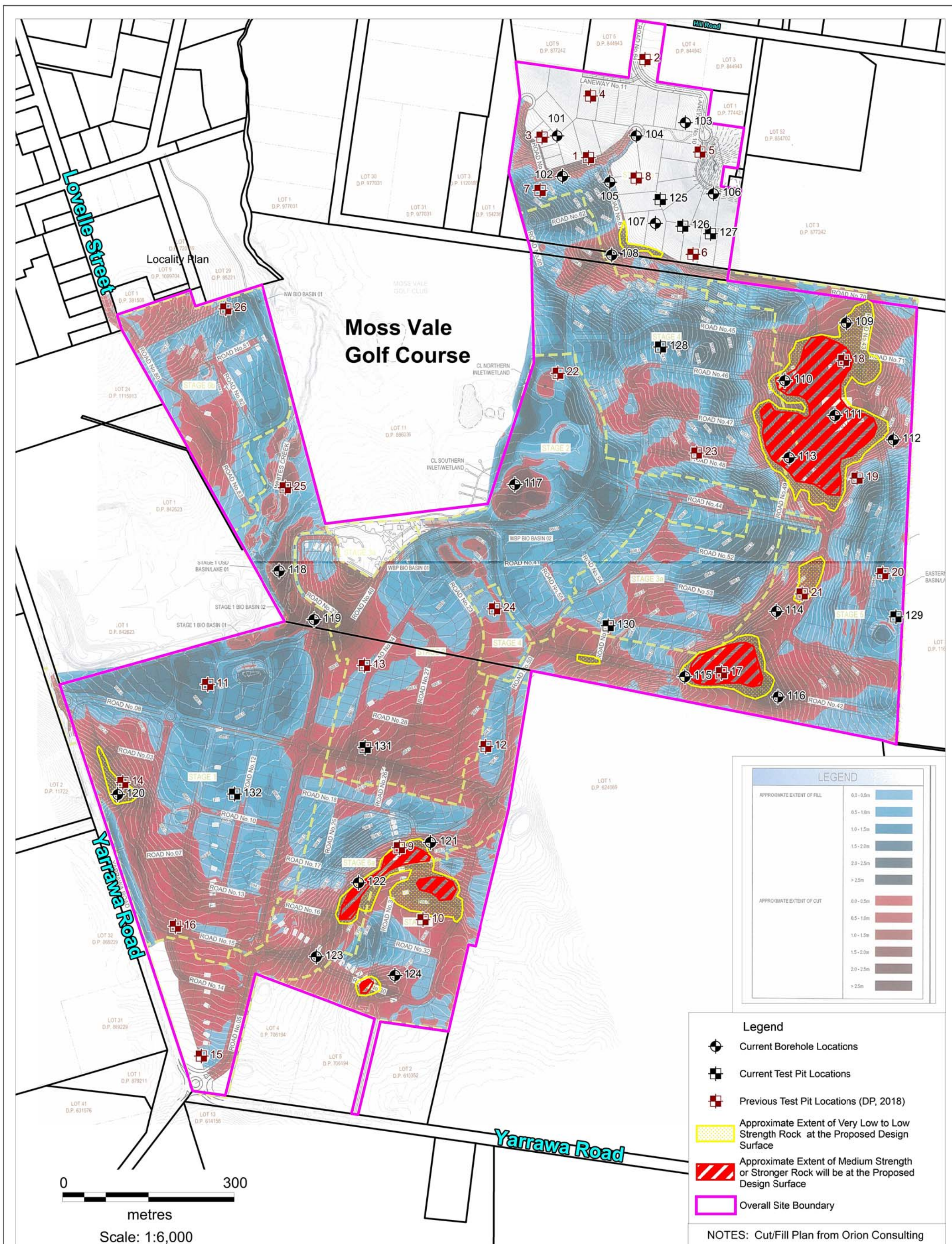


STANDARD CROSS-SECTION 40494.03.SECTION.GPJ D:\TEMPLATE\2012\_V1\_SYDNET.GDT 7/1/20











DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 101    DEPTH: 6.50 – 11.00 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrawa Road, Moss Vale

**SURFACE LEVEL:** 708.6 AHD  
**EASTING:** 259542  
**NORTHING:** 6172772  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 101  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

[illegible]

**RIG:** Hanjin                      **DRILLER:** Total Drilling                      **LOGGED:** FH/IKA                      **CASING:** HWT to 5.6m

**TYPE OF BORING:** 110mm solid flight auger 'TC bit' to 5.8m, coring 'NMLC' from 6.5m to 10.8m

**WATER OBSERVATIONS:** Groundwater observed between 4.0m and 4.5m during drilling

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 5.0-11.0m.  
w = field moisture content PL = plastic limit

### SAMPLING & IN SITU TESTING LEGEND

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test ls(50) (MPa)
		PL(D)	Point load diametral test ls(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)





DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 102    DEPTH: 4.55 – 7.50 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 700.5 AHD  
**EASTING:** 259552  
**NORTHING:** 6172702  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 102  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
700	0.2	TOPSOIL/Silty CLAY CL - low plasticity, dark brown, with root fibres, w<PL																									
699	0.4	Silty CLAY CL: low to medium plasticity, brown mottled dark brown, trace root fibres, hard, colluvium																				A					pp = 500 4,5,7 N = 12
698	1	CLAY CL - medium to high plasticity, brown, trace fine gravel, stiff, probable colluvium = brown mottled orange below 1.5m																				S					4,6,9 N = 15
697	2	- very stiff, trace fine sand below 2.5m																									5,10,11 N = 21
696	3.0	CLAY CL - medium to high plasticity, grey mottled orange, trace fine gravel, very stiff, residual																				S					7,11,17 N = 28
695	4.55	SHALE - fine grained, brown, thinly laminated to laminated, low strength then medium strength, highly then moderately weathered, slightly fractured, Wianamatta Group																									PL(A) = 0.4 PL(A) = 0.6
694	5	- dark grey and fresh below 6.28m																									PL(A) = 0.9
693	6																										PL(A) = 0.6
692	7.5	Bore discontinued at 7.5m (Limit of Investigation)																									
691	8																										
690	9																										
689	10																										
688	11																										

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 4.6m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0.0m to 4.5m, coring 'NMLC' from 4.55m to 7.5m

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 3.8-6.8m.  
w = field moisture content PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 103      DEPTH: 1.30 – 4.25 m      PROJECT: 40494.03      Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 732.1 AHD  
**EASTING:** 259765  
**NORTHING:** 6172795  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 103  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
732	0.3	TOPSOIL/Silty CLAY CL: low plasticity, dark brown, trace root fibres, w<PL																				A				pp = 350 18,25/100 refusal	
		CLAY CL: Low to medium plasticity, dark brown mottled brown, w<PL, very stiff, residual																				A					
	1.3	= brown mottled orange, trace fine grained sand below 0.5m																				S					
		DOLERITE: medium to coarse grained, dark grey, green and pale grey, medium strength, highly weathered, slightly fractured, Jurassic Volcanics																					C	100	92	PL(A) = 0.5	PL(A) = 0.4
																							C	100	96		
																							C	100	100		
	3.45	DOLERITE: medium to coarse grained, pale grey, very high strength, fresh, slightly fractured, Jurassic Volcanics																								PL(A) = 7.4	
	4.25	Bore discontinued at 4.25m (Limit of Investigation)																									

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 1.3m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0.0m to 1.3m, coring 'NMLC' from 1.3m to 4.25m

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 4.0-10.0m.  
w = field moisture content PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 104    DEPTH: 2.70 – 5.90 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 716.8 AHD  
**EASTING:** 259680  
**NORTHING:** 6172772  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 104  
**PROJECT No:** 40494.03  
**DATE:** 23/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type
716	0.15	TOPSOIL/Silty CLAY CL: low plasticity, dark brown with root fibres, w<PL (topsoil)																				A			pp = 100-150 2,3,4 N = 7
	0.45	Silty CLAY CL: low to medium plasticity, dark brown mottled brown, w~PL, stiff, colluvium																				A			
1		CLAY CL: medium plasticity, brown, trace fine grained sand, w<PL, stiff, residual w~PL below 1.5m																				S			
715	2																								3,5,7 N = 12
		- with low to dolerite corestones below 2.4m																							
714	2.7																					S			
713	3	DOLERITE: fine grained, dark grey brown, high strength, slightly weathered, slightly fractured, Jurassic Volcanics																				C	100	100	PL(A) = 8.1  PL(A) = 9.6
712	4																					C	100	100	
711	4.29	DOLERITE: fine to medium grained, pale brown orange, medium to high strength, highly weathered, highly fractured, Jurassic Volcanics																							PL(D) = 1.4
710	4.93	DOLERITE: fine to medium grained, pale brown orange, high strength, moderately weathered, slightly fractured, Jurassic Volcanics																							
709	5.9	Bore discontinued at 5.9m (Limit of Investigation)																							
708																									
707																									
706																									
705																									

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 5.9m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0m to 2.5m, coring 'NMLC' from 2.7m to 5.9m

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 2.5-5.5m.  
w = field moisture content PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
BB	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 105    DEPTH: 8.00 – 10.90 m    PROJECT: 40494.03    Oct 2019





# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 705.5 AHD  
**EASTING:** 259634  
**NORTHING:** 6172692  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 105  
**PROJECT No:** 40494.03  
**DATE:** 23/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
705	0.2	TOPSOIL/CLAY CL: low plasticity, dark brown, with trace silt and fine grained sand, w<PL (topsoil)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 7.6m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0-7.6m, coring 'NMLC' from 8.0m-10.9m

**WATER OBSERVATIONS:** wet zone at ~7.7m

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 7.4-10.4m.  
w = field moisture content PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	SP Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 106    DEPTH: 2.60 – 6.45 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrawa Road, Moss Vale

**SURFACE LEVEL:** 748.5 AHD  
**EASTING:** 259815  
**NORTHING:** 6172672  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 106  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

[illegible]

**RIG:** Hanjin                      **DRILLER:** Total Drilling                      **LOGGED:** FH                      **CASING:** HWT to 2.55m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0.0m to 2.5m, coring 'NMLC' from 2.5m to 6.45m

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 3.0-6.0m.  
w = field moisture content PL = plastic limit

### SAMPLING & IN SITU TESTING LEGEND

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U <sub>t</sub>	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W <sub>s</sub>	Water seep
E	Environmental sample	W <sub>l</sub>	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test (s(50) (MPa)
		PL(D)	Point load diametral test (s(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 107    DEPTH: 2.20 – 5.20 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 712.2 AHD  
**EASTING:** 259714  
**NORTHING:** 6172621  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 107  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type
712	0.3	TOPSOIL/Clayey SILT ML: brown, trace medium grained sand, w<PL																				A			7,9,15 N = 24
711	0.5	Silty CLAY CL: low plasticity, brown grey, w<PL, stiff, colluvium																				A			
1		CLAY CL - low to medium plasticity, brown mottled grey orange, w<PL, very stiff, residual																				S			
710	1.5	SANDSTONE: fine grained, pale grey, very low to medium strength, highly to moderately weathered, Wianamatta Group																							6,25/130 refusal
2	2.2																					S			
709	3	SANDSTONE - fine to medium grained, pale grey, medium strength, slightly weathered to fresh stained, slightly fractured, Wianamatta Group																							PL(A) = 0.5  PL(A) = 0.5  PL(A) = 0.5
708	4																								
707	5	- with laminated siltstone bands from 4.81m to 4.91m																							
706	5.2	Bore discontinued at 5.2m (Limit of Investigation)																							
705	6																								
704	7																								
703	8																								
702	9																								
701	10																								
	11																								

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 2.2m

**TYPE OF BORING:** 110mm solid flight auger TC bit from 0.0m to 2.2m, coring 'NMLC' from 2.2m to 5.2m

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. Standpipe piezometer installed: screen interval 1.7-4.7m.  
w = field moisture content PL = plastic limit

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 699.5 AHD  
**EASTING:** 259638  
**NORTHING:** 6172565  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 108  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
699	0.0	TOPSOIL/Clayey SILT ML: pale brown, trace root fibres, w<PL		A	0.0					
	0.1				0.1					
	0.3	Silty CLAY CL: low plasticity, pale brown, w<PL, very stiff, residual		A	0.4					
	0.5	CLAY CL: medium plasticity, grey mottled red, w<PL, very stiff, residual		S	0.5					
698	0.95	- becoming grey with trace gravel below 1.3m			0.95		8,8,9 N = 17			1
	1.5			S	1.5		9,12,14 N = 26			
	1.9				1.9		PEL*			2
	2.0				2.0					
697	3.0	SILTSTONE: brown, low to medium strength, highly to moderately weathered, with clay seams, Wianamatta Group		A	3.0		25/120 refusal			3
	3.12				3.12					
	4.0	- becoming brown below 3.6m		A	4.0					4
	4.1	Bore discontinued at 4.1m (Limit of investigation)			4.1					
696										
695										
694										

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 711.1 AHD  
**EASTING:** 260046  
**NORTHING:** 6172451  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 109  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
711	0.2	TOPSOIL/Clayey SILT ML: brown, trace root fibres, w<PL		A	0.0 0.1					
		CLAY CL: low to medium plasticity, brown mottled orange, hard, residual		A	0.4 0.5					
1		- becoming grey mottled orange below 1.0m		S	1.0		7,14,23 N = 37			1
710	1.6	SILTSTONE: grey mottled orange, very low to medium strength, highly weathered siltstone, with clay seams, Wianamatta Group		S	1.45					
					1.9 2.0		PEL*			2
2				S	2.5 2.62		25/120 refusal			
3										3
708										
		- becoming brown below 3.9m		A	3.9					4
707	4.0	Bore discontinued at 4.0m (Limit of investigation)			4.0					
5										5
706										

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)



DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 110    DEPTH: 1.60 – 4.50 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 709.1 AHD  
**EASTING:** 259940  
**NORTHING:** 6172349  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 110  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
709	0.2	TOPSOIL/Clayey SILT ML: brown, with root fibres, w<PL, residual																A			8,25/130 refusal
	0.5	CLAY CL: low to medium plasticity, red brown, w<PL, very stiff																A			
	1	SANDSTONE: fine to medium grained, brown mottled grey orange, very low to medium strength, highly to moderately weathered, with some clay bands, Wianamatta Group																S			
708	1.6	= pale grey below 1.5m																			25/80 refusal
	2	SANDSTONE: fine to medium grained, pale brown, brown and grey, low becoming medium strength, moderately to slightly weathered, fractured, Wianamatta Group																C	100	95	PL(A) = 0.2
	3	= medium strength, slightly to moderately weathered below 2.3m																			PL(A) = 0.6
707	4.5	Bore discontinued at 4.5m (Limit of Investigation)																			PEL*
706																					PL(A) = 0.5
705																					
704																					
703																					
702																					
701																					
700																					
699																					
698																					

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH/KA **CASING:** HWT to 1.6m  
**TYPE OF BORING:** 110mm solid flight auger TC bit from 1.6m, coring 'NMLC' from 1.6m to 4.5m  
**WATER OBSERVATIONS:** No free groundwater observed  
**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content PL = plastic limit, PEL = proposed excavation level

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

DOUGLAS PARTNERS PTY LTD  
PROPOSED RESIDENTIAL SUBDIVISION  
32 LOVELLE STREET & 141 YARRAWA ROAD, MOSS VALE

BORE: 111    DEPTH: 2.80 – 4.95 m    PROJECT: 40494.03    Oct 2019



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 711.0 AHD  
**EASTING:** 260026  
**NORTHING:** 6172288  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 111  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
711	0.2	TOPSOIL/Clayey SILT ML - brown, trace root fibres, w<PL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

**RIG:** Hanjin **DRILLER:** Total Drilling **LOGGED:** FH **CASING:** HWT to 2.8m  
**TYPE OF BORING:** 110mm solid flight auger TC bit from 2.8m, coring 'NMLC' from 2.8m to 4.95m  
**WATER OBSERVATIONS:** No free groundwater observed  
**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content PL = plastic limit, PEL = proposed excavation level

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 704.2 AHD  
**EASTING:** 260130  
**NORTHING:** 6172243  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 112  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
704	0.2	TOPSOIL/Clayey SILT ML: brown w<PL		A	0.0					
					0.1					
703		CLAY CL: low to medium plasticity, brown orange, w<PL, very stiff, residual		A	0.4		PEL*			
					0.4					
					0.5					
703		- becoming orange mottled grey below 0.9m		S	1.0		9,13,18 N = 31			
					1.45					
702	2.0	SILTSTONE: pale brown grey, very low to medium strength, highly to moderately weathered, with clay seams, Wianamatta Group								
702	2.6	Bore discontinued at 2.6m (Limit of investigation)		S	2.5		25/100 refusal			
					2.6					
701										
700										
699										

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrawa Road, Moss Vale

**SURFACE LEVEL:** 703.2 AHD  
**EASTING:** 259947  
**NORTHING:** 6172216  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 113  
**PROJECT No:** 40494.03  
**DATE:** 25/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
703	0.2	TOPSOIL/Clayey SILT ML: brown, trace root fibres, w<PL		A	0.0 0.1					
		CLAY CL: low to medium plasticity, pale brown mottled grey orange, w<PL, very stiff, residual		A	0.4 0.5					
		- becoming grey mottled orange, trace gravel below 0.6m		S			5,6,11 N = 17			
702					0.95				1	
	1.5	SANDSTONE: fine grained, grey mottled orange, very low to medium strength, highly weathered, Wianamatta Group		S	1.5 1.61		25/100 refusal			
701	2			A	2.0 2.1				2	
					2.9		PEL*			
700	3			S	3.0 3.0 3.12		25/120 refusal		3	
	4	- becoming grey below 4m							4	
699					4.5					
				S			20,20,23 N = 43			
					4.95					
698	5.0	Bore discontinued at 5.0m (Limit of investigation)							5	

 **Douglas Partners**  
Geotechnics / Environment / Groundwater

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 701.8 AHD  
**EASTING:** 259924  
**NORTHING:** 6171949  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 114  
**PROJECT No:** 40494.03  
**DATE:** 25/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
701.8 701 700 699 698 697 696	0.3	TOPSOIL/Clayey SILT ML: dark brown, with root fibres and trace gravel, w<PL		A	0.0 0.1					
		CLAY CL: low plasticity, brown, trace gravel, w<PL, very stiff, residual - becoming medium plasticity, brown mottled grey orange below 0.5m		A	0.4 0.5					
	1	- becoming pale grey, hard below 1.6m		S	0.95		7,9,15 N = 24			
					1.4 1.5 1.5		PEL*			
				S	1.95		10,15,19 N = 34			
	3	SANDSTONE: fine grained, pale grey mottled brown orange, very low strength, highly weathered, with clay seams, Wianamatta Group		S	3.0		10,18,22 N = 40			
					3.45					
	3.5	Bore discontinued at 3.5m (Limit of investigation)								
	4									
	5									

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 701.8 AHD  
**EASTING:** 259770  
**NORTHING:** 6171838  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 115  
**PROJECT No:** 40494.03  
**DATE:** 25/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details	
				Type	Depth	Sample			
701   									

**RIG:** Hanjin

**DRILLER:** Total Drilling

LOGGED: FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test ls(50) (MPa)
		PL(D)	Point load diametral test ls(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



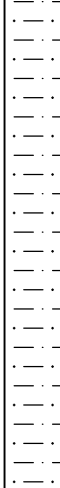


# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 705.0 AHD  
**EASTING:** 259930  
**NORTHING:** 6171800  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 116  
**PROJECT No:** 40494.03  
**DATE:** 25/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing			Water	Well Construction Details	
				Type	Depth	Sample			
705		TOPSOIL/Clayay SILT ML: dark brown, with root fibres, w<PL		A	0.0 0.1				
	0.3	CLAY CL: low to medium plasticity, dark brown mottled orange, w<PL, very stiff, residual - becoming brown mottled orange, very stiff, below 0.5m		A	0.4 0.5		5,9,11 N = 20		
	1	- becoming grey mottled orange below 1.4m		S	0.95				
				S	1.5		7,10,16 N = 26		
	2				1.95				
	3	SILTSTONE: grey mottled orange, very low to medium strength, highly to moderately weathered, with clay seams, Wianamatta Group		S	2.9 3.0 3.0 3.25		PEL* <hr/> 9,25/100 refusal		
	4	- becoming grey below 4.0m							
				S	4.5 4.61		25/110 refusal		
	5	Bore discontinued at 5.0m (Limit of investigation)							

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED: FH**

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 685.0 AHD  
**EASTING:** 259471  
**NORTHING:** 6172169  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 117  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
685	0.0	TOPSOIL/Clayey SILT ML: brown, trace root fibres, w<PL		A	0.0					
	0.1				0.1					
	0.2	CLAY CL: low plasticity, orange brown, w<PL, very stiff, residual		A	0.4					
		- becoming medium plasticity orange mottled grey below 0.5m		S	0.5		7,10,12 N = 22			
684	1				0.95					
				S	1.5		4,7,11 N = 18			
	2				1.95					
					2.4		PEL*			
					2.5					
683										
	3			S	3.0		5,10,18 N = 28			
					3.45					
682										
	4									
681										
	4.4									
	4.5	SANDSTONE: fine grained, pale brown, low to medium strength, highly to moderately weathered, Wianamatta Group		S	4.5		25/70 refusal			
		Bore discontinued at 4.5m (Limit of investigation)			4.57					
680	5									

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 683.6 AHD  
**EASTING:** 259062  
**NORTHING:** 6172022  
**DIP/AZIMUTH:** 90°/-

**BORE No:** 118  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
683	0.2	TOPSOIL/Clayey SILT ML: brown, with trace root fibres, w<PL		A	0.0					
					0.1					
682		CLAY CL: low to medium plasticity, brown grey, w<PL, stiff, residual  - becoming grey mottled orange below 0.5m		A	0.4					
					0.5					
				S			5,4,5 N = 9			
					0.95					
681		- becoming grey, w~PL below 1m			1.5					
				S			4,6,9 N = 15			
					1.95					
680		- becoming very stiff below 3m			2.9					
					3.0					
					3.0					
				S			6,13,16 N = 29			
679					3.45					
678	4.5	Shaly CLAY CL: low to medium plasticity, brown grey, w<PL, hard, with very low strength, highly weathered siltstone bands		S	4.5					
							16,21,24 N = 45			
678	5.0	Bore discontinued at 5.0m (Limit of investigation)			4.95					

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 686.7 AHD  
**EASTING:** 259125  
**NORTHING:** 6171936  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 119  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
686	0.3	TOPSOIL/Clayey SILT ML: brown, w<PI		A	0.0					
				A	0.1					
685	1	CLAY CL: low to medium plasticity, brown mottled grey, w<PL, stiff, residual		A	0.4					
				S	0.5		4,6,6 N = 12			
684	2	- becoming grey mottled orange below 1.3m			0.95					
				S	1.5		6,7,8 N = 15			
683	3				1.95					
				S	2.9		PEL*			
682	4	SILTSTONE: grey mottled orange, very low to medium strength, highly to moderately weathered, with clay seams, Wianamatta Group		S	3.0		12,25/130 refusal			
				S	3.0					
681	5	- becoming grey below 3.6m			3.28					
				S	4.5		12,25/130 refusal			
	4.8	Bore discontinued at 4.8m (Limit of investigation)			4.8					

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** Groundwater observed at 2.8m

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 697.6 AHD  
**EASTING:** 258778  
**NORTHING:** 6171632  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 120  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
697	0.2	TOPSOIL/Clayey SILT ML: red brown, trace root fibres, w<PL		A	0.0 0.1					
	0.4	Silty CLAY CL: low plasticity, red brown, w<PL, stiff to very stiff, residual		A	0.4 0.5					
		CLAY CL: low plasticity, red brown, w<PL, stiff to very stiff		S	0.95		8,7,9 N = 16			
696	1	- becoming orange red mottled grey below 1.5m		S	1.5		5,6,7 N = 13			
	2			S	1.95					
	3			S	2.9 3.0 3.0		PEL*			
695	3			S	3.45		4,6,8 N = 14			
	4			S	4.5		5,6,7 N = 13			
	5			S	4.95					
694	4									
693		- becoming w~PL below 4.5m								
692	5.0	Bore discontinued at 5.0m (Limit of investigation)								

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 699.8 AHD  
**EASTING:** 259328  
**NORTHING:** 6171546  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 121  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
699	0.2	TOPSOIL/Clayey SILT ML: brown, with root fibres, w<PL		A	0.0					
					0.1					
				A	0.4					
					0.5					
				S			5,5,6 N = 11			
698	1				0.9					
					0.95		PEL*			
					1.0					
697	2				2.0					
				S			25/150 refusal			
					2.15					
696	3				3.0					
				S			25/150 refusal			
					3.1					
695	4									
694	5									
	3.1	Bore discontinued at 3.1m (Limit of investigation)								

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)



# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 702.2 AHD  
**EASTING:** 259202  
**NORTHING:** 6171482  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 122  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
702	0.2	TOPSOIL/Clay CL: low plasticity, dark brown, with root fibres and trace silt, w<PL		A	0.0					
					0.1					
		CLAY CL: low plasticity, brown mottled grey, w<PL, very stiff, residual		A	0.4		pp = 350			
		- becoming brown mottled pale brown below 0.6m		S	0.5		7,8,9 N = 17			
1					0.95				1	
701	1.5	SANDSTONE: fine grained, brown mottled grey, very low to medium strength, highly to moderately weathered with clay seams, Wianamatta Group		S	1.5		15,26/150 refusal			
					1.8					
					1.9		PEL*			
					2.0				2	
700										
3										
699										
4										
698	4.2	Bore discontinued at 4.2m (Limit of investigation)		S	4.0		22,25/50 refusal		4	
					4.2					
5										
697										

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrawa Road, Moss Vale

**SURFACE LEVEL:** 701.1 AHD  
**EASTING:** 259133  
**NORTHING:** 6171354  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 123  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
701		TOPSOIL/Clayey SILT ML: pale brown, w<PL		A	0.0 0.1					
699	0.3	CLAY CL: medium plasticity, brown mottled orange, w<PL, stiff to hard, residual		A	0.4 0.5		pp = 500			
700	- becoming grey mottled orange below 1m			S	0.95		4,5,5 N = 10			
698	1				1.5		6,8,10 N = 18			
697	2			S	1.9 1.95 2.0		PEL*			
696	2.9	SILTSTONE: brown mottled orange, very low to medium strength, highly to moderately weathered, with clay seams, Wianamatta Group		S	3.0		7,18,27 N = 45			
695	4				3.45					
694	4.37	Bore discontinued at 4.37m (Limit of investigation)		S	4.0		12,21,25/70 refusal			
693	5				4.37					

**RIG:** Hanjin

**DRILLER:** Total Drilling

LOGGED: FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)




# BOREHOLE LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 708.3 AHD  
**EASTING:** 259265  
**NORTHING:** 6171320  
**DIP/AZIMUTH:** 90°/--

**BORE No:** 124  
**PROJECT No:** 40494.03  
**DATE:** 24/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
708 707 706 705 704 703	0.3	TOPSOIL/Clayey SILT ML: dark brown, trace root fibres, w<PL		A	0.0					
					0.1					
				A	0.4		pp = 300-400			
					0.4		PEL*			
					0.4					
				S	0.5		5,8,8			
					0.5		N = 16			
					0.95					
				A	1.4					
					1.5					
2 1 0 1 2 3 4 5	2.0	SILTSTONE: red brown, low to medium strength, moderately weathered, with clay seams, Wianamatta Group		A	1.9					
					2.0					
				S	2.1		25/100 refusal			
3 4 5	2.5	Bore discontinued at 2.5m (Limit of investigation)								

**RIG:** Hanjin

**DRILLER:** Total Drilling

**LOGGED:** FH

**CASING:** Uncased

**TYPE OF BORING:** 110mm solid flight auger TC bit

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** Location coordinates are in MGA94 Zone 56. w = field moisture content, PL = plastic limit, PEL = proposed excavation level

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 720.0 AHD  
**EASTING:** 259722  
**NORTHING:** 6172662

**PIT No:** 125  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
720	0.15	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w<PL		D	0.1		pp >600					
		Silty CLAY CL: low to medium plasticity, brown, with trace root fibres, w<PL, hard, residual		D	0.5							
719	1.0	SILTSTONE: brown, very low strength, highly weathered, with clay seams, Wianamatta Group		D	1.0			1				
		- becoming low to medium strength, moderately weathered below 1.3m		D	1.5							
718	1.8	SANDSTONE: fine grained, orange brown, low to medium strength, moderately weathered, Wianamatta Group		D	2.0			2				
717	2.1	Pit discontinued at 2.1m (Refusal on medium strength sandstone)										
716	3							3				
715	4							4				
714	5							5				

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

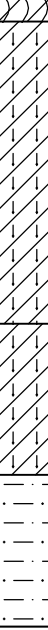
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 720.6 AHD  
**EASTING:** 259761  
**NORTHING:** 6172616

**PIT No:** 126  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
720 1 719 2 718	0.1	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w<PL		D	0.1							
		Silty CLAY CL: low to medium plasticity, brown, with cobbles and boulders, w<PL, hard, colluvium		D	0.5		pp >600					
	1.3	Silty CLAY CL: low to medium plasticity, dark grey mottled brown, w<PL, very stiff, residual - with bands of very low strength, highly weathered siltstone below 1.4m		D	1.0		pp = 350-400	1				
	1.9			D	1.5							
	2	SILTSTONE: grey brown, very low strength, highly weathered, with clay seams, Wianamatta Group		D	2.0			2				
717 4 716 5 715	2.5	Pit discontinued at 2.5m (Refusal on medium strength siltstone)		D	2.5							

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 722.9 AHD  
**EASTING:** 259810  
**NORTHING:** 6172603

**PIT No:** 127  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
722	0.15	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, cobbles and boulders, w<PL		D	0.1		pp >600					
		Silty CLAY CL: low to medium plasticity, red brown, with cobbles, boulders and trace fine grained sand, w<PL, very stiff, colluvium		D	0.5							
	0.75	Silty CLAY CL: low to medium plasticity, dark grey mottled brown, w<PL, hard, residual		D	1.0			1				
		- extremely low strength, residual soil siltstone bands below 1.3m		D	1.5							
	2.0	SILTSTONE: pale grey brown, very low strength, moderately weathered, with clay seams, Wianamatta Group		D	2.0			2				
721	2.15	Pit discontinued at 2.15m (Refusal on low to medium strength siltstone)										
720	3							3				
719	4							4				
718	5							5				
717												

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 693.2 AHD  
**EASTING:** 259724  
**NORTHING:** 6172407

**PIT No:** 128  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
693	0.1	TOPSOIL/Silty CLAY CL: low plasticity, pale brown, with root fibres, w<PL CLAY CH: medium to high plasticity, brown mottled orange, w<PL, hard, residual - becoming grey mottled orange below 0.5m		D	0.1							
				D	0.5		pp >500					
1				D	1.0		pp >500	1				
692				D	1.5		pp >600					
2				D	2.0		pp >600	2				
691				D	2.5		pp = 600					
		- with trace fine sand below 2.4m - becoming very stiff below 2.8m										
3	3.0	Pit discontinued at 3.0m (Limit of investigation)		D	3.0		pp = 300-400	3				
690												
4								4				
689												
5								5				
688												

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 692.0 AHD  
**EASTING:** 260136  
**NORTHING:** 6171941

**PIT No:** 129  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
692	0.2	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w>PL		D	0.1							
		CLAY CH: high plasticity, brown mottled grey orange, w<PL, very stiff to hard, residual		D	0.5		pp >400					
		- becoming grey mottled orange, very stiff below 0.7m		D	1.0		pp = 400	1				
691	1			D	1.5		pp = 200-300					
		- with very low to medium strength, highly weathered siltstone bands below 1.5m		D	2.0			2				
690	2											
	2.3	SILTSTONE: grey brown, low to medium strength, slightly weathered to moderately weathered, Wianamatta Group										
	2.5	Pit discontinued at 2.5m (Refusal on medium strength siltstone)		D	2.5							
689	3											
688	4											
687	5											

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 691.8 AHD  
**EASTING:** 259635  
**NORTHING:** 6171925

**PIT No:** 130  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
691 1 690 2 689 3 688 4 687 5 686	0.1	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w<PL CLAY CH: high plasticity, brown mottled orange, w<PL, hard, residual		D	0.1							
				D	0.5		pp = 500-550					
		- becoming orange mottled grey below 0.8m		D	1.0		pp = 500	1				
		- becoming grey mottled orange below 1.4m		D	1.5		pp >600					
	2.0	SILTSTONE: grey, low to medium strength, slightly weathered, Wianamatta Group		D	2.0			2				
	2.3	Pit discontinued at 2.3m (Refusal on medium strength siltstone)										

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 691.5 AHD  
**EASTING:** 259214  
**NORTHING:** 6171714

**PIT No:** 131  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
691.5 690 689 688 687 686	0.2	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w<PL		D	0.1							
		CLAY CL: low to medium plasticity, orange mottled brown, w<PL, hard, residual		D	0.5							
		-becoming grey mottled orange, hard below 0.7m		D	1.0		pp >600					
				D	1.4		PEL*					
				D	1.5		pp = 200-300					
				D	1.5							
		-becoming stiff to very stiff below 1.8m		D	2.0		pp = 200-350					
	2.3	CLAY CH: high plasticity, grey mottled orange, w<PL, very stiff, residual		D	2.5		pp = 300					
				D	3.0		pp = 350-400					
	3.2	Pit discontinued at 3.2m (Limit of investigation)										
	4											
	5											

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit, PEL = proposed excavation level

☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Prime Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 32 Lovelle Street & 141 Yarrowa Road, Moss Vale

**SURFACE LEVEL:** 688.8 AHD  
**EASTING:** 258987  
**NORTHING:** 6171633

**PIT No:** 132  
**PROJECT No:** 40494.03  
**DATE:** 22/10/2019  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
688 1 687 2 686 3	0.1	TOPSOIL/Silty CLAY CL: low plasticity, brown, with root fibres, w<PL CLAY CH: high plasticity, brown mottled grey orange, w<PL, hard, residual		D	0.1							
		- becoming orange mottled grey, w<PL, stiff below 0.7m		D	0.5		pp = 450					
		- becoming grey mottled orange below 1.4m		D	1.0		pp = 150-200					
		- with very low strength, highly weathered sandstone bands below 1.8m		D	1.5		pp = 100-150					
				D	2.0							
				D	2.5							
685 4 684 5 683	3.0	Pit discontinued at 3.0m (Limit of investigation)		D	3.0							

**RIG:** JCB 3CX-4 Backhoe with 450mm toothed bucket

**LOGGED:** FH

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** w = field moisture content, PL = plastic limit

- ☐ Sand Penetrometer AS1289.6.3.3  
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 707.4 AHD  
**EASTING:** 259597  
**NORTHING:** 6172734

**PIT No:** 1  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
707 706 705	0.1	TOPSOIL - dark brown mottled grey and red brown, silty clay, moist, FMC~PL		D	0.1		pp = 0-50		
	0.6	SILTY CLAY - soft, dark grey mottled green grey and orange brown, silty clay, moist, FMC>PL (COLLUVIUM)		D	0.5				
	1	SILTY CLAY - stiff to hard, dark grey mottled brown, silty clay with iron indurations, moist, FMC<PL (POSSIBLE COLLUVIUM)		D	1.0				
	1.6	SILTY CLAY - hard, grey mottled orange brown, silty clay with some extremely low strength, extremely weathered siltstone bands, moist, FMC<PL (RESIDUAL)		D	1.5				
	2.1	SILTSTONE - very low strength, moderately weathered, grey with orange brown bands siltstone with some extremely low strength, extremely weathered bands		D	2.0				
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



Pit 1 excavation.

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** Ground water ingress at 2.5m

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)


# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 739.3 AHD  
**EASTING:** 259694  
**NORTHING:** 6172904

**PIT No:** 2  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
739	0.1	TOPSOIL - dark brown, silty clay with some sandstone cobbles, moist, FMC<PL	X X X X	D	0.1							
	0.5	DOLERITE - medium strength, moderately weathered, grey brown dolerite										
	0.5	Pit discontinued at 0.5m (Refusal on medium strength dolerite)		D	0.5							



**Pit 2 excavation.**

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)




# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 708.2 AHD  
**EASTING:** 259515  
**NORTHING:** 6172770

**PIT No:** 3  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
708	0.1	TOPSOIL - brown grey, silty clay, moist, FMC<PL		D	0.01				
		SILTY CLAY - stiff to hard, grey mottled orange brown, silty clay, moist, FMC<PL (COLLUVIUM)		B	0.4		pp = 400-500		
				D	0.5				
				D	0.6				
1	1.0	SILTY CLAY - very stiff, grey mottled orange brown, silty clay with some gravel-sized ironstone fragments, moist, FMC<PL (RESIDUAL)		D	1.0				
707	1.1	SILTSTONE - very low strength, moderately weathered, dark grey siltstone with extremely low strength, extremely weathered bands		D	1.5				
				D	2.0				
2				D	2.5				
706	2.5	- becoming extremely low strength, extremely weathered, grey with orange brown bands siltstone with very low strength bands below 2.4m Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



**Pit 3 excavation.**

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 729.7 AHD  
**EASTING:** 259600  
**NORTHING:** 6172841

**PIT No:** 4  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
729	0.05	TOPSOIL - brown, sandy clay with some boulders (dolerite), moist, FMC<PL (COLLUVIUM)		D	0.1				
		SANDY CLAY - stiff, brown orange, friable, sandy clay, moist, FMC<PL (COLLUVIUM)		D	0.5				
	0.8	SANDY CLAY - stiff, orange brown, sandy clay with iron indurations, moist, FMC<PL (RESIDUAL)		D	1.0				
	1.1	DOLERITE - very low strength, highly weathered, orange brown dolerite with extremely low strength, extremely weathered bands		D	1.5				
728		- becoming low strength, moderately weathered brown orange with very low strength, highly weathered bands below 1.2m		D	2.0				
	2.0	Pit discontinued at 2.0m (Refusal on medium strength dolerite)		D	2.0				



Pit 4 excavation.

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)


# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 738.7 AHD  
**EASTING:** 259791  
**NORTHING:** 6172744

**PIT No:** 5  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
738	0.05	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1				5 10 15 20
	0.4	SANDY CLAY - stiff to hard, brown mottled orange brown, sandy clay with some cobbles (dolerite) and iron indurations, moist, FMC<PL (COLLUVIUM)		D	0.5				
		DOLERITE - very low strength, highly weathered, brown orange dolerite with some ironstone and extremely low strength, extremely weathered bands							
	1.0	Pit discontinued at 1.0m (Refusal on medium strength dolerite)		D	1.0				



**Pit 5 excavation.**

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

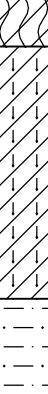
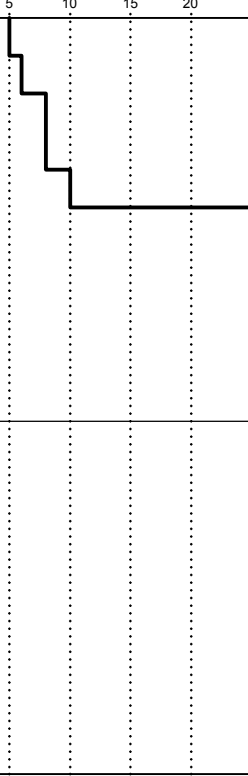
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrawa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 710.7 AHD  
**EASTING:** 259779  
**NORTHING:** 6172567

**PIT No:** 6  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
710	0.2	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1		pp >600		
		SILTY CLAY - very stiff to hard, brown, silty clay, moist, FMC<PL (COLLUVIUM)		D	0.5				
		- becoming orange brown with iron indurations and some cobbles (dolerite) below 0.7m		D	1.0				
	1.2	SILTSTONE - low strength, moderately weathered, grey siltstone with extremely low strength, extremely weathered bands		D	1.5		pp >600		
	1.6	Pit discontinued at 1.6m (Refusal on medium strength siltstone)							

Pit 6 excavation.

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

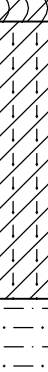
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG


**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 696.5 AHD  
**EASTING:** 259513  
**NORTHING:** 6172677

**PIT No:** 7  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
696	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - stiff, dark brown, silty clay, moist, FMC<PL (POSSIBLE COLLUVIUM/SLOPEWASH)		D	0.4		PEL*		
				D	0.5		pp >600		
				D	0.5				
1		- becoming very stiff to hard, grey mottled orange brown below 0.8m		D	1.0		pp >600		
	1.2	SILTSTONE - low to medium strength, moderately weathered, brown grey siltstone with very low strength, highly weathered bands							
	1.5	Pit discontinued at 1.5m (Refusal on medium strength siltstone)		D	1.5				
695									



Pit 7 excavation.

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

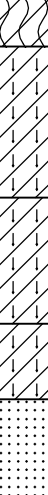
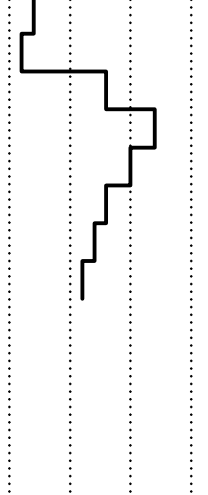
SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 712.3 AHD  
**EASTING:** 259680  
**NORTHING:** 6172699

**PIT No:** 8  
**PROJECT No:** 40494.01  
**DATE:** 18/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
712 711	0.2	TOPSOIL- brown, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - hard, dark brown, silty clay with some ironstone gravel, moist, FMC<PL (COLLUVIUM)		D	0.5		pp >600		
	0.8	SILTY CLAY - very stiff to hard, brown mottled grey and orange brown, silty clay with some sandy clay bands and sub-rounded to rounded gravel, moist, FMC<PL (COLLUVIUM)		D	1.0		pp >600		
	1.3	SILTY CLAY - very stiff to hard, grey mottled orange brown, moist, FMC<PL (RESIDUAL)		D	1.5		pp >600		
	1.6	SANDSTONE - low to medium strength, moderately weathered, grey, brown and orange brown, fine to medium-grained sandstone		D	2.0				
2	2.0	Pit discontinued at 2.0m (Refusal on medium strength sandstone)		D	2.0				



Pit 8 excavation.

**RIG:** Yanmar 5T excavator- 600mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 700.0 AHD  
**EASTING:** 259274  
**NORTHING:** 6171541

**PIT No:** 9  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
700	0.1	TOPSOIL - brown, silty clay with cobbles (syenite), moist, FMC<PL		D	0.1							
		SYENITE - medium strength, slightly weathered to fresh stained, grey syenite with very low to low strength, moderately to highly weathered bands		D	0.5							
					0.9		PEL*					
699	1.0	Pit discontinued at 1.0m (Refusal on medium strength syenite)		D	1.0							

**Pit 9 excavation.**

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 708.2 AHD  
**EASTING:** 259317  
**NORTHING:** 6171416

**PIT No:** 10  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
708	0.25	TOPSOIL - light brown, silty clay with some cobbles (syenite), moist, FMC<PL		D	0.1		pp >600  <b>PEL*</b>					
		SILTY CLAY - very stiff to hard, light brown mottled red brown, silty clay with trace ironstone gravel, moist, FMC<PL (RESIDUAL)		B	0.4							
1	1.0	SYENITE - very low strength, highly weathered, light brown, iron indurated syenite with extremely low strength, extremely weathered bands  - becoming low strength with very low strength bands below 1.4m		D	0.9							
				D	1.0							
707	1.8	Pit discontinued at 1.8m (Refusal on low strength syenite)		D	1.5							



Pit 10 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 686.0 AHD  
**EASTING:** 258940  
**NORTHING:** 6171823

**PIT No:** 11  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
686	0.3	TOPSOIL - dark brown, silty clay with some root fibres, moist, FMC<PL		D	0.1				
		SILTY CLAY - stiff to very stiff, light brown, silty clay, moist, FMC~PL (POSSIBLE ALLUVIUM)		D	0.5		pp = 300-400		
685	1			D	1.0		pp = 300-400	1	
		- becoming slightly sandy below 1.5m (PROBABLE RESIDUAL) - becoming light brown mottled grey below 1.6m		D	1.5		pp = 300-400		
684	1.9			D	2.0			2	
		SANDSTONE - very low strength, highly weathered, grey medium to coarse-grained sandstone with extremely low strength extremely weathered bands							
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



Pit 11 spoil.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

## SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	W	Water seep	S	Standard penetration test
E	Environmental sample	W	Water level	V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 694.3 AHD  
**EASTING:** 259424  
**NORTHING:** 6171716

**PIT No:** 12  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
694 693	0.1	TOPSOIL - light grey, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - very stiff to hard, light brown mottled orange red grey, silty clay, moist, FMC<PL (RESIDUAL)		D	0.5		pp >600		
		- becoming grey mottled orange brown with trace ironstone gravel below 0.7m		D	1.0		pp >600	1	
		- becoming grey mottled light brown below 1.4m		D	1.5		pp >600		
				D	2.0		pp = 500-600	2	
692		- becoming slightly sandy, grey mottled light brown below 2.1m, moist, FMC~PL		D	2.5		pp = 200-300		
	2.5	- becoming very stiff below 2.4m Pit discontinued at 2.5m (Limit of Investigation)							



Pit 12 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)


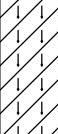






# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 689.0 AHD  
**EASTING:** 259212  
**NORTHING:** 6171856

**PIT No:** 13  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)		
				Type	Depth	Sample	Results & Comments				
689	0.1	TOPSOIL - brown, silty clay with trace rootlets, moist, FMC<PL		D	0.1						
		SILTY CLAY - very stiff, light brown mottled red brown and grey, silty clay with some sand and trace ironstone gravel, moist, FMC<PL (POSSIBLE ALLUVIUM)		B	0.4						
				D	0.5						
				D	0.6						
688	1.0	SILTY CLAY - hard, grey mottled light brown and red brown, silty clay with trace gravel-sized ironstone fragments, moist, FMC~PL (PROBABLE RESIDUAL)		D	1.0		pp >600	1			
		- with some ironstone gravel below 1.2m - becoming grey mottled light orange brown below 1.4m		D	1.5		pp >600				
687	2.0	SILTSTONE - very low to low strength, highly weathered to moderately weathered, grey siltstone with extremely low strength, extremely weathered bands		D	2.0			2			
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5						



Pit 13 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 695.0 AHD  
**EASTING:** 258793  
**NORTHING:** 6171653

**PIT No:** 14  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
695	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.5				
		SILTY CLAY - very stiff to hard, red brown, silty clay with some ironstone gravel, and cobble and boulder-sized fragments (syenite), moist, FMC~PL (RESIDUAL)							
694	0.7	SILTY CLAY - very stiff to hard, red brown, silty clay with some gravel-sized ironstone fragments, moist, FMC<PL (RESIDUAL)							
1		- becoming orange red brown below 1.1m		D	1.0		pp >600		
		- becoming orange brown mottled grey below 1.4m							
693	2.0	SYENITE - very low strength, highly weathered, light brown syenite with extremely low strength, extremely weathered bands		D	2.0		PEL*		
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



Pit 14 spoil.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2



SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 704.8 AHD  
**EASTING:** 258932  
**NORTHING:** 6171180

**PIT No:** 15  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
704	0.1	TOPSOIL - light brown grey, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - very stiff to hard, brown, silty clay, moist, FMC<PL (RESIDUAL)		D	0.5				
				D	1.0		pp = 500-600		
		- becoming grey mottled orange below 0.9m		D	1.5		pp = 200-300		
		- becoming stiff to very stiff and FMC~PL below 1.1m		D	2.0		pp = 200-300		
703	2.1	SYENITE - very low strength, highly weathered, grey syenite with clay bands		D	2.5				
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



Pit 15 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 696.2 AHD  
**EASTING:** 258885  
**NORTHING:** 6171404

**PIT No:** 16  
**PROJECT No:** 40494.01  
**DATE:** 14/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
696	0.2	TOPSOIL - grey, silty clay, moist, FMC<PL		D	0.1							
		SILTY CLAY - very stiff, brown, silty clay, FMC<PL (RESIDUAL)			0.4		PEL*					
				D	0.5							
					0.5							
					0.5							
	1	- becoming orange brown mottled brown with some gravel-sized ironstone fragments below 0.8m		D	1.0							
695		- becoming orange brown mottled grey and iron-indurated, moist, FMC~PL below 1.2m										
		- becoming hard below 1.5m		D	1.5		pp >600					
	2	- becoming slightly sandy with some very low to low strength, highly weathered, siltstone bands below 1.9m		D	2.0		pp = 500-600					
694	2.0	SILTSTONE - very low to low strength, highly to moderately weathered siltstone with extremely low strength, extremely weathered bands										
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5		pp = 400-500					



Pit 16 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 704.8 AHD  
**EASTING:** 259833  
**NORTHING:** 6171844

**PIT No:** 17  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
704	0.05	FILLING - dark brown, silty clay, moist, FMC~PL		D	0.1				
	0.3	FILLING - dark brown, silty clay with trace anthropogenic (bricks and concrete) and bones (probably cattle), moist, FMC~PL		D	0.5				
		SANDSTONE - very low to low strength, highly to moderately weathered, grey sandstone with extremely low strength, extremely weathered bands		D	1.0				
	1.0	Pit discontinued at 1.0m (Refused on low to medium strength sandstone)		D	1.0				
					2.9		PEL*		
					3.0				



Pit 17 spoil.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U <sub>s</sub>	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

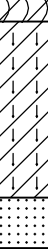


# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 714.1 AHD  
**EASTING:** 260043  
**NORTHING:** 6172384

**PIT No:** 18  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
714	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1							
		SILTY CLAY - hard, orange grey, silty clay with some sand, moist, FMC<PL (RESIDUAL)		D	0.5							
	0.8	SANDSTONE - low to medium strength, slightly weathered, brown grey sandstone with very low strength, highly weathered bands		B	0.9							
	1.0	Pit discontinued at 1.0m (Refusal on medium strength sandstone)		D	1.0							
					2.9		PEL*					
					3.0							

Pit 18 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)


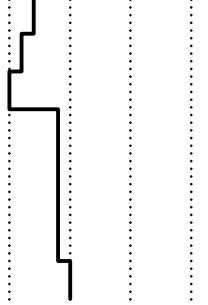



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 700.3 AHD  
**EASTING:** 260067  
**NORTHING:** 6172181

**PIT No:** 19  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
700 699	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - stiff to very stiff, orange brown, silty clay, moist, FMC<PL (RESIDUAL)		D	0.5		pp = 400-500		
	1	- becoming very stiff to hard below 0.5m		D	1.0		pp = 400-500	1	
		- becoming grey mottled with orange brown below 1.1m		D	1.5		pp = 400-500		
698	2.0	SILTSTONE - low to medium strength, slightly weathered, grey siltstone with some extremely low, extremely weathered bands		D	2.0			2	
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5				



Pit 19 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 691.4 AHD  
**EASTING:** 260113  
**NORTHING:** 6172016

**PIT No:** 20  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
691	0.1	TOPSOIL - brown grey, silty clay, moist, FMC<PL		D	0.1							
		SILTY CLAY - very stiff to hard, orange brown grey, silty clay, moist, FMC<PL (PROBABLE RESIDUAL)		D	0.5		pp = 500-600					
	1	- becoming orange brown mottled grey below 0.9m		D	1.0		pp = 500-600	1				
		- becoming grey mottled orange brown below 1.2m		D	1.5		pp = 300-400					
	2			D	2.0			2				
689	2.5	- with extremely low strength, extremely weathered siltstone bands below 2.4m Pit discontinued at 2.5m (Limit of Investigation)										



Pit 20 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)


# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 701.7 AHD  
**EASTING:** 259973  
**NORTHING:** 6171980

**PIT No:** 21  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
701	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1				
		SANDY CLAY - stiff to very stiff, orange brown, sandy clay, moist, FMC<PL (RESIDUAL)							
	0.5			D	0.5				
		SANDSTONE - very low to low strength, highly to moderately weathered, light brown, fine-grained sandstone with extremely low strength, extremely weathered bands							
				D	0.9 1.0 1.0		PEL*		
	1.3	Pit discontinued at 1.3m (Refusal on low strength sandstone)							



Pit 21 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U <sub>s</sub>	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W <sub>s</sub>	Water seep
E	Environmental sample	W <sub>l</sub>	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrawa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 684.4 AHD  
**EASTING:** 259546  
**NORTHING:** 6172361

**PIT No:** 22  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
684	0.1	TOPSOIL- brown, silty clay, moist, FMC<PL		D	0.1		pp >600	1	
		D		0.5					
		D		1.0					
		D		1.5					
	1.5	SANDSTONE - low to medium strength, slightly weathered, grey and orange brown, fine-grained sandstone with some ironstone bands							
	1.7	Pit discontinued at 1.7m (Refusal on medium strength sandstone)							



**Pit 22 excavation.**

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED: IKA/FH**

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 692.1 AHD  
**EASTING:** 259788  
**NORTHING:** 6172224

**PIT No:** 23  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
692	0.1	TOPSOIL - brown, silty clay, moist, FMC<PL		D	0.1				
		SILTY CLAY - very stiff, orange grey, friable, silty clay, moist, FMC<PL (RESIDUAL)		D	0.4		PEL*		
		- becoming very stiff to hard below 0.6m		D	0.5				
				D	0.5				
1		- becoming grey mottled with orange brown below 1.1m		D	1.0		pp >600		
				B	1.2				
	1.4	SILTSTONE - low to medium strength, slightly weathered, orange grey siltstone with very low strength, highly weathered bands		D	1.5				
				D	2.0				
2		- with some ironstone bands below 2.0m							
	2.2	Pit discontinued at 2.2m (Refusal on medium strength siltstone)							



Pit 23 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 688.4 AHD  
**EASTING:** 259438  
**NORTHING:** 6171954

**PIT No:** 24  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
688	0.2	TOPSOIL - light brown, silty clay, moist, FMC<PL		D	0.1							
	SILTY CLAY - very stiff to hard, light brown grey mottled orange brown, silty clay, moist, FMC<PL (PROBABLE ALLUVIUM)											
		B		0.4								
		D		0.5		pp >600						
		D		0.6								
	1			D	1.0		pp >600	1				
687			D	1.5		pp >600						
	2		D	2.0		pp >600	2					
		- becoming stiff, grey mottled orange brown, moist, FMC~PL below 2.2m										
686	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5		pp >600					



Pit 24 spoil.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 682.3 AHD  
**EASTING:** 259073  
**NORTHING:** 6172163

**PIT No:** 25  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
682	0.2	TOPSOIL - light brown grey, silty clay with some root fibres, moist, FMC<PL		D	0.1							
		SILTY CLAY - very stiff, light brown grey, friable, silty clay, moist, FMC<PL (ALLUVIUM)		D	0.4		PEL*					
681		- becoming very stiff to hard, orange grey, silty clay, moist, FMC<PL below 0.7m		D	0.5							
				D	0.5							
1				D	1.0		pp >600					
				D	1.5		pp >600					
2		- becoming slightly sandy with very low strength, highly weathered sandstone bands below 1.7m (RESIDUAL)		D	2.0							
	2.0	SANDSTONE - very low strength, highly weathered, light brown sandstone with extremely low strength, extremely weathered bands		D	2.0							
680				D	2.5							
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5							



Pit 25 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit; PEL = Proposed Excavation Level

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	W	Water seep
E	Environmental sample	W	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

# TEST PIT LOG

**CLIENT:** Moss Vale Pty Ltd  
**PROJECT:** Proposed Residential Subdivision  
**LOCATION:** 141 Yarrowa Road and 32 Lovelle Street, Moss Vale

**SURFACE LEVEL:** 682.3 AHD  
**EASTING:** 258967  
**NORTHING:** 6172472

**PIT No:** 26  
**PROJECT No:** 40494.01  
**DATE:** 17/9/2018  
**SHEET 1 OF 1**

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)			
				Type	Depth	Sample	Results & Comments		5	10	15	20
682 681 680	0.1	TOPSOIL - light brown grey, silty clay, FMC<PL		D	0.1							
		SILTY CLAY - very stiff to hard, light brown orange grey, friable, silty clay, moist, FMC<PL (RESIDUAL)		D	0.5							
		- becoming hard and orange brown below 0.6m		D	1.0		pp >600					
	1.6	SILTY CLAY - hard, grey mottled orange brown, silty clay with extremely weathered, extremely low strength siltstone bands, FMC<PL (RESIDUAL)		D	1.5		pp = 500-600					
	2			D	2.0		pp >600					
	2.5	Pit discontinued at 2.5m (Limit of Investigation)		D	2.5		pp >600					



Pit 26 excavation.

**RIG:** Backhoe 3CX-4-550mm toothed bucket

**LOGGED:** IKA/FH

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** FMC = field moisture content; PL = plastic limit

☐ Sand Penetrometer AS1289.6.3.3  
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test Is(50) (MPa)
		PL(D)	Point load diametral test Is(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)



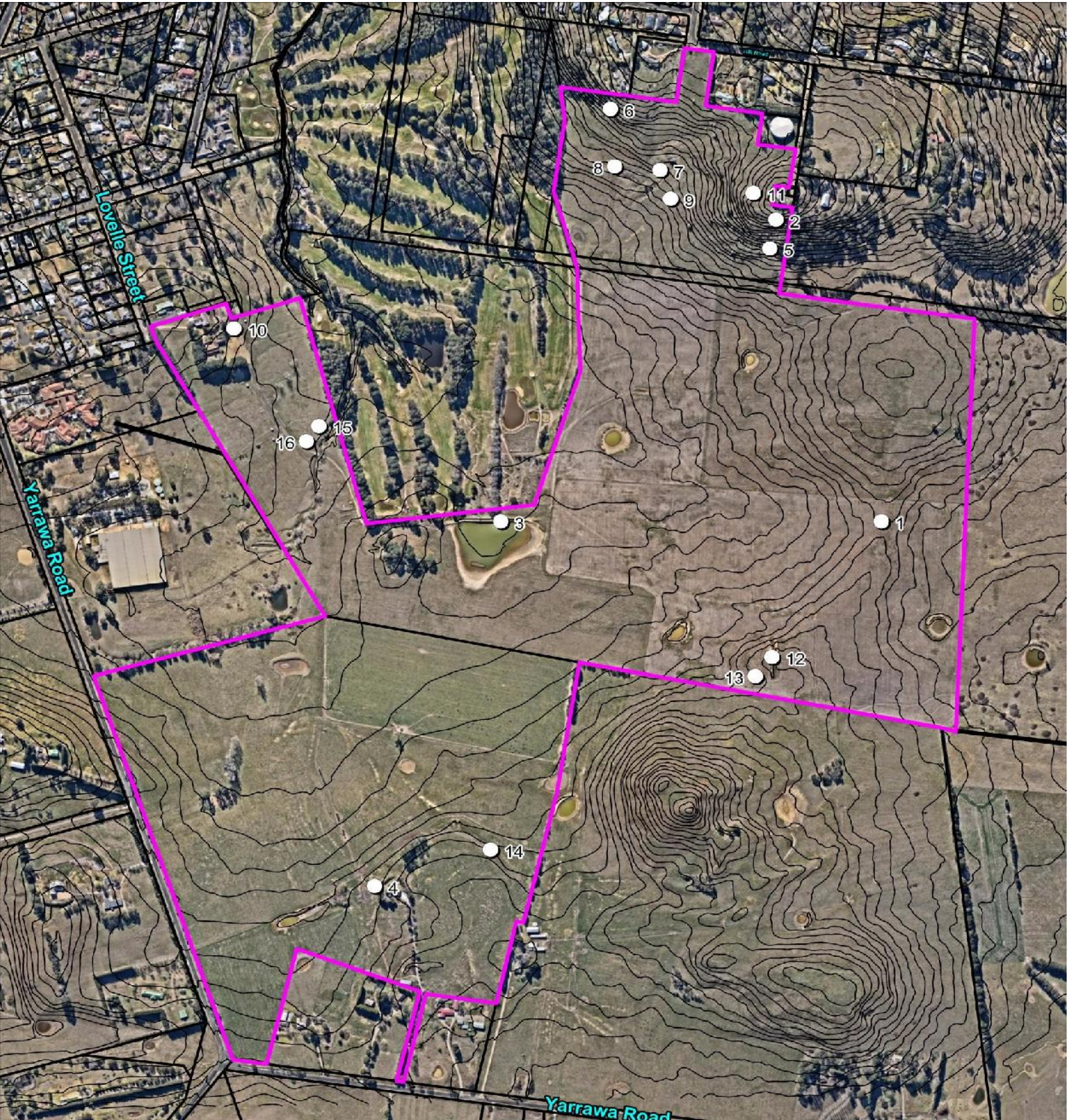






Photo 1: View looking west across the central part of the site from the low ridge lines in the eastern part of the site.



Photo 2: View looking south across the central part of the site from the very steep hillside in the northern part of the site.



Photo 3: View looking east from the large farm dam in the central part of the site. Note: the low ridge line in the background of the photo.



Photo 4: View looking northwest across the southern part of the site from the southern part of the site.

 <b>Douglas Partners</b> <i>Geotechnics   Environment   Groundwater</i>	CLIENT: Moss Vale Pty Ltd		<b>Site Photographs 1 to 4</b> <b>Proposed Residential Subdivision</b> <b>32 Lovelle Street and 141 Yarrowa Road, Moss Vale</b>	PROJECT No: 40494.03
	OFFICE: Wollongong	DRAWN BY: RJH		PLATE No: 2
	SCALE: NTS	DATE: 11 Sep 2018		REVISION: -





Photo 5: View looking north at the smaller of the two water reservoirs at the top of the hill iadjacent to the northern part of the site.



Photo 6: View looking southeast across the steep to very steep hillside in the northern part of the site.



Photo 7: View looking northwest across the active scarp in the lower-middle part of the hillside in the northern part of the site.



Photo 8: View looking northeast across the active scarp in the lower-middle part of the hillside in the northern part of the site. Note: the igneous boulders lying on the surface.





Photo 9: View looking at slumping in a drainage depression in the steep to very steep hillside in the northern part of the site.



Photo 10: View looking south across the northwestern part of the site. Note the coal washery reject filling in the raise roadway.



Photo 11: View looking at bedrock exposed near the crest of the steep to very steep hillside near the small water reservoir in the northern part of the site.



Photo 12: View looking at fine-grained sandstone exposed in a cutting in the eastern part of the site.

 <b>Douglas Partners</b> <i>Geotechnics   Environment   Groundwater</i>	CLIENT: Moss Vale Pty Ltd		<b>Site Photographs 9 to 12</b> <b>Proposed Residential Subdivision</b> <b>32 Lovelle Street and 141 Yarrawa Road, Moss Vale</b>	PROJECT No: 40494.03
	OFFICE: Wollongong	DRAWN BY: RJH		PLATE No: 4
	SCALE: NTS	DATE: 11 Sep 2018		REVISION: -





Photo 13: View looking at a cutting in the low ridgeline in the eastern part of the site. Note: the anthropenic material in the right of the photo.



Photo 14: View of looking at igneous cobbles exposed at the surface along a low natural batter in the southern part of the site.



Photo 15: View looking at a back scarp in the creek bank in the northern part of the site..



Photo 16: View looking at the bridge over the unnamed tributary of White Creek in the northern part of the site.

	CLIENT: Moss Vale Pty Ltd		<b>Site Photographs 13 to 16</b> <b>Proposed Residential Subdivision</b> <b>32 Lovelle Street and 141 Yarrawa Road, Moss Vale</b>	PROJECT No: 40494.03
	OFFICE: Wollongong	DRAWN BY: RJH		PLATE No: 5
	SCALE: NTS	DATE: 11 Sep 2018		REVISION: -