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Integrated Practical Solutions

Report on
Geotechnical Investigation

Upgrade to an Existing Access Road
Mossman Prawn Farm, Captain Cook Highway,
Mossman

Prepared for
Gassman Development Perspectives Pty Ltd

Project 77733.01
February 2021

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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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# Report on Geotechnical Investigation
# Upgrade to an Existing Access Road
# Mossman Prawn Farm, Captain Cook Highway, Mossman

## 1. Introduction

This report presents the results of a geotechnical investigation undertaken for a proposed upgrade to an existing access road at Mossman Prawn Farm, Captain Cook Highway, Mossman. The investigation was commissioned in an email dated 4 December 2020 from Alan Kelly of Gassman Development Perspectives Pty Ltd and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal CNS200205 dated 6 November 2010.

It is understood that an upgrade and widening (to 6 m) of an approximately 500 m long existing unsealed access road is proposed.

The investigation comprised the excavation of eight test pits, then laboratory testing of selected samples and engineering comment on the following:

- Summary of encountered subsurface conditions;
- Site preparation earthworks requirements;
- Pavement subgrade conditions, including design California bearing ratio (CBR), for pavement thickness design by others; and
- Comparison of pavement material laboratory test results on to TMR specification for Type 2 for unbound pavement materials, and suitability for reuse as a sub-base in accordance with the FNQROC S2 Road Pavement testing specifications.

## 2. Site Description

As noted above, the site comprises an approximately 500 m long existing unsealed access road, as shown on Drawing 1 in Appendix B.

The existing alignment is immediately north of an open drain with aquaculture ponds located beyond the drain. To the north of the existing road alignment, in the area of proposed widening, the site was flat and lawn covered, beyond which the flat site continued and was vegetated with long grass.

The existing road falls uniformly from around 5 m AHD, near its intersection with the Captain Cook Highway at its western end, to around 2 m AHD at its eastern end.

At the time of the investigation, the alignment comprised a mostly unsealed, single lane pavement. No detailed pavement inspection was undertaken, although cursory inspection indicated the pavement was serviceable, with numerous ‘potholes’. The initial approximately 100 m of the alignment, off the Captain Cook Highway, was sealed.

Photographs of the site are shown below as Figures 1 and 2.

**Figure 1: View of existing access road looking east from Captain Cook Highway**

**Figure 2: View of existing access road looking west from the eastern end of the alignment**

## 3. Geology

The Mossman 1:2500 000 Queensland department of Mines and Energy Geological Series Sheet SE 55-1 (second edition), and accompanying explanatory notes, indicates that the site is underlain by Tertiary to Quaternary deposits (TQr), which are described as typically comprising "sand, silt, mud and gravel: older unconsolidated to semi-consolidated residual and colluvial deposits". Furthermore, the map indicates Quaternary aged alluvial soils to the east of the eastern end of the alignment.

No residual or colluvial materials were encountered during the field work, rather roadbase fill over alluvial soils were encountered, which is inconsistent with the above geological description. The alluvial soils are consistent with previous experience in the area and mapping to the east of the alignment.

# 4. Field Work

## 4.1 Field Work Methods

The field work was undertaken on 7 January 2021 and comprised eight test pits (designated Pits 1 to 8). Pits 1 to 5 were spaced along the existing alignment, whilst Pits 6 to 8 were in the shoulder. The approximate locations are shown in Drawing 1 in Appendix D.

The pits were excavated by a 10 t excavator using a 600 mm wide toothed bucket. Bulk and disturbed samples were collected from each pit. A dynamic cone penetrometer test (DCP) was undertaken at each pit location. Pocket penetrometer (PP) tests were carried out on encountered cohesive materials (clays and silts) within the test pits, to provide information on strength consistency.

Upon completion , the pits were photographed for presentation on the pit logs, and backfilled using the excavated spoil, placed in layers and compacted using the excavator.

All field work was carried out in the presence of an experienced geotechnical engineer, who recorded the materials (and where appropriate, any groundwater) encountered, collected samples within the test pits, and carried out DCPs and PP tests.

A handheld GPS unit (generally accurate to within 5 m) was used to record UTM coordinates of the test locations using GDA94 datum, and these are shown on the attached logs. Surface elevations at the test locations were interpolated from previously supplied survey data, and should be considered accurate to no more than +/- 0.5 m.

## 4.2 Field Work Results

The subsurface conditions encountered within the pits are described on the logs in Appendix B. These should be read in conjunction with the general notes in Appendix A which explains the sampling methods, soil descriptions, and symbols and abbreviations used in their preparation.

In summary, the results can generally be described as follows:

**Pits 1 to 5 (through existing pavement)**

| | |
|---|---|
| **Roadbase Fill** | Generally dense roadbase fill comprising clayey gravel, silty gravel or gravel generally to between 0.25 m and 0.3 m depth (0.5 m depth in Pit 2). |
| **Clayey Silt** | Beneath the roadbase fill in Pits 3 to 5, but not in Pits 1 and 2, to depths of 0.4 m and 0.5 in Pits 3 and 4 respectively, and to pit termination at 1.4 m depth in Pit 5. Very stiff or hard , and sandy in Pit 5. |
| **Clayey Sand (Pit 1 only)** | Dense clayey fine sand beneath the roadbase fill in Pit 1, to 0.5 m depth. |
| **Sandy Clay / Silty Sandy Clay** | Stiff to hard, to termination depth in Pits 1, 2 and 4, and to 1.1 m depth in Pit 3. |
| **Clayey Sand (Pit 3 only)** | Dense, beneath the silty sandy clay to pit termination. |

**Pits 6 to 8 (immediately north of existing pavement)**

**Clayey Sand (Pit 7 only)** Loose to medium dense, in Pit 7 to 0.25 m depth.

**Clayey Silt** Surface layer in Pits 6 and 8, and beneath the clayey sand in Pit 7, to 0.6 m (Pits 6 and 7) or 0.4 m depth (Pit 8). Initially firm in Pits 6 and 8, then stiff below 0.2 m and 0.3 m depth, and stiff to very stiff in Pit 7.

**Sandy Clay** To the termination depth. Mostly stiff or very stiff, with some hard zones.

No free groundwater was encountered at the test locations to the depths tested. It should be noted, however, that groundwater levels are affected by climatic conditions and soil permeability, and will therefore vary with time. Furthermore, the site is located in the tropics and hence is subject to distinct seasonal rainfall differences.

## 5. Laboratory Testing

Laboratory testing comprised the following:

- Four day soaked CBR (98% Standard maximum dry density (SMDD) at the estimated optimum moisture content for SMDD (OMC) – 13 tests;
- Plasticity (Atterberg limits and linear shrinkage) – five tests; and
- Particle size distribution (PSD) – five tests.

These test results are summarised in Table 1 below, and detailed test reports are included in Appendix C. It is noted that TMR Type 2 grading envelopes are shown for the PSD tests, with reports duplicated for Type 2.3/2.4 and 2.5.

**Table 1: Summary of Results of Soil Classification Testing**

| Pit | Depth (m) | Material | W (%) | CBR * (%) | Plasticity Tests (%) | | | | Particle Size Distribution Tests (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | LL | PL | PI | LS | Silt/ Clay | Sand | Gravel | Cobble |
| 1 | 0.0 – 0.3 | Roadbase | 4.8 | 40 | 19.2 | 15.4 | 3.8 | 1.4 | 10 | 22 | 68 | 6 |
| | 0.3 – 0.5 | Clayey sand | 9.9 | 25 | - | - | - | - | - | - | - | - |
| 2 | 0.0 – 0.25 | Roadbase | 5.9 | 30 | 21.0 | 15.4 | 5.6 | 2.2 | 28 | 18 | 54 | 0 |
| | 0.25 – 0.5 | Fill | 9.9 | 10 | - | - | - | - | - | - | - | - |
| 3 | 0.0 – 0.25 | Roadbase | 7.0 | 17 | 24.0 | 17.2 | 6.8 | 3.0 | 13 | 17 | 70 | 0 |
| | 0.4 – 0.6 | Silty sandy clay | 1.2 | 20 | - | - | - | - | - | - | - | - |
| 4 | 0.0 – 0.25 | Roadbase | 7.1 | 19 | 22.0 | 17.4 | 4.6 | 2.2 | 11 | 16 | 73 | 2 |
| | 0.25 – 0.5 | Clayey silt | 12.5 | 14 | - | - | - | - | - | - | - | - |
| 5 | 0.0 – 0.3 | Roadbase | 5.9 | 17 | 24.0 | 17.4 | 6.6 | 2.8 | 13 | 14 | 73 | - |
| | 0.3 – 0.6 | Clayey sandy silt | 14. | 8 | - | - | - | - | - | - | - | - |
| 6 | 0.2 – 0.5 | Clayey silt | 19.7 | 7 | - | - | - | - | - | - | - | - |
| 7 | 0.2 – 0.5 | Clayey silt | 17.3 | 13 | - | - | - | - | - | - | - | - |
| 8 | 0.45 – 0.6 | Sandy clay | 16.2 | 13 | - | - | - | - | - | - | - | - |
| **TMR Specification Type 2 Un-bound** | | **Type 2.3** | - | **45** | **<28** | **-** | **<8** | **<4.5** | **Refer grading curves in Appendix D** | | | |
| | | **Type 2.4** | - | **35** | **<35** | **-** | **<12** | **<6.5** | | | | |
| | | **Type 2.5** | - | **15** | **<40** | **-** | **<14** | **<7.5** | | | | |

Where:

W = Field Moisture Content, LL = Liquid Limit, PI = Plasticity Index, PL = Plastic Limit, LS = Linear Shrinkage

*Four day soaked CBR, after sample compacted to approximately 98% SMDD at approximately OMC.

It is noted that the CBR testing was undertaken on samples after removal of the sample portion retained on a 19 mm sieve, as required by the testing standard.

# 6. Comments

## 6.1 Proposed Development

It is understood that sealing of the unsealed pavement is proposed, and would include a widening along the northern side of the existing alignment. Design is to be undertaken by others.

## 6.2 Subgrade Preparation Earthworks

The following general procedures are suggested for site preparation in the proposed pavement widening:

- Remove all surface vegetation and organic topsoil, existing ‘uncontrolled’ fill (if any, noting that none was identified in the test pits), and any deleterious soft, loose, wet or highly compressible materials.
- Assess the moisture content of the underlying soils. Where cohesive and necessary, adjust within 2% of OMC and tine prior to test rolling.
- Roll the exposed subgrade with at least six passes of a minimum 12 tonne deadweight smooth drum roller (in non-vibratory mode), with the final test roll pass accompanied by careful visual inspection by experienced personnel to detect any remaining deleterious zones, which should be excavated out and replaced with approved fill.
- Compact the subgrade to a minimum 98% Standard maximum dry density (SMDD).
- Seal or cover any exposed cohesive subgrade soil, at or close to formation level as soon as practicable, to reduce drying and cracking, or softening and swelling .
- Place any required fill in layers not exceeding 200 mm loose thickness and compact each layer as nominated above for density and moisture variation. Replacement fill should not contain individual particles greater than 75 mm size, and, if granular, should comprise well graded material (i.e. material having a non-uniform particle size distribution).

‘Level 1’ inspection and testing (ie. full-time supervision of fill placement and compaction), in accordance with (AS 3798, 2007), is recommended, however it noted that most roads are constructed with a lower level of inspection and testing (ie ‘Level 2’).

The work scope did not include detailed inspection of the existing pavement. However, cursory inspection during the investigation field work indicated that the existing unsealed pavement appeared serviceable, albeit with numerous potholes. Such potholing is relatively common for an unsealed pavement trafficked by commercial vehicles, particularly in an area of relatively high rainfall. In this case, and on the basis that the existing pavement materials are to be left in-situ and utilised as a lower pavement select layer, the following procedures are suggested for preparation of the existing unsealed pavement for overlying layers of pavement:

- Test roll the surface of the existing pavement with a minimum 12 t static roller, under inspection by experienced personnel, to detect any deleterious zones;
- Remove any deleterious materials;
- Rip the existing pavement to of 0.2 m depth, by a grader ripper bar or similar. Any medium sized cobble material (individual rocks greater than about 100 mm diameter) disturbed or exposed by the ripping should be removed from the profile;
- Compact the ripped pavement materials to at least 100% SMDD with a moisture content maintained within 2% of OMC; and
- Place overlying pavement materials in layers not exceeding 150 mm loose thickness and compact each layer as nominated above for density and moisture variation.

Construction should not be carried out during or following wet weather, as the relatively clayey and silty subgrade is anticipated to soften and become untrafficable for tyred equipment when over moistened. Soils which become wet and soft should be dried or replaced. The use of tracked earthmoving equipment may facilitate soil removal in such conditions, but relatively dry weather will be required for any moisture conditioning. Good surface drainage installed prior to earthworks would assist to avoid water ponding and to help reduce such difficulties.

## 6.3 Pavement Subgrade Conditions

Based on the investigation results, it is considered that pavement subgrade conditions, after site preparation as outlined in Section 6.2, would comprise stiff or stronger clayey silt to sandy clay, and medium dense clayey sand .

Laboratory testing of the subgrade samples collected during this investigation (refer Section 5) returned CBRs of 7% to 25% for the eight samples tested. These results are considered to be at the high end of the range of typical values expected for such soils.

Given the variety of subgrade materials and insufficient investigation scope to characterise discrete subgrade areas of each material type, and the range of laboratory results, it is recommended that a design CBR of 5% be adopted for pavement design at the site. This design CBR assumes the subgrade is prepared as recommended in Section 6.2, and that adequate surface drainage is provided and maintained.

## 6.4 Pavement Materials

The following comments are based on the results of the laboratory testing of the roadbase fill samples collected from Pits 1 to 5, and comparisons with the Queensland Department of Transport and Main Roads MRTS 05 (2020) for unbound road pavement materials.

The S2 FNQROC (2009) specification indicates that sub-base quality materials should be consistent with a TMR Type 2.3 material, and that Type 2.5 materials should be restricted to subgrade replacement.

It should be noted that the laboratory testing undertaken for this investigation is relatively limited, and further testing would usually be undertaken to assess potential pavement material suitability. In particular, no material durability testing was undertaken on the coarse component of the sampled materials.

In general, the results of the CBR, plasticity, and particle size distribution (PSD) testing indicates that the tested samples are probably marginally suitable as sub-base material, but are probably reasonably suitable subgrade replacement material, such as typically placed to minimise overlying pavement thickness requirements. Specifically:

- The CBR results ranged from 10% to 40%. No sample met the TMR CBR requirements for Type 2.3 materials, one sample met the TMR CBR requirements for a Type 2.4 material (Pit 1/0-0.3), and all of the tested samples met the TMR CBR requirements for a Type 2.5 material.
- All tested roadbase fill samples met the TMR plasticity index and linear shrinkage requirements for Types 2.3, 2.4 and 2.5 materials.
- The PSD results plotted against the TMR grading envelopes appropriate for Type 2.3, 2.4, and 2.5 materials, as provided in Appendix D, indicates that the tested materials from Pits 1, 3 and 5 come very close to meeting the requirements for Types 2.3, 2.4, and 2.5 materials. The sample from Pit 2 had an excessive amounts of fines (<0.075mm) and sand and did not meet the requirements Types 2.3 and 2.4, but did meet the requirements for Type 2.5. The sample from Pit 4 had insufficient medium to coarse gravel for Type 2.3 and 2.4 materials, and also Type 2.5 materials (albeit closer to the requirements for Type 2.5).

In summary, it is considered the tested materials generally meet or come close to the CBR, plasticity and PSD requirements for a Type 2.5 material. The plasticity requirements are met for a Type 2.3 or 2.4 material, but not the CBR or PSD requirement.

## 7. References

AS 3798. (2007). *Guidelines on Earthworks for Commercial and Residential Developments.* Standards Australia.

Queensland Department of Transport and Main Roads, Main Roads Technical Standard, “MRTS 05, Unbound Pavements”, July 2020.

FNQROC (Far North Queensland Regional Organisation of Councils) Development Manual – Operation Works Specification S2 Road Pavements – January 2009.

## 8. Limitations

Douglas Partners (DP) has prepared this report for this project at Mossman Prawn Farm, Captain Cook Highway, Mossman in accordance with DP’s proposal CNS200205 dated 6 November 2010 and acceptance received from Alan Kelly of Gassman Development Perspectives Pty Ltd dated 4 December 2020. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Gassman Development Perspectives Pty 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 upon information provided by the client and/or their agents.

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

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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**Douglas Partners Pty Ltd**

# Appendix A

About This Report
Sampling Method
Soil Descriptions
Symbols and Abbreviations

# About this Report

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

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

## Copyright


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

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

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

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

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

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

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

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

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

# About this Report

## Site Anomalies

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

## Information for Contractual Purposes

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

## Site Inspection

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

## Sampling

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

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

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

## Test Pits

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

## Large Diameter Augers

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

## Continuous Spiral Flight Augers

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

## Non-core Rotary Drilling

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

## Continuous Core Drilling

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

## Standard Penetration Tests

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

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

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

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 generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

## Soil Types

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

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

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

| Type | Particle size (mm) |
|---|---|
| Coarse gravel | 19 - 63 |
| Medium gravel | 6.7 - 19 |
| Fine gravel | 2.36 – 6.7 |
| Coarse sand | 0.6 - 2.36 |
| Medium sand | 0.21 - 0.6 |
| Fine sand | 0.075 - 0.21 |

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

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

| Term | Proportion of sand or gravel | Example |
|---|---|---|
| And | Specify | Clay (60%) and Sand (40%) |
| Adjective | >30% | Sandy Clay |
| With | 15 – 30% | Clay with sand |
| Trace | 0 - 15% | Clay with trace sand |

In coarse grained soils (>65% coarse)
- with clays or silts

| Term | Proportion of fines | Example |
|---|---|---|
| And | Specify | Sand (70%) and Clay (30%) |
| Adjective | >12% | Clayey Sand |
| With | 5 - 12% | Sand with clay |
| Trace | 0 - 5% | Sand with trace clay |

In coarse grained soils (>65% coarse)
- with coarser fraction

| Term | Proportion of coarser fraction | Example |
|---|---|---|
| And | Specify | Sand (60%) and Gravel (40%) |
| Adjective | >30% | Gravelly Sand |
| With | 15 - 30% | Sand with gravel |
| Trace | 0 - 15% | Sand with trace gravel |

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

# Soil Descriptions

## Cohesive Soils

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

| Description | Abbreviation | Undrained shear strength (kPa) |
|---|---|---|
| Very soft | VS | <12 |
| Soft | S | 12 - 25 |
| Firm | F | 25 - 50 |
| Stiff | St | 50 - 100 |
| Very stiff | VSt | 100 - 200 |
| Hard | H | >200 |
| Friable | Fr | - |

## Cohesionless Soils

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

| Relative Density | Abbreviation | Density Index (%) |
|---|---|---|
| Very loose | VL | <15 |
| Loose | L | 15-35 |
| Medium dense | MD | 35-65 |
| Dense | D | 65-85 |
| Very dense | VD | >85 |

## 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;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

## Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

## Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- 'Moist, dry of plastic limit' or 'w <PL' (i.e. hard and friable or powdery).
- 'Moist, near plastic limit' or 'w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- 'Moist, wet of plastic limit' or 'w >PL' (i.e. soils usually weakened and free water forms on the hands when handling).
- 'Wet' or 'w ≈LL' (i.e. near the liquid limit).
- 'Wet' or 'w >LL' (i.e. wet of the liquid limit).

# Symbols & Abbreviations

Douglas Partners

## Introduction

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

## Drilling or Excavation Methods

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

## Water

| | |
|---|---|
| ▷ | Water seep |
| ▽ | Water level |

## Sampling and Testing

| | |
|---|---|
| A | Auger sample |
| B | Bulk sample |
| D | Disturbed sample |
| E | Environmental sample |
| $U_{50}$ | Undisturbed tube sample (50mm) |
| W | Water sample |
| pp | Pocket penetrometer (kPa) |
| PID | Photo ionisation detector |
| PL | Point load strength Is(50) MPa |
| S | Standard Penetration Test |
| V | Shear vane (kPa) |

## Description of Defects in Rock

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

### Defect Type

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

### Orientation

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

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

### Coating or Infilling Term

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

### Coating Descriptor

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

### Shape

| | |
|---|---|
| cu | curved |
| ir | irregular |
| pl | planar |
| st | stepped |
| un | undulating |

### Roughness

| | |
|---|---|
| po | polished |
| ro | rough |
| sl | slickensided |
| sm | smooth |
| vr | very rough |

### Other

| | |
|---|---|
| fg | fragmented |
| bnd | band |
| qtz | quartz |

# Symbols & Abbreviations

## Graphic Symbols for Soil and Rock

### General

- Asphalt
- Road base
- Concrete
- Filling

### Soils

- Topsoil
- Peat
- Clay
- Silty clay
- Sandy clay
- Gravelly clay
- Shaly clay
- Silt
- Clayey silt
- Sandy silt
- Sand
- Clayey sand
- Silty sand
- Gravel
- Sandy gravel
- Cobbles, boulders
- Talus

### Sedimentary Rocks

- Boulder conglomerate
- Conglomerate
- Conglomeratic sandstone
- Sandstone
- Siltstone
- Laminite
- Mudstone, claystone, shale
- Coal
- Limestone

### Metamorphic Rocks

- Slate, phyllite, schist
- Gneiss
- Quartzite

### Igneous Rocks

- Granite
- Dolerite, basalt, andesite
- Dacite, epidote
- Tuff, breccia
- Porphyry

# Appendix B

Drawings


0 100 200 300 m

Notes:
1. Base image from MetroMaps (QLD Port Douglas 2020-08-16).
2. Locality image from street-directory.com.au
3. Test locations are approximate only and are shown with reference to existing site features.

| | | | | |
|---|---|---|---|---|
| Douglas Partners<br>Geotechnics · Environment · Groundwater | CLIENT: Gassman Development Perspectives Pty Ltd | | TITLE:<br>Site and Test Location Plan<br>Proposed Upgrade to Existing Access Road<br>Mossman Prawn Farm, Captain Cook Highway, Mossman | PROJECT No: 77733.01 |
| | OFFICE: Cairns | DRAWN BY: CM | | DRAWING No:1 |
| | SCALE: As Shown | DATE: February 2021 | | REVISION: 0 |

# Appendix C

Logs

# TEST PIT LOG

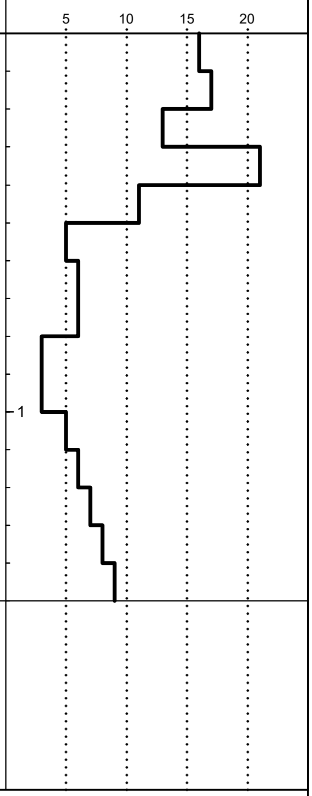
**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 2.0 m AHD
**EASTING:** 333469
**NORTHING:** 8175005

**PIT No:** 1
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water |
|---|---|---|---|---|---|---|---|---|
| 2 | | FILL GRAVEL GM: gravel fine to coarse and angular to rounded, orange grey brown, with fine to coarse sand, with low plasticity silt, trace rounded cobbles and small boulders, dense (roadbase) | | B | 0.0 | | | |
| | 0.3 | Clayey SAND SC: brown, fine grained, clay low plasticity, dense (alluvial) | | B | 0.3 | | | |
| | 0.5 | Sandy CLAY CL: low plasticity, yellow brown, sand fine grained, stiff (alluvial) | | | 0.5 | | | |
| | | | | | 0.6 | | pp = 150 | |
| | | | | D | 0.8 | | | |
| 1 | 1 | - becoming grey brown and yellow orange brown mottled from 1.0 m depth | | | | | | |
| | | | | D | 1.3 | | | |
| | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | | 1.5 | | pp = 150 | |

Dynamic Penetrometer Test (blows per 100mm)




**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket
**LOGGED:** Martin
**SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** DCP undertaken adjacent to pavement

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 2.5 m AHD
**EASTING:** 333424
**NORTHING:** 8174953

**PIT No:** 2
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 100mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | FILL Silty GRAVEL GM: gravel fine to coarse and angular to subrounded (subrounded gravel mostly fine to medium grained), orange brown, with fine to coarse sand, trace subrounded cobbles, dense (roadbase) | | B | 0.0 | | | | |
| | 0.25 | FILL Gravelly Sandy CLAY GC: gravel fine to coarse and angular to subrounded, sand fine to coarse, trace subrounded cobbles, grey brown, dense | | B | 0.25 | | | | |
| 2 | 0.5 | Sandy CLAY CL: low plasticity, orange yellow brown, sand fine grained, hard (alluvial) | | | 0.5 | | | | |
| | | | | | 0.6 | | pp = 400-500 | | |
| | | - orange red brown from 0.7 m depth | | D | 0.75 | | | | |
| | | - light grey brown from 0.8 m depth | | | | | | | |
| | 1 | | | | | | | | 1 |
| | | | | | 1.1 | | pp = 500 | | |
| | | - stiff from 1.3 m depth | | | | | | | |
| 1 | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | | 1.5 | | pp = 100 | | |

**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit, DCP undertaken adjacent to pavement

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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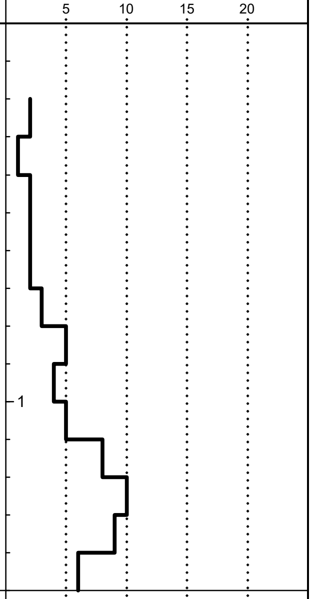
# TEST PIT LOG

**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 3.0 m AHD
**EASTING:** 333364
**NORTHING:** 8174866

**PIT No:** 3
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 100mm) |
|---|---|---|---|---|---|---|---|---|---|
| 3 | | FILL Clayey GRAVEL GC: gravel fine to coarse and angular to subrounded, grey brown, with fine to coarse sand, clay low plasticity, dense (roadbase) | | B | 0.0 | | | | |
| | 0.25 | Clayey SILT ML: low plasticity, yellow grey brown, hard (alluvial) | | D | 0.25<br>0.3 | | pp >600 | | |
| | 0.4 | Silty Sandy CLAY CL: low plasticity, sand fine grained, orange brown, hard (alluvial) | | B | 0.4<br>0.6 | | | | |
| | | | | | 0.8 | | pp = 400-450 | | |
| 2 | 1 | | | | | | | | |
| | 1.1 | Clayey SAND SC: fine to coarse grained, grey and red brown, dense (alluvial)<br>- becoming light grey red brown from 1.2 m depth | | | 1.1 | | pp >600 | | |
| | | | | | 1.3 | | pp = 150-200 | | |
| | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | | 1.5 | | | | |



**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit, DCP undertaken adjacent to pavement

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 3.5 m AHD
**EASTING:** 333304
**NORTHING:** 8174800

**PIT No:** 4
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 100mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | FILL GRAVEL GM: gravel fine to coarse and angular to rounded, orange grey brown, with fine to coarse sand, with low plasticity silt, trace rounded cobbles (to 250 mm diameter), dense (roadbase) | | B | 0.0 - 0.25 | | | | |
| | 0.25 | Clayey SILT ML: low plasticity, light grey brown, very stiff (alluvial) | | B | 0.4 | | pp = 200-250 | | |
| 3 | 0.5 | Silty Sandy CLAY CL-CI: low to medium plasticity, sand fine grained, brown, very stiff (alluvial) | | D | 0.5 - 0.6 | | pp = 200-300 | | |
| | | | | | 0.8 | | pp = 200 | | |
| | 1 | - grey brown and red brown fine from approximately 0.9 m depth | | | | | | | 1 |
| | | | | | 1.2 | | pp = 200 | | |
| 2 | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | D | 1.5 | | pp = 200-300 | | |

**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit, DCP undertaken adjacent to pavement

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

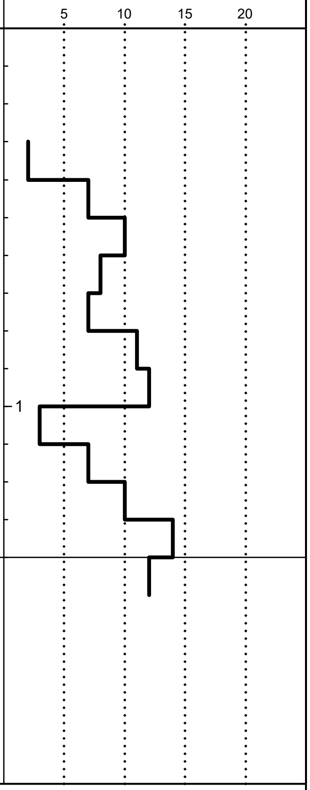
**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 4.0 m AHD
**EASTING:** 333268
**NORTHING:** 8174746

**PIT No:** 5
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water |
|---|---|---|---|---|---|---|---|---|
| 4 | | FILL Clayey GRAVEL GC: gravel fine to coarse and angular to rounded, orange grey brown, with fine to coarse sand, clay low plasticity, trace rounded cobbles and small boulders, dense (roadbase) | | B | 0.0 | | | |
| | 0.3 | Clayey Sandy SILT ML: low plasticity, light orange grey brown, trace fine to medium rounded gravel, very stiff to hard (alluvial) | | B | 0.3 | | | |
| | | | | | 0.6 | | | |
| | | | | | 0.6 | | pp = 400 | |
| | | | | | 0.8 | | pp = 400 | |
| 3 | 1 | | | | | | | |
| | | | | | 1.1 | | pp = 300 | |
| | 1.4 | Pit discontinued at 1.4m depth - limit of investigation | | D | 1.4 | | pp = 400 | |

Dynamic Penetrometer Test (blows per 100mm)




**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket
**LOGGED:** Martin
**SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit, DCP undertaken adjacent to pavement

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

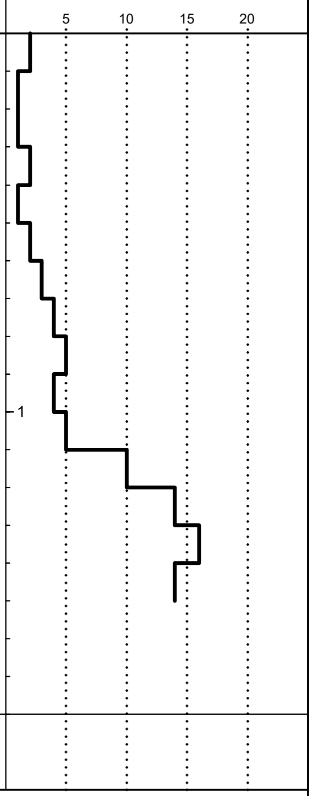
**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 4.0 m AHD
**EASTING:** 333223
**NORTHING:** 8174714

**PIT No:** 6
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water |
|---|---|---|---|---|---|---|---|---|
| 4 | | TOPSOIL Clayey SILT ML: low plasticity, dark grey brown, firm (with grass on surface) | | | | | | |
| | | | | | 0.2 | | | |
| | | - grading stiff below 0.3 m depth | | B | 0.4 | | pp = 100 | |
| | | | | | 0.5 | | pp = 180-200 | |
| | 0.6 | Sandy CLAY CL: low plasticity, fine grained sand, dark yellow brown, very stiff (alluvial) | | | | | | |
| | | | | | 0.7 | | pp = 250 | |
| | | - grading grey brown and red brown mottled from 0.9 m depth | | D | 0.9 | | | |
| 3 | 1 | | | | 1.0 | | pp = 200 | |
| | | | | D | 1.3 | | | |
| | | - grading stiff below 1.4 m depth | | | | | | |
| | | | | | 1.6 | | pp = 100-150 | |
| | 1.8 | Pit discontinued at 1.8m depth - limit of investigation | | | | | | |

Dynamic Penetrometer Test (blows per 100mm)




**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 3.5 m AHD
**EASTING:** 333294
**NORTHING:** 8174791

**PIT No:** 7
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 100mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | TOPSOIL Clayey SAND SC: fine to coarse, dark grey brown, loose to medium dense | | | 0.2 | | | | |
| | 0.25 | Clayey SILT ML: low plasticity, dark grey brown, trace fine sand, stiff to very stiff (alluvial) | | B | 0.3 | | pp = 200 | | |
| 3 | | | | | 0.5 | | pp = 200 | | |
| | 0.6 | Sandy CLAY CL/CI: low to medium plasticity, light grey mottled orange brown, sand fine grained, stiff (alluvial) | | | 0.8 | | pp = 150 | | |
| | 1 | - grading hard and to grey red brown mottled from 1.0 m depth with fine gravel sized ferruginous nodules | | D | 1.0 | | pp = 120 | | 1 |
| | | | | D | 1.4 | | | | |
| 2 | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | | 1.5 | | pp = 600 | | >> |

**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

Douglas Partners
Geotechnics / Environment / Groundwater

# TEST PIT LOG

**CLIENT:** Gassman Development Perspectives Pty Ltd
**PROJECT:** Upgrade to Existing Access Road
**LOCATION:** Mossman Prawn Farm, Captain Cook Highway, Mossman

**SURFACE LEVEL:** 2.5 m AHD
**EASTING:** 333426
**NORTHING:** 8174956

**PIT No:** 8
**PROJECT No:** 77733.01
**DATE:** 7/1/2021
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 100mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | TOPSOIL Clayey SILT ML: low plasticity, dark grey brown, trace fine to coarse sand, trace rootlets to 0.4 m depth, firm<br>- grading stiff below 0.2 m depth | | | 0.3 | | pp = 100 | | |
| 2 | 0.4 | Sandy CLAY CL-CI: low to medium plasticity, orange yellow brown, sand fine to medium grained, stiff to very stiff (alluvial)<br>- grading to light grey and red brown mottled from 0.7 m depth, with some fine ferruginous nodules<br>- grading stiff to very stiff below 1.2 m depth | | B | 0.45<br>0.5<br>0.6 | | pp = 100 | | |
| | | | | | 0.7 | | pp = 100 | | |
| | 1 | | | D | 1.0 | | pp = 80-100 | | |
| 1 | 1.5 | Pit discontinued at 1.5m depth - limit of investigation | | D | 1.5 | | pp = 350 | | |

**RIG:** Samsung 10 tonne excavator with 600mm wide toothed bucket **LOGGED:** Martin **SURVEY DATUM:** GDA94 Zone 55K

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** M= Moisture content, Wp= Plastic limit

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

**SAMPLING & IN SITU TESTING LEGEND**

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

Douglas Partners
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# Appendix D

Laboratory Results

# Material Test Report

Douglas Partners
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439 Montague Road West End QLD 4101
Phone: (07) 3237 8900
Fax: (07) 3237 8999
Email: serge.jajcanin@douglaspartners.com.au

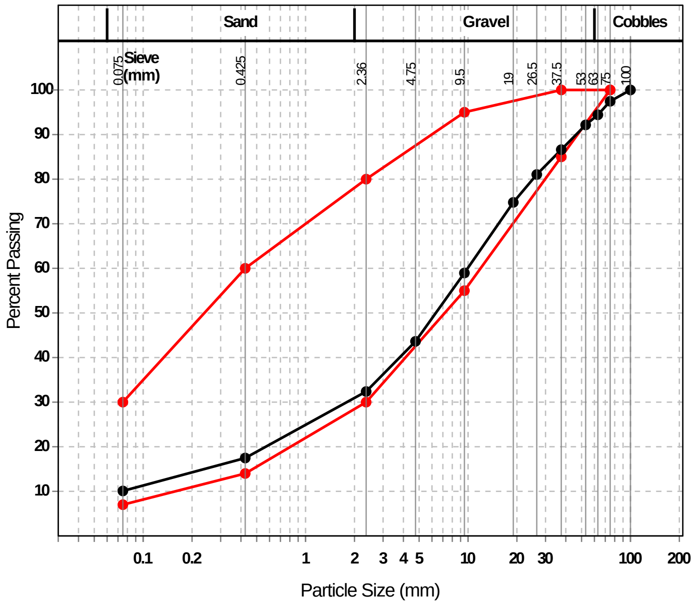
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 4 - *This version supersedes all previous issues*
**Reissue Reason:** *PSD Envelops.*
**Date Issued:** 15/02/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893A
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 21/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 1, Depth: 0.00 - 0.30 m**
**Material:** Fill

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 100 mm | **100** | | |
| 75 mm | **97** | 100 | 100 |
| 63 mm | **94** | | |
| 53 mm | **92** | | |
| 37.5 mm | **87** | 85 | 100 |
| 26.5 mm | **81** | | |
| 19 mm | **75** | | |
| 9.5 mm | **59** | 55 | 95 |
| 4.75 mm | **44** | | |
| 2.36 mm | **32** | 30 | 80 |
| 0.425 mm | **17** | 14 | 60 |
| 0.075 mm | **10** | 7 | 30 |
| Grading Envelop for Type - 2.5 (MRTS05 July 2020) | | | |

Particle Size Distribution



# Material Test Report

Douglas Partners
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Phone: (07) 3237 8900
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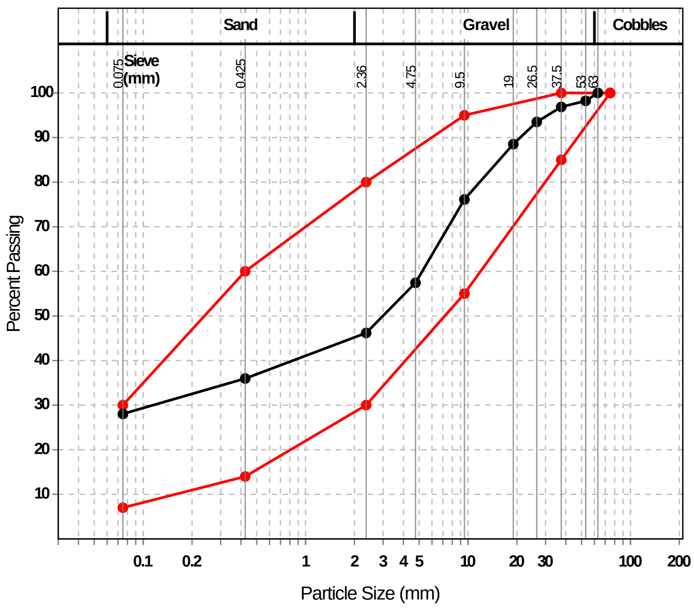
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 4 - *This version supersedes all previous issues*
**Reissue Reason:** *PSD Envelops.*
**Date Issued:** 15/02/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893C
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 21/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 2, Depth: 0.00 - 0.25 m**
**Material:** Fill

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **98** | | |
| 37.5 mm | **97** | 85 | 100 |
| 26.5 mm | **94** | | |
| 19 mm | **89** | | |
| 9.5 mm | **76** | 55 | 95 |
| 4.75 mm | **57** | | |
| 2.36 mm | **46** | 30 | 80 |
| 0.425 mm | **36** | 14 | 60 |
| 0.075 mm | **28** | 7 | 30 |
| Grading Envelop for Type - 2.5 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



# Material Test Report

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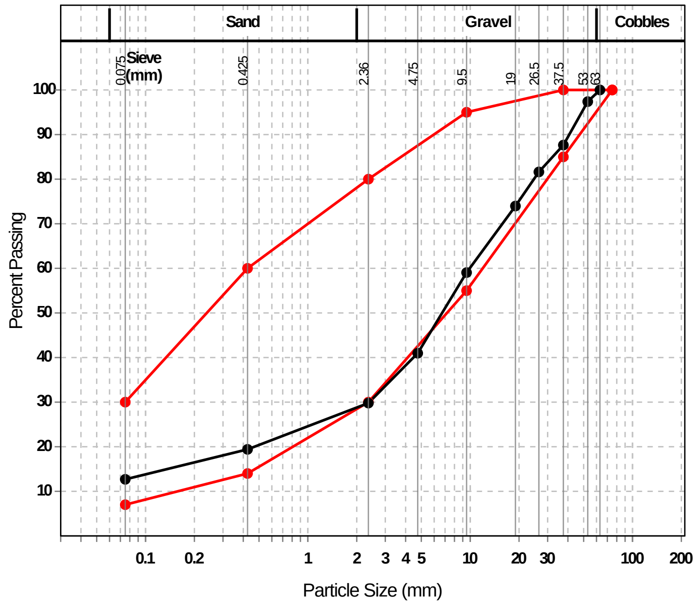
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 4 - *This version supersedes all previous issues*
**Reissue Reason:** *PSD Envelops.*
**Date Issued:** 15/02/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893E
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 21/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 3, Depth: 0.00 - 0.25 m**
**Material:** Fill

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **97** | | |
| 37.5 mm | **88** | 85 | 100 |
| 26.5 mm | **82** | | |
| 19 mm | **74** | | |
| 9.5 mm | **59** | 55 | 95 |
| 4.75 mm | **41** | | |
| 2.36 mm | **30** | 30 | 80 |
| 0.425 mm | **19** | 14 | 60 |
| 0.075 mm | **13** | 7 | 30 |
| Grading Envelop for Type - 2.5 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



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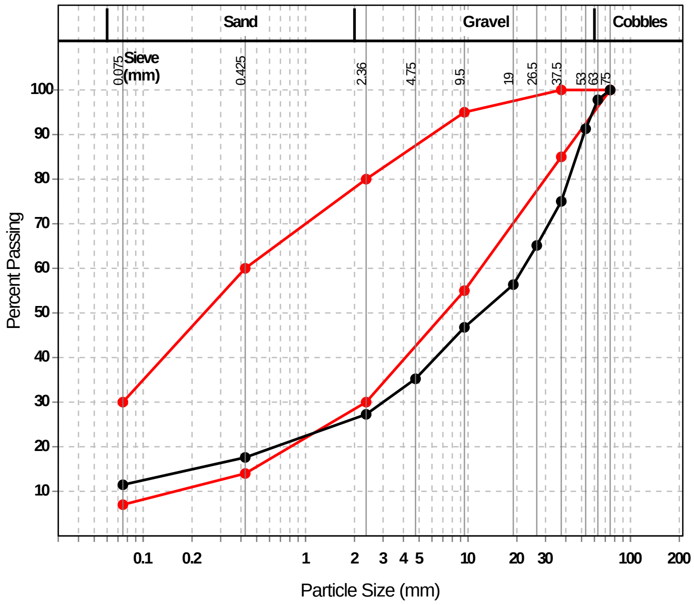
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 4 - *This version supersedes all previous issues* |
| **Reissue Reason:** | *PSD Envelops.* |
| **Date Issued:** | 15/02/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893G |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 21/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 4, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 75 mm | **100** | 100 | 100 |
| 63 mm | **98** | | |
| 53 mm | **91** | | |
| 37.5 mm | **75** | 85 | 100 |
| 26.5 mm | **65** | | |
| 19 mm | **56** | | |
| 9.5 mm | **47** | 55 | 95 |
| 4.75 mm | **35** | | |
| 2.36 mm | **27** | 30 | 80 |
| 0.425 mm | **18** | 14 | 60 |
| 0.075 mm | **11** | 7 | 30 |
| Grading Envelop for Type - 2.5 (MRTS05 July 2020) | | | |

Particle Size Distribution



# Material Test Report

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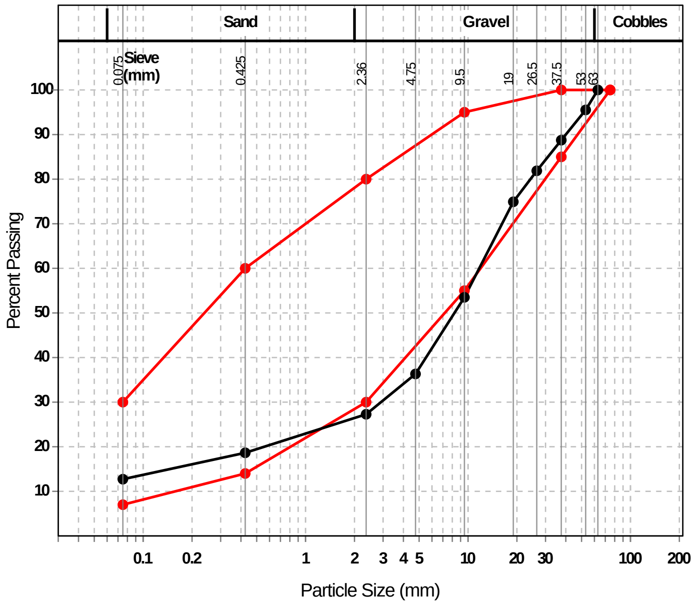
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 4 - *This version supersedes all previous issues*
**Reissue Reason:** *PSD Envelops.*
**Date Issued:** 15/02/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893I
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 21/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 5, Depth: 0.00 - 0.30 m**
**Material:** Fill

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **96** | | |
| 37.5 mm | **89** | 85 | 100 |
| 26.5 mm | **82** | | |
| 19 mm | **75** | | |
| 9.5 mm | **54** | 55 | 95 |
| 4.75 mm | **36** | | |
| 2.36 mm | **27** | 30 | 80 |
| 0.425 mm | **19** | 14 | 60 |
| 0.075 mm | **13** | 7 | 30 |
| Grading Envelop for Type - 2.5 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



# Material Test Report

| | |
|---|---|
| **Report Number:** | **77733.01-1A** |
| **Issue Number:** | 1 |
| **Date Issued:** | 15/02/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893A |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 21/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 1, Depth: 0.00 - 0.30 m** |
| **Material:** | Fill |

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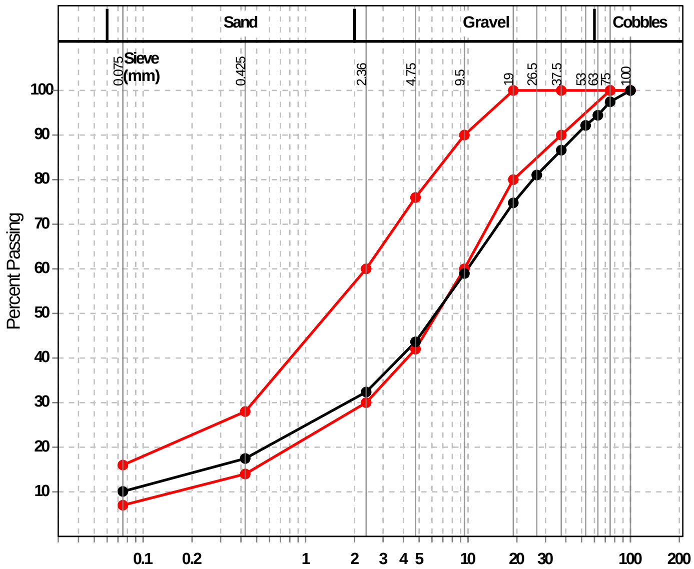
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 100 mm | **100** | 100 | 100 |
| 75 mm | **97** | 100 | 100 |
| 63 mm | **94** | | |
| 53 mm | **92** | | |
| 37.5 mm | **87** | 90 | 100 |
| 26.5 mm | **81** | | |
| 19 mm | **75** | 80 | 100 |
| 9.5 mm | **59** | 60 | 90 |
| 4.75 mm | **44** | 42 | 76 |
| 2.36 mm | **32** | 30 | 60 |
| 0.425 mm | **17** | 14 | 28 |
| 0.075 mm | **10** | 7 | 16 |
| Grading Envelop for Type - 2.3 & 2.4 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



Particle Size (mm)

# Material Test Report

**Douglas Partners**
Geotechnics / Environment / Groundwater

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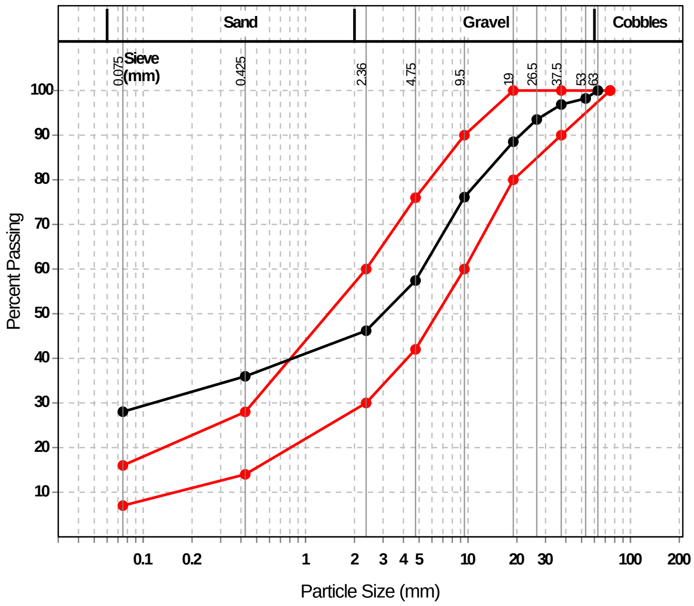
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1A** |
| **Issue Number:** | 1 |
| **Date Issued:** | 15/02/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893C |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 21/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 2, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **98** | | |
| 37.5 mm | **97** | 90 | 100 |
| 26.5 mm | **94** | | |
| 19 mm | **89** | 80 | 100 |
| 9.5 mm | **76** | 60 | 90 |
| 4.75 mm | **57** | 42 | 76 |
| 2.36 mm | **46** | 30 | 60 |
| 0.425 mm | **36** | 14 | 28 |
| 0.075 mm | **28** | 7 | 16 |
| Grading Envelop for Type - 2.3 & 2.4 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



# Material Test Report

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| | |
|---|---|
| **Report Number:** | **77733.01-1A** |
| **Issue Number:** | 1 |
| **Date Issued:** | 15/02/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893E |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 21/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 3, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

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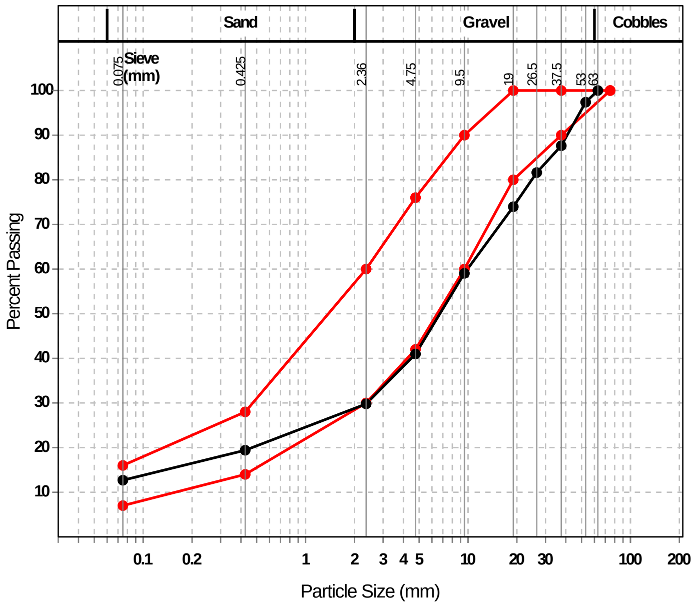
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **97** | | |
| 37.5 mm | **88** | 90 | 100 |
| 26.5 mm | **82** | | |
| 19 mm | **74** | 80 | 100 |
| 9.5 mm | **59** | 60 | 90 |
| 4.75 mm | **41** | 42 | 76 |
| 2.36 mm | **30** | 30 | 60 |
| 0.425 mm | **19** | 14 | 28 |
| 0.075 mm | **13** | 7 | 16 |
| Grading Envelop for Type - 2.3 & 2.4 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



# Material Test Report

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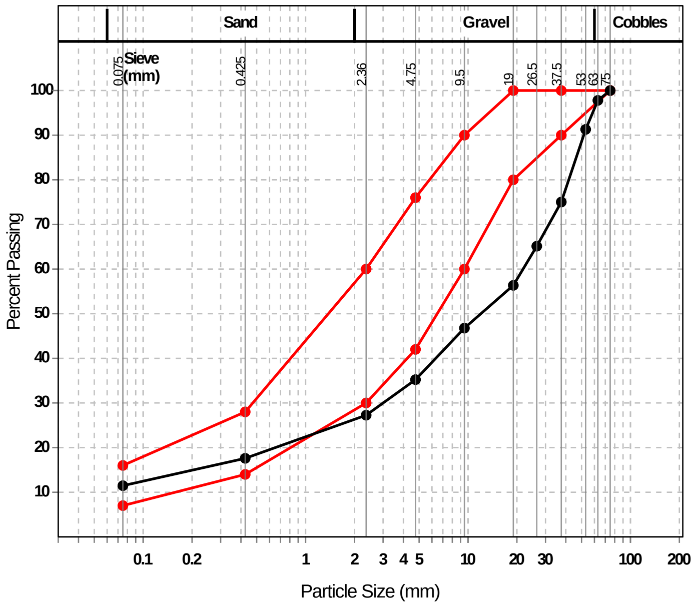
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1A**
**Issue Number:** 1
**Date Issued:** 15/02/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893G
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 21/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 4, Depth: 0.00 - 0.25 m**
**Material:** Fill

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 75 mm | **100** | 100 | 100 |
| 63 mm | **98** | | |
| 53 mm | **91** | | |
| 37.5 mm | **75** | 90 | 100 |
| 26.5 mm | **65** | | |
| 19 mm | **56** | 80 | 100 |
| 9.5 mm | **47** | 60 | 90 |
| 4.75 mm | **35** | 42 | 76 |
| 2.36 mm | **27** | 30 | 60 |
| 0.425 mm | **18** | 14 | 28 |
| 0.075 mm | **11** | 7 | 16 |
| Grading Envelop for Type - 2.3 & 2.4 (MRTS05 July 2020) | | | |

Particle Size Distribution



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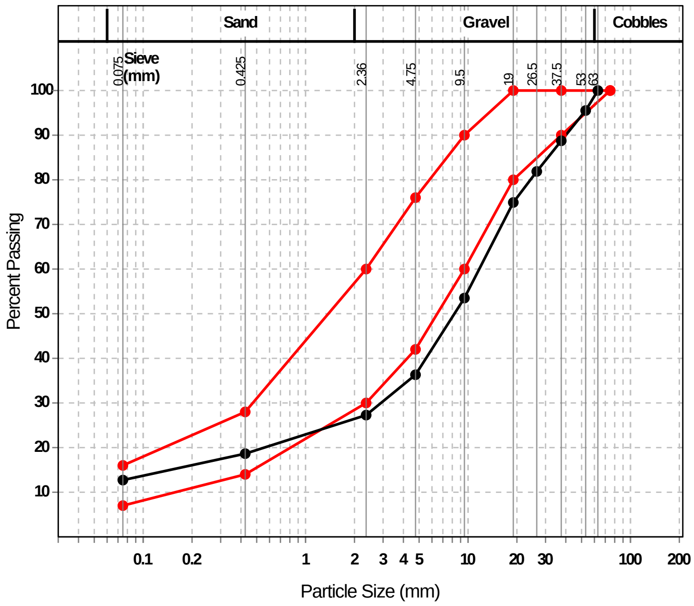
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1A** |
| **Issue Number:** | 1 |
| **Date Issued:** | 15/02/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893I |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 21/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 5, Depth: 0.00 - 0.30 m** |
| **Material:** | Fill |

| Particle Size Distribution (Q103A & AS 1289.2.1.1) | | | |
|---|---|---|---|
| Sieve | Passed % | Passing Limits | |
| 63 mm | **100** | | |
| 53 mm | **96** | | |
| 37.5 mm | **89** | 90 | 100 |
| 26.5 mm | **82** | | |
| 19 mm | **75** | 80 | 100 |
| 9.5 mm | **54** | 60 | 90 |
| 4.75 mm | **36** | 42 | 76 |
| 2.36 mm | **27** | 30 | 60 |
| 0.425 mm | **19** | 14 | 28 |
| 0.075 mm | **13** | 7 | 16 |
| Grading Envelop for Type - 2.3 & 2.4 (MRTS05 July 2020) | | | |

**Particle Size Distribution**



# Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Brisbane Laboratory
439 Montague Road West End QLD 4101
Phone: (07) 3237 8900
Fax: (07) 3237 8999
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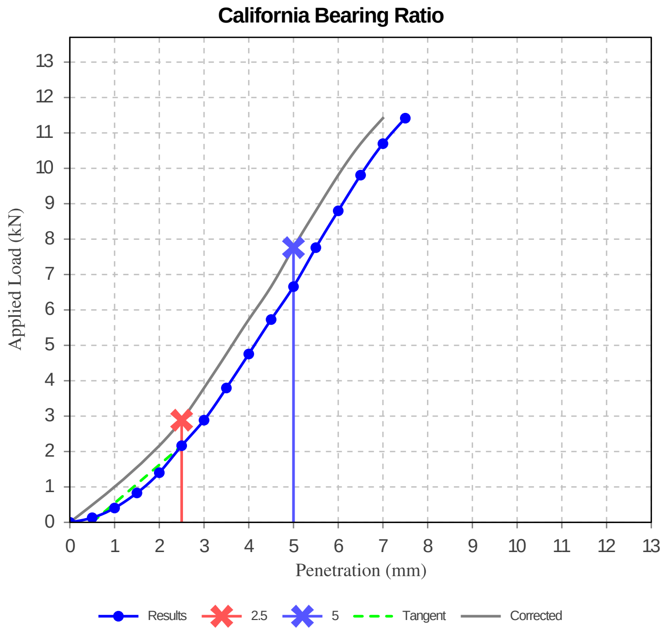
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893A |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 1, Depth: 0.00 - 0.30 m** |
| **Material:** | Fill |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 20 | | |
| CBR % (at 5 mm) | 40 | | |
| CBR % | **40** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 2.23 | | |
| Optimum Moisture Content (%) | 7.0 | | |
| Target Dry Density (t/m$^3$) | 2.19 | | |
| Achieved Dry Density (t/m$^3$) | 2.18 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 97.5 | | |
| Target Moisture Content (%) | 7.0 | | |
| Achieved Moisture Content (%) | 7.4 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 105.5 | | |
| Dry Density after Soaking (t/m$^3$) | 2.18 | | |
| Field Moisture Content (%) | 4.8 | | |
| Moisture Content at Placement (%) | 7.4 | | |
| Moisture Content Top 30mm (%) | 7.6 | | |
| Moisture Content Rest of Sample (%) | 7.3 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70 | | |
| Swell (%) | 0.2 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 25.1 | | |



# Material Test Report

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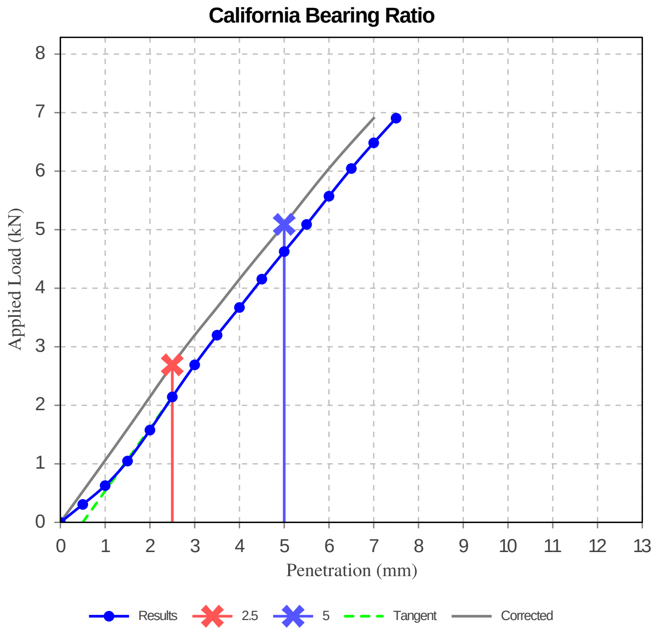
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 1
**Date Issued:** 28/01/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893B
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 23/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 1, Depth: 0.30 - 0.50 m**
**Material:** Natural

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 20 | | |
| CBR % (at 5 mm) | 25 | | |
| CBR % | **25** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density ($t/m^3$) | 2.00 | | |
| Optimum Moisture Content (%) | 9.5 | | |
| Target Dry Density ($t/m^3$) | 1.96 | | |
| Achieved Dry Density ($t/m^3$) | 1.96 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 9.5 | | |
| Achieved Moisture Content (%) | 9.7 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 102.0 | | |
| Dry Density after Soaking ($t/m^3$) | 1.96 | | |
| Field Moisture Content (%) | 9.9 | | |
| Moisture Content at Placement (%) | 9.7 | | |
| Moisture Content Top 30mm (%) | 10.9 | | |
| Moisture Content Rest of Sample (%) | 11.3 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.2 | | |
| Swell (%) | 0.0 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 7.7 | | |



# Material Test Report

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Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

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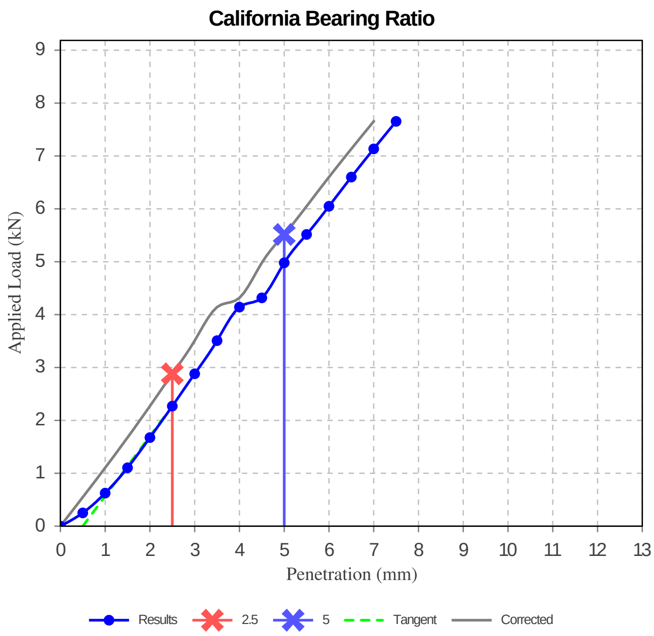
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893C |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 2, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 20 | | |
| CBR % (at 5 mm) | 30 | | |
| CBR % | **30** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 2.18 | | |
| Optimum Moisture Content (%) | 8.0 | | |
| Target Dry Density (t/m$^3$) | 2.13 | | |
| Achieved Dry Density (t/m$^3$) | 2.14 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 8.1 | | |
| Achieved Moisture Content (%) | 7.9 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 97.5 | | |
| Dry Density after Soaking (t/m$^3$) | 2.12 | | |
| Field Moisture Content (%) | 5.9 | | |
| Moisture Content at Placement (%) | 7.9 | | |
| Moisture Content Top 30mm (%) | 8.2 | | |
| Moisture Content Rest of Sample (%) | 7.9 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.4 | | |
| Swell (%) | 0.9 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 11.6 | | |



# Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
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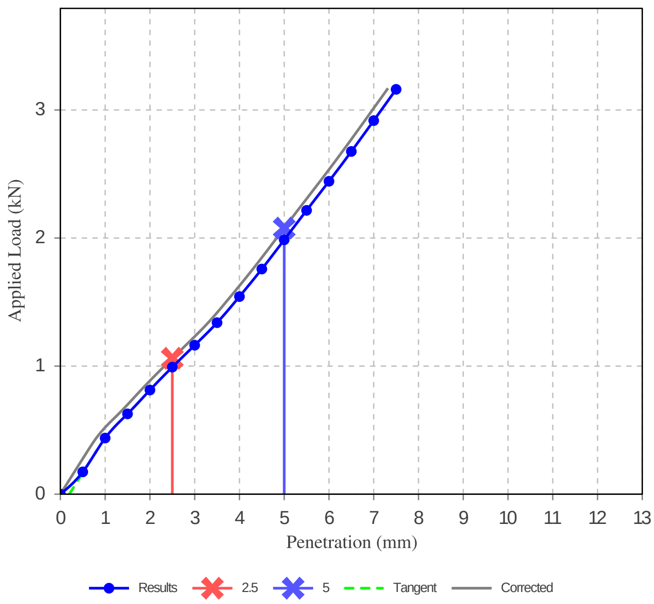
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893D |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 2, Depth: 0.25 - 0.50 m** |
| **Material:** | Natural |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 8 | | |
| CBR % (at 5 mm) | 10 | | |
| CBR % | **10** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.86 | | |
| Optimum Moisture Content (%) | 11.0 | | |
| Target Dry Density (t/m$^3$) | 1.83 | | |
| Achieved Dry Density (t/m$^3$) | 1.82 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 97.5 | | |
| Target Moisture Content (%) | 11.1 | | |
| Achieved Moisture Content (%) | 11.6 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 104.5 | | |
| Dry Density after Soaking (t/m$^3$) | 1.82 | | |
| Field Moisture Content (%) | 9.9 | | |
| Moisture Content at Placement (%) | 11.6 | | |
| Moisture Content Top 30mm (%) | 13.7 | | |
| Moisture Content Rest of Sample (%) | 14.9 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.4 | | |
| Swell (%) | 0.2 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 7.5 | | |

**California Bearing Ratio**



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Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

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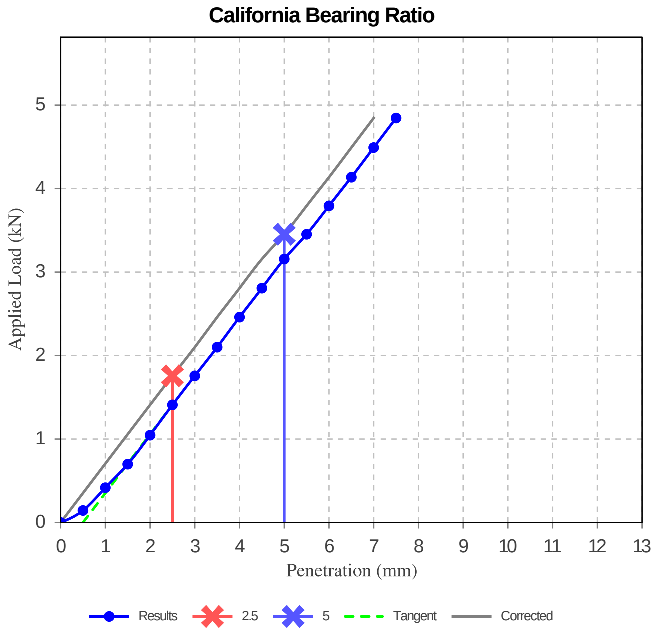
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd<br>Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893E |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department<br>*The results apply to the sample as received* |
| **Sample Location:** | **Pit 3, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 13 | | |
| CBR % (at 5 mm) | 17 | | |
| CBR % | **17** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density ($t/m^3$) | 2.14 | | |
| Optimum Moisture Content (%) | 9.0 | | |
| Target Dry Density ($t/m^3$) | 2.10 | | |
| Achieved Dry Density ($t/m^3$) | 2.10 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 9.1 | | |
| Achieved Moisture Content (%) | 9.2 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 101.0 | | |
| Dry Density after Soaking ($t/m^3$) | 2.09 | | |
| Field Moisture Content (%) | 7.0 | | |
| Moisture Content at Placement (%) | 9.2 | | |
| Moisture Content Top 30mm (%) | 9.8 | | |
| Moisture Content Rest of Sample (%) | 8.9 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.5 | | |
| Swell (%) | 0.2 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 26.1 | | |



# Material Test Report

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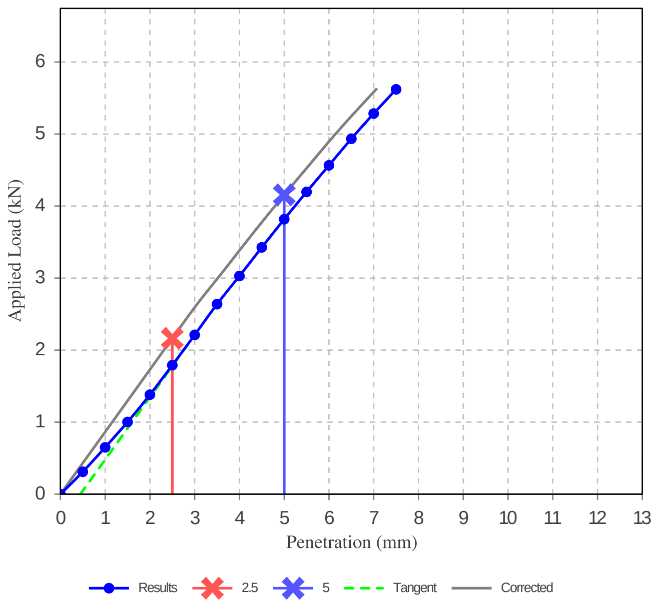
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd<br>Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893F |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department<br>*The results apply to the sample as received* |
| **Sample Location:** | **Pit 3, Depth: 0.40 - 0.60 m** |
| **Material:** | Natural |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 16 | | |
| CBR % (at 5 mm) | 20 | | |
| CBR % | **20** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 2.04 | | |
| Optimum Moisture Content (%) | 9.0 | | |
| Target Dry Density (t/m$^3$) | 2.00 | | |
| Achieved Dry Density (t/m$^3$) | 2.00 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 8.8 | | |
| Achieved Moisture Content (%) | 8.7 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 99.0 | | |
| Dry Density after Soaking (t/m$^3$) | 2.00 | | |
| Field Moisture Content (%) | 1.2 | | |
| Moisture Content at Placement (%) | 8.7 | | |
| Moisture Content Top 30mm (%) | 10.2 | | |
| Moisture Content Rest of Sample (%) | 10.3 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.6 | | |
| Swell (%) | 0.2 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 4.4 | | |

California Bearing Ratio



# Material Test Report

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|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893G |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 4, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

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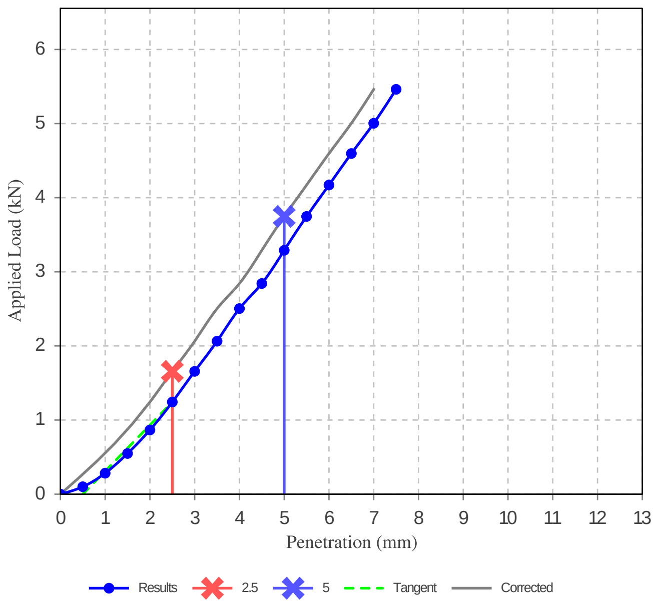
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 13 | | |
| CBR % (at 5 mm) | 19 | | |
| CBR % | **19** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 2.18 | | |
| Optimum Moisture Content (%) | 8.0 | | |
| Target Dry Density (t/m$^3$) | 2.14 | | |
| Achieved Dry Density (t/m$^3$) | 2.13 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 8.1 | | |
| Achieved Moisture Content (%) | 8.5 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 105.0 | | |
| Dry Density after Soaking (t/m$^3$) | 2.13 | | |
| Field Moisture Content (%) | 7.1 | | |
| Moisture Content at Placement (%) | 8.5 | | |
| Moisture Content Top 30mm (%) | 9.3 | | |
| Moisture Content Rest of Sample (%) | 8.8 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.6 | | |
| Swell (%) | -0.1 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 45.3 | | |

California Bearing Ratio



# Material Test Report

**Douglas Partners**
Geotechnics | Environment | Groundwater

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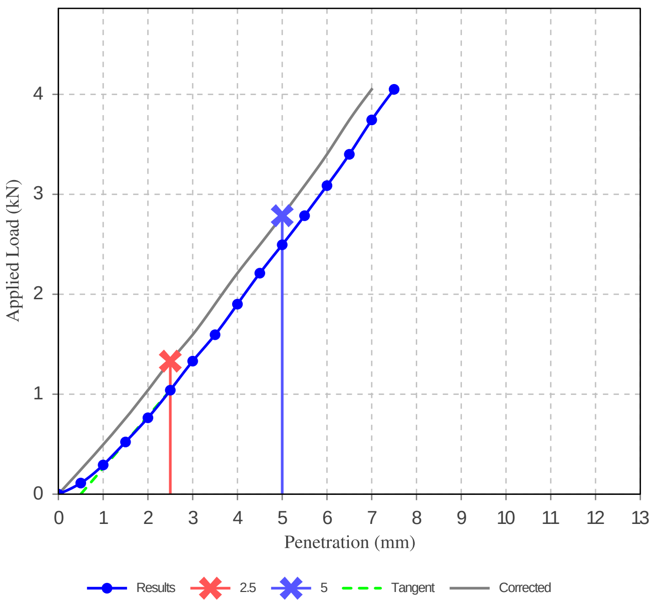
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893H |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 4, Depth: 0.25 - 0.50 m** |
| **Material:** | Natural |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 10 | | |
| CBR % (at 5 mm) | 14 | | |
| CBR % | **14** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.75 | | |
| Optimum Moisture Content (%) | 15.0 | | |
| Target Dry Density (t/m$^3$) | 1.71 | | |
| Achieved Dry Density (t/m$^3$) | 1.70 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 97.5 | | |
| Target Moisture Content (%) | 15.1 | | |
| Achieved Moisture Content (%) | 15.4 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 102.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.70 | | |
| Field Moisture Content (%) | 12.5 | | |
| Moisture Content at Placement (%) | 15.4 | | |
| Moisture Content Top 30mm (%) | 17.6 | | |
| Moisture Content Rest of Sample (%) | 17.6 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.8 | | |
| Swell (%) | 0.5 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.0 | | |

**California Bearing Ratio**



# Material Test Report

**Report Number:** **77733.01-1**
**Issue Number:** 1
**Date Issued:** 28/01/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893I
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 23/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 5, Depth: 0.00 - 0.30 m**
**Material:** Fill

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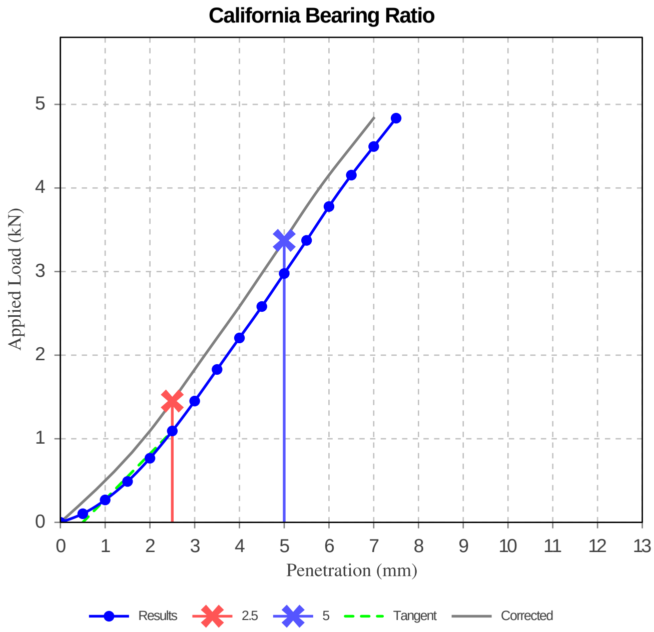
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 11 | | |
| CBR % (at 5 mm) | 17 | | |
| CBR % | **17** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 2.11 | | |
| Optimum Moisture Content (%) | 9.0 | | |
| Target Dry Density (t/m$^3$) | 2.07 | | |
| Achieved Dry Density (t/m$^3$) | 2.07 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 9.2 | | |
| Achieved Moisture Content (%) | 9.2 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 100.0 | | |
| Dry Density after Soaking (t/m$^3$) | 2.07 | | |
| Field Moisture Content (%) | 5.9 | | |
| Moisture Content at Placement (%) | 9.2 | | |
| Moisture Content Top 30mm (%) | 9.8 | | |
| Moisture Content Rest of Sample (%) | 10.2 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.9 | | |
| Swell (%) | -0.3 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 25.4 | | |



# Material Test Report

**Report Number:** **77733.01-1**
**Issue Number:** 1
**Date Issued:** 28/01/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893J
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 23/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 5, Depth: 0.30 - 0.60 m**
**Material:** Natural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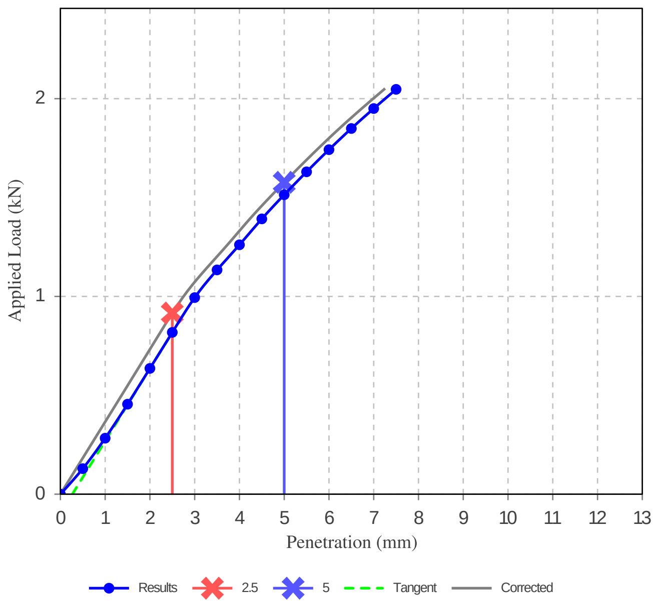
Laboratory Manager
Laboratory Accreditation Number: 828

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 7 | | |
| CBR % (at 5 mm) | 8 | | |
| CBR % | **8** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.93 | | |
| Optimum Moisture Content (%) | 12.5 | | |
| Target Dry Density (t/m$^3$) | 1.89 | | |
| Achieved Dry Density (t/m$^3$) | 1.88 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 12.3 | | |
| Achieved Moisture Content (%) | 12.5 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 101.5 | | |
| Dry Density after Soaking (t/m$^3$) | 1.88 | | |
| Field Moisture Content (%) | 14.0 | | |
| Moisture Content at Placement (%) | 12.5 | | |
| Moisture Content Top 30mm (%) | 14.9 | | |
| Moisture Content Rest of Sample (%) | 14.5 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 70.9 | | |
| Swell (%) | 0.3 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.0 | | |

**California Bearing Ratio**



# Material Test Report

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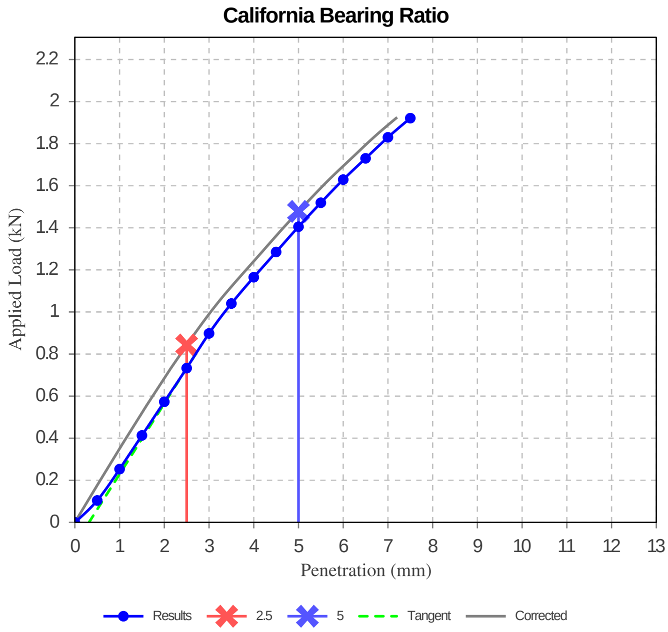
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893K |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 6, Depth: 0.20 - 0.50 m** |
| **Material:** | Natural |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 6 | | |
| CBR % (at 5 mm) | 7 | | |
| CBR % | **7** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.79 | | |
| Optimum Moisture Content (%) | 14.0 | | |
| Target Dry Density (t/m$^3$) | 1.76 | | |
| Achieved Dry Density (t/m$^3$) | 1.76 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 14.1 | | |
| Achieved Moisture Content (%) | 14.5 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 103.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.74 | | |
| Field Moisture Content (%) | 19.7 | | |
| Moisture Content at Placement (%) | 14.5 | | |
| Moisture Content Top 30mm (%) | 17.0 | | |
| Moisture Content Rest of Sample (%) | 17.9 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 68.2 | | |
| Swell (%) | 0.7 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.0 | | |



# Material Test Report

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Geotechnics | Environment | Groundwater

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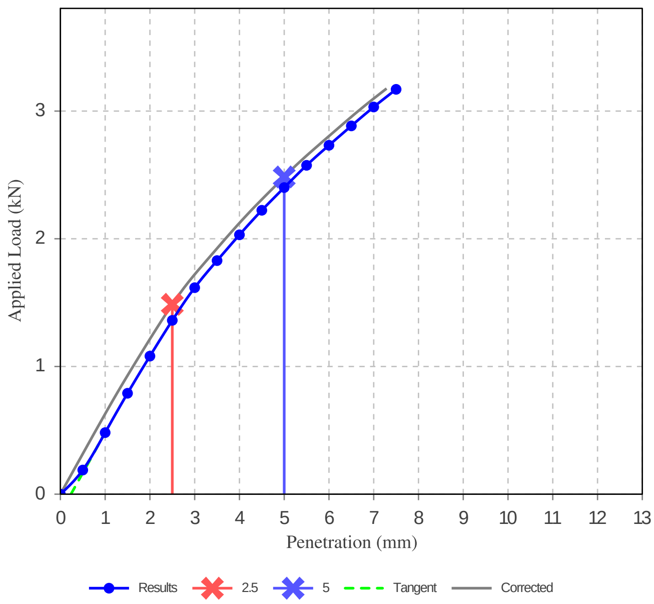
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 28/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893L |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 23/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 7, Depth: 0.20 - 0.50 m** |
| **Material:** | Natural |

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 11 | | |
| CBR % (at 5 mm) | 13 | | |
| CBR % | **13** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.96 | | |
| Optimum Moisture Content (%) | 10.0 | | |
| Target Dry Density (t/m$^3$) | 1.92 | | |
| Achieved Dry Density (t/m$^3$) | 1.91 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 97.5 | | |
| Target Moisture Content (%) | 10.1 | | |
| Achieved Moisture Content (%) | 10.5 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 104.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.90 | | |
| Field Moisture Content (%) | 17.3 | | |
| Moisture Content at Placement (%) | 10.5 | | |
| Moisture Content Top 30mm (%) | 14.1 | | |
| Moisture Content Rest of Sample (%) | 14.1 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 48.7 | | |
| Swell (%) | 0.7 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.0 | | |

**California Bearing Ratio**



# Material Test Report

**Report Number:** **77733.01-1**
**Issue Number:** 1
**Date Issued:** 28/01/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893M
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 23/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 8, Depth: 0.45 - 0.60 m**
**Material:** Natural

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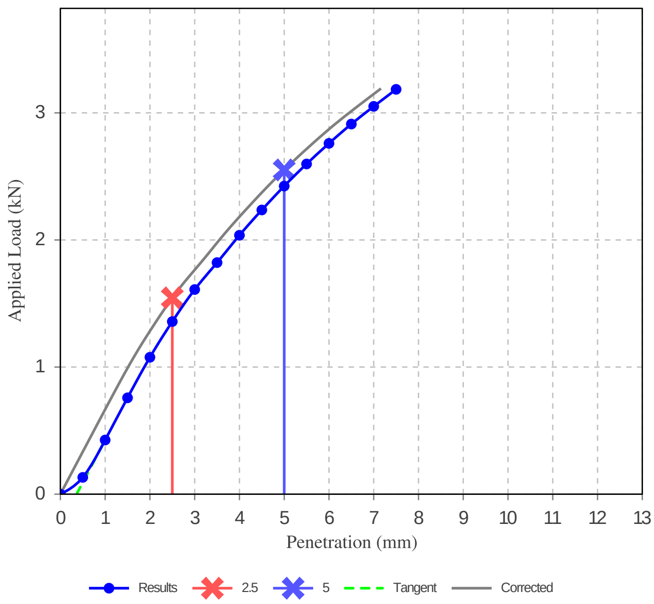
Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| California Bearing Ratio (Q113C & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| CBR % (at 2.5 mm) | 12 | | |
| CBR % (at 5 mm) | 13 | | |
| CBR % | **13** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | Q142A & AS 1289.2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.98 | | |
| Optimum Moisture Content (%) | 10.5 | | |
| Target Dry Density (t/m$^3$) | 1.94 | | |
| Achieved Dry Density (t/m$^3$) | 1.93 | | |
| Target Laboratory Density Ratio (%) | 98 | | |
| Laboratory Density Ratio (%) | 98.0 | | |
| Target Moisture Content (%) | 10.3 | | |
| Achieved Moisture Content (%) | 10.6 | | |
| Target Laboratory Moisture Ratio (%) | 100 | | |
| Laboratory Moisture Ratio (%) | 103.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.92 | | |
| Field Moisture Content (%) | 16.2 | | |
| Moisture Content at Placement (%) | 10.6 | | |
| Moisture Content Top 30mm (%) | 13.7 | | |
| Moisture Content Rest of Sample (%) | 12.7 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Test Condition | Soaked | | |
| Curing Hours | 49.3 | | |
| Swell (%) | 0.6 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.0 | | |

**California Bearing Ratio**



# Material Test Report

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Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 3 - *This version supersedes all previous issues* |
| **Reissue Reason:** | *PI* |
| **Date Issued:** | 29/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893A |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 28/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 1, Depth: 0.00 - 0.30 m** |
| **Material:** | Fill |

| Atterberg Limit (Q104D & Q105 & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| Liquid Limit (%) | 19.2 | | |
| Plastic Limit (%) | 15.4 | | |
| **Plasticity Index (%)** | **3.8** | | |
| Weighted Plasticity Index (%) | 66 | | |

| Linear Shrinkage (Q106) | | Min | Max |
|---|---|---|---|
| Linear Shrinkage (%) | 1.4 | | |
| Weighted Linear Shrinkage (%) | 23 | | |

# Material Test Report

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Approved Signatory: Srdjan Jajcanin
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **77733.01-1**
**Issue Number:** 3 - *This version supersedes all previous issues*
**Reissue Reason:** *PI*
**Date Issued:** 29/01/2021
**Client:** Gassman Development Perspectives Pty Ltd
Corner Manila Street & Cameron Street, Beenleigh QLD 4207
**Contact:** Allan Kelly
**Project Number:** 77733.01
**Project Name:** Upgrade to Existing Access Road
**Project Location:** Mossman Prawn Farm, Mossman
**Work Request:** 9893
**Sample Number:** BN-9893C
**Date Sampled:** 07/01/2021
**Dates Tested:** 19/01/2021 - 28/01/2021
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **Pit 2, Depth: 0.00 - 0.25 m**
**Material:** Fill

| Atterberg Limit (Q104D & Q105 & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| Liquid Limit (%) | 21.0 | | |
| Plastic Limit (%) | 15.4 | | |
| **Plasticity Index (%)** | **5.6** | | |
| Weighted Plasticity Index (%) | 201 | | |

| Linear Shrinkage (Q106) | | Min | Max |
|---|---|---|---|
| Linear Shrinkage (%) | 2.2 | | |
| Weighted Linear Shrinkage (%) | 78 | | |

# Material Test Report

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Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 3 - *This version supersedes all previous issues* |
| **Reissue Reason:** | *PI* |
| **Date Issued:** | 29/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893E |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 28/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 3, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| Atterberg Limit (Q104D & Q105 & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| Liquid Limit (%) | 24.0 | | |
| Plastic Limit (%) | 17.2 | | |
| **Plasticity Index (%)** | **6.8** | | |
| Weighted Plasticity Index (%) | 132 | | |

| Linear Shrinkage (Q106) | | Min | Max |
|---|---|---|---|
| Linear Shrinkage (%) | 3.0 | | |
| Weighted Linear Shrinkage (%) | 58 | | |

# Material Test Report

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Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 3 - *This version supersedes all previous issues* |
| **Reissue Reason:** | *PI* |
| **Date Issued:** | 29/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893G |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 28/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 4, Depth: 0.00 - 0.25 m** |
| **Material:** | Fill |

| Atterberg Limit (Q104D & Q105 & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| Liquid Limit (%) | 22.0 | | |
| Plastic Limit (%) | 17.4 | | |
| **Plasticity Index (%)** | **4.6** | | |
| Weighted Plasticity Index (%) | 81 | | |

| Linear Shrinkage (Q106) | | Min | Max |
|---|---|---|---|
| Linear Shrinkage (%) | 2.2 | | |
| Weighted Linear Shrinkage (%) | 39 | | |

# Material Test Report

| | |
|---|---|
| **Report Number:** | **77733.01-1** |
| **Issue Number:** | 3 - *This version supersedes all previous issues* |
| **Reissue Reason:** | *PI* |
| **Date Issued:** | 29/01/2021 |
| **Client:** | Gassman Development Perspectives Pty Ltd |
| | Corner Manila Street & Cameron Street, Beenleigh QLD 4207 |
| **Contact:** | Allan Kelly |
| **Project Number:** | 77733.01 |
| **Project Name:** | Upgrade to Existing Access Road |
| **Project Location:** | Mossman Prawn Farm, Mossman |
| **Work Request:** | 9893 |
| **Sample Number:** | BN-9893I |
| **Date Sampled:** | 07/01/2021 |
| **Dates Tested:** | 19/01/2021 - 28/01/2021 |
| **Sampling Method:** | Sampled by Engineering Department |
| | *The results apply to the sample as received* |
| **Sample Location:** | **Pit 5, Depth: 0.00 - 0.30 m** |
| **Material:** | Fill |

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Laboratory Manager
Laboratory Accreditation Number: 828

| Atterberg Limit (Q104D & Q105 & AS 1289.2.1.1) | | Min | Max |
|---|---|---|---|
| Liquid Limit (%) | 24.0 | | |
| Plastic Limit (%) | 17.4 | | |
| **Plasticity Index (%)** | **6.6** | | |
| Weighted Plasticity Index (%) | 123 | | |

| Linear Shrinkage (Q106) | | Min | Max |
|---|---|---|---|
| Linear Shrinkage (%) | 2.8 | | |
| Weighted Linear Shrinkage (%) | 52 | | |