Report on
Preliminary Geotechnical Investigation

Proposed Residential Subdivision - Balance Area
Canvey Road, Upper Kedron

Prepared for
Cedar Woods Ltd

Project 87335.00
April 2015
Document History

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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1. Introduction

This report presents the results of a preliminary geotechnical investigation undertaken for the balance area (ie excluding Stages 1 and 2) of the proposed residential subdivision to be located at Canvey Road, Upper Kedron. The investigation was commissioned by the developer, Cedar Woods Ltd.

It is understood that existing farmland is to be subdivided into approximately 1000 residential allotments over a number of stages. Stages 1 and 2, located on the eastern side of the site, are expected to commence first, with the remainder of the site (i.e. ‘Balance area’) to be development over a number of years.

The aim of this investigation, as outlined in Douglas Partners Pty Ltd’s (DP) Proposal BNE150028 dated 16 January 2015, was to assess the ground conditions at the site in order to provide preliminary comments on major geotechnical constraints for the development such as excavatability and stability to inform the cut and fill earthworks design.

The investigation in the balance area comprised the drilling and sampling of six test bores and ten test pits, followed by laboratory testing, engineering analysis and reporting. Details of the field work are presented in this report together with preliminary comments and recommendations on the issues listed above.

Investigation was carried out concurrently with investigation for Stages 1 & 2 which is reported separately.

This report must be read in conjunction with the notes entitled ‘About This Report’ attached and any other explanatory notes, and should be kept in its entirety without separation of individual pages or sections.

2. Site Description

The site is located off Canvey Road, Upper Kedron and is bounded by Mount Nebo Road to the south, national park to the west, Cedar Creek to the north, and existing residential developments to the east. At the time of the investigation, the site comprised a combination of cleared grazing land and some sparse to moderately dense vegetation. This vegetation was noted to be denser along the natural creek tributaries onsite which fed into Cedar Creek to the north, with the vegetation varied in size with trees ranging upwards of 20 m in height.

The terrain is generally described as rolling hills, with significant slopes of up to 1:1 (V:H) noted onsite. A wide (up to 30 m) tributary area was also encountered running in a northern direction through the
eastern portion of the site. This area was generally flat, and free of significant vegetation. This tributary area bounded the western side of the ‘Stage 1’ and ‘Stage 2’ development areas. A large, flat alluvial plain area was also noted in the northern portion of the site (local to Test Pit 24), which was bounded by Cedar Creek to the north.

Some scour was noted in areas with exposed soils, indicating a potential for erodible soils onsite. Prior to the investigation a significant rainfall event had occurred in the area however, which would contribute to the appearance of these scours.

An existing, single storey house was also noted in the eastern portion of the site, as well as multiple small earthen dams.

General views of the site at the time of the investigation are presented below as Figures 1 to 3.

Figure 1: General view of the site, looking north west from Bore 10
Figure 2: Example of scour encountered onsite, located south of Pit 15

Figure 3: View of the alluvial plain area local to Cedar Creek, looking north west from Bore 7
3. Geology

Reference to the Geological Survey of Queensland’s 1:100,000 series ‘Caboolture’ map indicates that the site is underlain by Devonian to Carboniferous aged Bunya Phyllite, typically comprising “phyllite, minor labile arenite, rare basic metavolcanics”.

The investigation encountered localised alluvium/colluvium (in the tributaries) and residual soils, overlying phyllite rock with localised arenite, which is in general agreement with the geology described above.

4. Field Work Methods

The field work was undertaken between 23 and 27 February 2015 and comprised the drilling of six bores (designated Bores 7 to 12), and ten test pits (designated Pits 20 to 29) at the approximate test locations indicated on Drawing 1 in Appendix B.

Bores 7 to 12 were placed in areas of proposed significant cut, Pits 24, 27, and 28 in areas of significant proposed fill, and Pits 20 to 26 and 29 in areas of low cut or fill (‘intermediate’ areas).

The bores were drilled to approximately 6.0 m depth using a track mounted MD300 drill rig utilising Tungsten Carbide (TC) continuous flight augering drill method. Standard penetration tests (SPTs) were undertaken within the bores at selected depths. Strata identification was undertaken through observation of the auger cutting returns and SPT samples. The bores were backfilled with compacted spoil on completion after checking for groundwater.

The test pits were excavated to depths of between 2.7 m and 3.4 m with a 8T Cat 308E excavator using a 450 mm wide toothed bucket. Strata identification was undertaken through observation of the spoil and material in the face of the excavation. Samples were recovered from layers encountered to provide suitable samples for laboratory testing. Dynamic cone penetrometer (DCP) tests were undertaken adjacent to the bores to provide information on subsoil strength/density. Upon completion, the test pits were backfilled with the spoil material, which was tamped and track rolled for nominal compaction.

The test locations were set out by a geotechnical engineer in accessible locations close to those nominated by the client. The position of each test was recorded using a hand-held GPS accurate to approximately 5m, and the coordinates are shown on the bore report sheets in Appendix C.

The field work was undertaken by experienced geotechnical personnel who logged the bores and collected samples for visual and tactile assessment and for laboratory testing.
5. Field Work Results

The subsurface conditions encountered during field work are described in detail on the borehole log sheets in Appendix C. Notes defining the classification methods and descriptive terms used to describe the soils are given in Appendix A. The subsurface conditions for the two predominant areas are described below.

5.1 ‘Cut’ Areas

In summary, the subsurface conditions encountered in Bores 7 to 12 in the proposed significant ‘cut’ areas comprised topsoil over residual clays and sands, with phyllite at relatively shallow depth. The subsurface conditions in the ‘cut’ area are further described below:

- **Topsoil** – Topsoil was encountered to between 0.05 m and 0.1 m depth in the ‘cut’ areas. The topsoil generally comprised medium dense silty sand, and firm to stiff, low and medium plasticity silty and sandy clay. The topsoils were generally moist.

- **Residual Clays and Sands**: Residual soils were encountered in all bores beneath the topsoil to depths of 0.7 m to 2.6 m, and generally comprised firm to stiff, medium to high plasticity sandy and silty clays. The clay was found to be gravelly and low plasticity in Bores 7 and 8. Medium dense silty sands were also locally encountered in Bore 10. The soils were generally yellow brown, grey, and red brown in colour, and were moist.

- **Phyllite**: Phyllite was encountered beneath the residual soils in the bores in this area, and continued to bore termination depths of between 6.02 m and 6.17 m. The phyllite was generally extremely low and very low strength, and extremely to highly weathered. In Bores 11 and 12, this material graded to low strength with some medium strength bands between 3.9 m and 5.8 m depth. The phyllite was dark grey, brown, and orange in colour. TC bit refusal was not encountered in any of the bores, indicating that rock stronger than medium strength was not encountered within the depths of the investigation.

Groundwater ingress was noted in Bore 10 from 6.0 m depth, but was not encountered in any of the other bores. It should be noted that groundwater depths and ground moistures are affected by climatic conditions and soil permeability, and will therefore vary with time.

5.2 ‘Intermediate’ Areas

In summary, the subsurface conditions encountered in the proposed ‘intermediate’ areas (Pits 20 to 23, 25, 25, 29) comprised topsoil over residual clays and sands, with phyllite at relatively shallow depth. The subsurface conditions in the ‘cut’ area are further described below:

- **Topsoil** – Topsoil was encountered to between 0.1 m and 0.2 m depth in the ‘intermediate’ areas. The topsoil generally comprised soft to firm, firm, and stiff, high plasticity silty clay. The topsoils were generally moist.

- **Residual Clays and Sands**: Residual soils were encountered in all pits in this area beneath the topsoil to depths of 0.4 m to 0.8 m, and generally comprised soft to very stiff, medium and high plasticity sandy and silty clays. Locally the residual soils comprised dense clayey gravel in Pit 25
and dense gravely sand in Pit 21. The soils were generally yellow brown, orange, grey, and red brown in colour, and were moist.

- **Phyllite**: Phyllite was encountered beneath the residual soils in the pits in this area, and continued to termination depths of between 2.7 m and 3.4 m. The phyllite was generally extremely low and very low strength, and extremely to highly weathered. In all pits aside from Pit 21, this material graded to low strength with some medium strength bands at depths between 1.3 m and 2.7 m. The phyllite was dark grey, brown, and orange in colour. Bucket refusal was not encountered in any of the pits, indicating that rock stronger than medium strength was not encountered within the depths of the investigation.

Free groundwater was not encountered in any of the pits in this area. It should be noted that groundwater depths and ground moistures are affected by climatic conditions and soil permeability, and will therefore vary with time.

### 5.3 ‘Fill’ Areas

In summary, the subsurface conditions encountered at the test locations in the ‘fill’ areas comprised **topsoil** over **alluvium/colluvium** in Pit 24, and topsoil over **residual clays** and **phyllite** at relatively shallow depth in Pits 27 and 28. The subsurface conditions in the ‘fill’ area are further described below:

- **Topsoil** – Topsoil was encountered in the pits in this area to approximately 0.2 m depth. The topsoil generally comprised soft to stiff, dark brown, high plasticity silty clay. The topsoil was generally moist, and contained organic content.

- **Alluvium/Colluvium (Pit 24)** – Alluvial and colluvial soils were encountered below the overlying topsoil in Pit 24, and extended to pit termination at 3.0 m depth. The alluvial/colluvial soils consisted of very stiff, high plasticity silty clay overlying dense, fine to coarse sandy gravels. The soils were brown and orange brown in colour, and moist and wet.

- **Residual Clays and Gravels (Pits 27-28)**: Residual soils were encountered in Pits 27 and 28 beneath the topsoil, and continued to depths of 0.5 m to 0.6 m. The residual soils generally comprised stiff to very stiff, high plasticity silty clays, and dense, fine to coarse sandy gravels. The soils were generally brown, orange brown, red brown, and were moist.

- **Phyllite (Pits 27-28)**: Phyllite was encountered beneath the overlying soils in the Pits 27 and 28 in this area to termination depths of 3.0 m. The phyllite was generally extremely low strength and extremely weathered, grading to low and medium strength and moderately to slightly weathered with depth. The phyllite was dark grey, brown, and orange in colour. Bucket refusal was not encountered in any of the pits, indicating that rock stronger than medium strength was not encountered within the depths of the investigation.

Groundwater was encountered at 2.5 m depth within the alluvial/colluvial soils in Pit 24, but was not encountered in the remaining pits. It should be noted, however, that groundwater depths and ground moistures are affected by climatic conditions and soil permeability, and will therefore vary with time.
6. Proposed Development

It is understood that this development will involve the subdivision of existing into approximately 1000 residential allotments over a number of stages. Stages 1 and 2, located on the eastern side of the site, are expected to commence first, with the remainder of the site (the balance area) to be development over a number of years.

In excess of 5 m of cut to fill could be expected for the balance area of the development. It is understood that cut and fill volumes will be finalised as part of detailed design.

7. Preliminary Comments

The subsurface conditions encountered in the investigation mostly comprised shallow topsoil, overlying residual clays and sands to mostly less than 1 m depth, but locally more, then weathered phyllite to the depths investigated. The phyllite was typically extremely low and very low strength, and extremely to highly weathered. In all pits aside from Pit 21, this material graded to low strength with some medium strength bands at depth. Very stiff or dense colluvium/alluvium was locally encountered in Pit 24 in the creek floodplain in the north of the site.

Based on these conditions, it is expected that excavations in the topsoil, alluvium/colluvium, residual soils, and extremely low strength phyllite could be carried out using small sized equipment such as 8-12 tonne hydraulic excavators, although it is likely larger equipment will be adopted for production rates. Bulk excavation of the very low strength and low to medium strength phyllite is likely to be unproductive using small sized equipment, and larger equipment such as 30 tonne excavators would be likely to be required to excavate this material, especially in confined excavations. Ripping with D9 (or larger) dozers would likely be required for bulk excavation.

Site preparation in accordance with usual good practice is expected to be suitable, with stripping of topsoils and treatment of any loose or soft/wet soils and benching for slopes steeper than 8H:1V.

The site soils are not expected to be highly dispersive, however with clay soils present, there is likely to be erosion risk associated with concentrated water flows (eg Figure 2), and usual good erosion and sediment control practices will be required.

It is expected that the majority of the materials won from the proposed cut area of the site will probably comprise clayey sands, low to high plasticity clays, and weathered phyllite which could be reused as bulk filling. The clay material may be difficult to handle and compact when wet. Further, the clays should preferably be blended with weathered phyllite, or placed at least 0.6 m below final subgrade level of buildings and roads. Bulking factors (existing insitu to compacted insitu) are expected to range from approximately 0.9 to 1.0 for the clays to approximately 1.0 to 1.1 for the low strength phyllite rock.

Permanent cut batter slopes, up to 4 m in height could be preliminary designed no steeper than 2H:1V in the residual clays, filling and extremely low to very low strength phyllite, and 0.75H:1V in the low strength (or stronger) phyllite. A bench should be adopted for slopes higher than about 4 m.

For any detention dams, site preparation would be expected to essentially comprise stripping of surficial loose/soft soils along with a foundation key. Previous analysis suggests that detention dams
up to 7 m in height could be constructed using select site won materials with embankment slopes of 1V:2H.

Mass gravity rock walls are expected to be suitable for the proposed retaining walls. Global slope stability of retained fill in areas of steep natural slopes 1V:2.5H is also expected to be generally adequate except where there are areas of deep residual soil (eg Bore 8). Special treatment such as removal and replacement of the clays under the retaining wall with select granular fill, or possibly tiered retaining walls, may be required in those areas.

Based on the investigation, it is expected that the subgrade conditions for pavements and on-ground slabs will vary across the site and generally comprise either filling or stiff sandy and silty clay soils, or extremely low strength rock with CBR values ranging from 3% to 5% for the clays and filling, to 10% for the less weathered phyllite insitu.

8. References


9. Limitations

DP has prepared this preliminary report for the Balance Area of the proposed Residential Subdivision to be located at Canvey Road, Upper Kedron in accordance with DP's proposal BNE150028 (Rev. 1) dated 3 February 2015 as requested by Cedar Woods Ltd. The work was carried out under DP’s Conditions of Engagement. This report is provided for the exclusive use of Cedar Woods Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other 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 up on 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 limited by undetected variations in ground conditions across the site and between sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with the notes entitled ‘About This Report’ in Appendix A and any other explanatory notes 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, as this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required by the Health and Safety Legislation and Regulations, to be included in a safety report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of 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 Upgrade 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
Notes entitled ‘About This Report’

Explanatory Notes
Sampling Procedures
Soil Descriptions
Rock Descriptions
Symbols and Abbreviations
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.

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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:
- 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.
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 Methods

**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:
  
  \[
  \begin{array}{l}
  4,6,7 \\
  N=13
  \end{array}
  \]
- 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:
  
  \[
  \begin{array}{l}
  15, 30/40 \text{ mm}
  \end{array}
  \]
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, 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:

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</thead>
<tbody>
<tr>
<td>Coarse gravel</td>
<td>20 - 63</td>
</tr>
<tr>
<td>Medium gravel</td>
<td>6 - 20</td>
</tr>
<tr>
<td>Fine gravel</td>
<td>2.36 - 6</td>
</tr>
<tr>
<td>Coarse sand</td>
<td>0.6 - 2.36</td>
</tr>
<tr>
<td>Medium sand</td>
<td>0.2 - 0.6</td>
</tr>
<tr>
<td>Fine sand</td>
<td>0.075 - 0.2</td>
</tr>
</tbody>
</table>

The proportions of secondary constituents of soils are described as:

<table>
<thead>
<tr>
<th>Term</th>
<th>Proportion</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>And</td>
<td>Specify</td>
<td>Clay (60%) and Sand (40%)</td>
</tr>
<tr>
<td>Adjective</td>
<td>20 - 35%</td>
<td>Sandy Clay</td>
</tr>
<tr>
<td>Slightly</td>
<td>12 - 20%</td>
<td>Slightly Sandy Clay</td>
</tr>
<tr>
<td>With some</td>
<td>5 - 12%</td>
<td>Clay with some sand</td>
</tr>
<tr>
<td>With a trace of</td>
<td>0 - 5%</td>
<td>Clay with a trace of sand</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Description</th>
<th>Abbreviation</th>
<th>Undrained shear strength (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very soft</td>
<td>vs</td>
<td>&lt;12</td>
</tr>
<tr>
<td>Soft</td>
<td>s</td>
<td>12 - 25</td>
</tr>
<tr>
<td>Firm</td>
<td>f</td>
<td>25 - 50</td>
</tr>
<tr>
<td>Stiff</td>
<td>st</td>
<td>50 - 100</td>
</tr>
<tr>
<td>Very stiff</td>
<td>vst</td>
<td>100 - 200</td>
</tr>
<tr>
<td>Hard</td>
<td>h</td>
<td>&gt;200</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Relative Density</th>
<th>Abbreviation</th>
<th>SPT N value</th>
<th>CPT qc value (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very loose</td>
<td>vl</td>
<td>&lt;4</td>
<td>&lt;2</td>
</tr>
<tr>
<td>Loose</td>
<td>l</td>
<td>4 - 10</td>
<td>2 - 5</td>
</tr>
<tr>
<td>Medium dense</td>
<td>md</td>
<td>10 - 30</td>
<td>5 - 15</td>
</tr>
<tr>
<td>Dense</td>
<td>d</td>
<td>30 - 50</td>
<td>15 - 25</td>
</tr>
<tr>
<td>Very dense</td>
<td>vd</td>
<td>&gt;50</td>
<td>&gt;25</td>
</tr>
</tbody>
</table>
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 Descriptions**

**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 - 1993. The terms used to describe rock strength are as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>Abbreviation</th>
<th>Point Load Index Is(50) MPa</th>
<th>Approx Unconfined Compressive Strength MPa*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely low</td>
<td>EL</td>
<td>&lt;0.03</td>
<td>&lt;0.6</td>
</tr>
<tr>
<td>Very low</td>
<td>VL</td>
<td>0.03 - 0.1</td>
<td>0.6 - 2</td>
</tr>
<tr>
<td>Low</td>
<td>L</td>
<td>0.1 - 0.3</td>
<td>2 - 6</td>
</tr>
<tr>
<td>Medium</td>
<td>M</td>
<td>0.3 - 1.0</td>
<td>6 - 20</td>
</tr>
<tr>
<td>High</td>
<td>H</td>
<td>1 - 3</td>
<td>20 - 60</td>
</tr>
<tr>
<td>Very high</td>
<td>VH</td>
<td>3 - 10</td>
<td>60 - 200</td>
</tr>
<tr>
<td>Extremely high</td>
<td>EH</td>
<td>&gt;10</td>
<td>&gt;200</td>
</tr>
</tbody>
</table>

* Assumes a ratio of 20:1 for UCS to Is(50)

**Degree of Weathering**

The degree of weathering of rock is classified as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely weathered</td>
<td>EW</td>
<td>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.</td>
</tr>
<tr>
<td>Highly weathered</td>
<td>HW</td>
<td>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</td>
</tr>
<tr>
<td>Moderately weathered</td>
<td>MW</td>
<td>Staining and discolouration of rock substance has taken place</td>
</tr>
<tr>
<td>Slightly weathered</td>
<td>SW</td>
<td>Rock substance is slightly discoloured but shows little or no change of strength from fresh rock</td>
</tr>
<tr>
<td>Fresh stained</td>
<td>Fs</td>
<td>Rock substance unaffected by weathering but staining visible along defects</td>
</tr>
<tr>
<td>Fresh</td>
<td>Fr</td>
<td>No signs of decomposition or staining</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragmented</td>
<td>Fragments of &lt;20 mm</td>
</tr>
<tr>
<td>Highly Fractured</td>
<td>Core lengths of 20-40 mm with some fragments</td>
</tr>
<tr>
<td>Fractured</td>
<td>Core lengths of 40-200 mm with some shorter and longer sections</td>
</tr>
<tr>
<td>Slightly Fractured</td>
<td>Core lengths of 200-1000 mm with some shorter and loner sections</td>
</tr>
<tr>
<td>Unbroken</td>
<td>Core lengths mostly &gt; 1000 mm</td>
</tr>
</tbody>
</table>
Rock Descriptions

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

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

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:

<table>
<thead>
<tr>
<th>Term</th>
<th>Separation of Stratification Planes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinly laminated</td>
<td>&lt; 6 mm</td>
</tr>
<tr>
<td>Laminated</td>
<td>6 mm to 20 mm</td>
</tr>
<tr>
<td>Very thinly bedded</td>
<td>20 mm to 60 mm</td>
</tr>
<tr>
<td>Thinly bedded</td>
<td>60 mm to 0.2 m</td>
</tr>
<tr>
<td>Medium bedded</td>
<td>0.2 m to 0.6 m</td>
</tr>
<tr>
<td>Thickly bedded</td>
<td>0.6 m to 2 m</td>
</tr>
<tr>
<td>Very thickly bedded</td>
<td>&gt; 2 m</td>
</tr>
</tbody>
</table>
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
U50 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
calcite
carbonaceous
clay
iron oxide
manganese
silty

Shape
curved
irregular
planar
stepped
undulating

Roughness
polished
rough
slickensided
smooth
very rough

Other
fragmented
band
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
- Porphry
Appendix B

Drawing 1 – Test Location Plan
LEGEND:-
- Geotechnical Bore Location and Number
- Geotechnical Test Pit Location and Number

NOTE:--
1. Plan adapted from Nearmap.
2. Test locations are approximate only and were located using handheld GPS.
Appendix C

Bore Log and Test Pit Report Sheets
Bores 7-12
Pits 22-29
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Type</th>
<th>Depth</th>
<th>Sample</th>
<th>Results &amp; Comments</th>
<th>Water</th>
<th>Dynamic Penetrometer Test (blows per 0mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>TOPSOIL - stiff, dark brown, low plasticity sandy clay, some fine gravel, moist</td>
<td>D</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td>GRAVELLY SANDY CLAY - stiff, dark brown, low plasticity gravelly sandy clay, fine to coarse grained sand, fine to coarse sub-angular gravel, dry</td>
<td>S</td>
<td>1.5</td>
<td>1.65</td>
<td>30/150mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYLLITE - extremely low strength, extremely weathered, light brown grey phyllite</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>- extremely low to very low strength, highly weathered</td>
<td>S</td>
<td>3.0</td>
<td>3.29</td>
<td>24, 30/135mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- some low to medium strength bands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- very low strength with some low strength bands</td>
<td>S</td>
<td>4.5</td>
<td>4.61</td>
<td>30/110mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bore discontinued at 6.12m depth - Limit of investigation</td>
<td>S</td>
<td>6.0</td>
<td>6.12</td>
<td>30/120mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RIG:** MD300 (Track)  
**DRILLER:** Taberner Drilling  
**LOGGED:** JS  
**CASING:** Nil  

**TYPE OF BORING:** Auger  
**WATER OBSERVATIONS:** No free groundwater observed  
**REMARKS:**
### BOREHOLE LOG

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SURFACE LEVEL:** --  
**EASTING:** 491511  
**NORTHING:** 6966511  
**DATE:** 25/2/2015  
**PROJECT No:** 87335.00  
**BORE No:** 8  
**CASING:** Nil  
**REMARKS:**

#### Description of Strata

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>TOPSIOL - stiff, brown, medium plasticity silty clay, moist</td>
</tr>
<tr>
<td>1.1</td>
<td>SILTY CLAY - stiff, grey brown, medium plasticity silty clay with some fine grained sand, dry to moist</td>
</tr>
<tr>
<td>2.6</td>
<td>GRAVELLY CLAY - hard, grey banded orange brown, low plasticity gravelly clay, moist (weathered phyllite)</td>
</tr>
<tr>
<td>3.0</td>
<td>PHYLITE - extremely low strength, extremely weathered, grey banded orange brown phyllite</td>
</tr>
<tr>
<td></td>
<td>- grading to very low to extremely low strength, extremely to highly weathered</td>
</tr>
</tbody>
</table>
| 6.13      | - some low strength bands  

Bore discontinued at 6.13m depth - Limit of investigation

---

#### Dynamic Penetrometer Test

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Test Results &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>D 7,12.22 N = 34</td>
</tr>
<tr>
<td>1.5</td>
<td>S 7, 30/150mm</td>
</tr>
<tr>
<td>4.5</td>
<td>S 30/120mm</td>
</tr>
<tr>
<td>6.0</td>
<td>S 30/130mm</td>
</tr>
</tbody>
</table>

---

**RIG:** MD300 (Track)  
**DRILLER:** Taberner Drilling  
**LOGGED:** BM

**WATER OBSERVATIONS:** No free groundwater observed

---

**SAMPLING & IN SITU TESTING LEGEND**

- A Auger sample
- B Bulk sample
- BLK Block sample
- C Core drilling
- D Disturbed sample
- E Environmental sample
- G Gas sample
- P Piston sample
- PL(D) Point load diametral test Is(50) (MPa)
- PL(A) Point load axial test Is(50) (MPa)
- S Standard penetration test
- V Shear vane (kPa)

---

**Sand Penetrometer AS1289.6.3.3**

**Cone Penetrometer AS1289.6.3.2**

---

**Douglas Partners**

---

**SURFACE LEVEL:** --  
**EASTING:** 491511  
**NORTHING:** 6966511  
**DATE:** 25/2/2015  
**PROJECT No:** 87335.00  
**BORE No:** 8  
**CASING:** Nil  
**REMARKS:**

#### Description of Strata

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>TOPSIOL - stiff, brown, medium plasticity silty clay, moist</td>
</tr>
<tr>
<td>1.1</td>
<td>SILTY CLAY - stiff, grey brown, medium plasticity silty clay with some fine grained sand, dry to moist</td>
</tr>
<tr>
<td>2.6</td>
<td>GRAVELLY CLAY - hard, grey banded orange brown, low plasticity gravelly clay, moist (weathered phyllite)</td>
</tr>
<tr>
<td>3.0</td>
<td>PHYLITE - extremely low strength, extremely weathered, grey banded orange brown phyllite</td>
</tr>
<tr>
<td></td>
<td>- grading to very low to extremely low strength, extremely to highly weathered</td>
</tr>
</tbody>
</table>
| 6.13      | - some low strength bands  

Bore discontinued at 6.13m depth - Limit of investigation

---

#### Dynamic Penetrometer Test

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Test Results &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>D 7,12.22 N = 34</td>
</tr>
<tr>
<td>1.5</td>
<td>S 7, 30/150mm</td>
</tr>
<tr>
<td>4.5</td>
<td>S 30/120mm</td>
</tr>
<tr>
<td>6.0</td>
<td>S 30/130mm</td>
</tr>
</tbody>
</table>

---

**RIG:** MD300 (Track)  
**DRILLER:** Taberner Drilling  
**LOGGED:** BM

**WATER OBSERVATIONS:** No free groundwater observed

---

**SAMPLING & IN SITU TESTING LEGEND**

- A Auger sample
- B Bulk sample
- BLK Block sample
- C Core drilling
- D Disturbed sample
- E Environmental sample
- G Gas sample
- P Piston sample
- PL(D) Point load diametral test Is(50) (MPa)
- PL(A) Point load axial test Is(50) (MPa)
- S Standard penetration test
- V Shear vane (kPa)

---

**Sand Penetrometer AS1289.6.3.3**

**Cone Penetrometer AS1289.6.3.2**

---

**Douglas Partners**
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Graphic Log</th>
<th>Sampling &amp; In Situ Testing</th>
<th>Water</th>
<th>Dynamic Penetrometer Test (blows per 0mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>TOPSOIL - firm, dark brown, medium high plasticity silty clay, some sand, moist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td>SILTY CLAY - firm, grey brown, medium plasticity silty clay with some fine grained sand, moist</td>
<td>G</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>PHYLITITE - extremely low strength, extremely weathered, light grey and orange brown phyllite</td>
<td>S</td>
<td></td>
<td></td>
<td>19, 22, 30/130mm</td>
</tr>
<tr>
<td>3.0</td>
<td>- very low strength, highly weathered</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.08</td>
<td>- some low strength bands</td>
<td></td>
<td></td>
<td></td>
<td>30/80mm</td>
</tr>
<tr>
<td>4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16, 22, 30/120mm</td>
</tr>
<tr>
<td>4.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>- conglomerate band (300mm), low strength, moderately weathered, sub-rounded clasts</td>
<td>D</td>
<td></td>
<td></td>
<td>30/150mm</td>
</tr>
<tr>
<td>6.15</td>
<td>Bore discontinued at 6.15m depth - Limit of investigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **Type of Boring:** Auger
- **Water Observations:** No free groundwater observed
- **Remarks:**

**Legend:**
- A: Auger sample
- B: Bulk sample
- BLK: Block sample
- C: Core drilling
- D: Disturbed sample
- E: Environmental sample
- G: Gas sample
- PID: Photo ionisation detector (ppm)
- PLD: Point load diametral test (kPa)
- PL(A): Point load axial test (kPa)
- S: Standard penetration test
- V: Vane shear test

**Definitions:**
- **TOPSOIL:** firm, dark brown, medium high plasticity silty clay, some sand, moist
- **SILTY CLAY:** firm, grey brown, medium plasticity silty clay with some fine grained sand, moist
- **PHYLITITE:** extremely low strength, extremely weathered, light grey and orange brown phyllite

**Client:** Cedar Grove Developments
**Project:** Proposed Cedar Grove Subdivision
**Location:** Canvey Road, Upper Kedron
**Surface Level:**

**Easting:** 491727  **Nordling:** 6966341
**Date:** 24/2/2015
**Project No:** 87335.00
**Bore No:** 9

**Rig:** MD300 (Track)  **Driller:** Taberner Drilling  **Logged:** BM  **Casing:** Nil

**Additional Notes:**
- **Static Penetrometer Test**
- **Cone Penetrometer Test**
TOPSOIL - medium dense, brown, fine grained silty sand topsoil, moist
Silty Sand - medium dense, yellow brown, silty fine grained sand, dry to moist
Phyllite - extremely low strength, extremely weathered, grey banded orange brown phyllite
- grading to very low strength, highly weathered
- grading to very low to low strength, highly to moderately weathered
Bore discontinued at 6.07m depth - Limit of investigation

Type | Depth | Sample |
--- | --- | --- |
A Auger sample | G Gas sample | PID Photo ionisation detector (ppm) |
B Bulk sample | P Piston sample | PLD Point load axial test (50) (MPa) |
C Core drilling | W Water sample | S Standard penetration test |
D Disturbed sample | S Water seep | V Shear vane (kPa) |
E Environmental sample | G Gas sample | PID Photo ionisation detector (ppm) |

Dynamic Penetrometer Test (blows per 0mm)

<table>
<thead>
<tr>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/145mm</td>
<td>30/150mm</td>
<td>30/80mm</td>
<td>30/70mm</td>
</tr>
</tbody>
</table>

REMARKS:
- Sand Penetrometer AS1289.6.3.3
- Cone Penetrometer AS1289.6.3.2

RIG: MD300 (Track) DRILLER: Taberner Drilling LOGGED: BM CASING: Nil

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater ingress at 6.0m
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Sampling &amp; In Situ Testing</th>
<th>Dynamic Penetrometer Test (blows per 0mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>TOPSOIL - firm, dark grey, medium plasticity sandy silty clay topsoil, fine to coarse grained sand, moist to wet</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SILTY CLAY - firm to stiff, brown and red brown, high plasticity silty clay with some medium to coarse grained sand, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>PHYLLITE - extremely low to very low strength, highly weathered, light brown and grey phyllite</td>
<td>S</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>- low strength, moderately weathered, some extremely and very low strength bands</td>
<td></td>
<td>30/140mm</td>
</tr>
<tr>
<td>6.09</td>
<td>Bore discontinued at 6.09m depth - Limit of investigation</td>
<td></td>
<td>6.09</td>
</tr>
</tbody>
</table>

**SURFACE LEVEL:** --

**EASTING:** 490855  
**NORTHING:** 6966314  

**BORE No:** 11  
**PROJECT No:** 87335.00  

**DATE:** 26/2/2015

---

**RIG:** MD300 (Track)  
**DRILLER:** Taberner Drilling  
**LOGGED:** JS  
**CASING:** Nil

**TYPE OF BORING:** Auger  
**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:**

---

**SAMPLING & IN SITU TESTING LEGEND**

- A Auger sample
- B Bulk sample
- BLK Block sample
- C Core drilling
- D Disturbed sample
- E Environmental sample
- G Gas sample
- P Piston sample
- PL(D) Point load diametral test (kPa)
- PL(A) Point load axial test (kPa)
- S Standard penetration test
- U Tube sample (x mm dia.)
- W Water sample
- S STANDARD PENETRATOR (kPa)
TOPSOIL - firm, brown, medium plasticity silty clay topsoil with some fine to coarse grained sand, moist

SILTY CLAY - stiff, red brown, medium to high plasticity silty clay with a trace of fine to medium grained sand, moist

PHYLLITE - very low strength, highly weathered, light brown and grey phyllite

- low strength, moderately weathered, grey

Bore discontinued at 6.02m depth - Limit of investigation

---

**RIG:** MD300 (Track)  
**DRILLER:** Taberner Drilling  
**LOGGED:** JS  
**CASING:** Nil  
**TYPE OF BORING:** Auger  
**WATER OBSERVATIONS:** No free groundwater observed  
**REMARKS:**

---

**SAMPLING & IN SITU TESTING LEGEND**

- **A:** Auger sample  
- **B:** Bulk sample  
- **BLK:** Block sample  
- **C:** Core drilling  
- **D:** Disturbed sample  
- **E:** Environmental sample  
- **G:** Gas sample  
- **P:** Piston sample  
- **PL:** Pocket penetrometer  
- **PLD:** Point load diametral test  
- **PP:** Pocket penetrometer  
- **S:** Standard penetration test  
- **V:** Shear vane  
- **W:** Water sample  
- **X:** Water level  
- **PID:** Photo ionisation detector  
- **PP:** Pocket penetrometer  

**Dynamic Penetrometer Test (blows per 0mm):**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Results &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.07</td>
<td>TOPSOIL - firm, brown, medium plasticity silty clay topsoil with some fine to coarse grained sand, moist</td>
</tr>
<tr>
<td>1.4</td>
<td>PHYLLITE - very low strength, highly weathered, light brown and grey phyllite</td>
</tr>
<tr>
<td>6.02</td>
<td>Bore discontinued at 6.02m depth - Limit of investigation</td>
</tr>
</tbody>
</table>

---

**BOREHOLE LOG**

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SURFACE LEVEL:** --  
**EASTING:** 490742  
**NORTHING:** 696603  
**DATE:** 26/2/2015  
**BORE No:** 12  
**PROJECT No:** 87335.00  
**SHEET 1 OF 1**

---

**SURFACE LEVEL:** --  
**EASTING:** 490742  
**NORTHING:** 696603  
**DATE:** 26/2/2015  
**BORE No:** 12  
**PROJECT No:** 87335.00  
**SHEET 1 OF 1**
## TEST PIT LOG

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SURFACE LEVEL:** --  
**EASTING:** 491642  
**NORTHING:** 6966919  
**DATE:** 25/2/2015  
**PIT No:** 20  
**PROJECT No:** 87335.00  
**DATE:** 25/2/2015  
**SHEET 1 OF 1**

### Sampling & In Situ Testing Legend

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Auger sample</td>
</tr>
<tr>
<td>B</td>
<td>Bulk sample</td>
</tr>
<tr>
<td>BLK</td>
<td>Block sample</td>
</tr>
<tr>
<td>C</td>
<td>Core drilling</td>
</tr>
<tr>
<td>D</td>
<td>Disturbed sample</td>
</tr>
<tr>
<td>E</td>
<td>Environmental sample</td>
</tr>
<tr>
<td>G</td>
<td>Gas sample</td>
</tr>
<tr>
<td>P</td>
<td>Piston sample</td>
</tr>
<tr>
<td>PL</td>
<td>Pocket penetrometer (kPa)</td>
</tr>
<tr>
<td>PLD</td>
<td>Pocket load axial test (Is50) (MPa)</td>
</tr>
<tr>
<td>PL(D)</td>
<td>Pocket load diametral test (Is50) (MPa)</td>
</tr>
<tr>
<td>W</td>
<td>Water sample</td>
</tr>
<tr>
<td>S</td>
<td>Water seep</td>
</tr>
<tr>
<td>V</td>
<td>Shear vane (kPa)</td>
</tr>
<tr>
<td>PID</td>
<td>Photo ionisation detector (ppm)</td>
</tr>
</tbody>
</table>

### Dynamic Penetrometer Test (blows per 100mm)

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Graphic Log

- **TOPSOIL** - soft to firm, dark brown, high plasticity silty clay topsoil with some organics, moist
- **SILTY CLAY** - firm to stiff, red brown mottled brown, high plasticity silty clay with some fine grained sand, moist
- **PHYLLITE** - extremely low strength, extremely weathered, orange brown and grey phyllite

- **- very low to low strength, highly weathered**
- **- low strength, moderately weathered**

Pit discontinued at 3.0m depth - Limit of investigation

### Results & Comments

**LOGGED:** MS  
**SURVEY DATUM:** MGA94

### WATER OBSERVATIONS

No free groundwater observed

**REMARKS:**

**RIG:** Cat 308E
CLIENT: Cedar Woods Ltd
OFFICE: Brisbane
DATE: April 2015

PROJECT No: 87335.00
PLATE No: -
REVISION: -

Test Pit Photograph – Pit 20
Proposed Residential Subdivision
Canvey Road, Upper Kedron
### Test Pit Log

**Client:** Cedar Grove Developments  
**Project:** Proposed Cedar Grove Subdivision  
**Location:** Canvey Road, Upper Kedron  
**Surface Level:** --  
**Easting:** 491734  
**Northing:** 6966673  
**Pit No:** 21  
**Project No:** 87335.00  
**Date:** 27/2/2015  
**Sheet:** 1 of 1

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Sampling &amp; In Situ Testing</th>
<th>Dynamic Penetrometer Test (blows per 100mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>TOPSOIL - firm, dark brown, high plasticity silty clay topsoil with some organics and fine gravel, moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>SILTY CLAY - soft to firm, brown mottled orange brown, high plasticity silty clay with some fine to medium grained sand, moist</td>
<td>D 0.5</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>SILTY GRAVELLY SAND - dense, brown and orange brown, silty gravelly fine to medium grained sand with a trace of high plasticity clay, fine gravel, moist</td>
<td>D 0.6</td>
<td>pp = 150-170</td>
</tr>
<tr>
<td></td>
<td>PHYLITE - extremely low strength, extremely weathered, dark brown, brown and orange phylite</td>
<td>D 0.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- very low strength, highly weathered</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- very low to low strength, highly to moderately weathered, dark brown, grey and orange</td>
<td>D 1.4</td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>Pit discontinued at 3.4m depth - Limit of investigation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

**Rig:** Cat 308E  
**Logged:** MS  
**Survey Datum:** MGA94  

**Water Observations:** No free groundwater observed

**Sampling & In Situ Testing Legend:**

- A: Auger sample  
- B: Bulk sample  
- BLK: Block sample  
- C: Core drilling  
- D: Disturbed sample  
- E: Environmental sample  
- G: Gas sample  
- P: Piston sample  
- T: Tube sample (x mm dia.)  
- W: Water sample  
- Water level  
- V: Shear vane (kPa)

- D: Dynamic Penetrometer Test  
- PL: Point load axial test (kN)  
- PP: Point load diametral test (kN)  
- IS: Standard penetration test  
- PP: Pocket penetrometer (kPa)  
- PL: PL(D)  
- PID: Photo ionisation detector (ppm)  

**Additional Information:**

- Dynamic Penetrometer Test (blows per 100mm)
  - 5
  - 10
  - 15
  - 20

**Dynamic Penetrometer Test (blows per 100mm):**

- 1
- 2
- 3
- 4
### Sampling & In Situ Testing

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Type</th>
<th>Depth</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>TOPSOIL - firm, dark brown, high plasticity silty clay with some organics and fine gravel, moist</td>
<td>D</td>
<td>0.3</td>
<td>pp = 140-190</td>
</tr>
<tr>
<td>0.4</td>
<td>SANDY CLAY - firm to stiff, yellow brown mottled orange, medium plasticity sandy clay with some silt, moist</td>
<td>D</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>PHYLITe - very low to low strength, highly weathered, black and orange brown phyllite - low strength, highly to moderately weathered</td>
<td>D</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>grey and orange brown</td>
<td>D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pit discontinued at 3.0m depth - Limit of investigation

### Dynamic Penetrometer Test (blows per 100mm)

- 5
- 10
- 15
- 20

RIG: Cat 308E

LOGGED: MS

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

- **SAMPLING & IN SITU TESTING LEGEND**
  - A: Auger sample
  - B: Bulk sample
  - BLK: Block sample
  - C: Core drilling
  - D: Disturbed sample
  - E: Environmental sample
  - G: Gas sample
  - P: Piston sample
  - PL: Pocket penetrometer (kPa)
  - PL(A): Point load axial test (kN) (MPa)
  - PL(D): Point load diametral test (kN) (MPa)
  - W: Water sample
  - B: Water level
  - S: Shear vane (kPa)
  - V: Standard penetration test
  - (pp) Photo ionisation detector (ppm)

---

**TEST PIT LOG**

**CLIENT:** Cedar Grove Developments

**PROJECT:** Proposed Cedar Grove Subdivision

**LOCATION:** Canvey Road, Upper Kedron

**SURFACE LEVEL:** –

**EASTING:** 491823

**NORTHING:** 6966128

**DATE:** 26/2/2015

**PIT No:** 22

**PROJECT No:** 87335.00

**DATE:** 26/2/2015

**SHEET 1 OF 1**
CLIENT: Cedar Woods Ltd
OFFICE: Brisbane
DATE: April 2015

Test Pit Photograph – Pit 22
Proposed Residential Subdivision
Canvey Road, Upper Kedron

PROJECT No: 87335.00
PLATE No: -
REVISION: -
## TEST PIT LOG

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SITE LEVEL:**  
**EASTING:** 491667  
**NORTHING:** 6965955  
**DATE:** 26/2/2015  
**PIT No:** 23  
**PROJECT No:** 87335.00  
**DATE:** 26/2/2015  
**SHEET** 1 OF 1

### Sampling & In Situ Testing

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
<th>Graphic Log Type</th>
<th>Sampling &amp; In Situ Testing</th>
<th>Results &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>TOPSOIL - firm, dark brown, high plasticity sandy clay topsoil with some organics and fine gravel, moist</td>
<td>D 0.5 pp = 180-220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>SILTY CLAY - firm to stiff, red brown mottled orange, high plasticity silty clay with some gravel, moist</td>
<td>D 0.7 pp = 250-270</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1.0       | - very stiff  
PHYLITE - extremely low strength, extremely weathered, brown, red brown and orange phyllite  
- very low strength, highly weathered, red brown and grey  
- low strength | D 1.5 |
| 2.0       | - low to medium strength, highly to moderately weathered, grey banded orange brown | D 2.9 |
| 3.0       | Pit discontinued at 3.0m depth - Limit of investigation |

### Dynamic Penetrometer Test

<table>
<thead>
<tr>
<th>(blows per 100mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 10 15 20</td>
</tr>
</tbody>
</table>

### Cone Penetrometer  AS1289.6.3.2

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Cone Penetrometer (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>pp = 180-220</td>
</tr>
<tr>
<td>0.8</td>
<td>pp = 250-270</td>
</tr>
<tr>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td></td>
</tr>
</tbody>
</table>

### Remarks:

**WATER OBSERVATIONS:** No free groundwater observed

**RIG:** Cat 308E  
**LOGGED:** MS  
**SURVEY DATUM:** MGA94

---

**SAMPLING & IN SITU TESTING LEGEND**

- **A** Auger sample  
- **B** Bulk sample  
- **BLK** Block sample  
- **C** Core drilling  
- **D** Disturbed sample  
- **E** Environmental sample  
- **G** Gas sample  
- **P** Piston sample  
- **PL** Pocket penetrometer (kPa)  
- **PLD** Point load diametral test (kPa)  
- **PP** Photo ionisation detector (ppm)  
- **RL** Point load axial test (kPa)  
- **S** Standard penetration test  
- **U** Tube sample (x mm dia.)  
- **W** Water sample  
- **W** Water level  

---

**Douglas Partners**
CLIENT: Cedar Woods Ltd
OFFICE: Brisbane
DATE: April 2015

Test Pit Photograph – Pit 23
Proposed Residential Subdivision
Canvey Road, Upper Kedron

PROJECT No: 87335.00
PLATE No: -
REVISION: -
TOPSOIL - soft, dark brown, high plasticity silty clay with some organics, moist

SILTY CLAY - stiff, brown mottled light brown, high plasticity silty clay with some fine grained sand, moist - becoming very stiff, gravelly

SANDY GRAVEL - dense, brown and orange brown, sandy fine to coarse rounded gravel with some silt, moist - some medium sized cobbles

Pit discontinued at 3.0m depth - Limit of investigation

**WATER OBSERVATIONS:** Groundwater observed at 2.5m

**REMARKS:**
Test Pit Photograph – Pit 24

Proposed Residential Subdivision
Canvey Road, Upper Kedron

CLIENT: Cedar Woods Ltd
OFFICE: Brisbane
DATE: April 2015

PROJECT No: 87335.00
PLATE No: -
REVISION: -
### TEST PIT LOG

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SURFACE LEVEL:** --  
**EASTING:** 491109  
**NORTHING:** 6966497  
**PIT No:** 25  
**PROJECT No:** 87335.00  
**DATE:** 26/2/2015  
**SHEET 1 OF 1**

---

#### Sampling & In Situ Testing Legend

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
<th>Type</th>
<th>Depth</th>
<th>Sample</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Auger sample</td>
<td>G</td>
<td></td>
<td>PID</td>
<td>Photo ionisation detector (ppm)</td>
</tr>
<tr>
<td>B</td>
<td>Bulk sample</td>
<td>P</td>
<td></td>
<td>PL(D)</td>
<td>Point load axial test 2(L50) (kPa)</td>
</tr>
<tr>
<td>C</td>
<td>Core drilling</td>
<td>W</td>
<td></td>
<td>pp</td>
<td>Standard penetration test</td>
</tr>
<tr>
<td>D</td>
<td>Disturbed sample</td>
<td>B</td>
<td></td>
<td>V</td>
<td>Shear vane (kPa)</td>
</tr>
<tr>
<td>E</td>
<td>Environmental sample</td>
<td>W</td>
<td></td>
<td>pp</td>
<td>Pocket penetrometer (kPa)</td>
</tr>
</tbody>
</table>

---

#### Dynamic Penetrometer Test

<table>
<thead>
<tr>
<th>Blows per 100mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

---

#### Pit Log

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>TOPSOIL - stiff, dark brown, high plasticity sandy clay with some organics and gravel, moist</td>
</tr>
<tr>
<td>0.4</td>
<td>CLAYEY GRAVEL - dense, red brown and grey, clayey fine to coarse gravel with some silt, moist</td>
</tr>
<tr>
<td>0.5</td>
<td>PHYLITITE - extremely low strength, extremely weathered, red brown, grey and orange phyllite - very low to low strength, highly weathered</td>
</tr>
</tbody>
</table>

- low to medium strength, slightly weathered, light brown, orange and grey

Pit discontinued at 3.0m depth - Limit of investigation

---

**RIG:** Cat 308E  
**LOGGED:** MS  
**SURVEY DATUM:** MGA94

---

**WATER OBSERVATIONS:** No free groundwater observed

---

**REMARKS:**

---

**Sampling & In Situ Testing**
<table>
<thead>
<tr>
<th>CLIENT:</th>
<th>Cedar Woods Ltd</th>
<th>TEST Pit Photograph – Pit 25</th>
<th>PROJECT No:</th>
<th>87335.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFICE:</td>
<td>Brisbane</td>
<td>Proposed Residential Subdivision</td>
<td>PLATE No:</td>
<td>-</td>
</tr>
<tr>
<td>DATE:</td>
<td>April 2015</td>
<td>Canvey Road, Upper Kedron</td>
<td>REVISION:</td>
<td>-</td>
</tr>
</tbody>
</table>
**TOPSOIL** - stiff, dark brown, high plasticity silty clay topsoil with some organics and fine gravel, moist

**SILTY CLAY** - stiff to very stiff, red brown mottled grey, high plasticity silty clay with some gravel and fine grained sand

**PHYLLITE** - extremely low strength, extremely weathered, red-brown and grey phyllite
- very low strength, highly weathered
- low strength, grey white and brown, moderately weathered

- low to medium strength, light grey white and orange

Pit discontinued at 2.7m depth - Limit of investigation

### RIG: Cat 308E

**LOGGED:** MS

**SURVEY DATUM:** MGA94

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:**

### SAMPLING & IN SITU TESTING LEGEND

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auger sample</td>
<td>A</td>
<td>Gas sample</td>
</tr>
<tr>
<td>Bulk sample</td>
<td>B</td>
<td>Piston sample</td>
</tr>
<tr>
<td>Core drilling</td>
<td>C</td>
<td>Water sample</td>
</tr>
<tr>
<td>Disturbed sample</td>
<td>D</td>
<td>Water seep</td>
</tr>
<tr>
<td>Environmental sample</td>
<td>E</td>
<td>Water level</td>
</tr>
<tr>
<td>Dynamic Penetrometer Test</td>
<td></td>
<td>(blows per 100mm)</td>
</tr>
<tr>
<td>Cone Penetrometer</td>
<td></td>
<td>AS1289.6.3.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sampling &amp; In Situ Testing</th>
<th>Results &amp; Comments</th>
<th>Dynamic Penetrometer Test (blows per 100mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5   10  15  20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.2 0.6 pp = 280-320</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.8 1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
TOPSOIL - stiff to very stiff, dark brown, high plasticity silty clay with some organics and fine gravel, moist

SILTY SANDY GRAVEL - estimated dense, red brown and orange, silty sandy fine to coarse gravel, fine grained sand, moist

PHYLLITE - extremely low strength, extremely weathered, grey brown and orange phyllite
- very low strength, highly weathered
- low strength, slightly weathered
- low to medium strength

Pit discontinued at 3.0m depth - Limit of investigation

RIG: Cat 308E
LOGGED: MS
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:
CLIENT: Cedar Woods Ltd
OFFICE: Brisbane
DATE: April 2015
PROJECT No: 87335.00

Test Pit Photograph – Pit 27
Proposed Residential Subdivision
Canvey Road, Upper Kedron

PLATE No: -
REVISION: -
### TEST PIT LOG

**CLIENT:** Cedar Grove Developments  
**PROJECT:** Proposed Cedar Grove Subdivision  
**LOCATION:** Canvey Road, Upper Kedron  
**SURFACE LEVEL:** --  
**EASTING:** 490747  
**NORTHING:** 6966498  
**DATE:** 25/2/2015  
**PIT No:** 28  
**PROJECT No:** 87335.00  
**DATE:** 25/2/2015  
**SHEET:** 1 OF 1

---

### Sampling & In Situ Testing

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>TOPSOIL - estimated firm, dark brown, high plasticity silty clay with some organics and fine grained sand and gravel, moist</td>
</tr>
<tr>
<td>0.6</td>
<td>SILTY CLAY - stiff to very stiff, red brown mottled brown, high plasticity silty clay with a trace of fine gravel, moist</td>
</tr>
<tr>
<td></td>
<td>PHYLLITE - extremely low strength, extremely weathered, brown, red and grey phyllite</td>
</tr>
<tr>
<td></td>
<td>- very low strength, highly weathered</td>
</tr>
<tr>
<td>1.0</td>
<td>- low strength, moderately weathered, dark grey and orange brown</td>
</tr>
<tr>
<td>2.4</td>
<td>- medium strength</td>
</tr>
<tr>
<td>3.0</td>
<td>Pit discontinued at 3.0m depth - Limit of investigation</td>
</tr>
</tbody>
</table>

---

### Dynamic Penetrometer Test (blows per 100mm)

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Type</th>
<th>Results &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>D</td>
<td>pp = 180-220</td>
</tr>
<tr>
<td>0.5</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

---

### WATER OBSERVATIONS:

No free groundwater observed

### REMARKS:

RIG: Cat 308E  
LOGGED: MS  
SURVEY DATUM: MGA94

---

**SAMPLING & IN SITU TESTING LEGEND**

- **A** Auger sample
- **B** Bulk sample
- **BLK** Block sample
- **C** Core drilling
- **D** Disturbed sample
- **E** Environmental sample
- **G** Gas sample
- **P** Piston sample
- **PL(D)** Pocket penetrometer (kPa)
- **PL(A)** Point load axial test (is(50) MPa)
- **PL(D)** Point load diametral test (is(50) MPa)
- **S** Shear vane (kPa)
- **W** Water sample
- **V** Water level
- **RS** Ring shear (kPa)
- **D** Dynamic Penetrometer Test
- **CPT** Cone Penetrometer (AS1289.6.3.2)
- **SPT** Standard penetration test
- **RIG** Cone Penetrometer (AS1289.6.3.3)

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**Douglas Partners**

Geotechnics | Environment | Groundwater
**TOPSOIL** - stiff, dark brown, high plasticity silty clay topsoil with some organics and fine grained sand and gravel, moist

**SILTY CLAY** - stiff, orange mottled brown, high plasticity silty clay with some gravel, moist

**PHYLLITE** - extremely low strength, extremely weathered, brown, orange and grey phyllite
- very low strength, highly weathered
- low strength, moderately weathered, grey and orange brown
- low to medium strength

Pit discontinued at 3.0m depth - Limit of investigation

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### Sampling & In Situ Testing Legend

- **A**: Auger sample
- **B**: Bulk sample
- **BLK**: Block sample
- **C**: Core drilling
- **D**: Disturbed sample
- **E**: Environmental sample
- **G**: Gas sample
- **PLA**: Point load axial test (Is(50) (MPa))
- **PLD**: Point load diametral test (Is(50) (MPa))
- **PP**: Pocket penetrometer (kPa)
- **S**: Standard penetration test
- **U**: Tube sample (x mm dia.)
- **W**: Water sample
- **X**: Water level
- **V**: Shear vane (kPa)

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

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### Dynamic Penetrometer Test

<table>
<thead>
<tr>
<th>Blow (blows per 100mm)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Cone Penetrometer AS1289.6.3.2

- **Cone Penetrometer AS1289.6.3.2**