1 October 2019

Mr Paul Croft
Infinity Yaldhurst Limited
PO Box 390
Wanaka

Dear Paul

RE: Stage 1 Earthworks Completion Report - Yaldhurst Park, Yaldhurst, Christchurch
(Our Reference: 15518.000.000_16)

1 Introduction

ENGEO Ltd was requested by Infinity Yaldhurst Limited, to undertake construction monitoring of Stage 1 of the subdivision development and complete a Stage 1 Earthworks Completion Report of the work completed to date at Yaldhurst Park, Yaldhurst, Christchurch.

ENGEO previously provided the following deliverables pertaining to the site development. These documents should be read in conjunction with this report.

- Geotechnical investigation report for Stage 1 of the subdivision development at Yaldhurst Park (dated 9 November 2018, reference: 15518.000.000_01).
- Geotechnical Investigation report for Stages 2 to 6 of the subdivision development at Yaldhurst Park (dated: 6 December 2018, reference: 15518.000.000_02).
- RFI document for the subdivision development at Yaldhurst Park (dated: 12 February 2019, reference: 15518.000.000_03).
- Earthworks specification for the subdivision development at Yaldhurst Park (dated: 15 March 2019, reference: 15518.000.000_05).
- Stage 1 Subgrade Observations Progress Report for the subdivision development at Yaldhurst Park (dated: 26 June 2019, reference: 15518.000.000_06).

The proposed Stage 1 development involves subdividing the existing 3.84 ha area into 45 residential or commercial lots and reserves.

Site grading included topsoil stripping, general cutting, and filling to achieve design site grades, and subgrade preparation and fill placement in accordance with the earthworks Code of Practice for Earth Fill of Residential Development (NZS4431).

2 Subgrade Observations

During each of the subgrade observation visits discussed in the following sections, ENGEO completed Scala penetrometer (Scala) testing of the native subgrade, and assessed general fill and topsoil placement. We provide the results of this testing along with a location plan as an attachment to this report (Appendix 1).

2.1 Site Visits

During the construction and earthworks associated with Stage 1 of the subdivision development at Yaldhurst Park, we completed 18 site visits between 21 June 2019 to 11 September 2019. We previously provided a progress report for the first three site visits between 21 June 2019 to 24 June 2019 (Ref: 15518.000.000_06). The remaining 15 site visits are summarised in subsequent sections.

2.1.1 Site Visit Four (3 July 2019):

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited, to assess the subgrade of Lots 22 to 36 prior to filling, and Lots 103, 104, 107 and 108 prior to placement of top soil.

Lots 22 to 36 observations and recommendations:

- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- Within the areas of fill (Lots 28 to 34) the upper 200 mm of the subgrade had been excavated and recompacted in accordance with our previous geotechnical recommendations provided in our letter issued on 26 June 2019 (reference: 15518.000.000_06).
- The excavations were moist at the time of our visit.
- Within the right of way on the northern boundary, and within Lots 21, 22, 35 and 36, organic soil, topsoil and fill stockpiles were observed.
    - We recommended that the organic soils and stockpiles be removed, and ENGEO assess the subgrade prior to filling.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lots 22 to 36 at the time of our visit.
- We understand that approximately 600 mm of fill (at the deepest) was then placed across Lots 28 to 36.

Road 501 observations and recommendations:

- Road 501 had been over excavated approximately 100 mm below adjacent ground level, and filled with compacted granular fill prior to our site visit.
    - This was completed by Dormer construction prior to our site visit as a “temporary” measure to enable service installation during winter. ENGEO did not observe the subgrade of the right of way during this site visit.

Lots 103, 104, 107 and 108 observations and recommendations:

- We observed a combination of cut (native soils) or general fill which comprised of sandy silt and silty sand in the base of the excavations.
- The excavations were moist at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lots 103, 104, 107 and 108 at the time of our visit.
- 200 mm to 300 mm of topsoil was then placed per the proposed design.

Figure 1: Site Photographs – Site Visit Four

Photo 1: Within Lots 22 to 36 the upper 200 mm of the subgrade has been turned and recompacted (black arrow). Organic soil and topsoil stock piles were observed (orange arrow). Photo facing west.

Photo 2: Road 501 had been backfilled with granular fill. Photo facing south.

Photo 3: Lots 107 and 108 following compacted engineered fill suitable for topsoil placement. Photo facing north.

Photo 4: Lots 103 and 104 following compacted engineered fill suitable for topsoil placement. Photo facing west.

2.1.2 Site Visit Five (9 July 2019)

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 9 July 2019, to assess the fill placement of Lots 22 to 36 prior to placement of topsoil.

Lots 22 to 34 observations and recommendations:

- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.
- The excavations were moist to saturated at the time of our visit.
    - We recommended that the localised areas which have standing water (as a result of the recent rainfall event during the weekend) be left to dry out prior to placement of topsoil.
- Through discussions with Dormer construction on-site, the areas of fill were a maximum of 400 mm deep (two layers of fill).
    - 200 mm to 300 mm of topsoil was then placed per the proposed design.

Lots 34 to 36 observations and recommendations:

- Within the right of way on the northern boundary, and within Lots 34, 35 and 36, organic soil, topsoil and fill stockpiles were observed.
    - We recommended that the organic soils and stockpiles be removed and ENGEO assess the subgrade prior to filling.
- We observed granular gravel fill in the base of the right of way directly adjacent to Lot 34 and partially adjacent to Lot 35.
    - Through discussions with Dormers during our site visit, we understand that this area had been over excavated approximately 100 mm below adjacent ground level into native silt or sand, and backfilled with compacted granular fill. ENGEO did not observe the base of this right of way excavation prior to filling.
    - This was completed by Dormer construction prior to our site visit as a “temporary” measure to enable service installation during winter.

Lots 103, 104, 107 and 108 observations and recommendations:

- Topsoil has either been placed or was in the process of being placed on Lots 103, 104, 107 and 108 at the time of our visit.
- Through discussions with Dormers during our site visit, topsoil from Lot 109 was excavated and “flipped” onto the adjacent lots (107 and 108) to enable ENGEO to observe the base of the excavation.
- The excavations were moist at the time of our visit.

Figure 2: Site Photographs – Site Visit Five

Photo 5: View over Lots 25 to 32 prior to topsoil placement. Photo facing southwest.

Photo 6: View over Lots 34 to 36. Photo facing northwest.

Photo 7: Topsoil placed on Lot 104. Photo facing south.

Photo 8: Topsoil being placed on Lot 103. Photo facing west.

2.1.3 Site Visit Six – 12 July 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 12 July 2019, to assess the subgrade of Lots 37 to 40 and 109 prior to placement of general fill.

Lots 37 to 40 observations and recommendations:

- Approximately 70% of excavation was completed across Lots 37 to 40 during our site visit. The remaining 30% of the excavation has been left to enable access to neighbouring properties. This area will be excavated and filled following the installation of a new right-of-way at a later date.
- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lots 37 to 40 at the time of our visit.
- We understand that approximately 300 mm to 400 mm of general fill (at the deepest) was then placed across Lots 37 to 40.

Lot 109 observations and recommendations:

- We observed sandy silt and silty sand with trace organics in the base of the excavation.
- The excavation was moist at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lot 109 at the time of our visit.
- We understand that approximately 400 mm to 500 mm of general fill (at the deepest) was then placed across Lot 109.

Figure 3: Site Visit Six – 12 July 2019

Photo 9: View of Lots 37 to 40. Right of way to be over excavated observed (orange arrow). Photo facing north.

Photo 10: Lot 109 with topsoil stockpiled adjacent to the excavation. Photo facing southwest.

2.1.4 Site Visit Seven – 19 July 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 19 July 2019, to assess the fill placement of Lots 37 to 40,109 and 35 to 36 prior to placement of topsoil.

Lots 37 to 40 observations and recommendations:

- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.
    - Through discussions with Dormer construction on-site, the areas of fill were a maximum of 400 mm deep (two layers of fill).
        - 200 mm to 300 mm of topsoil was then placed per the proposed design.
- Excavations were moist to saturated at the time of our visit.
    - We recommended that the localised areas which have standing water (as a result of the recent rainfall) be left to dry out prior to placement of topsoil.

Lot 109 observations and recommendations:

- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.

- Through discussions with Dormer construction on-site, the areas of fill were a maximum of 600 mm deep (three layers of fill).
    - 200 mm to 300 mm of topsoil was then placed per the proposed design.

Lots 35 to 36 and associated right-of-way observations and recommendations:

- We observed the subgrade of Lots 35 and 36 which comprised sandy silt and silty sand with trace organics in the base of the excavations.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate Bearing capacity of 200 kPa was available in the subgrade of Lots 35 to 36 at the time of our visit.
- We assessed, then when using Austroads Guide to design part 2 (2019), that a CBR of at least 6% was available in the base of the right of way excavation.
- A service trench was excavated on the northern perimeter of the right of way.
- The excavations were wet to saturated at the time of our visit.
- 200 mm to 300 mm of topsoil was then placed per the proposed design.

Figure 4: Site Visit Seven – 19 July 2019

Photo 11: Lots 37 40 following placement of engineered fill. Note areas of saturated soil.

Photo 12: Lot 109 following placement of engineered fill. Photo facing southwest.

Photo 13: Lots 35 and 36. Note standing water in the base of the excavation. Photo facing west.

Photo 14: Service trench excavated on the northern perimeter of the right-of-way. Photo facing west.

2.1.5 Site Visit Eight – 5 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 5 August 2019, to assess the subgrade of the road and right of ways in the western side of stage 1 prior to placement of pit run, engineered fill and road pavement.

Observations and recommendations:

- The proposed roads and right of ways had been excavated approximately 0.2 m below design subgrade level to allow for imported pit run to be placed as a working platform for the civil service installation.
- We observed native sandy silt and silty sand in the base of most of the excavations.
    - Within the centre of the roads, the service trenches had been excavated and backfilled with compacted AP65. Through discussions with the contractor, the hardfill was placed in 200 mm layers and compacted to at least 95% of MDD.
    - We observed some localized areas of organic soil, uncontrolled fill and soft silt during our site visit.
        - We recommended these areas of organic soil, uncontrolled fill and soft soil be over excavated and backfilled with compacted pit run material. This was being completed during our visit.
- The excavations were moist to wet at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the base of the right of way excavations.
- We assessed, then when using Austroads Guide to design part 2 (2019) standard, that a CBR of at least 6% was available in the base of the right of way excavations.

Figure 5: Site Visit Eight – 5 August 2019

Photo 15: View of the road 501 and adjacent. Photo facing southwest.

Photo 16: View of the road 501 and adjacent. Photo facing east.

2.1.6 Site Visit Nine – 7 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 7 August 2019, to assess the subgrade of Lots 85 to 90 and adjacent right of way (lot 300) prior to placement of topsoil.

Lots 85 to 90 observations and recommendations:

- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- We understand that the subgrade had been proof rolled prior to our site visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lots 85 to 90 at the time of our visit.
- We understand that approximately 100 mm of general fill (at the deepest) was then placed across Lots 85 & 86.

Right of way (Lot 300) observations and recommendations:

- The proposed right of way (Lot 300) had been excavated approximately 0.2 m below design subgrade level to allow for imported pit run to be placed as a working platform for service installation.
- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- Some loose soil was observed in the base of the road excavation.
    - We recommended that the loose soil be removed prior to importation of pit run fill.
- The excavations were moist to wet at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of at least 200 kPa was available in the base of the right of way excavations at the time of our visit.
- We assessed, then when using Austroads Guide to design part 2 (2019) standard, that a CBR of at least 6% was available in the base of the right of way excavation.

Figure 6: Site Visit Nine – 7 August 2019

Photo 17: View of Lots 85 to 90. Photo facing southwest.

Photo 18: View over right of way (Lot 300) adjacent to Lots 85 to 90. Photo facing southwest.

2.1.7 Site Visit Ten – 8 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 8 August 2019, to assess the subgrade of the rubbish trench within Lot 76 prior to placement of general fill.

Rubbish Trench (Lot 76) observations and recommendations:

- During stripping of the site, Dormers encountered a rubbish pit approximately 2 m deep, 3 m wide and 20 m long within a proposed residential lot (Lot 76).
    - The rubbish was excavated from the trench and disposed off-site prior to our site visit.
- We observed sandy silt and silty sand with trace organics in the base of the excavation.
    - One section of the excavation had been over excavated down to gravel (approximately 2.5 m below adjacent ground level) to allow for drainage.
- The base of the over-excavation comprised of sandy gravel with trace silt.
- The excavation was moist to wet at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of at least 200 kPa was available in the subgrade of the trench at the time of our visit.
- We recommended that area which was over excavated to gravel be backfilled with angular ballast (or equivalent).
    - The ballast comprised of 40 mm to 60 mm crushed rock with no fines. The ballast was wrapped in geotextile (Bidim A29 or AS410, or equivalent).
- The trench was then backfilled with geotechnically approved general fill in 200 mm layers.

To minimise the potential for differential fill settlement across Lot 76, we recommended the following sequence be implemented:

- Excavate a minimum of 500 mm (below the topsoil layer) across the entire lot area.

- Re-place site won silt spread uniformly in layers having a loose thickness no greater than 200 mm maximum, compacted to a minimum of 95% Maximum Dry Density.

Figure 7: Site Visit Ten – 8 August 2019

Photo 19: Rubbish trench excavation. Photo facing southeast.

Photo 20: Deepened excavation to gravel layer approximately 2.5 m bgl.

2.1.8 Site Visit 11 – 13 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 13 August 2019, to assess the subgrade of Lots 79 to 84 and approximately 50% of lots 73 to 78.

Lots 79 to 84 and approximately 50% of lots 73 to 78 observations and recommendations:

- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- We understand that the subgrade had been proof rolled prior to our site visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the subgrade of Lots 79 to 84 at the time of our visit.
- We understand that approximately 100 mm to 200 mm of general fill (at the deepest) was then placed across Lots 79 to 84.

Figure 8: Site Visit 11 – 13 August 2019

Photo 21: View of Lots 79 to 84. Photo facing southwest.

Photo 22: View over Lots 79 to 84. Photo facing west.

2.1.9 Site Visit 12 – 15 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 15 August 2019, to assess Lots 79 to 84 and approximately 50% of Lots 73 to 78 prior to placement of topsoil.

Lots 73 to 84 observations and recommendations:

- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.
    - Through discussions with Dormer construction onsite, the areas of fill were a maximum of 200 mm deep (one layer of fill).
- The excavations were moist to wet at the time of our visit.
    - We recommended that the localised areas which had standing water (as a result of the recent rainfall) be left to dry out, statically re-compacted and re-compaction tested prior to placement of topsoil.
- 200 mm to 300 mm of topsoil was then placed per the proposed design subject to drying or removal of the standing water.

Figure 9: Site Visit 12 – 15 August 2019

Photo 23: View of Lots 79 to 84. Photo facing southwest.

Photo 24: View of Lots 79 to 84. Photo facing northeast.

2.1.10 Site Visit 13 – 19 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 19 August 2019, to assess the remaining 50% of the subgrade of Lots 73 to 78 and right of way 301.

Lots 73 to 78 observations and recommendations:

- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- We understand that the subgrade had been proof rolled prior to our site visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of 200 kPa was available in the remaining 50% of the subgrade of Lots 73 to 79 at the time of our visit. We understand that approximately 200 mm of general fill (at the deepest) was then placed across Lots 73 & 78.

Right of way (Lot 301) observations and recommendations:

- The proposed right of way had been excavated approximately 0.2 m below design subgrade level to allow for imported pit run to be placed as a working platform for service installation.
- We observed sandy silt and silty sand with trace organics in the base of the excavations.
- The excavations were moist at the time of our visit.
- Some loose soil was observed in the base of the road excavation.
    - We recommend that the loose soil is removed prior to importation of pit run
- The excavations were moist to wet at the time of our visit.
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of at least 200 kPa was available in the base of the right of way excavations at the time of our visit.

- We calculated the weighted average of the CBR for the upper 1 m of material that will be below the pavement section, which consists of 200 mm of pit run and 800 mm of native silt and sand. Assuming a CBR of 13% for the compacted pit run, and based on the Scala test results for the native silt / sand, we assessed that the weighted average CBR over the upper 1m to be at least 6% once 200 mm of compacted pit run is placed below the design pavement section.

Figure 10: Site Visit 14 – 19 August 2019

Photo 25: View right of way 301. Photo facing northeast.

Photo 26: View right of way 301. Photo facing southwest.

2.1.11 Site Visit 15 – 21 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 21 August 2019, to assess Lots 73 to 78 prior to placement of topsoil.

Lots 73 to 78 observations and recommendations:

- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.
    - Through discussions with Dormer construction onsite, the areas of fill were a maximum of 200 mm deep (one layer of fill).
- The excavations were moist at the time of our visit.
- 200 mm to 300 mm of topsoil was then placed per the proposed design.

Figure 11: Site Visit 15 – 21 August 2019

Photo 27: View Lots 73 to 78. Photo facing southwest.

Photo 28: View right of way 301. Photo facing northeast.

2.1.12 Site Visit 16 – 23 August 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 23 August 2019, to assess the rubbish trench within Lot 76 prior to placement of topsoil.

Rubbish Trench (Lot 76) observations and recommendations:

- To minimise the potential for differential fill settlement across Lot 76, A minimum of 500 mm (below the topsoil layer) was excavated across the entire lot area and replaced with site won silt which was spread uniformly in layers having a loose thickness no greater than 200 mm maximum, and compacted to a minimum of 95% Maximum Dry Density.
- General fill which comprised of sandy silt and silty sand was observed in the base of the excavations.
- The excavations were moist at the time of our visit.
- Through discussions with Dormer construction onsite, the areas of fill were a maximum of 2 m deep (10 layers of general fill) plus an additional area of over-excavation (2 m by 2m) approximately 3 m bgl.
- 200 mm to 300 mm of topsoil was then placed across Lot 76 per the proposed design.

Figure 12: Site Visit 16 – 23 August 2019

Photo 29: Lot 76 with the entire are over excavated and recompacted. Photo facing east.

Photo 30: Lot 76 with the entire are over excavated and recompacted. Photo facing southeast.

2.1.13 Site Visit 17 – 3 September 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 3 September 2019, to assess the subgrade of right of way 4.

Right of way 4 observations and recommendations:

- The proposed right of way had been excavated approximately 0.2 m below design subgrade level to allow for imported pit run to be placed as a working platform for service installation.
- We observed sandy silt, silty sand with trace organics, and compacted hardfill in the base of the excavations.
    - Hardfill was observed in the base of the excavations from the trenched excavations for service installation. The trenches were backfilled with compacted hardfill following service installation.
- The excavations were moist at the time of our visit.
- Some loose soil was observed in the base of the right of way excavation.
    - We recommended that the loose soil is removed prior to importation of pit run fill
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of at least 200 kPa was available in the base of the right of way excavations at the time of our visit.
- We assessed, then when using Austroads Guide to design part 2 (2019), that a CBR of at least 6% was available in the base of the right of way excavation.

Figure 13: Site Visit 17 – 3 September 2019

Photo 31: View of right of way 4. Photo facing west.

Photo 32: Depth of excavation below subgrade level to allow for backfill of pit run (subbase).

2.1.14 Site Visit 18 – 11 September 2019

We were requested by Dormer Construction on behalf of Infinity Yaldhurst Limited on 11 September 2019, to assess the subgrade of road 507.

Road 507 observations and recommendations:

- The proposed right of way had been excavated approximately 0.2 m below design subgrade level to allow for imported pit run to be placed as a working platform for service installation.
- We observed sandy silt, silty sand with trace organics, and compacted hardfill in the base of the excavations.
    - Hardfill was observed in the base of the excavations from the trenched excavations for service installation. The trenches were backfilled with compacted hardfill following service installation.
- The excavations were moist at the time of our visit.
- Some loose soil was observed in the base of the right of way excavation.
    - We recommended that the loose soil is removed prior to importation of pit run
- We assessed, with a Scala penetrometer, that a geotechnical ultimate bearing capacity of at least 200 kPa was available in the base of the right of way excavations at the time of our visit.
- We assessed, then when using Austroads Guide to design part 2 (2019), that a CBR of at least 6% was available in the base of the excavation.

Figure 14: Site Visit 18 – 11 September 2019

Photo 33: View of road 507. Photo facing west.

Photo 34: View of road 507. Photo facing east.

3 NDM Testing

We recommended that all site-won fill and hardfill be compacted in lifts no greater than 200 mm thick to a minimum of 95 % Maximum Dry Density (MDD). The degree of compaction for each lift should be tested in accordance with NZS4407:2015 using a nuclear density meter (NDM). ENGEO completed all of the NDM testing for the lots where fill was required. The test results are presented as attachments to this report (Appendix 3).

We recommended that all topsoil be placed and compacted (track rolled or statically compacted) to create a non-yielding surface prior to grass seeding. The Christchurch City Council specification suggests a minimum thickness of 200 mm and a maximum thickness of 300 mm.

Generally, the test results indicated that the majority of the engineered fill material was placed to at least 95% of the MDD and within 3.5 percentage points of the optimum moisture content (OMC). Where tests indicated that the compaction was less than 95% of MDD, the area was re-worked, and compacted to achieve the required density.

ENGEO has only been provided with compaction testing results of the material regarded as general fill. This generally consisted of site-won silty, sandy alluvium that was free of topsoil or organic material. During future construction of foundations, we recommend that all topsoil be removed within the building footprint to expose either native soil, or the compacted general fill.

We recommend that a geotechnical professional is contracted to provide a lot specific geotechnical report to support the building consent. ENGEO can provide this reporting, if requested.

4 Conclusions

Based on our site observations, we consider the subsurface conditions observed to date to be consistent with those anticipated from our earlier Stage 1 geotechnical investigation dated 11 September 2019 (Ref. 15518.000.000_12).

Accordingly, we consider the lots which have been assessed to be geotechnically suitable for the proposed re-development subject to recommendations outlined in our geotechnical report and this completion report. ENGEO has also provided a Statement of Suitability of Earth Fill for Residential Development presented as an attachment to this document (Appendix 4).

5 References

Austroads Limited, 2019: Guide to Road Design Part 2 – Design Considerations (Project number: SRD6071).

ENGEO (NZ) Ltd, September, 2019: Stage 1 Geotechnical Investigation (Revision 1) of Yaldhurst Park, Yaldhurst, Christchurch (Ref: 15518.000.000_12).

ENGEO (NZ) Ltd, March, 2019: Earthworks Guidance Document of Yaldhurst Park, Yaldhurst, Christchurch (Ref: 15518.000.000_05).

Ministry of Business, Innovation and Employment, December 2012: Repairing and Rebuilding Houses affected by the Canterbury Earthquakes (http://www.dbh.govt.nz/guidance-on-repairs-after-earthquake).

Standards Association of New Zealand (2015), Methods of sampling and testing road aggregates, NZS4407:2015, Standards New Zealand, Wellington.

6 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Infinity Yaldhurst Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Hamish Foy

Geotechnical Engineer

Report reviewed by

Don Bruggers, CMEngNZ (CPEng)

Principal Engineer

Attachments:

- Scala Results
- CBR Results
- NDM Results
- Suitability of Earthfill

APPENDIX 1

Scala Results

DATE PLOTTED: 05 September 2019 11:39:20 p.m. BY: rwilliams

PATH: I:\cch\eng\Projects\15501 to 15600\15518 - Yaldhurst Park Development\07_GIS\FG\1_TestingPlan.mxd

1561200 1561300 1561400 1561500

5181100 5181000

FERDINAND TERRACE

JARNAC BOULEVARD

SP01 SP02 SP03 SP04 SP05 SP06 SP07 SP08 SP09 SP10 SP11 SP12 SP13 SP14 SP15 SP16 SP17 SP18 SP19 SP20 SP21 SP22 SP23 SP24 SP25 SP26 SP27 SP28 SP29 SP30 SP31 SP32F SP33F SP34F SP35F SP36F SP37F SP38F SP39F SP40F SP41F SP42 SP43 SP44 SP45 SP46 SP47 SP48 SP48F SP49 SP49F SP50F SP51F SP52F SP53F SP54 SP55 SP56 SP57F SP58F SP59F SP60 SP61 SP62 SP63 SP64 SP65 SP66 SP67 SP68 SP69 SP70 SP71 SP72 SP73 SP74 SP75 SP76 SP77 SP78 SP79 SP80 SP81 SP82 SP83 SP84 SP85 SP86 SP87 SP88 SP89 SP90 SP91 SP92 SP93 SP94 SP95 SP96 SP97 SP98 SP99 SP100 SP101 SP102 SP103 SP104 SP105 SP106 SP107 SP108 SP109

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09

105 106 107 108 109 401 402 501 507

Legend

- Scala penetrometer
- Test pit
- Existing property boundary (Sep 2019)

Aerial: LINZ and Eagle Technology, CC BY 4.0.
Map image: Eagle Technology.
Development layout: Graham Surveying 18036-EW-1002

0 25 50
Metres

PROJECTION: NZGD 2000 New Zealand Transverse Mercator

Christchurch Office
124 Montreal Street Sydenham, Christchurch 8023
Tel: 03 328 9012, www.engeo.co.nz

Title: Site testing plan

Client: Infinity Yaldhurst Limited

Project: Yaldhurst Park Yaldhurst Christchurch

Designed: HF
Drawn: RW
Checked: DRAFT
Date: Sep 19

Figure No: 1
Size: A3

Proj No: 15518.000.000

Scale: 1:1,000

Revision: A

ORIGINAL FIGURE PRINTED IN COLOUR

Client:	Infinity Yaldhurst Limited	**ENGEO Ref:**	15518.000.000
Project:	Subdivision Development	**Client ref:**	N/A
Site address:	Yaldhurst Park, Yaldhurst	**Date:**	26.04.2019 to 11.09.2019
Location:	Refer to Site Location Plan	**By:**	HF

Test No.	SP01	Test No.	SP02	Test No.	SP03	Test No.	SP04
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	4	100	4	100	4
200	4	200	3	200	4	200	4
300	3	300	5	300	4	300	4
400	3	400	3	400	4	400	5
500	4	500	3	500	5	500	4
600	3	600	2	600	4	600	3
700	3	700	2	700	3	700	4
800	4	800	3	800	4	800	4
900	3	900	4	900	3	900	3

Test No.	SP05	Test No.	SP06	Test No.	SP07	Test No.	SP08
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	4	100	5	100	2	100	15+
200	5	200	4	200	3	200	
300	6	300	2	300	2	300	
400	4	400	2	400	3	400	
500	4	500	3	500	3	500	
600	5	600	6	600	6	600	
700	4	700	4	700	5	700	
800	3	800	6	800	3	800	
900	3	900	4	900	4	900	

Test No.	SP09	Test No.	SP10	Test No.	SP11	Test No.	SP12
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	6	100	15+	100	4	100	6
200	14	200		200	4	200	5
300	15+	300		300	5	300	4
400		400		400	5	400	5
500		500		500	5	500	5
600		600		600	6	600	5
700		700		700	7	700	6
800		800		800	7	800	5
900		900		900	8	900	6
		1000		1000		1000	

Client: Infinity Yaldhurst Limited
ENGEO Ref: 15518.000.000
Project: Subdivision Development
Client ref: N/A
Site address: Yaldhurst Park, Yaldhurst
Date: 26.04.2019 to 11.09.2019
Location: Refer to Site Location Plan
By: HF

Test No.	SP013	Test No.	SP014	Test No.	SP015	Test No.	SP016
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	4	100	4	100	2	100	4
200	5	200	5	200	3	200	3
300	5	300	5	300	4	300	4
400	4	400	4	400	3	400	4
500	5	500	6	500	3	500	5
600	6	600	6	600	4	600	4
700	6	700	5	700	3	700	5
800	5	800	6	800	3	800	5
900	6	900	5	900	4	900	6
1000		1000		1000		1000	

Test No.	SP017	Test No.	SP018	Test No.	SP019	Test No.	SP020
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	3	100	7	100	3
200	4	200	4	200	5	200	3
300	4	300	5	300	5	300	4
400	4	400	5	400	5	400	5
500	5	500	5	500	5	500	6
600	5	600	5	600	5	600	7
700	6	700	6	700	5	700	6
800	6	800	7	800	5	800	7
900	6	900	7	900	6	900	7
1000		1000		1000		1000	

Test No.	SP21	Test No.	SP22	Test No.	SP23
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	5	100	7	100	6
200	5	200	5	200	6
300	5	300	6	300	6
400	6	400	6	400	5
500	6	500	6	500	4
600	5	600	6	600	4
700	6	700	7	700	4
800	6	800	7	800	7
900	6	900	9	900	9
1000		1000		1000	

Client:	Infinity Yaldhurst Limited	**ENGEO Ref:**	15518.000.000
Project:	Subdivision Development	**Client ref:**	N/A
Site addres	Yaldhurst Park, Yaldhurst	**Date:**	26.04.2019 to 11.09.2019
Location:	Refer to Site Location Plan	**By:**	HF

Test No.	SP024	Test No.	SP025	Test No.	SP026	Test No.	SP027
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	5	100	3	100	3
200	3	200	5	200	3	200	3
300	4	300	5	300	3	300	4
400	6	400	6	400	3	400	5
500	6	500	6	500	4	500	6
600	6	600	5	600	4	600	5
700	6	700	6	700	5	700	5
800	6	800	6	800	6	800	6
900	7	900	6	900	6	900	7
1000		1000		1000		1000	

Test No.	SP028	Test No.	SP029	Test No.	SP030	Test No.	SP031
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	5	100	3	100	3
200	2	200	6	200	5	200	3
300	2	300	9	300	5	300	4
400	5	400	13	400	6	400	5
500	5	500	15+	500	6	500	7
600	4	600		600	7	600	6
700	5	700		700	6	700	6
800	6	800		800	7	800	7
900	5	900		900	9	900	6
1000		1000		1000		1000	

Test No.	SP32	Test No.	SP33	Test No.	SP34	Test No.	SP35
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	5	100	4	100	4	100	3
200	5	200	4	200	4	200	3
300	8	300	6	300	5	300	3
400	7	400	7	400	5	400	3
500	7	500	11	500	5	500	4
600	8	600	15+	600	5	600	5
700	9	700		700	6	700	6
800	11	800		800	6	800	6
900	12	900		900	6	900	6
1000		1000		1000		1000	

Client:	Infinity Yaldhurst Limited	**ENGEO Ref:**	15518.000.000
Project:	Subdivision Development	**Client ref:**	N/A
Site addres	Yaldhurst Park, Yaldhurst	**Date:**	26.04.2019 to 11.09.2019
Location:	Refer to Site Location Plan	**By:**	HF

Test No.	SP036	Test No.	SP037	Test No.	SP038	Test No.	SP039
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	4	100	6	100	3
200	4	200	4	200	6	200	5
300	3	300	4	300	6	300	6
400	4	400	5	400	5	400	6
500	5	500	7	500	6	500	5
600	4	600	5	600	7	600	6
700	4	700	5	700	9	700	7
800	4	800	6	800	8	800	7
900	5	900	7	900	9	900	6
1000		1000		1000		1000	

Test No.	SP040	Test No.	SP041	Test No.	SP042	Test No.	SP043
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	2	100	3	100	4
200	2	200	4	200	4	200	4
300	3	300	4	300	5	300	6
400	3	400	3	400	4	400	7
500	3	500	4	500	6	500	7
600	4	600	4	600	6	600	8
700	5	700	5	700	6	700	7
800	4	800	6	800	4	800	8
900	6	900	5	900	6	900	9
1000		1000		1000		1000	

Test No.	SP044	Test No.	SP045	Test No.	SP046	Test No.	S047
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	4	100	3	100	2
200	3	200	4	200	3	200	2
300	3	300	4	300	4	300	3
400	3	400	4	400	5	400	3
500	4	500	5	500	6	500	4
600	4	600	5	600	5	600	4
700	4	700	6	700	5	700	4
800	5	800	5	800	6	800	6
900	7	900	6	900	6	900	5
1000		1000		1000		1000	

Client: Infinity Yaldhurst Limited **ENGEO Ref** 15518.000.000

Project: Subdivision Development **Client ref:** N/A

Site addres Yaldhurst Park, Yaldhurst **Date:** 26.04.2019 to 11.09.2019

Location: Refer to Site Location Plan **By:** HF

Test No.	SP048	Test No.	SP049	Test No.	SP050	Test No.	SP051
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	2	100	2	100	1
200	3	200	2	200	2	200	2
300	4	300	2	300	3	300	3
400	4	400	3	400	4	400	3
500	5	500	2	500	5	500	3
600	4	600	2	600	4	600	4
700	4	700	2	700	5	700	5
800	5	800	5	800	5	800	5
900	6	900	3	900	6	900	5
1000		1000		1000		1000	

Test No.	SP052	Test No.	SP053	Test No.	SP054	Test No.	SP055
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	1	100	2	100	3	100	3
200	4	200	3	200	5	200	4
300	4	300	2	300	5	300	6
400	4	400	3	400	5	400	5
500	5	500	4	500	6	500	6
600	5	600	3	600	5	600	7
700	6	700	3	700	6	700	8
800	6	800	4	800	6	800	10
900	5	900	3	900	5	900	12
1000		1000		1000		1000	

Test No.	SP056	Test No.	SP057	Test No.	SP058	Test No.	SP059
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	2	100	2	100	4
200	3	200	2	200	3	200	4
300	4	300	2	300	6	300	4
400	4	400	3	400	5	400	4
500	4	500	2	500	6	500	3
600	5	600	3	600	6	600	3
700	6	700	3	700	5	700	3
800	6	800	3	800	6	800	4
900	9	900	3	900	7	900	5
1000		1000		1000		1000	

Client: Infinity Yaldhurst Limited **ENGEO Ref** 15518.000.000

Project: Subdivision Development **Client ref:** N/A

Site addres Yaldhurst Park, Yaldhurst **Date:** 26.04.2019 to 11.09.2019

Location: Refer to Site Location Plan **By:** HF

Test No.	SP060	Test No.	SP061	Test No.	SP062	Test No.	SP063
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	5	100	2	100	5
200	4	200	4	200	3	200	4
300	3	300	3	300	3	300	4
400	3	400	4	400	3	400	4
500	3	500	3	500	3	500	4
600	3	600	3	600	3	600	4
700	5	700	4	700	3	700	5
800	6	800	4	800	3	800	5
900	7	900	4	900	5	900	6
1000		1000		1000		1000	

Test No.	SP064	Test No.	SP065	Test No.	SP066	Test No.	SP067
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	5	100	5	100	8	100	4
200	4	200	5	200	7	200	4
300	4	300	5	300	6	300	7
400	4	400	3	400	7	400	13
500	3	500	3	500	7	500	15+
600	4	600	3	600	7	600	
700	3	700	3	700	7	700	
800	3	800	3	800	8	800	
900	5	900	5	900	14	900	
1000		1000		1000		1000	

Test No.	SP068	Test No.	SP069	Test No.	SP070	Test No.	SP071
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	7	100	3	100	4	100	1
200	3	200	3	200	3	200	4
300	4	300	7	300	4	300	4
400	5	400	5	400	4	400	4
500	5	500	5	500	5	500	5
600	5	600	6	600	5	600	5
700	5	700	6	700	5	700	6
800	6	800	6	800	5	800	9
900	6	900	6	900	5	900	15+
1000		1000		1000		1000	

Client: Infinity Yaldhurst Limited **ENGEO Ref** 15518.000.000

Project: Subdivision Development **Client ref:** N/A

Site addres Yaldhurst Park, Yaldhurst **Date:** 26.04.2019 to 11.09.2019

Location: Refer to Site Location Plan **By:** HF

Test No.	SP072	Test No.	SP073	Test No.	SP074	Test No.	SP075
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	5	100	8	100	12
200	2	200	6	200	6	200	11
300	2	300	3	300	4	300	5
400	2	400	3	400	3	400	3
500	2	500	5	500	4	500	2
600	3	600	3	600	3	600	4
700	4	700	4	700	4	700	2
800	5	800	4	800	3	800	2
900	4	900	4	900	6	900	5
1000		1000		1000		1000	

Test No.	SP076	Test No.	SP077	Test No.	SP078	Test No.	SP079
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	5	100	9	100	3	100	3
200	5	200	9	200	5	200	3
300	5	300	9	300	5	300	3
400	4	400	9	400	4	400	3
500	4	500	7	500	4	500	4
600	6	600	8	600	3	600	6
700	4	700	6	700	6	700	5
800	4	800	8	800	6	800	5
900	5	900	9	900	6	900	6
1000		1000		1000		1000	

Test No.	SP080	Test No.	SP081	Test No.	SP082	Test No.	SP083
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	3	100	3	100	4	100	3
200	3	200	4	200	4	200	4
300	4	300	5	300	3	300	3
400	4	400	5	400	4	400	5
500	4	500	4	500	5	500	5
600	4	600	5	600	4	600	7
700	5	700	5	700	4	700	5
800	6	800	6	800	5	800	5
900	6	900	5	900	6	900	6
1000		1000		1000		1000	

Client: Infinity Yaldhurst Limited **ENGEO Ref** 15518.000.000

Project: Subdivision Development **Client ref:** N/A

Site addres Yaldhurst Park, Yaldhurst **Date:** 26.04.2019 to 11.09.2019

Location: Refer to Site Location Plan **By:** HF

Test No.	SP084	Test No.	SP085	Test No.	SP086	Test No.	SP087
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	2	100	2	100	2
200	3	200	5	200	4	200	2
300	5	300	7	300	4	300	3
400	5	400	10	400	4	400	2
500	4	500	10	500	4	500	3
600	6	600	12	600	3	600	2
700	5	700		700	3	700	2
800	7	800		800	3	800	2
900	7	900		900	3	900	3
1000		1000		1000		1000	

Test No.	SP088	Test No.	SP089	Test No.	SP090	Test No.	SP091
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	1	100	2	100	2	100	3
200	1	200	2	200	3	200	3
300	1	300	3	300	2	300	3
400	2	400	2	400	2	400	3
500	2	500	3	500	3	500	4
600	2	600	3	600	4	600	3
700	2	700	3	700	3	700	5
800	3	800	6	800	5	800	4
900	3	900	7	900	4	900	5
1000		1000		1000		1000	

Test No.	SP092	Test No.	SP093	Test No.	SP094	Test No.	SP095
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	2	100	3	100	2
200	2	200	3	200	4	200	2
300	2	300	3	300	5	300	3
400	2	400	7	400	4	400	4
500	2	500	6	500	3	500	5
600	2	600	5	600	4	600	5
700	3	700	4	700	3	700	5
800	3	800	3	800	3	800	5
900	4	900	5	900	5	900	5
1000		1000		1000		1000	

Client: Infinity Yaldhurst Limited **ENGEO Ref** 15518.000.000

Project: Subdivision Development **Client ref:** N/A

Site address: Yaldhurst Park, Yaldhurst **Date:** 26.04.2019 to 11.09.2019

Location: Refer to Site Location Plan **By:** HF

Test No.	SP096	Test No.	SP097	Test No.	SP098	Test No.	SP099
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	1	100	1	100	1	100	1
200	2	200	2	200	2	200	1
300	2	300	2	300	4	300	2
400	2	400	2	400	4	400	2
500	2	500	3	500	4	500	3
600	2	600	5	600	3	600	3
700	3	700	5	700	3	700	3
800	3	800	3	800	3	800	4
900	3	900	3	900	3	900	4
1000		1000		1000		1000	

Test No.	SP100	Test No.	SP101	Test No.	SP102	Test No.	SP103
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	1	100	2	100	1	100	2
200	2	200	2	200	1	200	2
300	2	300	3	300	2	300	2
400	4	400	3	400	2	400	4
500	5	500	3	500	2	500	4
600	4	600	3	600	3	600	4
700	4	700	4	700	4	700	4
800	4	800	4	800	4	800	4
900	4	900	5	900	4	900	4
1000		1000		1000		1000	

Test No.	SP104	Test No.	SP105	Test No.	SP106	Test No.	SP107
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	4	100	7	100	4
200	2	200	4	200	8	200	3
300	2	300	4	300	7	300	6
400	2	400	4	400	9	400	7
500	2	500	4	500	10	500	7
600	2	600	4	600	10	600	6
700	2	700	4	700	10	700	4
800	3	800	4	800		800	4
900	3	900	4	900		900	5
1000		1000		1000		1000	

Client:	Infinity Yaldhurst Limited	**ENGEO Ref:**	15518.000.000
Project:	Subdivision Development	**Client ref:**	N/A
Site address:	Yaldhurst Park, Yaldhurst	**Date:**	26.04.2019 to 11.09.2019
Location:	Refer to Site Location Plan	**By:**	HF

Test No.	SP108	Test No.	SP109	Test No.	SP110	Test No.	SP111
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	4	100	3	100	3	100	1
200	4	200	5	200	2	200	1
300	4	300	6	300	3	300	2
400	6	400	6	400	3	400	2
500	9	500	6	500	3	500	5
600	5	600	5	600	4	600	5
700	7	700	4	700	5	700	4
800	5	800	4	800	5	800	5
900	5	900	5	900	5	900	5
1000		1000		1000		1000	

Test No.	SP112	Test No.	SP113	Test No.	SP114	Test No.	SP115
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	2	100	3	100	2	100	4
200	2	200	3	200	3	200	5
300	3	300	5	300	3	300	4
400	4	400	4	400	2	400	4
500	4	500	4	500	4	500	5
600	5	600	5	600	5	600	4
700	5	700	6	700	5	700	4
800	4	800	6	800	7	800	5
900	4	900	6	900	7	900	5
1000		1000		1000		1000	

Test No.	SP116	Test No.	SP117	Test No.	SP118	Test No.	SP119
Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows	Depth (mm)	Blows
100	5	100		100		100	
200	5	200		200		200	
300	4	300		300		300	
400	5	400		400		400	
500	6	500		500		500	
600	5	600		600		600	
700	5	700		700		700	
800	4	800		800		800	
900	5	900		900		900	
1000		1000		1000		1000	

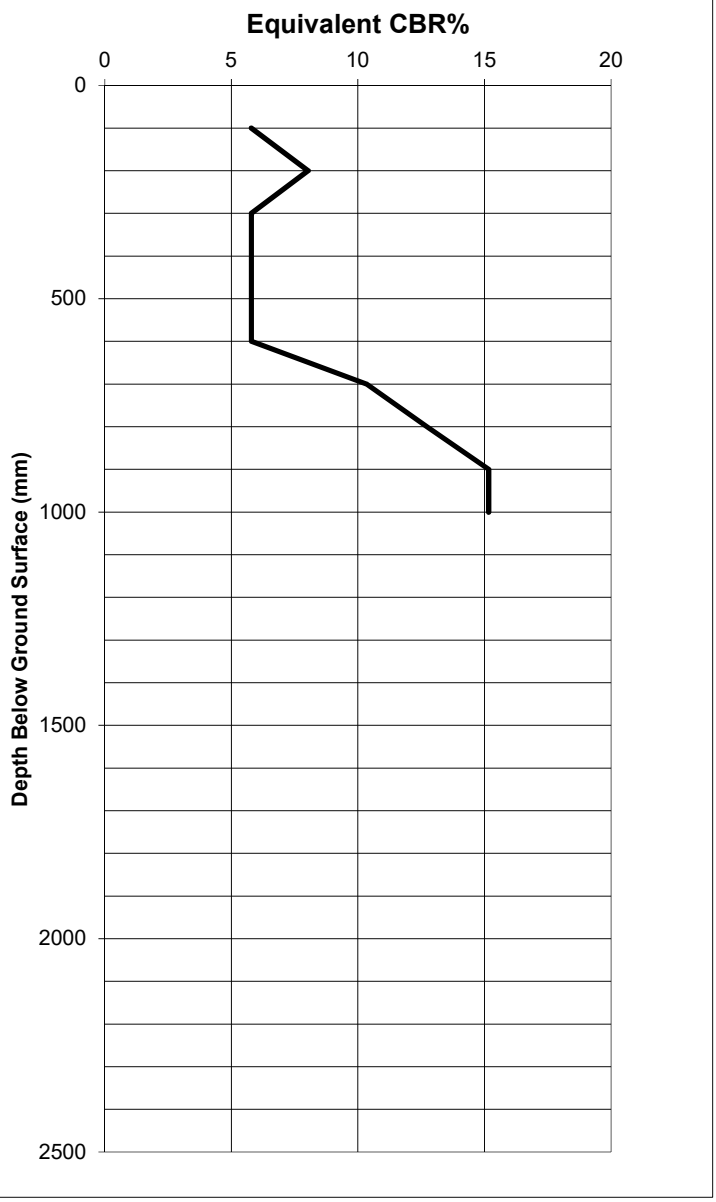
APPENDIX 2

CBR Results

ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP60	**Project**		**Number**	
Location	See site plan				

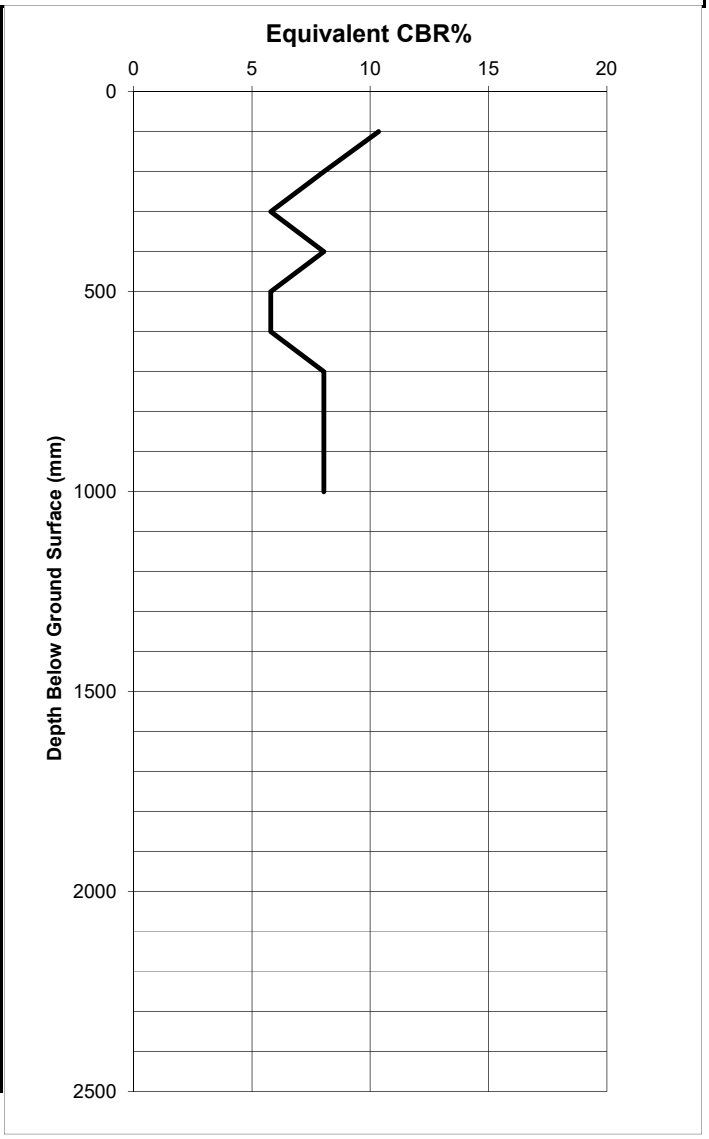
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	4	25	8
300	3	33	6
400	3	33	6
500	3	33	6
600	3	33	6
700	5	20	10
800	6	17	13
900	7	14	15
1000	7	14	15
	Sum		90
	Average		9



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP61	**Project**		**Number**	
Location	See site plan				

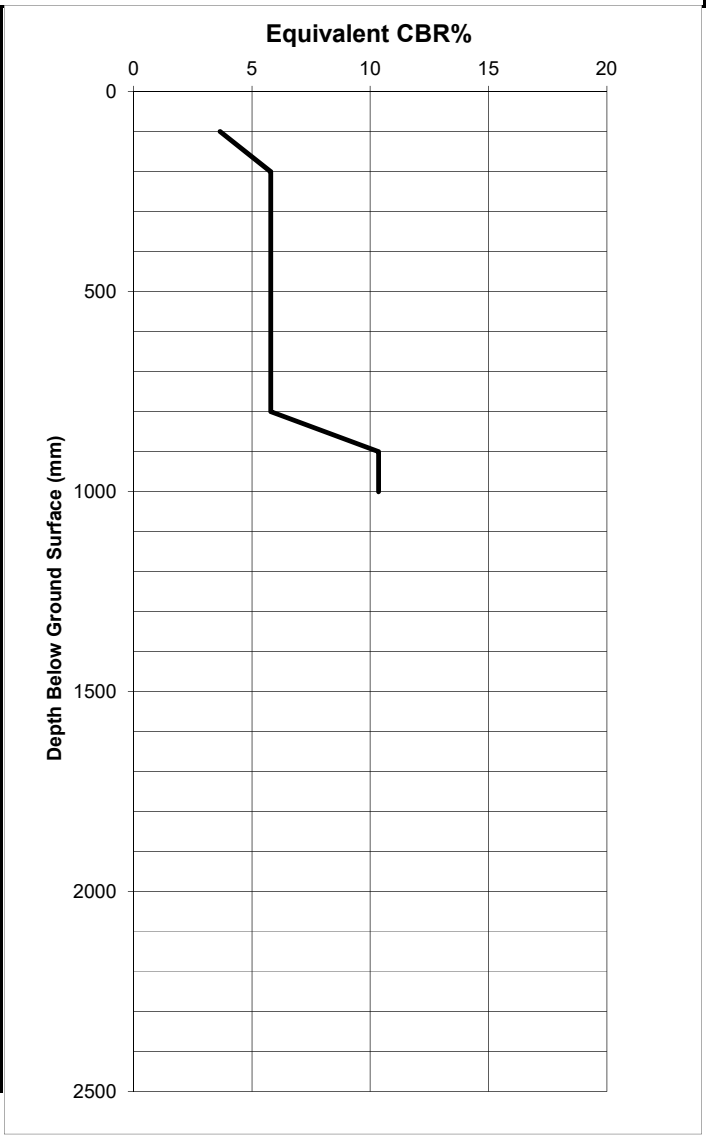
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	5	20	10
200	4	25	8
300	3	33	6
400	4	25	8
500	3	33	6
600	3	33	6
700	4	25	8
800	4	25	8
900	4	25	8
1000	4	25	8
	Sum		76
	Average		8



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP62	**Project**		**Number**	
Location	See site plan				

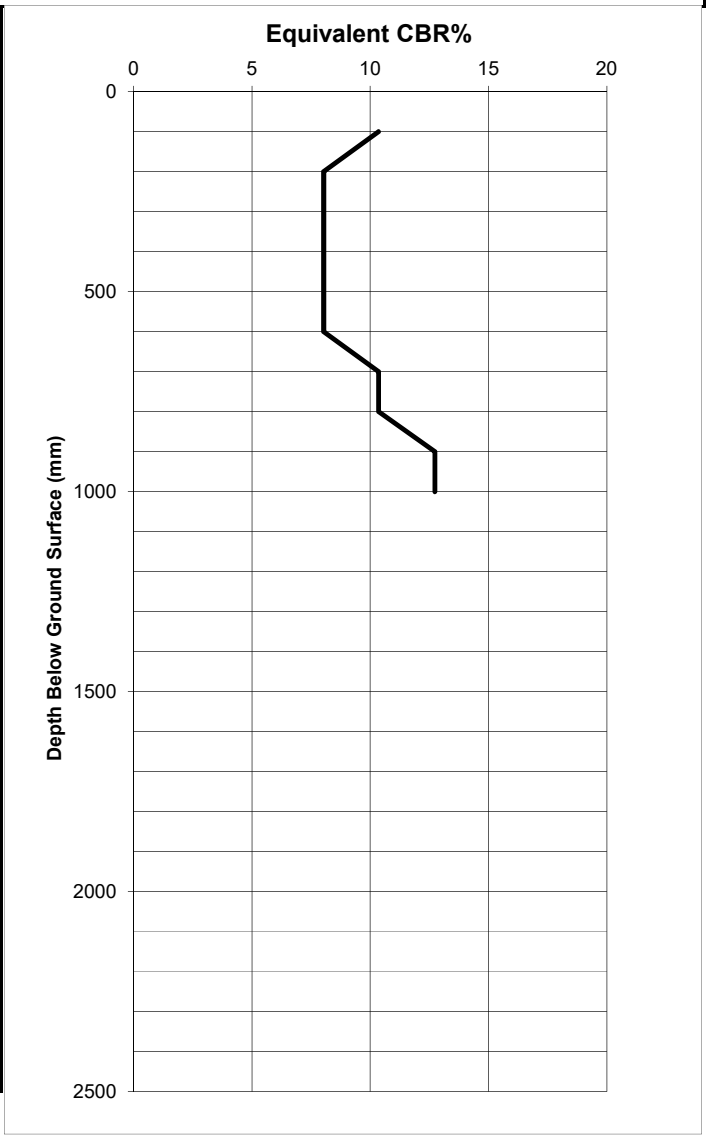
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	2	50	4
200	3	33	6
300	3	33	6
400	3	33	6
500	3	33	6
600	3	33	6
700	3	33	6
800	3	33	6
900	5	20	10
1000	5	20	10
	Sum		65
	Average		6



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP63	**Project**		**Number**	
Location	See site plan				

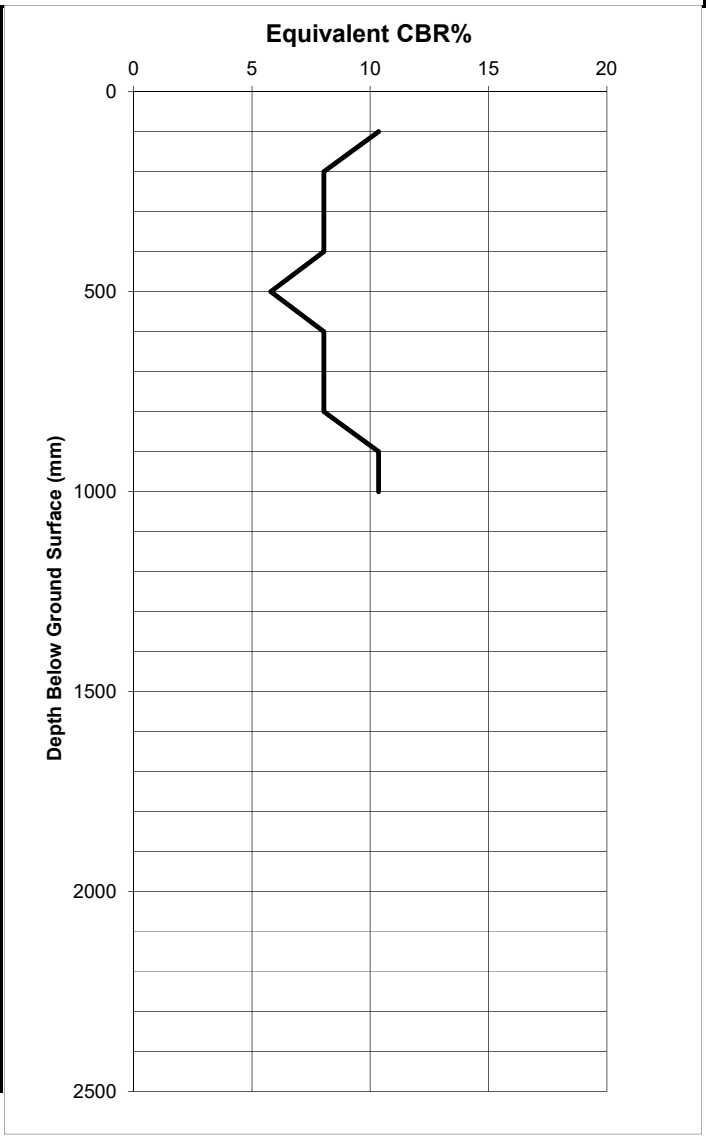
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	5	20	10
200	4	25	8
300	4	25	8
400	4	25	8
500	4	25	8
600	4	25	8
700	5	20	10
800	5	20	10
900	6	17	13
1000	6	17	13
	Sum		97
	Average		10



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park	**Date**	5/08/2019
Test No	SP64 **Project**	**Number**	
Location	See site plan		

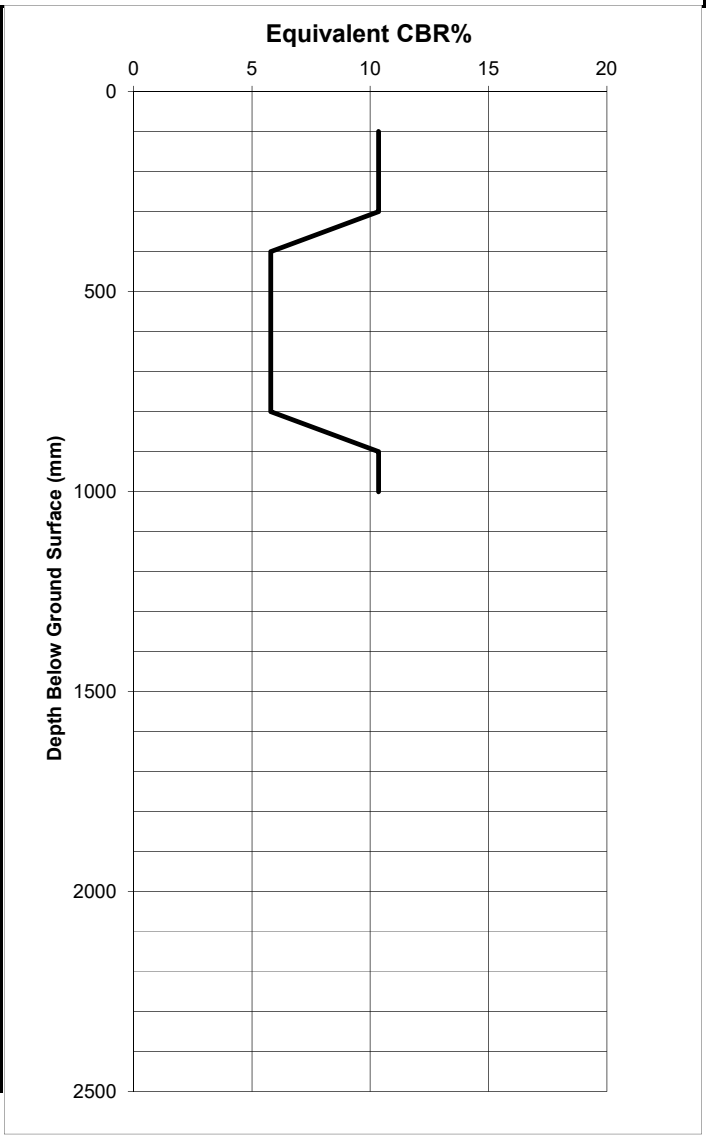
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	5	20	10
200	4	25	8
300	4	25	8
400	4	25	8
500	3	33	6
600	4	25	8
700	4	25	8
800	4	25	8
900	5	20	10
1000	5	20	10
	Sum		85
	Average		9



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP65	**Project**		**Number**	
Location	See site plan				

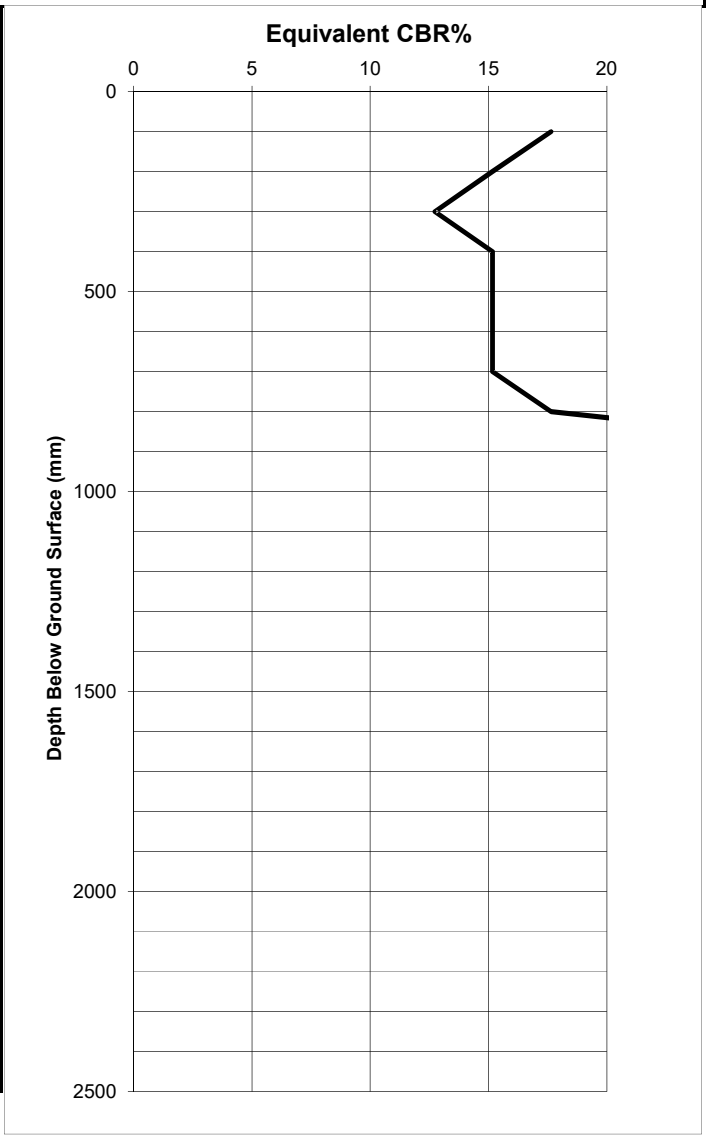
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	5	20	10
200	5	20	10
300	5	20	10
400	3	33	6
500	3	33	6
600	3	33	6
700	3	33	6
800	3	33	6
900	5	20	10
1000	5	20	10
	Sum		81
	Average		8



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP66	**Project**		**Number**	
Location	See site plan				

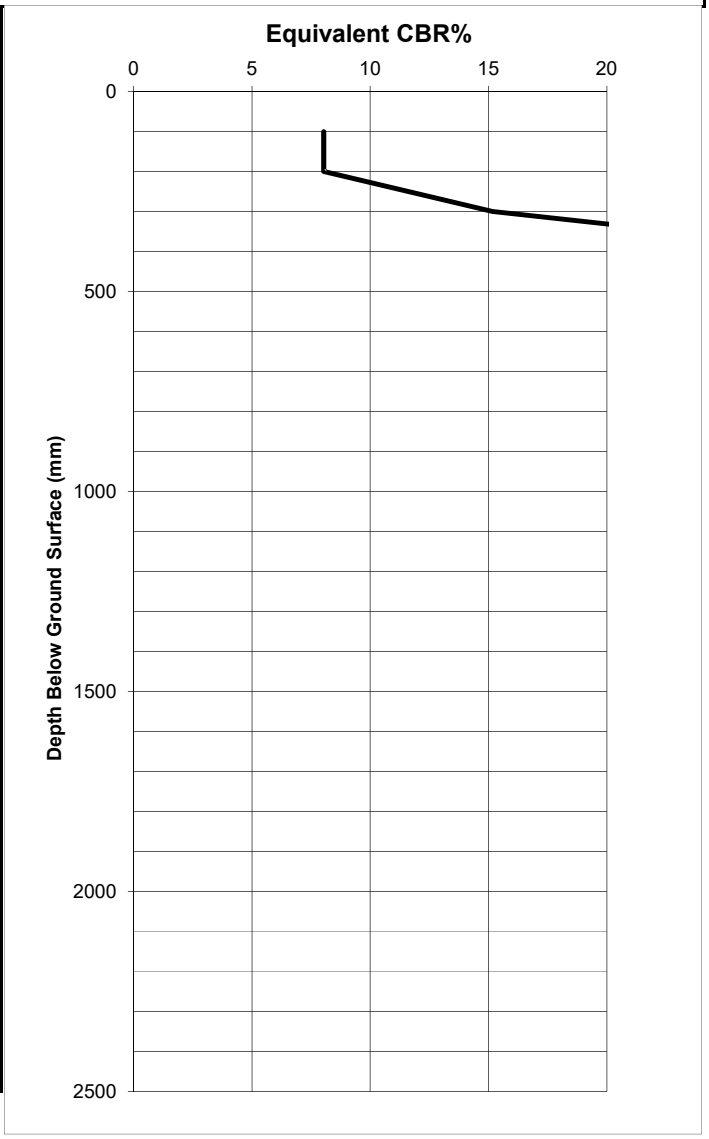
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	8	13	18
200	7	14	15
300	6	17	13
400	7	14	15
500	7	14	15
600	7	14	15
700	7	14	15
800	8	13	18
900	14	7	33
1000	15	7	36
	Sum		193
	Average		19



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP67	**Project**		**Number**	
Location	See site plan				

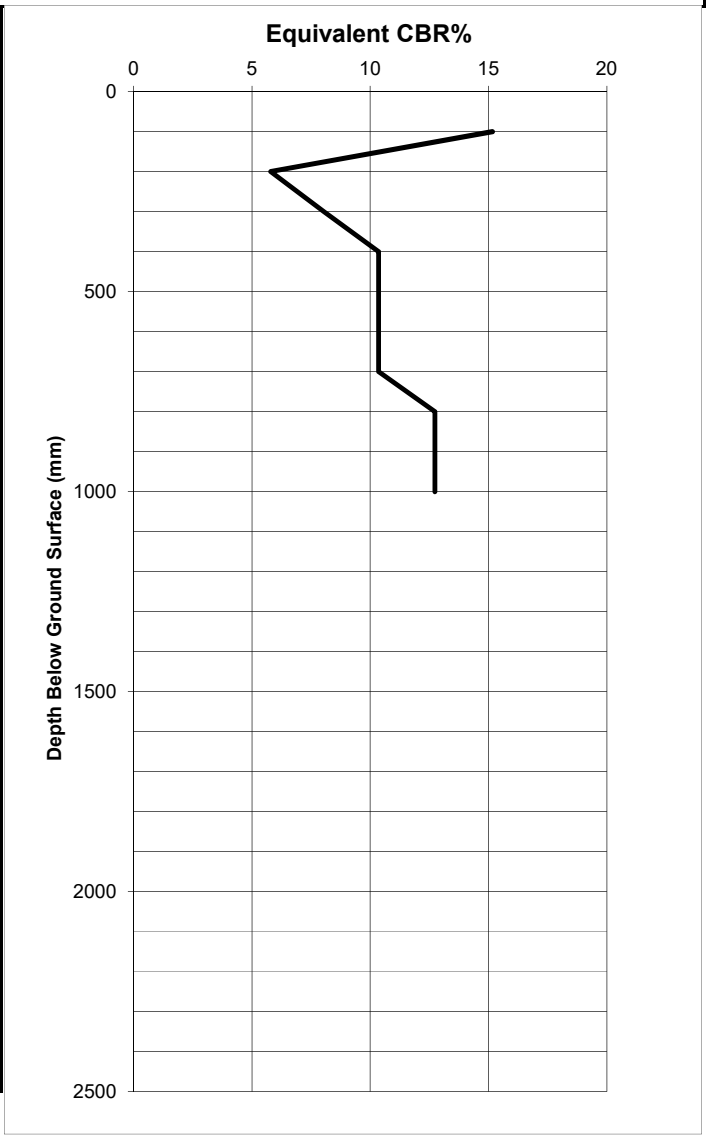
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	4	25	8
200	4	25	8
300	7	14	15
400	13	8	31
500	15	7	36
600	15	7	36
700	15	7	36
800	15	7	36
900	15	7	36
1000	15	7	36
	Sum		278
	Average		28



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park	**Date**	5/08/2019
Test No	SP68 **Project**	**Number**	
Location	See site plan		

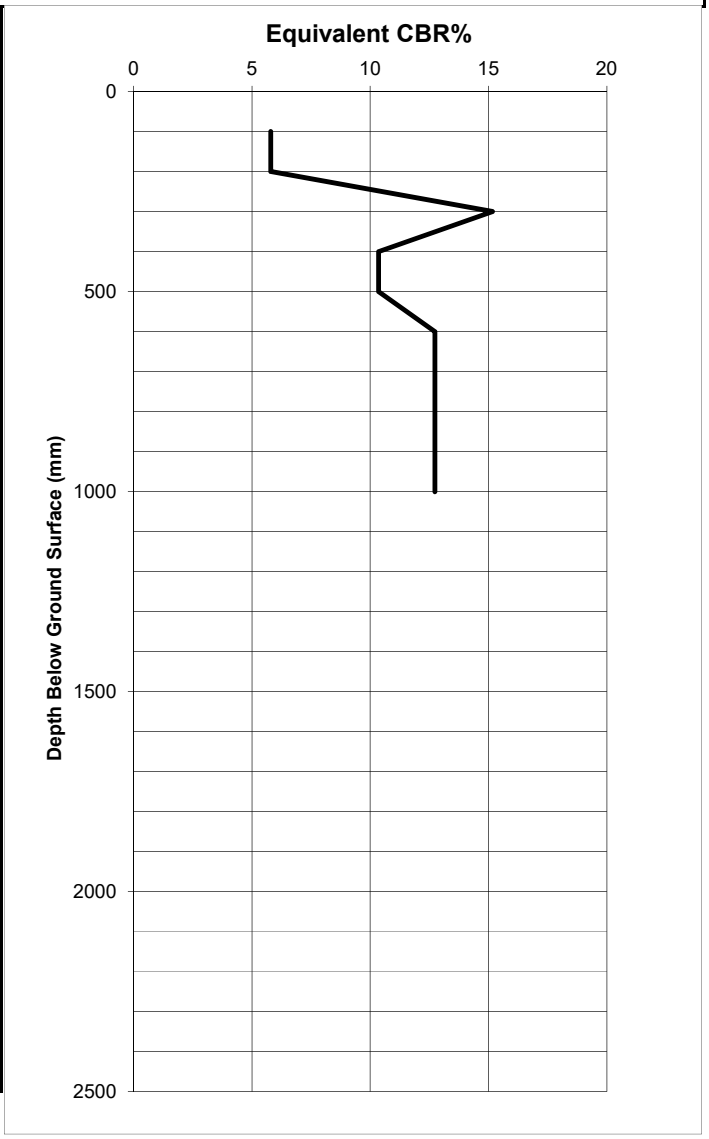
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	7	14	15
200	3	33	6
300	4	25	8
400	5	20	10
500	5	20	10
600	5	20	10
700	5	20	10
800	6	17	13
900	6	17	13
1000	6	17	13
	Sum		109
	Average		11



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP69	**Project**		**Number**	
Location	See site plan				

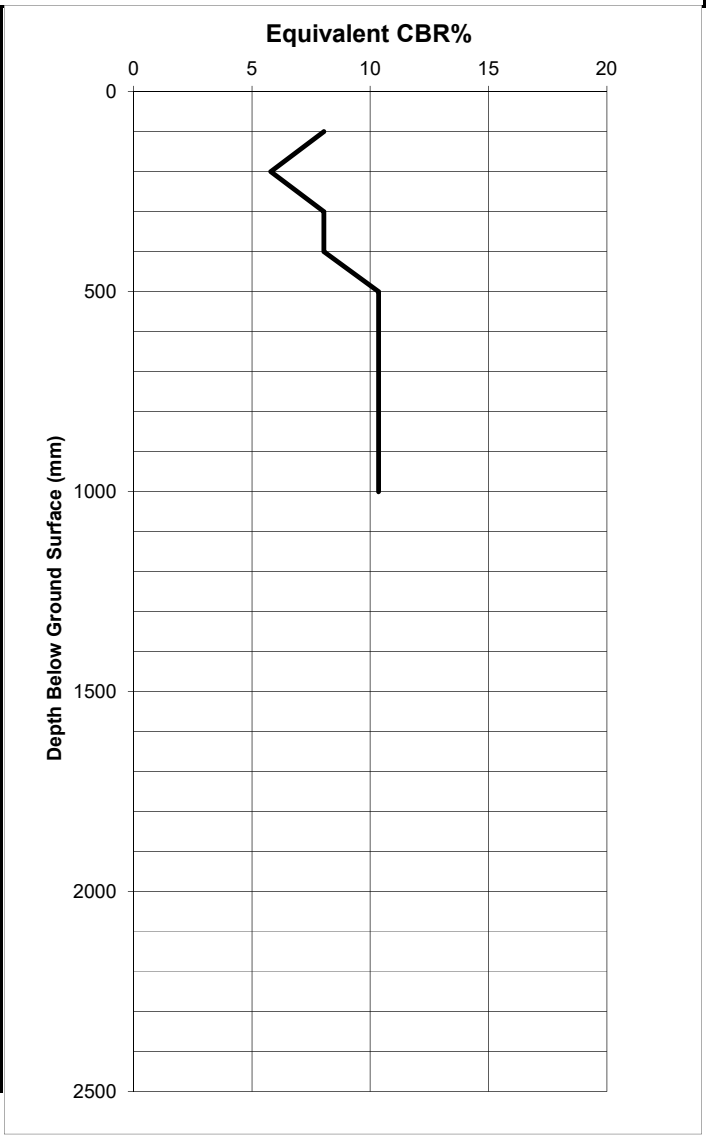
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	3	33	6
300	7	14	15
400	5	20	10
500	5	20	10
600	6	17	13
700	6	17	13
800	6	17	13
900	6	17	13
1000	6	17	13
	Sum		111
	Average		11



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP70	**Project**		**Number**	
Location	See site plan				

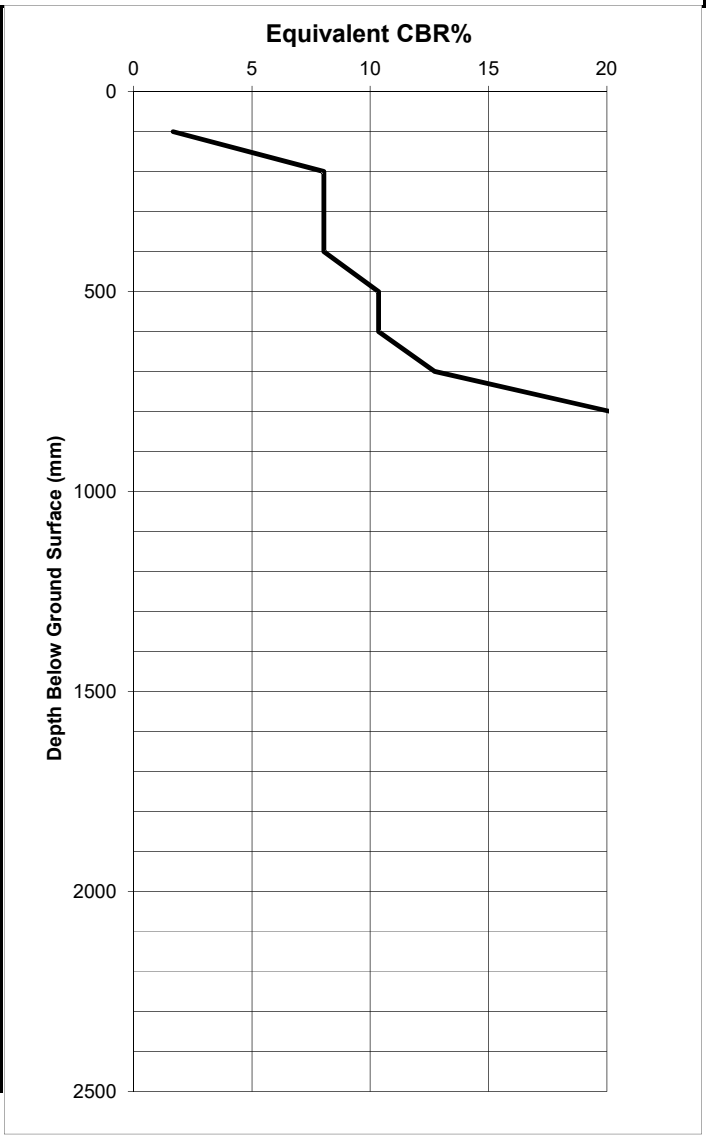
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	4	25	8
200	3	33	6
300	4	25	8
400	4	25	8
500	5	20	10
600	5	20	10
700	5	20	10
800	5	20	10
900	5	20	10
1000	5	20	10
	Sum		92
	Average		9



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 501 Yaldhurst Park			**Date**	5/08/2019
Test No	SP71	**Project**		**Number**	
Location	See site plan				

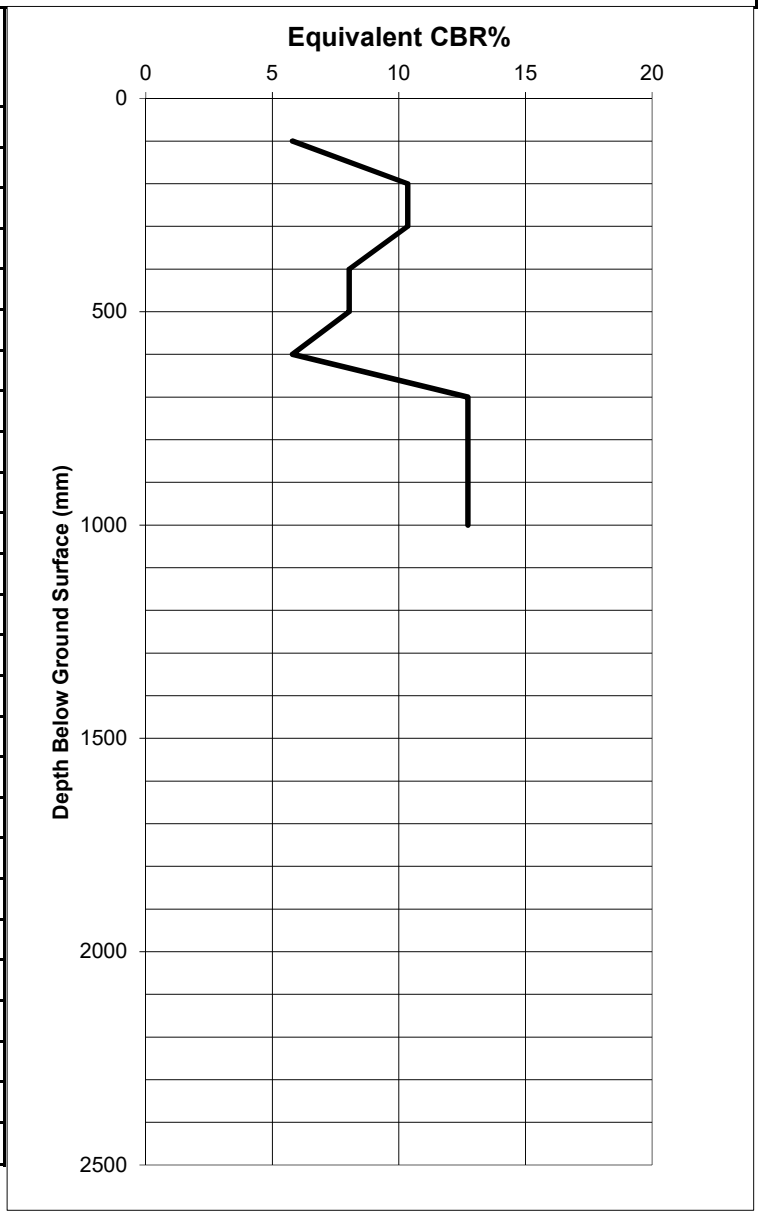
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	1	100	2
200	4	25	8
300	4	25	8
400	4	25	8
500	5	20	10
600	5	20	10
700	6	17	13
800	9	11	20
900	15	7	36
1000	15	7	36
	Sum		151
	Average		15



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 300 Yaldhurst Park			**Date**	7/08/2019
Test No	SP78	**Project**		**Number**	
Location	See site plan				

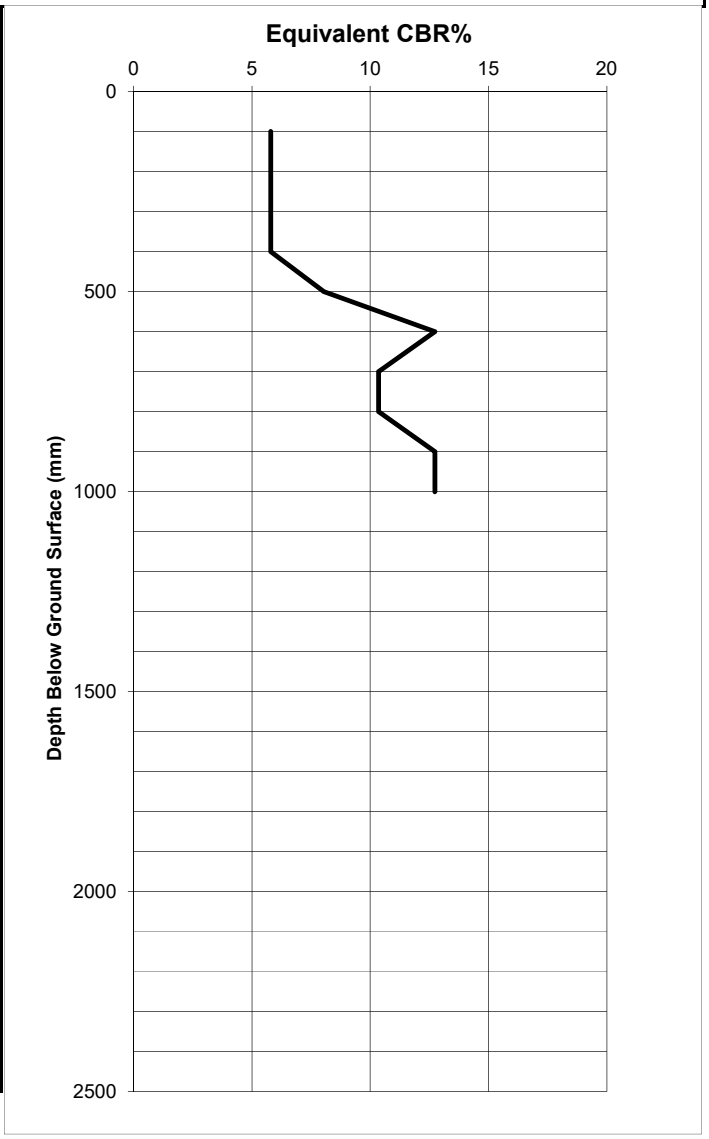
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	5	20	10
300	5	20	10
400	4	25	8
500	4	25	8
600	3	33	6
700	6	17	13
800	6	17	13
900	6	17	13
1000	6	17	13
	Sum		99
	Average		10



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 300 Yaldhurst Park			**Date**	7/08/2019
Test No	SP79	**Project**		**Number**	
Location	See site plan				

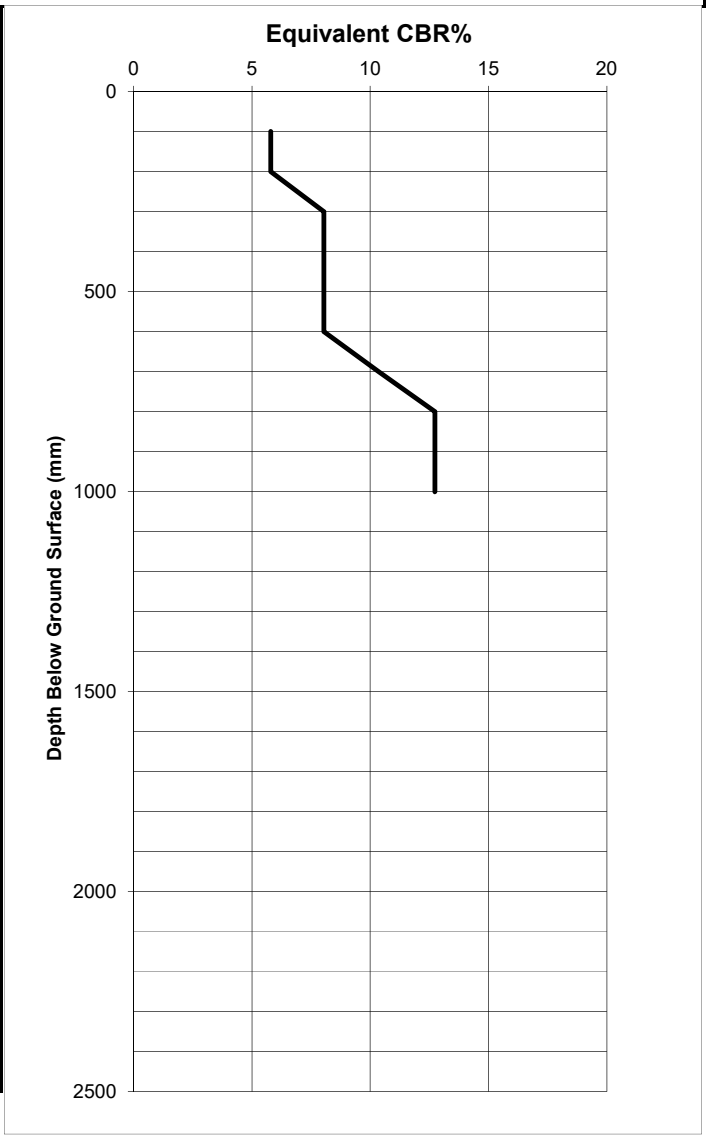
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	3	33	6
300	3	33	6
400	3	33	6
500	4	25	8
600	6	17	13
700	5	20	10
800	5	20	10
900	6	17	13
1000	6	17	13
	Sum		90
	Average		9



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 300 Yaldhurst Park			**Date**	7/08/2019
Test No	SP80	**Project**		**Number**	
Location	See site plan				

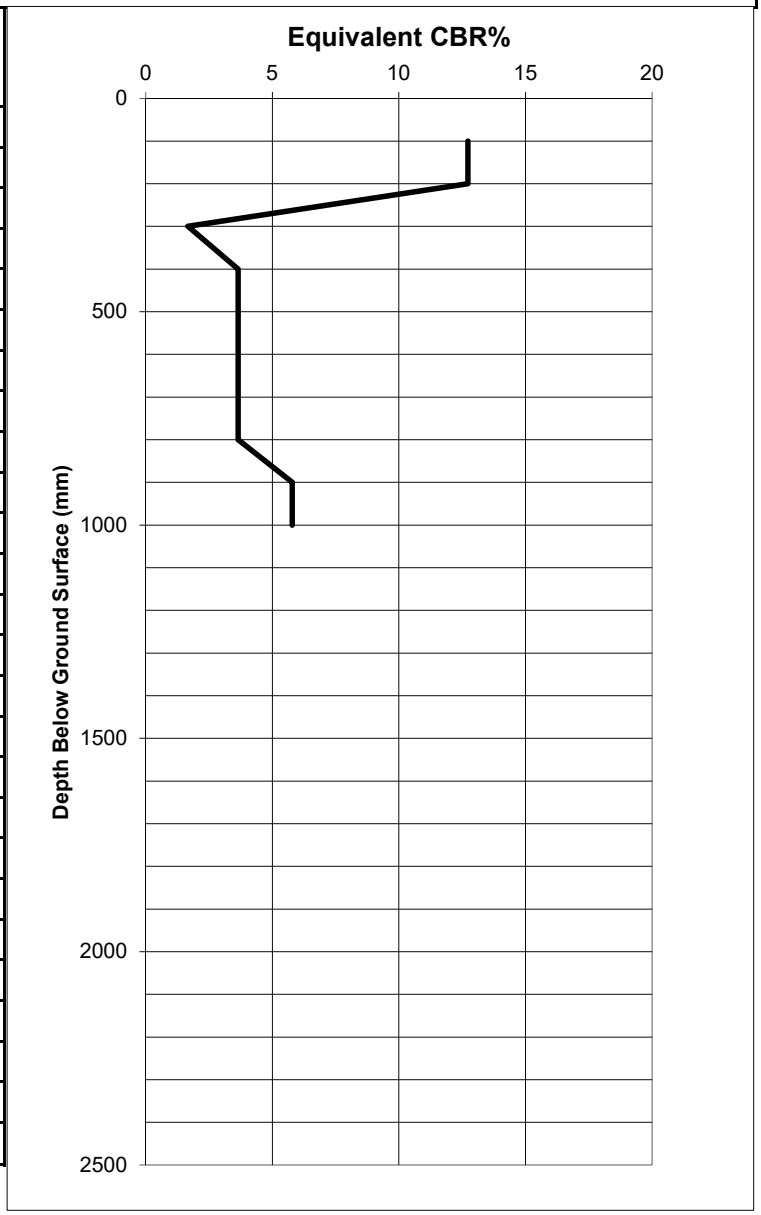
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	3	33	6
300	4	25	8
400	4	25	8
500	4	25	8
600	4	25	8
700	5	20	10
800	6	17	13
900	6	17	13
1000	6	17	13
	Sum		92
	Average		9



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 301 Yaldhurst Park			**Date**	19/08/2019
Test No	SP96	**Project**		**Number**	
Location	See site plan				

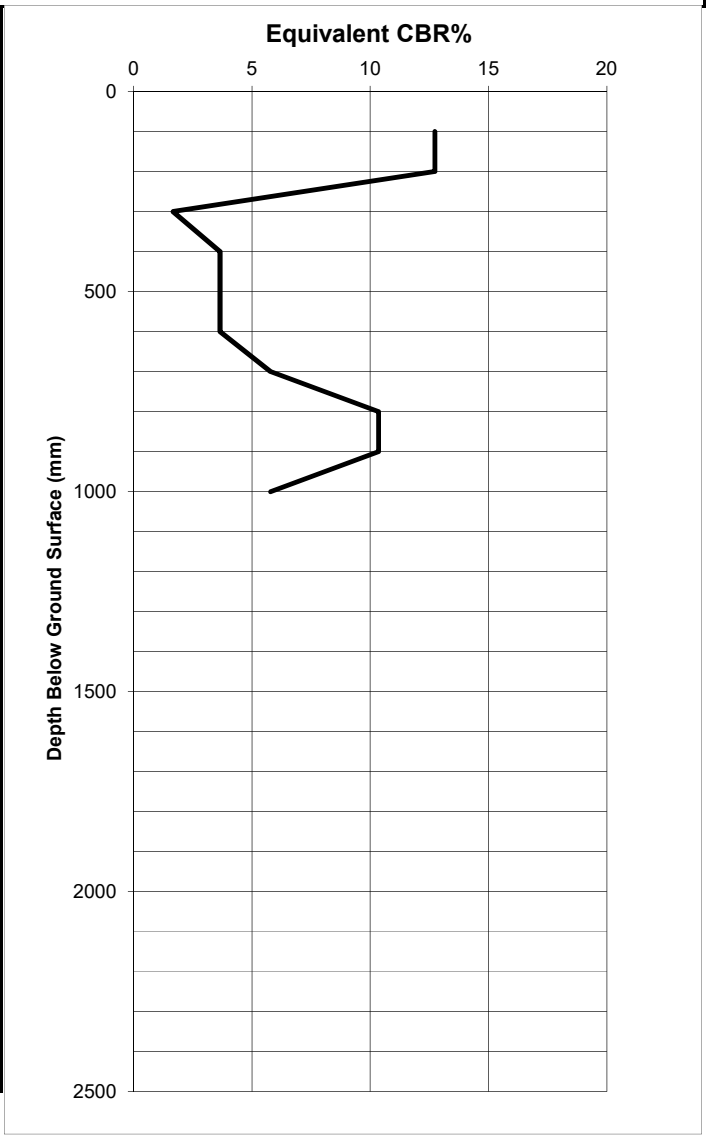
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	6	17	13
200	6	17	13
300	1	100	2
400	2	50	4
500	2	50	4
600	2	50	4
700	2	50	4
800	2	50	4
900	3	33	6
1000	3	33	6
	Sum		57
	Average		6



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 301 Yaldhurst Park			**Date**	19/08/2019
Test No	SP97	**Project**		**Number**	
Location	See site plan				

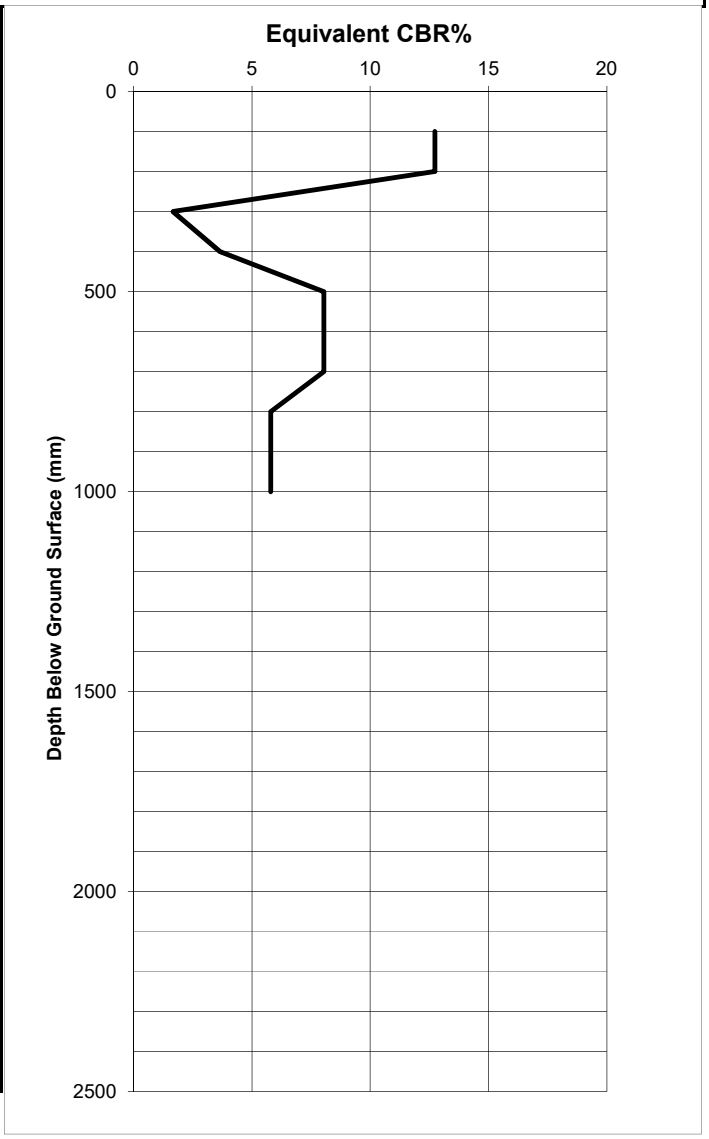
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	6	17	13
200	6	17	13
300	1	100	2
400	2	50	4
500	2	50	4
600	2	50	4
700	3	33	6
800	5	20	10
900	5	20	10
1000	3	33	6
	Sum		70
	Average		7



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 301 Yaldhurst Park	**Date**	19/08/2019
Test No	SP98	**Project Number**	
Location	See site plan		

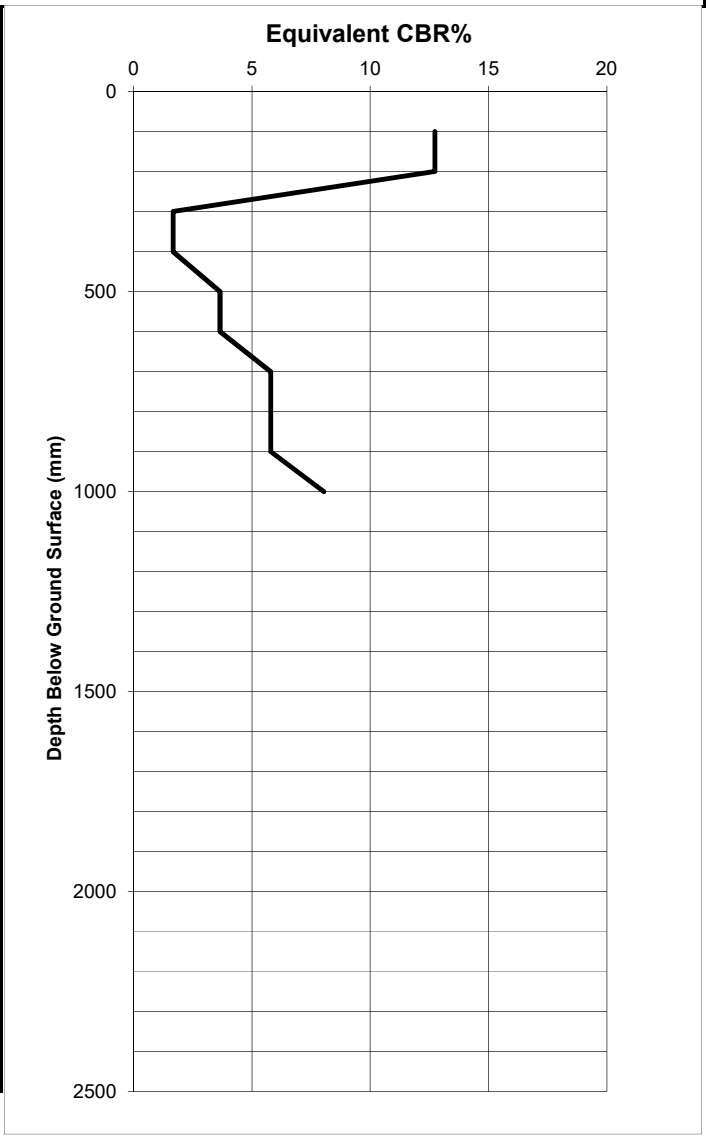
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	6	17	13
200	6	17	13
300	1	100	2
400	2	50	4
500	4	25	8
600	4	25	8
700	4	25	8
800	3	33	6
900	3	33	6
1000	3	33	6
	Sum		72
	Average		7



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 301 Yaldhurst Park			**Date**	19/08/2019
Test No	SP99	**Project**		**Number**	
Location	See site plan				

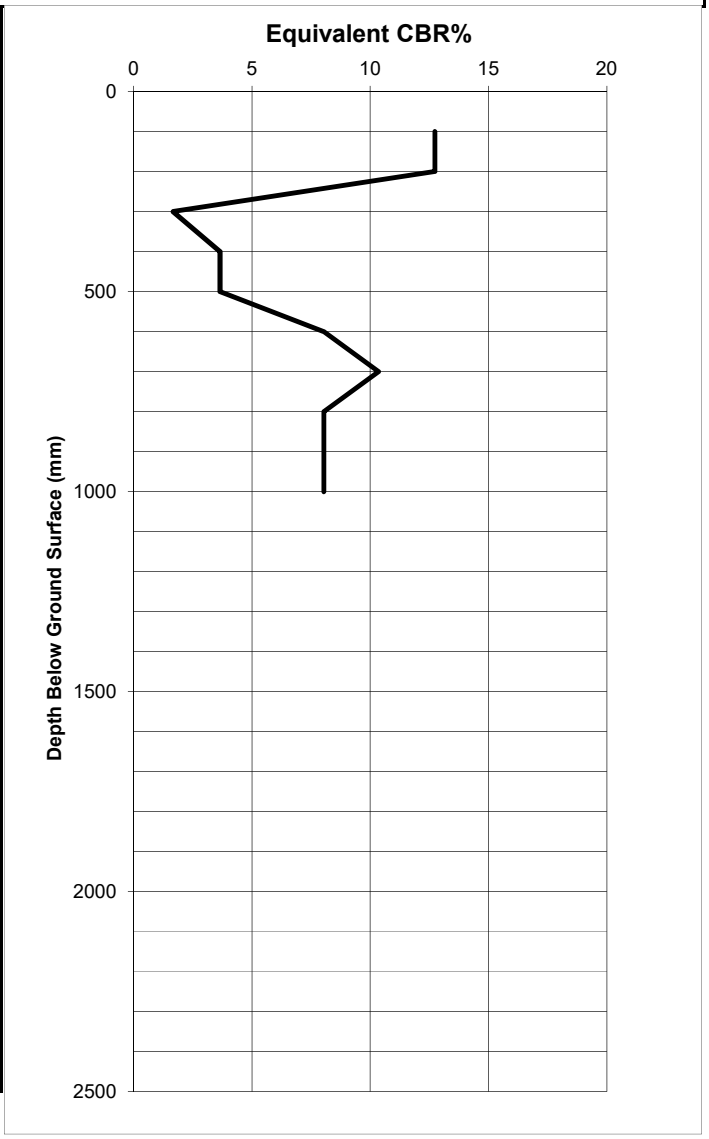
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	6	17	13
200	6	17	13
300	1	100	2
400	1	100	2
500	2	50	4
600	2	50	4
700	3	33	6
800	3	33	6
900	3	33	6
1000	4	25	8
	Sum		61
	Average		6



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 301 Yaldhurst Park	**Date**	19/08/2019
Test No	SP100 **Project**	**Number**	
Location	See site plan		

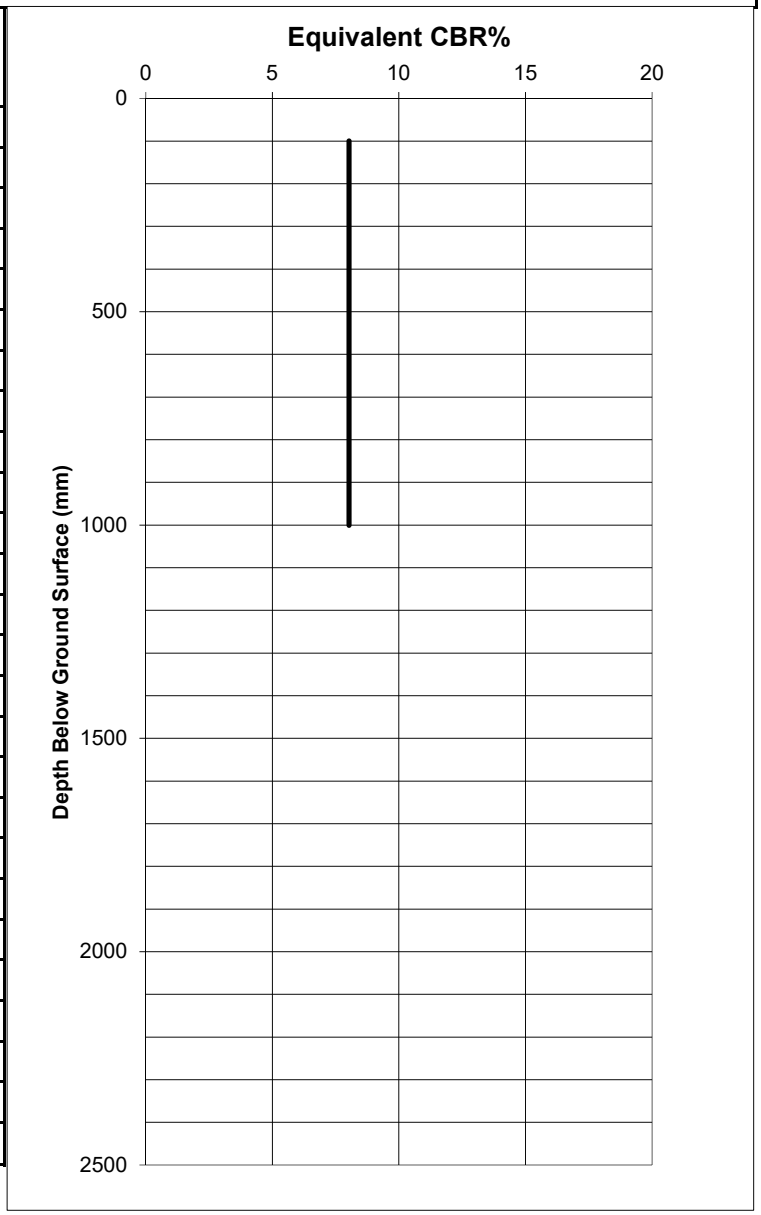
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	6	17	13
200	6	17	13
300	1	100	2
400	2	50	4
500	2	50	4
600	4	25	8
700	5	20	10
800	4	25	8
900	4	25	8
1000	4	25	8
	Sum		77
	Average		8



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 4 Yaldhurst Park			**Date**	3/09/2019
Test No	SP105	**Project**		**Number**	
Location	See site plan				

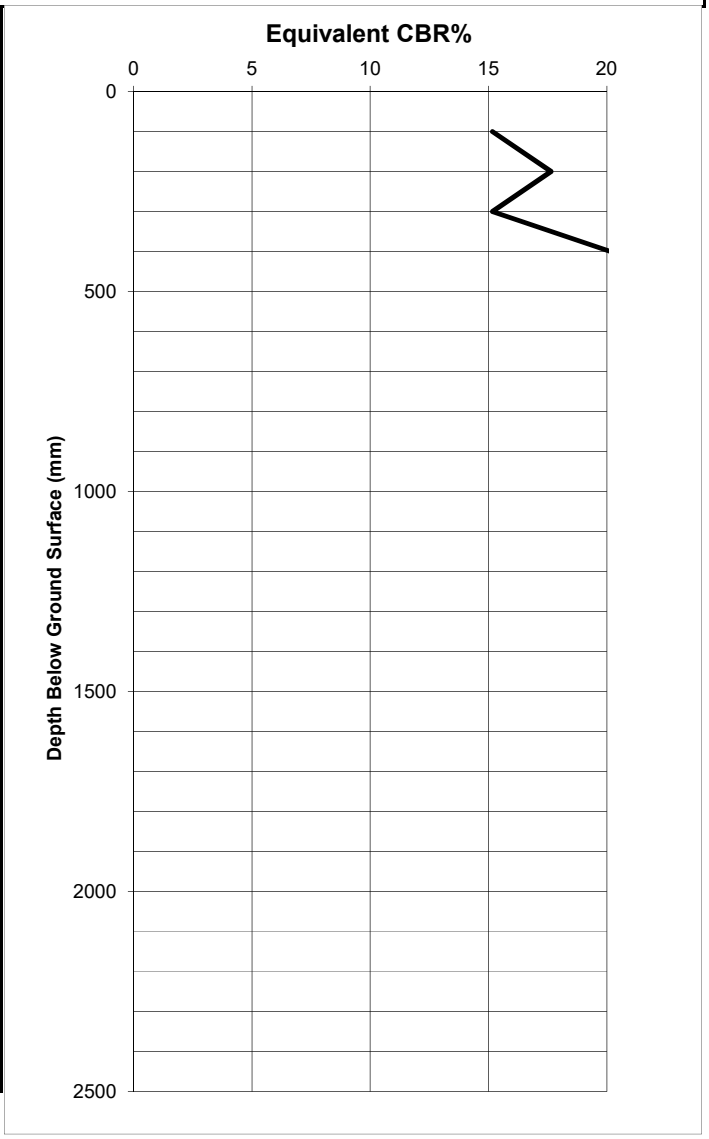
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	4	25	8
200	4	25	8
300	4	25	8
400	4	25	8
500	4	25	8
600	4	25	8
700	4	25	8
800	4	25	8
900	4	25	8
1000	4	25	8
	Sum		80
	Average		8



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 4 Yaldhurst Park			**Date**	3/09/2019
Test No	SP106	**Project**		**Number**	
Location	See site plan				

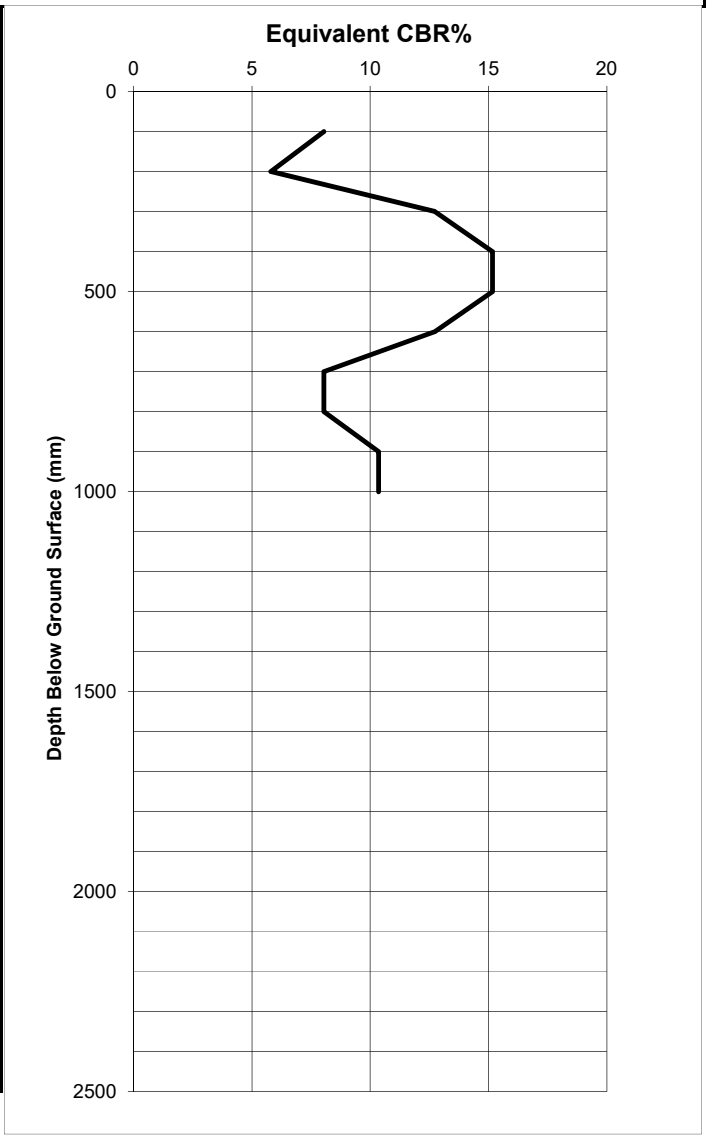
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	7	14	15
200	8	13	18
300	7	14	15
400	9	11	20
500	10	10	23
600	10	10	23
700	10	10	23
800	10	10	23
900	10	10	23
1000	10	10	23
	Sum		205
	Average		20



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 4 Yaldhurst Park	**Date**	3/09/2019
Test No	SP107 **Project**	**Number**	
Location	See site plan		

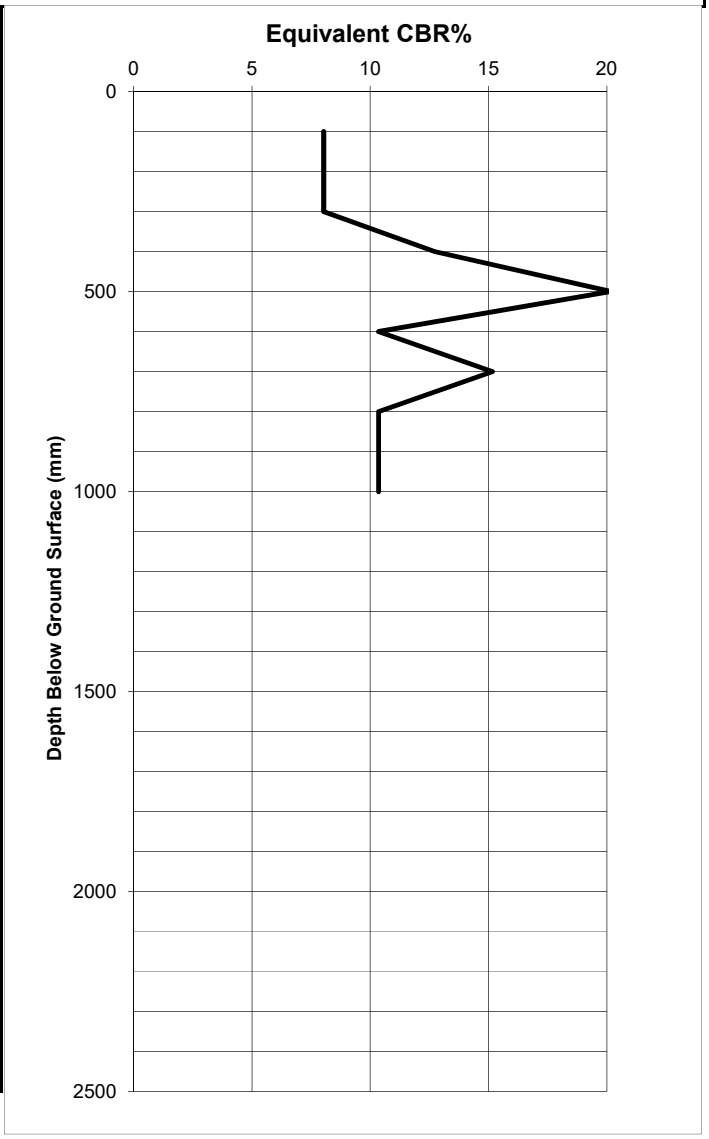
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	4	25	8
200	3	33	6
300	6	17	13
400	7	14	15
500	7	14	15
600	6	17	13
700	4	25	8
800	4	25	8
900	5	20	10
1000	5	20	10
	Sum		106
	Average		11



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 4 Yaldhurst Park	**Date**	3/09/2019
Test No	SP108 **Project**	**Number**	
Location	See site plan		

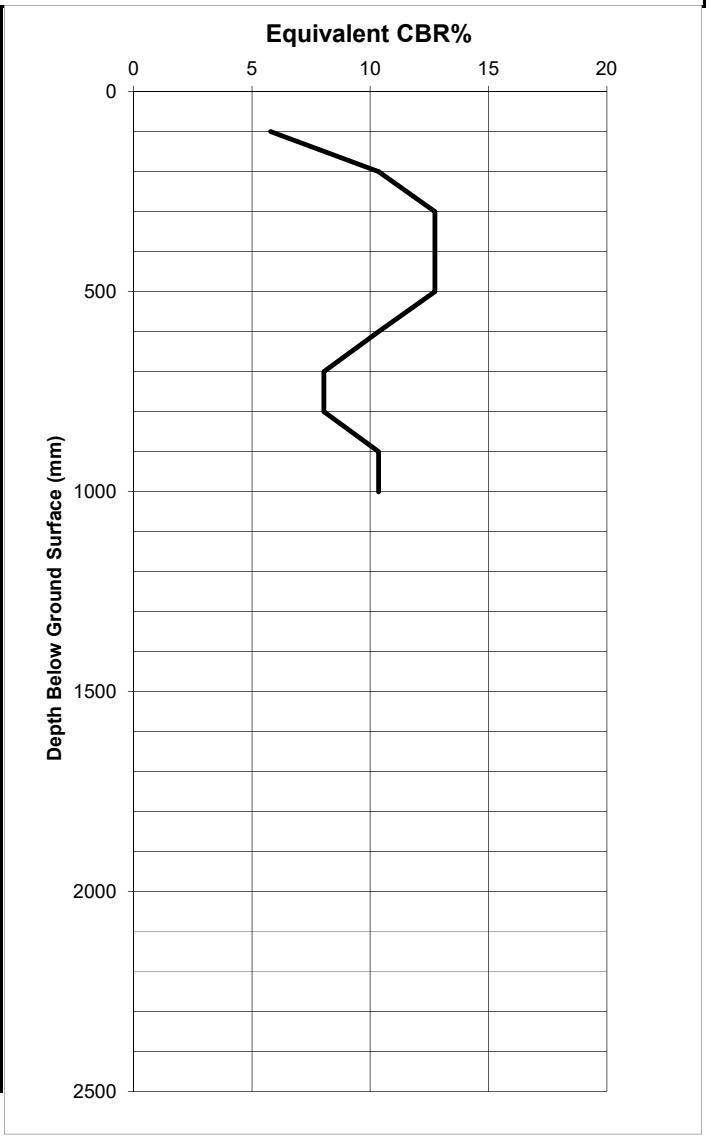
Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	4	25	8
200	4	25	8
300	4	25	8
400	6	17	13
500	9	11	20
600	5	20	10
700	7	14	15
800	5	20	10
900	5	20	10
1000	5	20	10
	Sum		114
	Average		11



ENGEO LTD
Scala Penetrometer Test (DCP)

Client	ROW 4 Yaldhurst Park			**Date**	3/09/2019
Test No	SP109	**Project**		**Number**	
Location	See site plan				

Depth Below Surface (mm)	Number of Blows	Penetration mm/Blow	Equivalent CBR% Austroads
0			
100	3	33	6
200	5	20	10
300	6	17	13
400	6	17	13
500	6	17	13
600	5	20	10
700	4	25	8
800	4	25	8
900	5	20	10
1000	5	20	10
	Sum		101
	Average		10



APPENDIX 3

NDM Results

WET SIEVE ANALYSIS
TEST REPORT

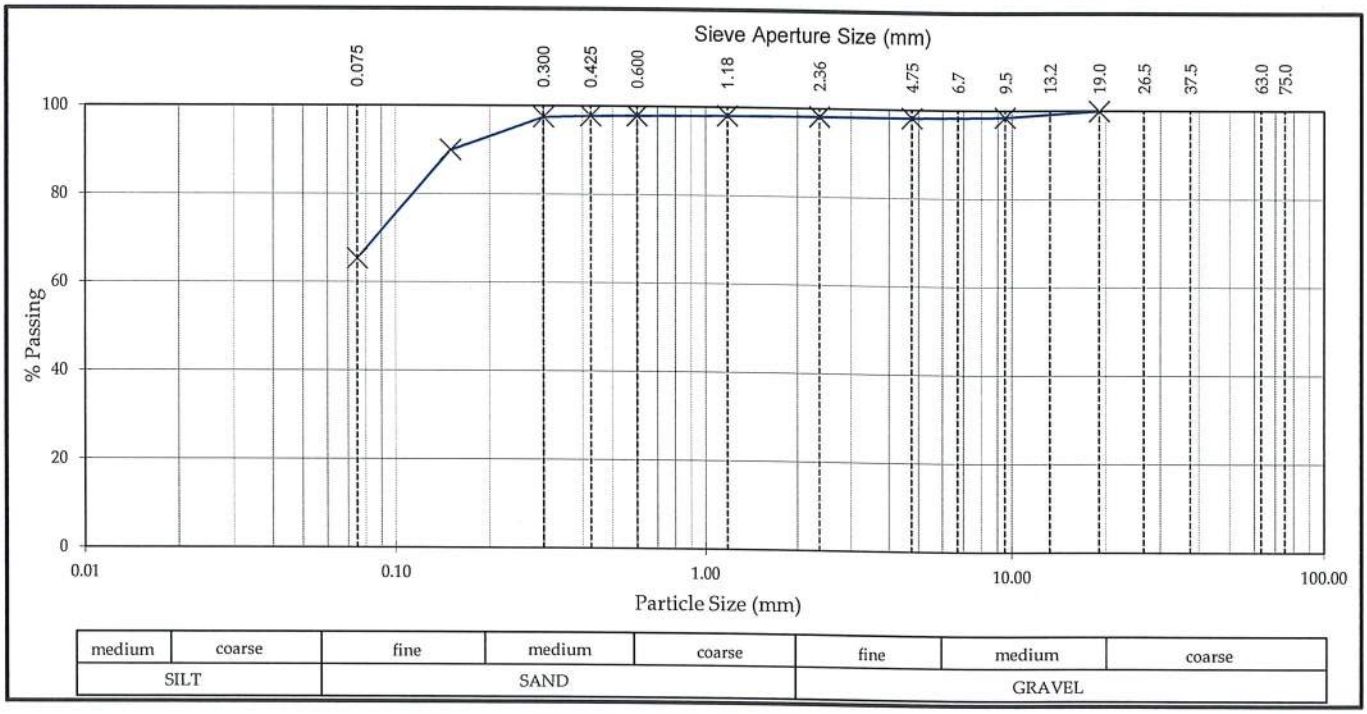
WSP | OPUS

Project :	**Material Investiagtion**
Location :	**Yaldhurst Park, Sample #1**
Client :	**ENGEO Limited**
Contractor :	**ENGEO Limited**
Sampled by :	**Hamish Foy**
Date sampled :	**November 2018**
Sampling method :	**NZS 4402: 1986 (Fine)**
Sample description :	**Silty Sand**
Sample condition	**Damp as received**

Project No :	**6-JENGO.16/6LC**
Lab Ref No :	**CH5291**
Client Ref No :	**Hamish Foy**

Sieve Analysis

Size (mm)	% Passing	Size (mm)	% Passing	Size (mm)	% Passing	Size (mm)	% Passing
75.00	-	19.00	100	4.75	98	0.425	98
63.00	-	13.20	-	2.36	98	0.300	97
37.50	-	9.50	98	1.18	98	0.150	90
26.50	-	6.70	-	0.600	98	0.075	65



Test Method	Notes
NZS 4407 : 2015 Test 3.8.1	*Fraction passing finest sieve is by difference.*

Date tested : 14 February 2019
Date reported : 14 February 2019

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
This report may only be reproduced in full

IANZ Approved Signatory

Designation : *Assistant Laboratory Manager*
Date : 14 February 2019

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

WSP Opus
Christchurch Laboratory
Quality Management Systems Certified to ISO 9001

52C Hayton Rd, Wigram
PO Box 1482, Christchurch Mail Centre,
Christchurch 8140, New Zealand

Telephone +64 3 343 0739
Website www.wsp-opus.co.nz

DRY DENSITY / WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

WSP | OPUS

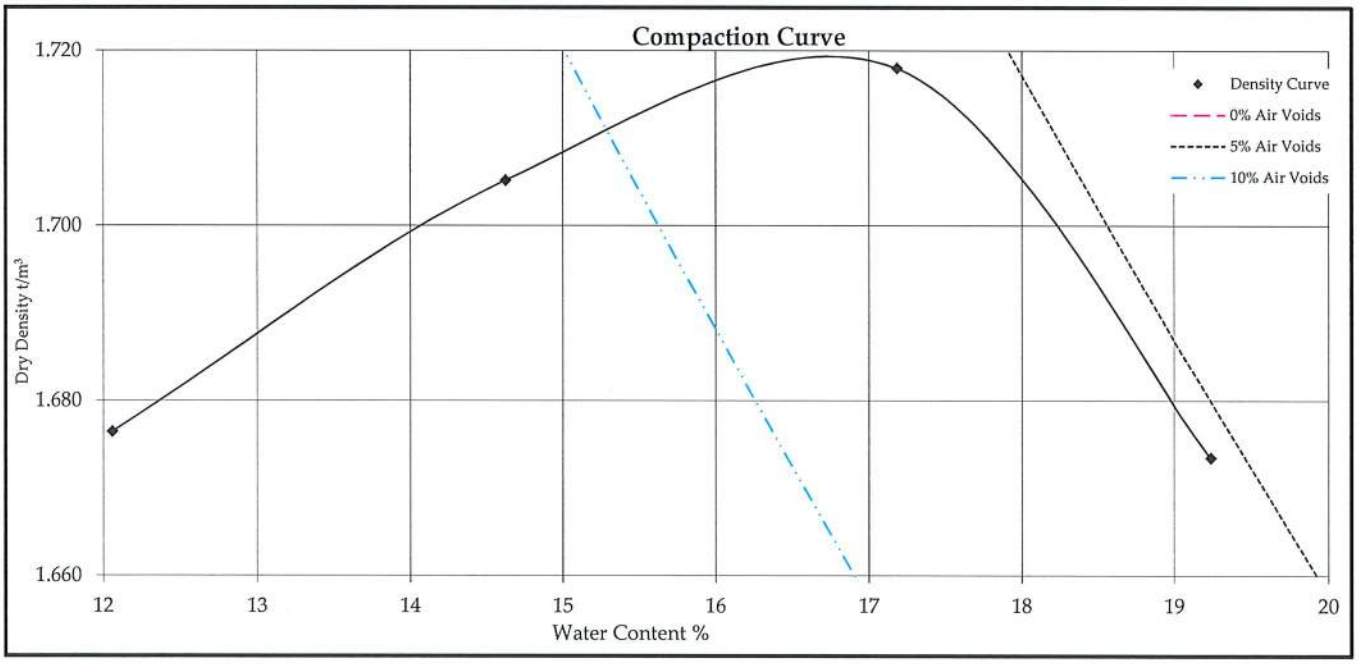
Project :	**Material Investigation**
Location :	**Yaldhurst Park, Sample #1**
Client :	**ENGEO Limited**
Contractor :	**ENGEO Limited**
Sampled by :	**Hamish Foy**
Date sampled :	**November 2018**
Sampling method :	**NZS 4402: 1986 (Fine)**
Sample description :	**Silty Sand**
Sample condition :	**Damp as received**
Solid density :	**2.68 t/m³ (Assumed)**
Source :	**Sample #1**

Project No :	**6-JENGO.16/6LC**
Lab Ref No :	**CH5291**
Client Ref No :	**Hamish Foy**

Test Results

Maximum dry density	1.72	t/m³	Natural water content	-	%	
Optimum water content	17.0	%	Fraction tested	Passing 19.0mm		

Sample ID		-4%	-2%	NAT	+2%	+4%	+6%	
Bulk density	t/m³	1.879	1.955	2.013	1.995	1.982	1.958	
Water content	%	12.1	14.6	17.2	19.2	22.0	24.2	
Dry density	t/m³	1.676	1.705	1.718	1.673	1.624	1.577	
Sample condition		Dry Hard	Moist Firm	Moist Firm	Moist Firm	Moist Soft	Moist Soft	



Test Methods		Notes
Compaction	NZS 4402 : 1986 Test 4.1.1 (Standard)	

Date tested : 14 February 2019
Date reported : 15 February 2019

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IANZ Approved Signatory

Designation : *Assistant Laboratory Manager*
Date : 15 February 2019

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WET SIEVE ANALYSIS
TEST REPORT

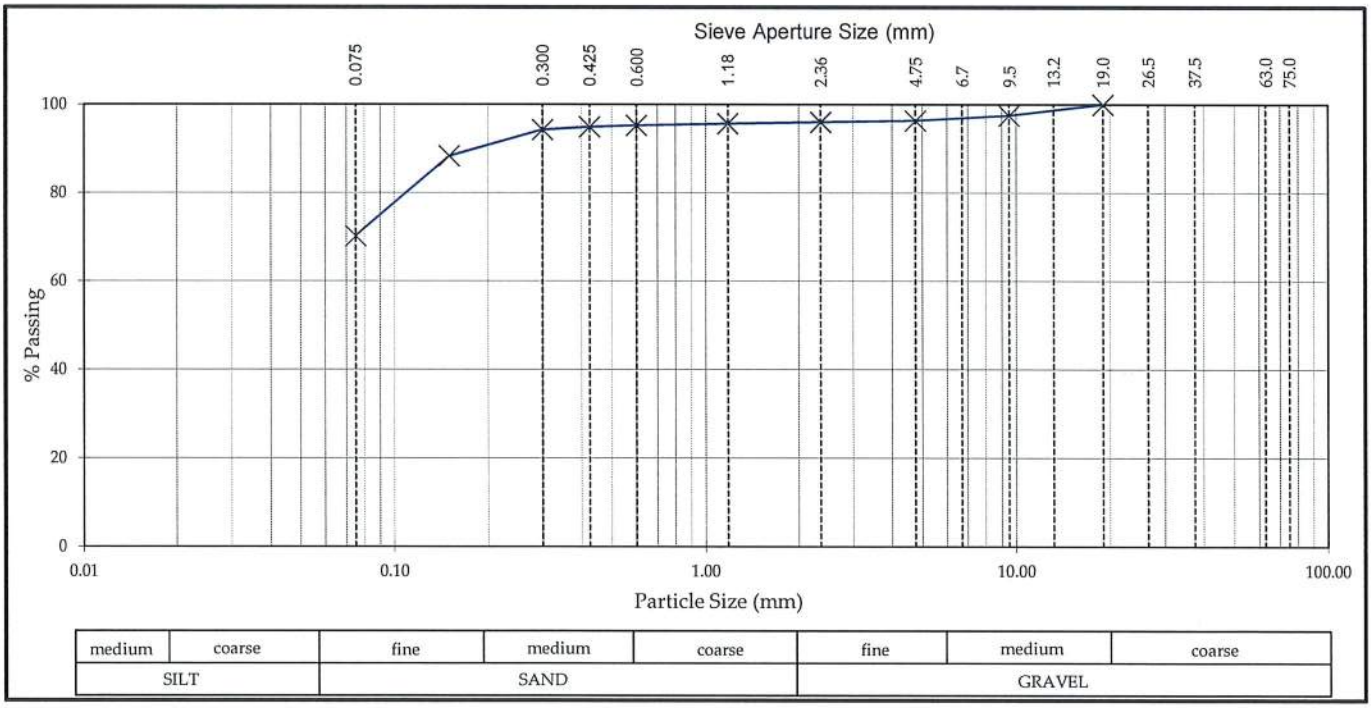
WSP OPUS

Project :	**Material Investiagtion**
Location :	**Yaldhurst Park, Sample #2**
Client :	**ENGEO Limited**
Contractor :	**ENGEO Limited**
Sampled by :	**Hamish Foy**
Date sampled :	**November 2018**
Sampling method :	**NZS 4402: 1986 (Fine)**
Sample description :	**Silty Sand**
Sample condition	**Damp as received**

Project No :	**6-JENGO.16/6LC**
Lab Ref No :	**CH5296**
Client Ref No :	**Hamish Foy**

Sieve Analysis

Size (mm)	% Passing	Size (mm)	% Passing	Size (mm)	% Passing	Size (mm)	% Passing
75.00	-	19.00	100	4.75	96	0.425	95
63.00	-	13.20	-	2.36	96	0.300	94
37.50	-	9.50	97	1.18	96	0.150	88
26.50	-	6.70	-	0.600	95	0.075	70



Test Method	Notes
NZS 4407 : 2015 Test 3.8.1	*Fraction passing finest sieve is by difference.*

Date tested : 14 February 2019
Date reported : 18 February 2019

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
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IANZ Approved Signatory

Designation : *Assistant Laboratory Manager*
Date : 18 February 2019

IANZ ACCREDITED LABORATORY

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Telephone +64 3 343 0739
Website www.wsp-opus.co.nz

DRY DENSITY / WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

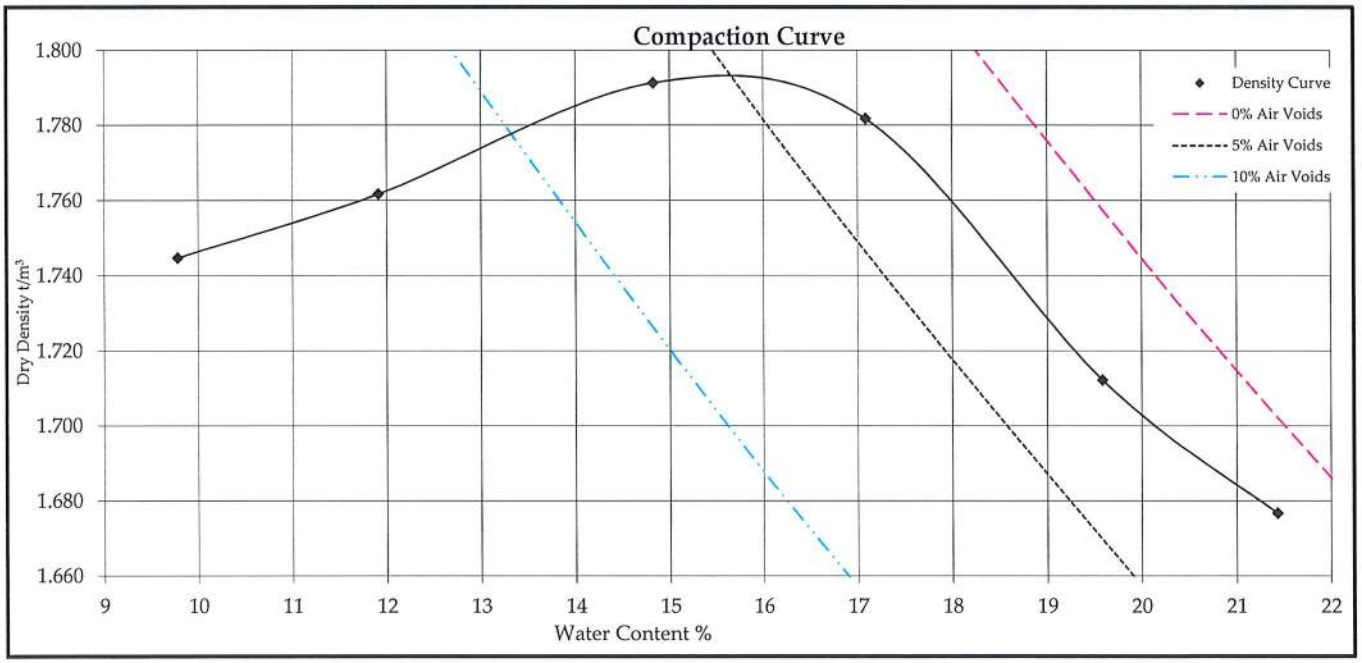
WSP | OPUS

Project :	**Material Investigation**
Location :	**Yaldhurst Park, Sample #2**
Client :	**ENGEO Limited**
Contractor :	**ENGEO Limited**
Sampled by :	**Hamish Foy**
Date sampled :	**November 2018**
Sampling method :	**NZS 4402: 1986 (Fine)**
Sample description :	**Silty Sand**
Sample condition :	**Damp as received**
Solid density :	**2.68 t/m³ (Assumed)**
Source :	**Sample #2**

Project No :	**6-JENGO.16/6LC**
Lab Ref No :	**CH5296**
Client Ref No :	**Hamish Foy**

Test Results

Maximum dry density	1.79 t/m³			Natural water content	- %		
Optimum water content	16.0 %			Fraction tested	Passing 19mm		
Sample ID	-6%	-4%	-2%	NAT	+2%	+4%	+6%
Bulk density t/m³	1.915	1.972	2.057	2.086	2.048	2.036	1.975
Water content %	9.8	11.9	14.8	17.1	19.6	21.4	24.0
Dry density t/m³	1.745	1.762	1.791	1.782	1.712	1.677	1.594
Sample condition	Moist Hard	Moist Hard	Wet Hard	Wet Hard	Wet Firm	Wet Firm	Saturated Soft



Test Methods		Notes
Compaction	NZS 4402 : 1986 Test 4.1.1 (Standard)	

Date tested : 15 February 2019
Date reported : 18 February 2019

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
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IANZ Approved Signatory

Designation : *Assistant Laboratory Manager*
Date : 18 February 2019

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NDM Compaction Results Date: 20/09/2019

Contractor:	Dormer Construction Limited
Development:	Yaldhurst Park - Stage 1
Tests Conducted by:	Sam Gilchrist (Dormer Construction)
NDM ID / Serial Number:	Troxler CS137 / 77-5636
Material Source:	Site won
Material Type:	Silt, sandy sily, silty sand, & sandy gravel
Maximum Dry Density (MDD):	1790 kg/m³
Optimum Moisture Content:	0.16 %
Required MDD %:	95 %
Required MDD:	1700.5 kg/m³

Test	Position Number (attached)	Dry Density	Wet Density	Water Content	Moisture Percentage	Compaction Percentage
1	1	1736	1969	233.3	13.4	97.0%
2	2	1722	1962	240.5	14	96.2%
3	3	1742	2008	266.2	15.3	97.3%
4	4	1688	1958	269.1	15.9	94.3%
5	5	1726	2034	307.7	17.8	96.4%
6	6	1700	1972	282	16	95.0%
7	7	1779	2034	230	13	99.4%
8	8	1742	2031	239	13.3	97.3%
9	9	1771	2020	249.1	14.1	98.9%
10	10	1769	1999	230.5	13	98.8%
11	11	1748	1967	219	12.5	97.7%
12	12	1862	2107	244.8	13.1	104.0%
13	13	1793	2027	231.9	12.6	100.2%
14	14	1763	2000	237.6	13.5	98.5%
15	15	1710	1929	211.5	12.3	95.5%
16	16	1705	1920	214.7	12.6	95.3%
17	17	1818	2034	216.1	11.9	101.6%
18	18	1810	2034	223.3	12.3	101.1%
19	19	1748	1981	239	13.7	97.7%
20	20	1730	1953	223.3	12.9	96.6%
21	21	1702	1903	200.4	11.8	95.1%
22	22	1720	1931	210.4	12	96.1%
23	23	1747	1987	240.5	13.4	97.6%
24	24	1767	2012	244.58	13.9	98.7%
25	25	1749	2012	263.4	15.1	97.7%
26	26	1818	2057	239	13.1	101.6%
27	27	1724	1970	246.2	14.3	96.3%
28	28	1708	1980	292	15.6	95.4%
29	29	1749	2046	249.1	13.6	97.7%
30	30	1739	1986	246.2	14.2	97.2%
31	31	1755	2028	273.4	15.6	98.0%
32	32	1816	2071	254.8	14.5	101.5%
33	33	1710	2001	290.6	17	95.5%
34	34	1706	1905	279.1	16.4	95.3%
35	35	1758	2010	251.9	14.2	98.2%
36	36	1752	2012	260.5	14.9	97.9%
37	37	1726	1981	254.8	14.8	96.4%
38	38	1782	2007	257.8	14.5	99.6%
39	39	1765	2029	263.4	14.9	98.6%
40	40	1732	1987	254.8	14.7	96.8%
41	41	1700	1782	272	16	95.0%
42	42	1728	1981	249	14.3	96.5%
43	43	1818	2034	216	11.9	101.6%
44	44	1747	1987	240.5	13.4	97.6%

45	45	1722	1962	240.5	14	96.2%
46	46	1808	2054	246.4	13.6	101.0%
47	47	1742	1987	245	14.1	97.3%
48	48	1816	2043	226.4	12.5	101.5%
49	49	1753	1974	220.4	12.6	97.9%
50	50	1737	2055	317.6	18.3	97.0%
51	51	1724	2012	287.7	16.7	96.3%
52	52	1703	2022	319	18.7	95.1%
53	53	1734	2058	323.3	18.6	96.9%
54	54	1721	2046	324.7	18.9	96.1%
55	55	1719	2051	331.9	19.3	96.0%
56	56	1772	2034	267.1	14.8	99.0%
57	57	1713	1922	209.3	12.2	95.7%
58	58	1725	1985	239.2	15	96.4%
59	59	1719	1904	264.9	15.4	96.0%
60	60	1826	2065	239.3	13.1	102.0%
61	61	1841	2079	237.8	12.9	102.8%
62	62	1762	1990	227.9	12.9	98.4%
63	63	1709	1942	233.6	13.7	95.5%
64	64	1744	1975	230.8	13.2	97.4%
65	65	1733	1979	226.4	12.9	96.8%
66	66	1757	1966	209.3	11.9	98.2%
67	67	1743	1951	207.9	11.9	97.4%
68	68	1701	1997	296.2	17.4	95.0%
69	69	1715	2015	300.5	17.5	95.8%
70	70	1727	2029	301.9	17.5	96.5%
71	71	1757	2043	286.3	16.3	98.2%
72	72	1746	2042	297.7	17.3	97.5%
73	73	1752	2056	303.4	17.3	97.9%
74	74	1715	2014	299.1	17.4	95.8%
75	75	1716	2013	296.2	17.3	95.9%
76	76	1714	2002	287.7	16.8	95.8%
77	77	1742	2007	266.2	15.3	97.3%
78	78	1748	1982	239	13.8	97.7%
79	79	1752	2012	260.5	14.9	97.9%
80	80	Missed line				#VALUE!
81	81	Missed line				#VALUE!
82	82	1812	1969	156.6	8.6	101.2%
83	83	1748	1931	183.7	10.5	97.7%
84	84	1761	1942	130.9	10.3	98.4%
85	85	1764	1936	172.3	9.8	98.5%
86	86	1808	2013	205.1	11.3	101.0%
87	300	1860	2056	196.5	10.6	103.9%
88	301	1746	1935	188	10.6	97.5%
89	302	1736	1922	186.6	10.7	97.0%
90	303	1770	1934	183.7	10.4	98.9%
91	304	1809	1973	163.8	9.1	101.1%
92	305	1797	1967	169.5	9.1	100.4%
93	306	1839	2009	169.5	9.2	102.7%
94	307	161	1943	182.3	10.4	9.0%
95	308	1758	1942	183.7	10.4	98.2%
96	309	1748	1930	182.3	10.1	97.7%

APPENDIX 4

Suitability of Earthfill

NZS 4431:1989
STATEMENT OF SUITABILITY OF EARTH FILL FOR RESIDENTIAL DEVELOPMENT

To Christchurch City Council

STATEMENT OF SUITABILITY OF EARTH FILL FOR RESIDENTIAL DEVELOPMENT

Subdivision: **Stage 1 Yaldhurst Park**

Owner / Developer: **Infinity Yaldhurst Limited**

Location: **Yaldhurst Park, Yaldhurst, Christchurch**

The earth fill shown on the attached plan (Graham Surveying Limited cut / fill plan, reference: GSL 18036-EW-1002 dated 9 November 2018) has been placed in compliance with the terms of NZS 4431.

While work was in progress ENGEO Ltd (ENGEO) was retained as the Geotechnical Engineer (ENGINEER) to provide inspection (testing and observation services) related to site grading activities under the supervision of the Engineer named below who is registered in terms of the Engineers Registration Act 1924.

Name: **Donald Bruggers** (CPEng Number 1022574)

Address: C/- **ENGEO**, 124 Montreal Street, Sydenham, Christchurch.

During the work, the Engineer or staff under their control made periodic visits of inspection to the site as detailed in this report (15518.000.000_15 dated 26 September 2019) which can be attached. Details of the soil testing carried out to check the quality of the fill by the inspecting engineer and their testing agency are also included in this report.

The attached plan (Graham Surveying Limited cut / fill plan, reference: GSL 18036-EW-1002 dated 9 November 2018) shows those lots affected by filling and the extent of the fill as part of the development works.

In the opinion of the inspecting engineer the following special limitations should be observed:

- Nil.

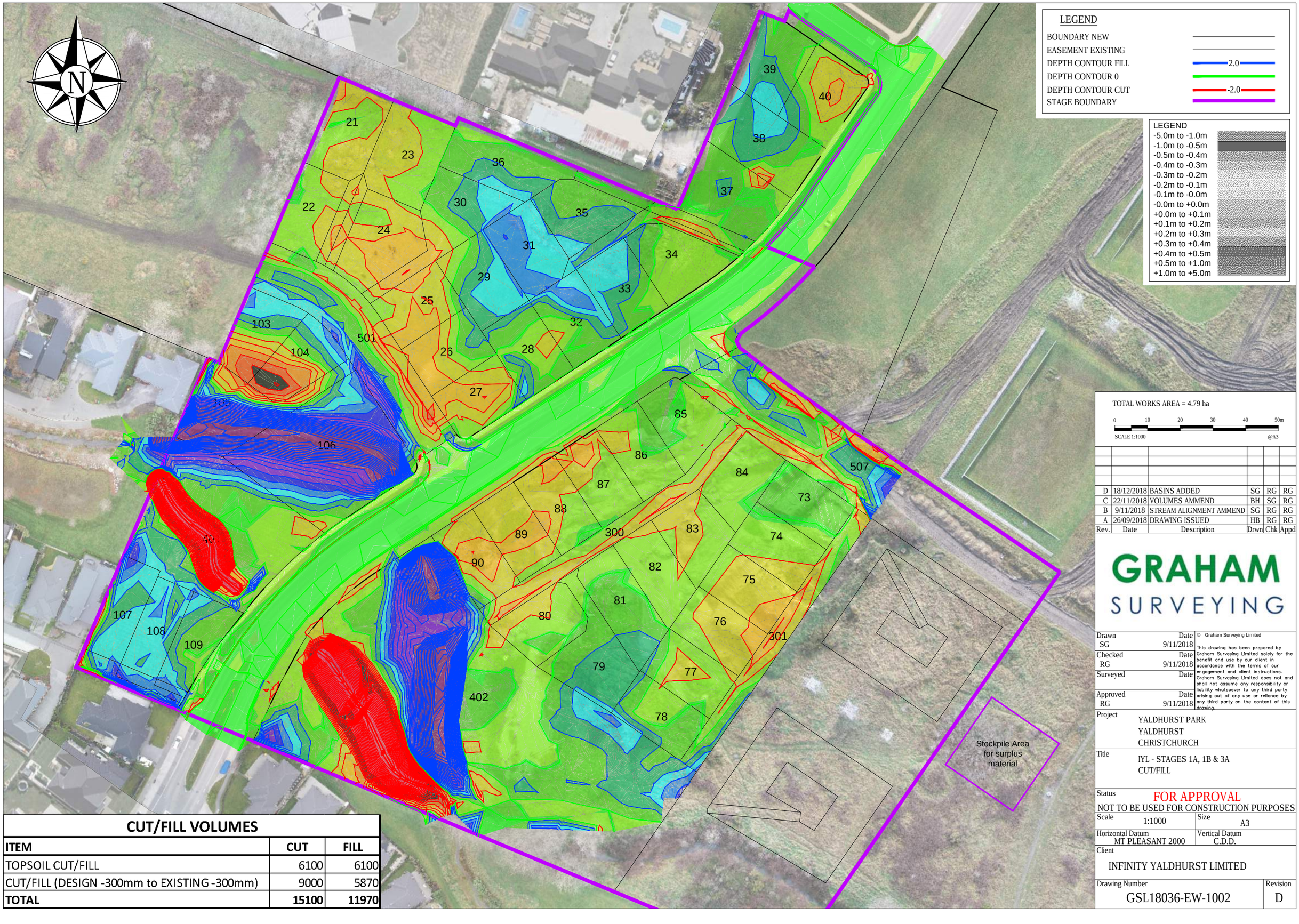
This certification, that the earth fills have been placed in compliance with the terms of NZS 4431 does not remove the necessity for the normal inspection and design of foundations as would be made in natural ground.

…… …….. (signature)

…….Principal Engineer……. (position)

…….26 September 2019…… . (date)

On behalf of **Infinity Yaldhurst Limited**



CUT/FILL VOLUMES

ITEM	CUT	FILL
TOPSOIL CUT/FILL	6100	6100
CUT/FILL (DESIGN -300mm to EXISTING -300mm)	9000	5870
TOTAL	**15100**	**11970**

Rev.	Date	Description	Drwn	Chk	Appd
D	18/12/2018	BASINS ADDED	SG	RG	RG
C	22/11/2018	VOLUMES AMMEND	BH	SG	RG
B	9/11/2018	STREAM ALIGNMENT AMMEND	SG	RG	RG
A	26/09/2018	DRAWING ISSUED	HB	RG	RG

GRAHAM SURVEYING

Drawn SG	Date 9/11/2018	© Graham Surveying Limited
Checked RG	Date 9/11/2018	This drawing has been prepared by Graham Surveying Limited solely for the benefit and use by our client in accordance with the terms of our engagement and client instructions. Graham Surveying Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this drawing.
Surveyed	Date	
Approved RG	Date 9/11/2018	

Project
YALDHURST PARK
YALDHURST
CHRISTCHURCH

Title
IYL - STAGES 1A, 1B & 3A
CUT/FILL

Status
FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Scale	Size
1:1000	A3

Horizontal Datum	Vertical Datum
MT PLEASANT 2000	C.D.D.

Client
INFINITY YALDHURST LIMITED

Drawing Number	Revision
GSL18036-EW-1002	D