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19 December 2025

Hancock Energy (PBN) Pty Ltd
31 Ventnor Avenue
West Perth WA 6005

Job No: 25FCE1551
Your ref: Contract HE 128

Attention: Mr Peter Spalding,

Dear Peter,

Project: Geotechnical Investigation by Test Pitting – Belisama Gas Project

Report

EXECUTIVE SUMMARY

FCE have completed a geotechnical investigation by test pitting at Belisama Gas Project where Hancock intend to construct a Central Processing Facility and associated infrastructure. This investigation is a prelude to a drilling investigation planned to be completed next year. Soil conditions at the site vary slightly over however are generally sandy and may be described as top soil to 500mm consisting of sand with silt overlying either clayey sand with gravel, gravelly sand with silt, or more sand with silt up to a depth of 2.5m. Measured soil compaction across the site is lower than the standard required for building so some compaction will be required prior to building however the materials are expected to compact well under 13t flat drum roller. There was no evidence of large monolithic rock or a high-water table in the test pits during the investigation.

Provided the recommendations for earthworks preparation provided in this report are followed FCE are of the opinion that:

- The soil conditions at the site will be suitable for supporting the proposed development.
- The site can achieve a Class “A” or Class “S” site classification in accordance with AS2870-2011 depending on the area.

BACKGROUND

On instruction from Hancock Energy (PBN) Pty Ltd (Hancock), Flow Consulting Engineers (FCE) have completed a geotechnical investigation by test pitting at the proposed Belisama Gas Project (BGP) site in the Mt Adams area of Western Australia. Hancock intend to construct a Central Processing Facility (CPF) and associated infrastructure at the site.

This test pitting investigation is a prelude to a drilling investigation planned to be completed next year. The purpose of this investigation is to describe soil conditions and make a preliminary determination if the site will be suitable for supporting the proposed development.

The field investigation programme and all related studies were planned and supervised by Geotechnical Engineers Mr Lester Smith and Ms Trinity Muller from FCE. Lenane Holdings Pty Ltd

provided the excavator and operator for test pit excavation. Identification and pegging of the test pit locations was carried out by HTD Surveyors and Planners prior to the date of investigation. The materials testing of samples taken during the investigation was completed at Blacktop Material Engineering's (BME) Geraldton, ALS, SGS, and Materials Consultants Perth NATA accredited soils laboratories. The site investigation was completed on the 4 November 2025.

SCOPE OF REPORT

FCE's proposal for this study was described in our proposal to Hancock dated 27 October 2025. The scope of our work proposed was to provide a factual & explanatory investigation report which includes:

1. Identify the site and the eleven investigation locations. Excavate to a maximum depth of 2.5m depth using an excavator (21 Tonne). Test pits shall be logged in accordance with Australian Standard AS 1726-2017 "Geotechnical Site Investigations".
2. Complete a desktop geological study and provide some geological background on the site.
3. Provide a general description of the site based on site observations.
4. Describe the soil types encountered during the field investigation which includes the construction of test pits to 2.5m depth at 11 locations at the site with a excavator. Provide results of Perth Sand Penetrometer testing (PSP) to 1m depth adjacent to each test pit. Provide photographs of the site soil types and each test pit.
5. Report depth to groundwater or rock if encountered.
6. Describe the results of the laboratory materials testing completed on the sampled soils including
    i. Particle Size Distribution (PSD), Atterberg Limit Testing (PI), Unified Soil Classification Symbol (USC)
    ii. Maximum Modified Dry Density (MMDD) / Optimum Moisture Content
    iii. Soaked CBR (SCBR)
    iv. Permeability
    v. Direct Shear Test
    vi. Shrink Swell Index
    vii. Soil for organic Content and recommend required topsoil strip depth.
    viii. Soil pH value and Chloride content to determine whether the site soils are "aggressive" to steel and concrete.
    ix. Emerson
    x. Oedometer
    xi. Electrical soil resistivity
7. Provide the AS2870:2011 Lot site classification for the site. Advise of calculated ground surface movements due to soil moisture content change.
8. Complete the soil electrical resistivity testing in accordance with the requirements of AS1768. We will use the standard test method for field measurement of soil resistivity using the

Wenner Four-Electrode Method as per Figure 1 below using a DET2/2 Megger soil resistivity tester. We will provide the current calibration Certificate for the meter.

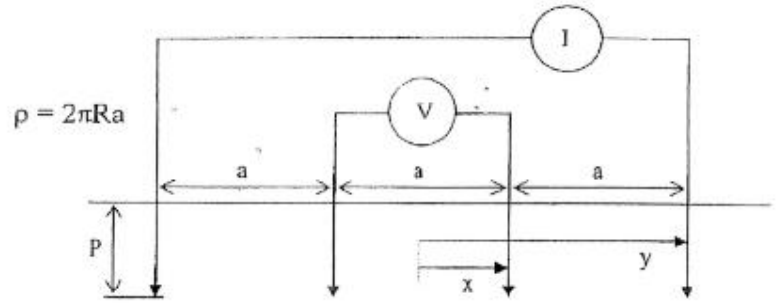

Figure 1–Wenner Method.

Figure 1 – Wenner Method

We will use electrode spacing 0.5, 1, 2, 3, 4, 5, 10, 15, 20, 30. The resistivity testing will be completed in two directions at the test location.

9. Provide a description of suitable compaction testing methods for the site.
10. Make a visual inspection and report on the existence of Acid Sulfate Soils (ASS). Determine if an acid sulfate soils investigation is required. Report if asbestos, hydrocarbon, contamination, and / or uncontrolled fill was observed at the site during the site investigation.
11. Provide soil bearing capacity and settlement estimates for the site.
12. Assess the suitability of site material for use as subgrade, basecourse and structural fill.
13. Recommend compaction technique for site materials.
14. Provide soil excavation characteristics and stability criteria for open excavations.
15. Provide erosion and sediment control guidance.
16. Provide recommendations for retaining and geotechnical design parameters for retaining design.
17. Recommend appropriate wind design criteria.
18. Recommend appropriate earthquake design seismic hazard factor and the subsoil class.
19. Provide advice to complete the construction of roads. Design to include base and subbase thickness for an unsealed road based on traffic information supplied by Hancock. Material requirements to be specified.
20. Provide advice on completing earthworks for buildings.
21. Provide recommendations for the construction and maintenance of site drainage.
22. Provide advice on maximum slopes for grading cut and fill embankments batters/slopes. Include advice for loose topsoil stockpiles.
23. Provide recommendations for pond retention bund stability and provide recommended bund section detail.

REPORT

1 SITE INVESTIGATION LOCATIONS

The BGP is in the northern Perth Basin, approximately 300km north of Perth, circa 34km south-east of Dongara. The proposed location for the BGP is on part of Lot M441 on Plan P002981 (No. 1906) Yandanooka West Rd, Milo in the Shire of Mingenew and Irwin. Aerial photographs showing the location and topography of the area are provided as Figures 1 to 3 in Appendix A.

Eleven investigative test pits were excavated with a 21t excavator within the proposed areas for the CPF facility and associated infrastructure. The location of the test pits is marked on Figure 4 in Appendix A. The nominal georeferenced coordinates for the location of 11 test pits are provided below.

Test Pit No.	Northing	Easting
1	6754556.29	332059.84
2	6754415.82	331930.43
3	6754278.28	332355.57
4	6754360.12	331752.69
5	6754360.12	331488.90
6	6754043.29	332539.63
7	6753687.26	332539.63
8	6753331.40	332539.63
9	6752976.08	332539.63
10	6754508.60	331243.67
11	6754302.88	331277.92

Table 1: Test pit coordinates.

2 DESKTOP GEOLOGICAL STUDY

The area of study falls within the 1:100000 Mingenew Dongara Geological Map. The proposed location is mainly within an area known as the river drainage system. Soil types within the river drainage system comprise of clay, silt and sand sediments which have been deposited by flowing water from the nearby river systems including the Irwin River. The mapping also suggests that the area will contain both ferruginous laterite gravel and non-calcareous sand formed by aeolian processes. Extracts from the Geological map are provided Table 1 below.

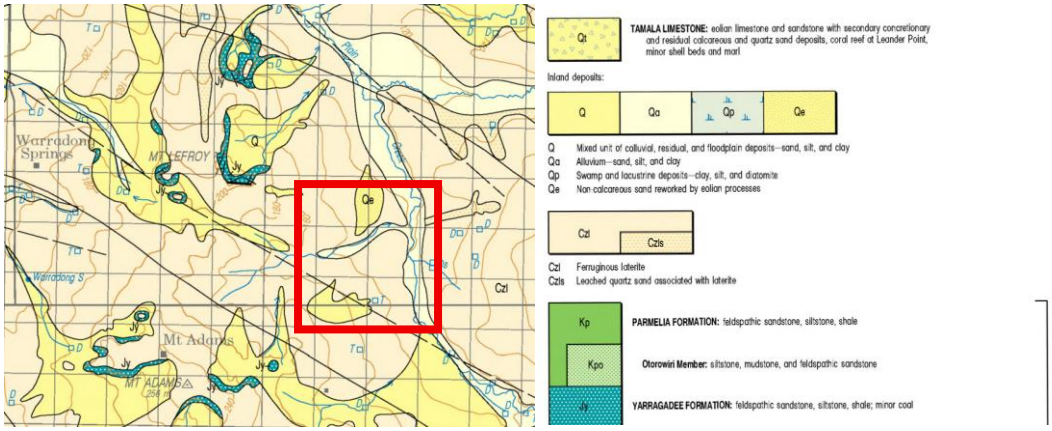

Table 1.

3 GENERAL SITE DESCRIPTION

The location and topography of the site is shown in Figures 1 to 3 in Appendix A. Photographs of the site are provided in Appendix B. The farmland has previously been cropped. It is currently covered in low grasses. The surface of the site slopes gradually down from west to east. There is a creek next to the east boundary of the Lot. There are trees along the fence in the middle of the Lot. There is a grove of trees next to Test Pit 9. There are gravel pits along the driveway leading up to the site. Site escorts stated during the investigation that the paddock next to the Creek often floods in the wet season.

4 TEST PIT FINDINGS

The location of the 11 test pits excavated at the site are shown marked on Figure 4 in Appendix A. Excavation was achieved with a 21t excavator to a maximum depth of 2.5m. Photographs of the soil types encountered in each Test Pit are provided in Appendix B. The soils appear to be native and previously undisturbed apart from the topsoil which contains roots from cropping. The soil profile at each Test Pit may be described as:

- Test Pit 1 (TP1)
  - 0 - 300mm:
    A layer of grey sand with silt. The material was granular when excavated. The material was dry. There were roots in the top 100mm.

  - 300 - 1800mm:
    A layer of cream/grey sand with silt. The material was granular when excavated. The material was dry. The material was sampled at 300-500mm for material testing.

  - 1800 - 2500mm:
    A layer of cream/yellow sand with silt and minor gravel. The material was granular when excavated. The material was dry.

  PSP1 (6, 7, 6) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 2 (TP2)
  - 0 - 300mm:
    A layer of grey sand with silt. The material was granular when excavated. The material was dry. There were roots in the top 100mm.

- 300 - 1800mm:
  A layer of cream/grey sand with silt. The material was granular when excavated. The material was dry.

- 1800 - 2500mm:
  A layer of cream/yellow silty sand. The material was granular when excavated. The material was dry. The material was sampled at 2000-2200mm for material testing.

PSP2 (5, 6, 5) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 3 (TP3)
  - 0 - 500mm:
    A layer of grey sand with silt. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material was sampled at 300-500mm for material testing.

  - 500 - 1700mm:
    A layer of cream/grey sand with silt. The material was granular when excavated. The material was dry.

  - 1700 - 2500mm:
    A layer of cream/yellow sand with silt and minor gravel. The material was mostly granular when excavated. Some laterite gravel and trace clay was starting to form at the bottom. The material was damp.

  PSP3 (5, 6, 5) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 4 (TP4)
  - 0 - 700mm:
    A layer of grey/cream/yellow sand with silt. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material was sampled at 300-500mm for material testing.

  - 700 - 2500mm:
    A layer of light brown/cream gravelly sand with clay. The material was lightly cemented together when excavated. The material was difficult to excavate.

  PSP4 (5, 9, Refusal) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 5 (TP5)
  - 0 - 500mm:
    A layer of grey/white gravelly sand with silt. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material was sampled at 300-500mm for material testing.

  - 500 - 900mm:
    A layer of grey/cream gravelly sand with silt. The material was lightly cemented together when excavated. The material was dry.

- 900 - 1100mm:
  A layer of cream/yellow/pink clayey sand with gravel. The material was lightly cemented together when excavated. The material was dry.

- 1100 - 2600mm:
  A layer of pink clayey sand with gravel. The material was clumped together when excavated. The material was very dry. The material was difficult to excavate.

PSP5 (7, Refusal) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 6 (TP6)
  - 0 - 700mm:
    A layer of dark grey sand with silt topsoil. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material appeared to have decomposed organics in the layer. The material was sampled at 300-500mm for material testing.

  - 700 - 2000mm:
    A layer of cream/grey sand with silt. The material was granular when excavated. The material was dry.

  - 2000 - 2500mm:
    A layer of cream/grey silty sand mixed with yellow clayey sand with silt. The yellow clayey sand was wet while the silty sand was dry. The silty sand was granular when excavated while the yellow clayey sand was clumped.

  PSP6 (5, 5, 6) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 7 (TP7)
  - 0 - 100mm:
    A layer of dark grey sand with silt topsoil. The material was granular when excavated. The material was dry. There were roots in the top 100mm.

  - 100 - 1000mm:
    A layer of cream/grey sand with silt. The material was granular when excavated. The material was dry.

  - 1000 - 2500mm:
    A layer of yellow/cream clayey sand with minor gravel. The material was clumped together when excavated. The material was moist. The material was sampled at 1000-1500mm for material testing.

  PSP7 (4, 14, 20+) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 8 (TP8)
  - 0 - 300mm:
    A layer of grey sand with silt topsoil. The material was granular when excavated. The material was dry. There were roots in the top 100mm.

- 300 - 800mm:
  A layer of cream/grey gravelly sand with silt. The material was granular when excavated. The material was dry. The material was sampled at 300-500mm for material testing.

- 800 - 2500mm:
  A layer of yellow/cream clayey sand with minor gravel. The material was clumped together when excavated. The material was dry.

PSP8 (5, 7, Refusal) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 9 (TP9)
  - 0 - 700mm:
    A layer of grey sand with silt topsoil. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material was sampled at 300-500mm for material testing.

  - 700 - 2500mm:
    A layer of cream sand with silt. The material was granular when excavated. The material was dry. There were trees roots throughout the layer ranging from 20mm to 75mm diameter.

  PS9 (4, 6, 4) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 10 (TP10)
  - 0 - 700mm:
    A layer of cream/grey sand with silt and minor gravel. The material was granular when excavated. The material was dry. There were roots in the top 100mm. The material was sampled at 300-500mm for material testing.

  - 700 - 2000mm:
    A layer of cream/orange gravelly sand with silt. The material was granular when excavated. The material was dry.

  - 2000 - 2500mm:
    A layer of orange/pink gravelly clayey sand. The material was lightly cemented together when excavated. The material was dry.

  PSP10 (7, 10, 36+) adjacent to the Test Pit commencing at 150mm below ground level.

- Test Pit 11 (TP11)
  - 0 - 400mm:
    A layer of grey/cream sand with silt and gravel. The material was granular when excavated. The material was dry. There were roots in the whole layer.

  - 400 - 1600mm:
    A layer of cream/yellow gravelly sand with silt. The material was granular when excavated. The material was dry.

- 1600 - 2500mm:
  A layer of yellow/pink gravelly clayey sand. The material was lightly cemented together when excavated. The material was dry. The material was sampled at 2000-2500mm for material testing.

PSP11 (9, Refusal) adjacent to the Test Pit commencing at 150mm below ground level.

The compaction across the site to 750mm depth is lower than the standard required for building. The site soils will require compaction and compaction testing to confirm suitable soil compaction before construction can commence.

5 WATER TABLE & ROCK

There was no evidence of the water table within the excavation depth of 2.5m of the ground surface. The BOM Australian Groundwater Explorer has records of nearby boreholes over the last few decades. The records indicate that the water table is at least 30+m below the site. It appear that stormwater flow follows the lay of the land and runs downwards towards the creek both above ground and below ground where there may exist a perched water table due to impermeable soils at depth. As a result the water table will meet the creek to the East. There was no evidence of rock within the excavation depth of between 2.5m of the ground surface.

6 RESULTS OF LABORATORY MATERIALS TESTING

Please refer to Appendix H for an explanation of these tests. All test certificates are provided in Appendix C. Results are summarised in the following section.

6.1 *Particle Size Distribution (PSD), Atterberg Limit (PI) & Unified Soil Classification Symbol (USC) Testing*

- USC which provides a description of the site soils are shown in Table 2 below:

Unified Soil Classification Symbol (USC)		
Test Pit 1 @ 300-500mm depth below GL	SM	25BME4118
Test Pit 2 @ 2000-2200mm depth below GL	SM	25BME4119
Test Pit 3 @ 300-500mm depth below GL	SP-SM	25BME4120
Test Pit 4 @ 300-500mm depth below GL	SW-SM	25BME4121
Test Pit 5 @ 300-500mm depth below GL	SW-SM	25BME4122
Test Pit 6 @ 300-500mm depth below GL	SW-SM	25BME4123
Test Pit 7 @ 1000-1500mm depth below GL	SC	25BME4124
Test Pit 8 @ 300-500mm depth below GL	SW-SM	25BME4125
Test Pit 9 @ 300-500mm depth below GL	SP-SM	25BME4126
Test Pit 10 @ 300-500mm depth below GL	SP-SM	25BME4127
Test Pit 11 @ 2000-2500mm depth below GL	SC	25BME4128

Table 2.

The symbols represent the following soil descriptions:

- SP – Poorly graded sand and gravel-sand mixtures with little or no fines. (Poorly graded refers to the lack of range of size of the sand particle sizes).
- SW – Well-graded sand and gravel-sand mixtures with little or no fines. (Well graded refers to the wide range of size of the sand particles.)
- SC – Sand-clay mixtures
- SM – Sand-silt mixtures

The silt and clay fraction of the sample is the fraction passing the 75micron sieve. As a guide, usually soils are preferred for foundation material which do not contain more than 5 to 10% fraction passing the 75micron sieve. The objection to material with a high silt and clay content is that silt has poor bearing qualities when saturated. The fraction passing the 75micron sieve of samples is shown in Table 3 below. The material varies across the site and as the depth increases. The material in the top 500mm across the site generally has a low silt and clay content and will make ideal foundation material. The amount of clay in the sample is indicated by the Atterberg Limits. As can be seen in the table below a couple of sites have some clay at depth but generally the soils may be described as sandy.

Test Pit No.	Fraction Passing 75micron	Linear Shrinkage	Reactive Clay Fraction
Test Pit 1 @ 300-500mm depth below GL	12 %	0.0 %	No clay fraction.
Test Pit 2 @ 2000-2200mm depth below GL	13 %	0.0 %	No clay fraction.
Test Pit 3 @ 300-500mm depth below GL	6 %	0.0 %	No clay fraction.
Test Pit 4 @ 300-500mm depth below GL	9 %	0.0 %	No clay fraction.
Test Pit 5 @ 300-500mm depth below GL	8 %	0.0 %	No clay fraction.
Test Pit 6 @ 300-500mm depth below GL	11 %	0.0 %	No clay fraction.
Test Pit 7 @ 1000-1500mm depth below GL	29 %	5.0 %	Moderate clay fraction.
Test Pit 8 @ 300-500mm depth below GL	8 %	0.0 %	No clay fraction.
Test Pit 9 @ 300-500mm depth below GL	5 %	0.0 %	No clay fraction.
Test Pit 10 @ 300-500mm depth below GL	10 %	0.0 %	No clay fraction.
Test Pit 11 @ 2000-2500mm depth below GL	20 %	5.0 %	Moderate clay fraction.

Table 3.

6.2 *Maximum Dry Density / Optimum Moisture Content*

The maximum dry density of the materials indicate that compaction of the materials is measurable with a nuclear densometer instrument. The Maximum Modified Dry Density (MMDD) and Optimum Moisture Content (OMC) test results are presented in Table 4 below.

Test Pit No.	MMDD (t/m^3) / OMC (%)
Test Pit 1 @ 300-500mm depth below GL	1.86 / 11.5
Test Pit 2 @ 2000-2200mm depth below GL	1.98 / 8.0
Test Pit 3 @ 300-500mm depth below GL	1.85 / 14.0
Test Pit 4 @ 300-500mm depth below GL	1.90 / 9.0
Test Pit 5 @ 300-500mm depth below GL	2.03 / 8.0
Test Pit 6 @ 300-500mm depth below GL	1.87 / 16.0
Test Pit 7 @ 1000-1500mm depth below GL	2.04 / 10.0
Test Pit 8 @ 300-500mm depth below GL	1.95 / 9.0
Test Pit 9 @ 300-500mm depth below GL	1.76 / 14.0
Test Pit 10 @ 300-500mm depth below GL	1.90 / 11.0
Test Pit 11 @ 2000-2500mm depth below GL	2.10 / 8.0

Table 4.

6.3 *California Bearing Ratio (SCBR) Test*

The results of SCBR tests performed on the soil samples in accordance with AS1289.6.1.1 & AS1289.2.1.1 are presented in Table 5 below:

Test Pit No.	Soaked CBR	Plasticity Index	Meet CGG Subgrade Requirements
Test Pit 1 @ 300-500mm depth below GL	25 %	Non-plastic	Yes
Test Pit 2 @ 2000-2200mm depth below GL	30 %	Non-plastic	Yes
Test Pit 3 @ 300-500mm depth below GL	30 %	Non-plastic	Yes
Test Pit 4 @ 300-500mm depth below GL	25 %	Non-plastic	Yes
Test Pit 5 @ 300-500mm depth below GL	40 %	Non-plastic	Yes
Test Pit 6 @ 300-500mm depth below GL	40 %	Non-plastic	Yes
Test Pit 7 @ 1000-1500mm depth below GL	20 %	14	Yes
Test Pit 8 @ 300-500mm depth below GL	40 %	Non-plastic	Yes
Test Pit 9 @ 300-500mm depth below GL	19 %	Non-plastic	Yes
Test Pit 10 @ 300-500mm depth below GL	35 %	Non-plastic	Yes

Test Pit 11 @ 2000-2500mm depth below GL	30 %	13	Yes

Table 5.

The City of Greater Geraldton (CGG) land development guidelines stipulate that subgrade shall have a soaked CBR exceeding 7% and a Plasticity Index (PI) less than 15. For reference generally a soaked CBR for sand above 20 is considered good. As can be seen from the results, all the native site materials will make suitable subgrade without a need for a subbase. The material meets CGG requirements for subgrade. The sandy soils will be suitable when compacted to support pavements and building pads.

6.4 *Permeability*

Laboratory tests are completed on soil samples remoulded in the laboratory under controlled conditions. A constant head permeability AS1289.6.7.1 laboratory test was completed on the soil samples taken from site. The permeability tests were modelled at a field density of 90% MMDD. Results are provided in Table 6 below.

Test Pit No.	**Permeability (m/s)**	**Permeability (m/day)**
Test Pit 2 @ 2000-2200mm depth below GL	7E-07	6E-02
Test Pit 11 @ 2000-2500mm depth below GL	1E-07	1E-02

Table 6.

Soils with permeability coefficients 10^{-1} - 10^{-4}m/s are generally considered as quite permeable and generally comprise sands and gravels. For drainage purposes these soils are well regarded. Soils with permeability coefficients 10^{-4} - 10^{-6}m/s are generally considered as poorly drained and comprised of very fine sands, organic and inorganic silts, mixtures of sand, silt, and clay. Soils with permeability coefficients 10^{-6} - 10^{-9}m/s are generally considered practically impervious. It is expected that the soil permeability across the site will range with depth from quite slow draining (shallow soils) to practically impervious (soils at depth).

6.5 *Direct Shear Test*

The Multistage Direct Shear Test AS1289 6.2.2 provides the effective friction angle and drained cohesion parameters of the soil. Multistage Direct Shear Tests were completed on the soil sample taken from Test Pit 3 and Test Pit 4. The tests were completed as multistage, consolidated, drained, inundated & saturated. The specimen was remoulded at 95% MMDD & 100% OMC. Results are provided in Table 7 below.

Test Pit No.	**Drained Cohesion (kPa)**	**Effective Friction Angle (Degrees)**
Test Pit 2 @ 2000-2200mm depth below GL	7	38°
Test Pit 11 @ 2000-2500mm depth below GL	52	41°

Table 7.

6.6 *Shrink Swell Index*

The results of the remoulded shrink swell index are shown in the Table 8 below.

Test Pit No.	Shrink-Swell Index
Test Pit 1 @ 300-500mm depth below GL	Unobtainable
Test Pit 2 @ 2000-2200mm depth below GL	Unobtainable
Test Pit 3 @ 300-500mm depth below GL	Unobtainable
Test Pit 4 @ 300-500mm depth below GL	Unobtainable
Test Pit 5 @ 300-500mm depth below GL	Unobtainable
Test Pit 6 @ 300-500mm depth below GL	Unobtainable
Test Pit 7 @ 1000-1500mm depth below GL	0.0 %
Test Pit 8 @ 300-500mm depth below GL	Unobtainable
Test Pit 9 @ 300-500mm depth below GL	Unobtainable
Test Pit 10 @ 300-500mm depth below GL	Unobtainable
Test Pit 11 @ 2000-2500mm depth below GL	0.1 %

Table 8

Results reflect the low clay content and low reactivity of the sandy soils.

6.7 *Soil Organic Content*

The results from soil organic test performed on samples collected are provided in Table 9 below.

Test Pit No.	Organic Content
Test Pit 4 @ 300-500mm depth below GL	0.4 %
Test Pit 6 @ 300-500mm depth below GL	0.5 %

Table 9.

The experience of FCE in the past suggests that if the material contains greater than 1-2% organic matter compaction can be very difficult or impossible to achieve. When more than roughly 2% of organic material becomes dissolved through the soil it has a significant effect on the physical characteristics of the soil. That effect is to make conditioning and compaction of the soil to 95% MMDD almost impossible. Results indicate that soils from this site will condition and compact well due to the low organic content.

6.8 *Soil pH Value and Chloride Content*

6.8.1 ***Soil pH Value***

The results of the Soil pH Value tests performed on the soil samples are provided in Table 10 below:

Test Pit No.	pH Value
Test Pit 1 @ 300-500mm depth below GL	6.3
Test Pit 2 @ 2000-2200mm depth below GL	6.3

Test Pit 3 @ 300-500mm depth below GL	6.3
Test Pit 4 @ 300-500mm depth below GL	6.2
Test Pit 5 @ 300-500mm depth below GL	6.3
Test Pit 6 @ 300-500mm depth below GL	6.4
Test Pit 7 @ 1000-1500mm depth below GL	6.3
Test Pit 8 @ 300-500mm depth below GL	6.4
Test Pit 9 @ 300-500mm depth below GL	6.4
Test Pit 10 @ 300-500mm depth below GL	6.6
Test Pit 11 @ 2000-2500mm depth below GL	6.2

Table 10.

The criteria for “non-aggressive” soil conditions (low permeability soils or soils above the groundwater table) is >5.5. These pH results suggest an exposure classification A1 in accordance with AS3600.

AS4100 Steel structures does not make any distinction of exposure classification for steel structures. AS4100 recommends that for steelwork requiring long-life protection, recommendations on protection systems may be found in AS/NZS 2312.

6.8.2 *Soils Chloride Content*

The results of the Soil Chloride Content tests performed on the soil samples are provided in Table 11 below:

Test Pit No.	**Chloride (Cl^{-1}) Content**
Test Pit 1 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 2 @ 2000-2200mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 3 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 4 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 5 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 6 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 7 @ 1000-1500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 8 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 9 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 10 @ 300-500mm depth below GL	<10 mg/kg (<0.001 % by weight)
Test Pit 11 @ 2000-2500mm depth below GL	<10 mg/kg (<0.001 % by weight)

Table 11.

The criteria for high salt content is more than 0.02% by weight. Hence, the material from the Test Pits have very low salt content. These results suggest an exposure classification A1 in accordance with AS3600. Results from Table 10 to Table 11 above suggest an exposure classification A1 for concrete.

6.9 *Emerson*

The Emerson Class number classifies a soil based on its tendency to disperse in distilled water. A Class of 1 is highly dispersive. While a Class of 8 is stable. The Emerson Class number for each test pit are presented in Table 12.

Test Pit No.	Emerson Class Number
Test Pit 1 @ 300-500mm depth below GL	3
Test Pit 2 @ 2000-2200mm depth below GL	3
Test Pit 3 @ 300-500mm depth below GL	3
Test Pit 4 @ 300-500mm depth below GL	3
Test Pit 5 @ 300-500mm depth below GL	3
Test Pit 6 @ 300-500mm depth below GL	3
Test Pit 7 @ 1000-1500mm depth below GL	6
Test Pit 8 @ 300-500mm depth below GL	3
Test Pit 9 @ 300-500mm depth below GL	3
Test Pit 10 @ 300-500mm depth below GL	3
Test Pit 11 @ 2000-2500mm depth below GL	6

Table 12.

6.10 *Oedometer*

The results from the oedometer tests are expected in January 2026 and will be included in the report then.

6.11 *Electrical Conductivity Testing*

The results of the electrical resistivity testing in accordance with AS 1289.4.4.1 are provided in Table 13.

Test Pit No.	Mean Moisture Content (%)	Mean Resistivity (Ω.m)
Test Pit 1 @ 300-500mm depth below GL	17.5	235
Test Pit 2 @ 2000-2200mm depth below GL	18.4	315
Test Pit 3 @ 300-500mm depth below GL	17.8	360
Test Pit 4 @ 300-500mm depth below GL	18.3	365
Test Pit 5 @ 300-500mm depth below GL	15.2	430
Test Pit 6 @ 300-500mm depth below GL	19.9	560

Test Pit 7 @ 1000-1500mm depth below GL	21.9	90
Test Pit 8 @ 300-500mm depth below GL	17.3	235
Test Pit 9 @ 300-500mm depth below GL	19.8	765
Test Pit 10 @ 300-500mm depth below GL	16.5	340
Test Pit 11 @ 2000-2500mm depth below GL	24.1	125

Table 13

7 AS2870 – 2011 SITE CLASSIFICATION FOR THE SITE

Please refer to Appendix G for an explanation of site classification. Calculations of estimation of characteristic surface movement predicted from soil shrinkage indices using method prescribed in "AS2870:2011 - Residential Slabs and Footings" suggest that the following surface movement, at the site, resulting from the soils response to atmospheric moisture, may be expected. Any existing or nearby trees influence the surface movement. Test Pits where the soil profile contains less than 15% silt and no reactive clay fraction may be classed as "A". No material was encountered which contained heavy clay. The surface movement and site classification in accordance with AS2870-2011 are provided in Table 14.

Test Pit No.	Expected Surface Movement (mm)*	Site Classification in Accordance with AS2870:2011
TP1	0mm	A
TP2	0mm	A
TP3	0mm	A
TP4	0-20mm	S
TP5	0-20mm	S
TP6	0mm	A
TP7	0-20mm	S
TP8	0-20mm	S
TP9	0mm	A
TP10	0-20mm	S
TP11	0-20mm	S

* Estimation of the characteristic surface movement completed in accordance with AS2870:2011.

Table 14: Site Classification

Results indicate the site classification is either class "S" or "A", both classifications indicating stable sites with low soil reactivity to moisture.

8 SOIL ELECTRICAL RESISTIVITY TESTING

The locations of the soil electrical resistivity tests conducted at the site is shown marked on Figure 5 in Appendix A. FCE have completed the testing in accordance with the requirements of "AS1768:2021 Lightning Protection". The standard test method for field measurement of soil resistivity using the

Wenner Four-Electrode Method was used. Electrode spacing was 0.5, 1, 2, 3, 4, 5, 10, 15, 20, 30. The arrangement of electrodes used to carry out the testing is shown below in Figure 1 below. At the test location, resistivity testing was completed in two directions.

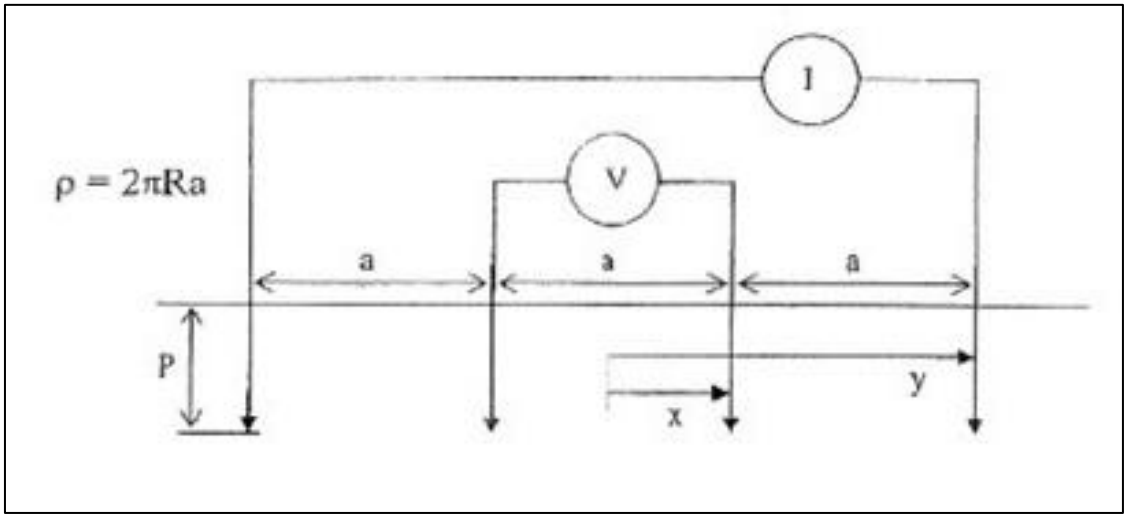

Figure 1.

“AEMC 6471 – Digital Ground Resistance and Soil Resistivity Tester” was used to complete the testing. A photograph of the resistivity tester and its Calibration Certificate is provided in Appendix E.

Please refer to Appendix G for background information and explanation of earth resistivity testing, factors which affect earth resistivity and descriptions of methods to increase earth resistance. The results of soil electrical resistivity testing are provided in Appendix D.

9 SOIL COMPACTION & SUITABLE COMPACTION MEASUREMENT TECHNIQUES

Please refer to Appendix H for an explanation of Perth Sand Penetrometer (PSP) testing and the limitations of the PSP test. No materials were encountered on site which are suitable for accurate PSP measurement in accordance with AS1289.6.3.3. The materials contain too much silt and/or contain a reactive clay fraction and/or contain particles greater than 2mm diameter. The PSP **cannot** be used on any native material in accordance with the Australian Standard test method AS1289.6.3.3 for using the PSP instrument. Measurement of soil compaction should be undertaken by a NATA accredited soils laboratory using a nuclear densometer to Australian Standard 1289 5.8.1 “Soil compaction and density tests using nuclear density gauge”.

10 ACID SULFATE SOILS (ASS) & VISUAL IDENTIFICATION OF ASBESTOS, HYDROCARBON & UNCONTROLLED FILL

Please refer to Appendix H for an explanation of acid sulfate soils. The ASS Risk Mapping suggests that the site is not considered to present an ASS risk. The geology and soil types found during the investigation at the site are consistent with low ASS risk. The soils at the site are below threshold levels which the Department of Environment require the development of an acid sulfate management plan. The economic activities supported at the site do not appear to have ever included any commercial activities associated with the manufacture or handling of asbestos cement products. No surface or buried asbestos or hydrocarbon contamination was observed during the investigation. No uncontrolled fill materials were observed.

11 BEARING CAPACITY AND SETTLEMENT

Bearing capacity and settlement assessment for lightly loaded structures founded on shallow pad or strip footings, founded directly on the site materials, have considered footing widths of between 0.3m and 1m and a typical founding depth of 0.5m below final formation level.

For the range of footing dimensions considered, a maximum allowable bearing pressure of 125kPa is recommended for dry compacted soils which have been constructed in accordance with the recommendations provided in this report. This recommendation is based on a Factor of Safety of 3 against bearing capacity failure. Total and differential settlements under the recommended maximum bearing pressures would generally be anticipated to be less than 20mm and 10mm, respectively. Soil layers observed within the range of influence of shallow footings are considered to be essentially free draining, such that settlements would be expected to be immediate, occurring during construction.

It should be noted that the recommended maximum bearing pressures presented make no allowance for any simultaneous horizontal load or vertical load eccentricity as the presence of either may have a reducing effect on the maximum bearing pressure recommendations. The design of site drainage to ensure that foundation soils are kept dry will be important to achieving the stipulated bearing pressures.

12 SITE MATERIAL FOR USE AS SUBGRADE, BASECOURSE AND STRUCTURAL FILL MATERIAL

12.1 *Suitability of Site Materials as Structural Fill*

Structural fill material is preferred which is non-plastic, does not contain material greater than 2mm diameter and does not contain more than 15% passing the 75-micron sieve. The grey or cream sand with silt material in most test pits will make suitable structural fill material. The clayey material will not be preferred structural fill material.

12.2 *Suitability of Site Materials as Subgrade*

As explained in *California Bearing Ratio (SCBR) Test* section above, all site materials will make suitable subgrade. The soil samples meet the City of Greater Geraldton's (CGG) requirements for subgrade (which is a soaked CBR exceeding 7 and a PI less than 15%).

12.3 *Suitability of Site Materials as Basecourse*

No materials were tested on site which meet the minimum requirements of Main Roads Western Australia (MRWA) for basecourse material. Main Roads Specification 501 "PAVEMENTS" stipulates that for gravel basecourse, designed for 20yr traffic, the material should meet the following minimum requirements:

1. Liquid Limit (LL) shall not exceed 25%
2. Linear Shrinkage (LS) shall not exceed 2%.
3. Soaked CBR shall not be less than 80%.

It is suspected that the material in the bottom of TP10 and TP11 will be close to suitable material for a basecourse. However, it is not Hancock's intention to use these areas which are within the building area as borrow pits. Observations of nearby terrain further west suggests that suitable gravel material can be sourced from an existing pit. If Hancock drop off borrow pit samples to FCE we will arrange testing and determine how suitable the gravel is to use as basecourse material. Its possible that the sites gravel requirements could be met from pits on site.

13 RECOMMENDED COMPACTION METHOD

Compaction of native sand with silt site materials will be most effectively achieved by conditioning the materials to optimum before compacting. The mandatory use of large 20t flat drum vibe rollers for initial compaction should be considered. Flat drum rollers are more efficient in achieving density in non-cohesive or sandy soil types.

Should cut/fill design levels expose the clayey material (at depth) on site, the use of a large 20t pad foot roller on vibe is suggested for initial compaction. Pad foot rollers are more efficient in achieving density in cohesive soil types.

It is suggested from the outset of construction that trials are completed to determine the most effective way to achieve compaction. FCE would be pleased to assist with these trials if requested.

14 SOIL EXCAVATION CHARACTERISTICS AND CUT AND FILL SLOPE STABILITY CRITERIA

The angle of repose of the site materials 38° to 41°. Temporary excavation up to 1 m depth can be conducted with a maximum dry slope angle of 1V: 3H. Bench has to be created if excavation is deeper than 1m. Cut and fill batters above groundwater table will be generally stable at 1V: 3H in soils and at an angle of 1V:1.5H in rock to prevent collapse of trench walls. Fill slopes should not be steeper than 1V:3H. It is expected that a small excavator will be able to excavate the sand at the site.

15 EROSION AND SEDIMENT CONTROL

The soils at the site will be susceptible to scouring from medium to high velocity overland water flow or strong winds. The materials contain fine particles which are easily transported by water and wind movement. To avoid scouring, embankments receiving flow from significant catchments, should be stone pitched or otherwise armoured. Provision to stop airborne silt and sand shall be taken during windy periods during construction by water suppression, until the sandy soils in the work area can be stabilised with by either capping with stable soils or seeding with ground cover.

16 SUITABLE RETAINING OPTIONS

Earth retaining systems shall be designed in accordance with “AS4678-2002 Earth-retaining structures.” Any conventional form of retaining system designed in accordance with AS4678-2002 will be suitable at the site and will perform well. FCE would be please to supply certified retaining options if requested. The suggested design parameters for temporary and permanent retaining wall design for the site soils are provided in Table 15 below.

Parameters	Native Sand with Silt
Backfill Material Loose Bulk Density	1.68 t/m^3
Backfill Material Compacted Density	1.98 t/m^3
Compacted Soil Angle of Internal Friction	38 degrees
Drained Cohesion Cu	7 kPa
Compacted Soil K_a Active Pressure Coefficient	0.24
Compacted Soil K_p Passive Pressure Coefficient	4.2

Table 15: Retaining Wall Design Parameters.

17 WIND CLASSIFICATION

In accordance with “AS/NZS 1170.2-2021 Structural design actions - Wind actions” the site is classified as:

- Cyclonic Region B2
- Terrain Category 2

In accordance with “AS 4055-2021 Wind loads for housing” and “NCC 2022 – ABCB Housing Provisions – Schedule 11 Western Australia – WA Part 2.3.5 Table 2.3.5” the site is classified as:

- Topographic Class T0
- Non-shielded
- Wind Class C2

18 EARTHQUAKE

In accordance with “AS 1170.4-2024 Structural design actions - Earthquake actions in Australia” the design seismic hazard factor for a 1 in 500-year earthquake event in the project area is 0.09. The Subsoil class of Ce may be assumed.

19 EARTHWORKS FOR ROADS AND HARDSTAND

Please refer to Appendix F for the recommended procedure to complete earthworks for roadworks and hardstands.

20 EARTHWORKS FOR BUILDINGS

Please refer to Appendix G for the recommended procedure to complete earthworks for buildings.

21 RECOMMENDATIONS FOR THE CONSTRUCTION AND MAINTENANCE OF SITE DRAINAGE

The sandy soils at the site are expected to drain quite well. AS2870-2011 recognises that the economical residential building designs provided by the Standard based on the site classification will avoid significant damage only if the soil moisture content of the foundation material under the building is stable for the design life of the building. For all sites (sites with reactive soils) drainage and soil moisture conditions around the building need to be managed to avoid abnormal moisture conditions. Normal moisture conditions are those caused by seasonal and regular climatic effects, effects of building and normal garden conditions. Abnormal moisture conditions result from construction which fail to detail or construct drainage in accordance with the following recommendations:

1. Removal of an existing building or structure likely to have significantly modified the soil moisture conditions under the footprint of the proposed building.
2. The effects of a large sump which holds water on an adjacent site.
3. The effect of trees too close to a footing.
4. Excessive or irregular watering of gardens adjacent to the buildings.
5. Discharge of site drainage alongside buildings.
6. Failure to maintain site drainage.
7. Failure to repair plumbing leaks promptly.

8. Loss of vegetation from near the building.

Surface drainage shall be designed and constructed to avoid water ponding against or near the building's footings. The ground in the immediate vicinity of the perimeter footing, including the ground uphill from the slab on cut and fill sites, shall be graded to fall 100 mm minimum away from the footing over a distance of 2m and shaped to prevent ponding of water. Where filling is placed adjacent to the building, the filling shall be compacted and graded to ensure drainage of water away from the building. Any paving shall also be suitably sloped away from the building. The requirements of AS2870 Clause 5.2.2 shall be applied to reduce the possibility of surface water entering indoor areas. It is recommended that the developer be familiar with the foundation performance and maintenance recommendations set out in Appendix B AS2870-2011 & CSIRO publication "Foundation Maintenance and Footing Performance: A Homeowner's Guide ". These documents provide important information on the implications of plumbing, property maintenance, drainage, and the structural performance expectations of buildings.

22 EMBANKMENTS

The angle of repose of the site materials 38° to 41°. Cut and fill batters above groundwater table will be generally stable at 1V: 3H in soils and at an angle of 1V:1.5H in rock to prevent collapse of trench walls. Fill slopes should not be steeper than 1V:3H.

23 POND RETENTION BUND STABILITY

Pond walls will be stable at 1V: 3H in the sandy soils.

SCOPE & LIMITS OF GEOTECHNICAL INVESTIGATION

This report presents the results of a geotechnical investigation prepared for the purpose of this commission. The data and advice provided herein relate only to the project and structures described herein. The advice tendered in this report is based on information obtained from the investigation locations tests points and sample points and is not warranted in respect to the conditions that may be encountered across the site at other than these locations. It is emphasised that the actual characteristics of the subsurface materials may vary significantly between adjacent test points and sample intervals and at allocations other than where observations, explorations and investigations have been made. Subsurface conditions, including groundwater levels and contaminant concentrations can change in a limited time. This should be borne in mind when assessing the data.

It should be noted that because of the inherent uncertainties in subsurface evaluations, changed or unanticipated subsurface conditions may occur that could affect total project cost and/or execution. FCE does not accept responsibility for the consequences of significant variances in the conditions and the requirements for execution of the work.

Should you have any queries please do not hesitate to contact Mr Lester Smith of this office on (08) 9964 5459.

Yours faithfully

Lester Smith
Engineering Manager
Attachment: Appendix A to H.

Appendix A: Site & Test Pit Locality Plan

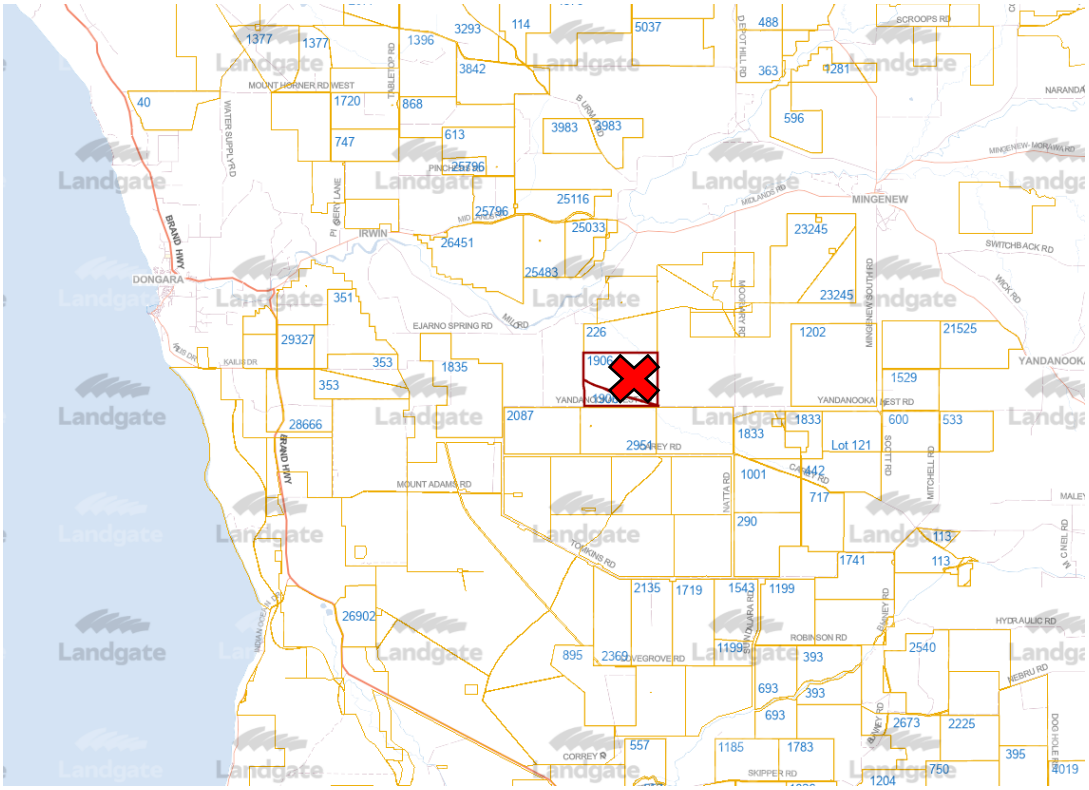

Figure 1: Site location

Figure 2: Site location.

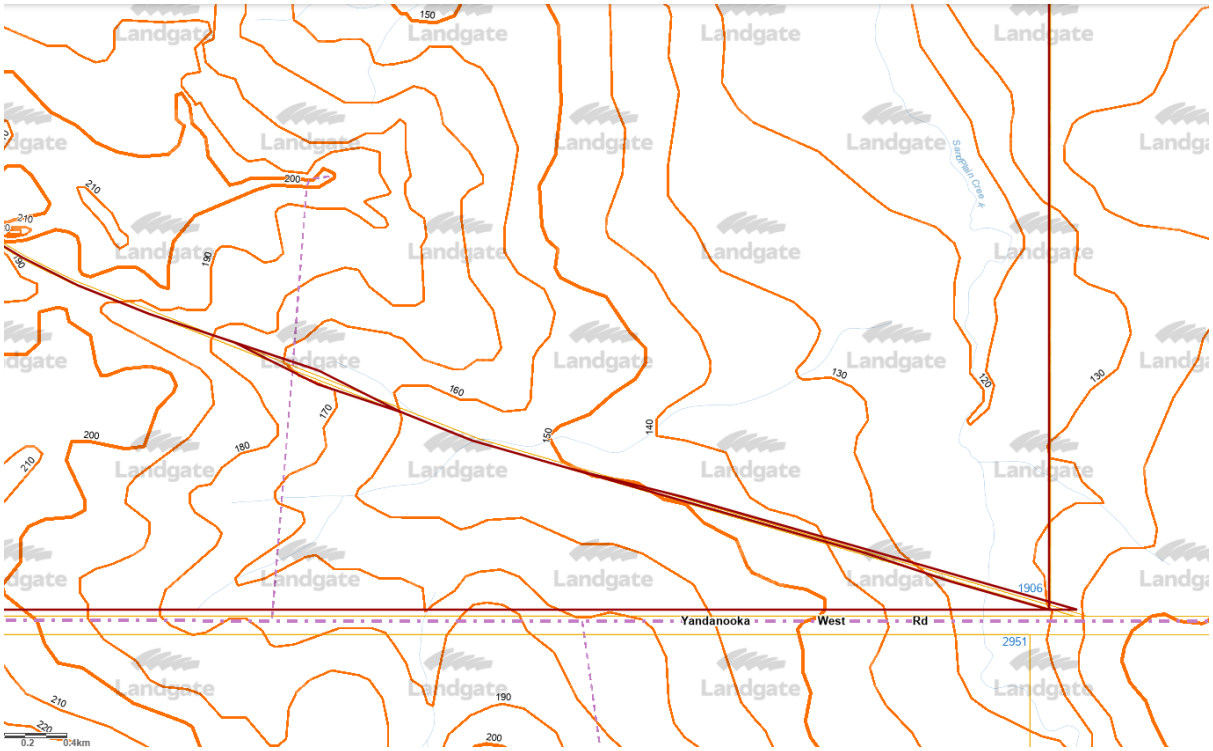

Figure 3: Site topography.

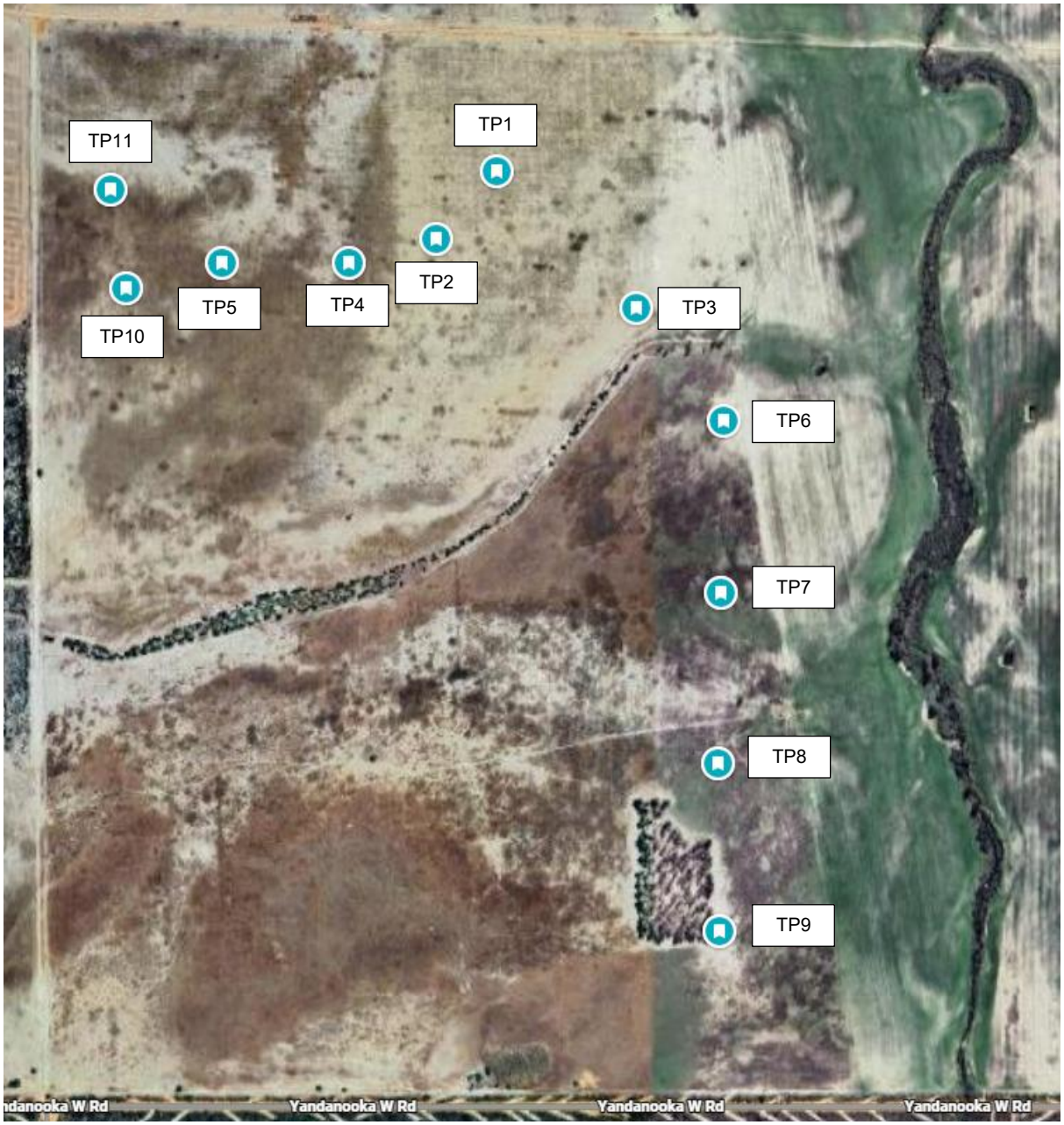

Figure 4: Test pit locations.

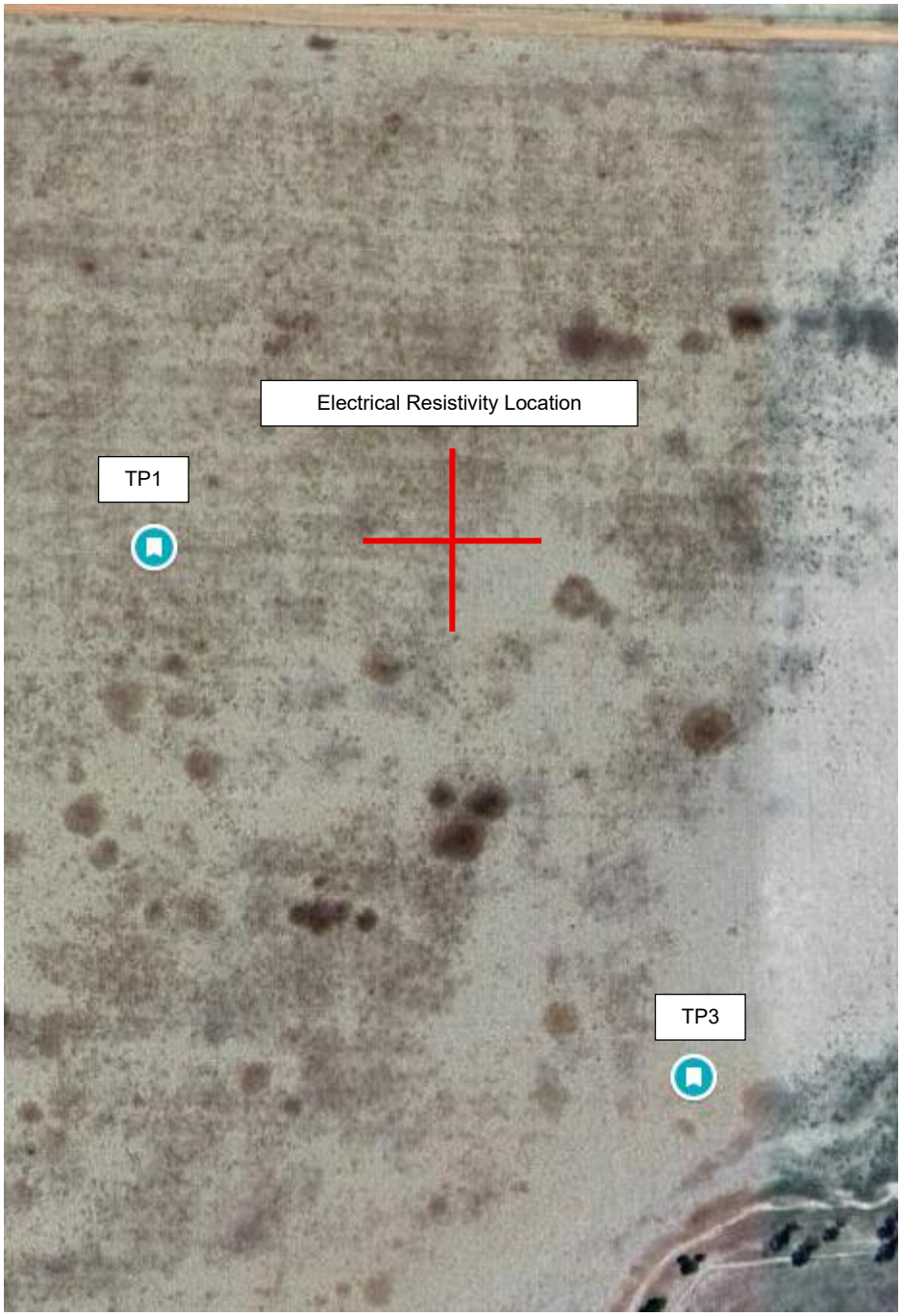

Figure 5: Electrical resistivity testing location.

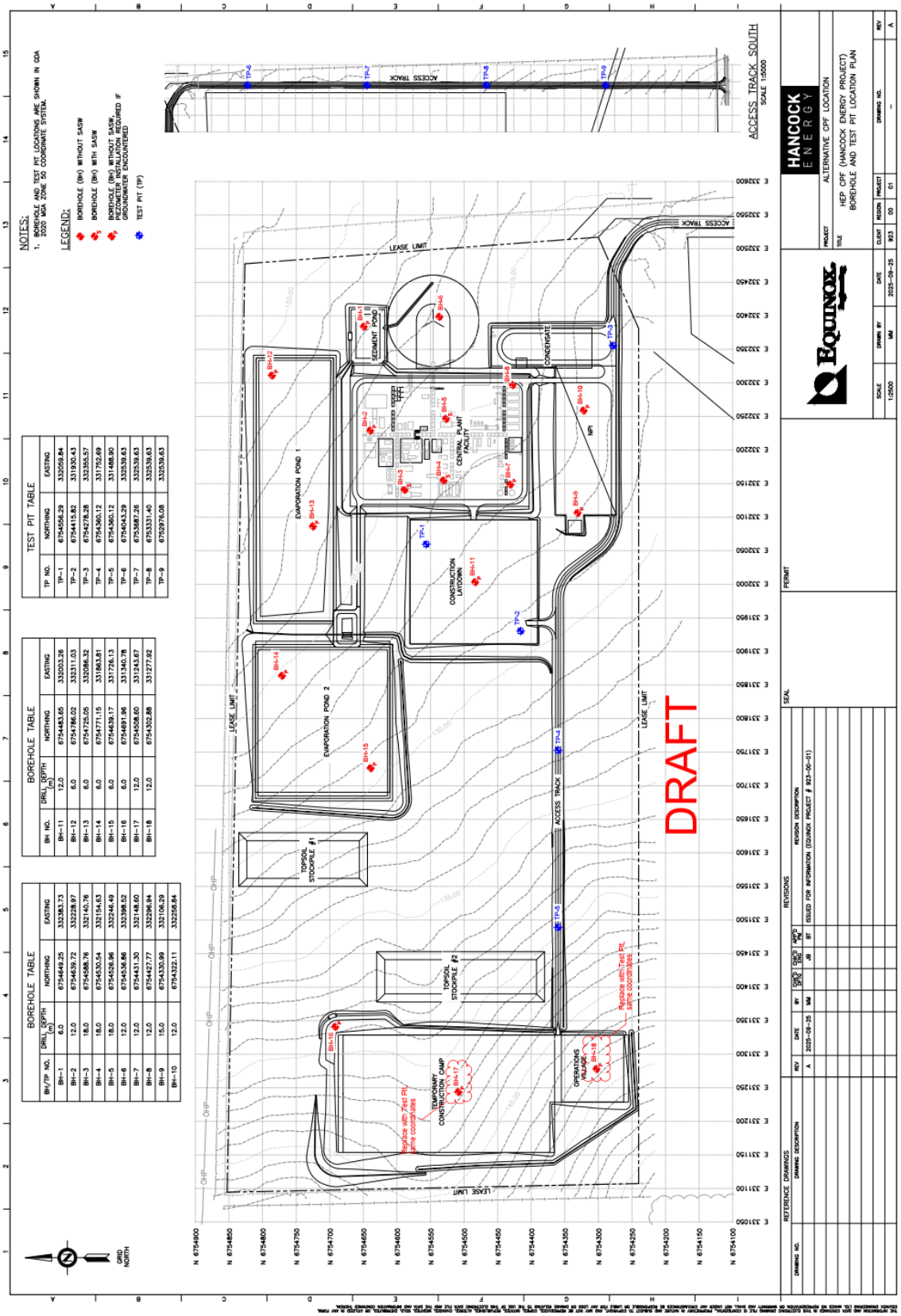

Figure 6: Site plan.

Appendix B: Photographs of site.

Figure 1: Soil profile of Test Pit 1.

Figure 2: Material excavated from Test Pit 1.

Figure 3: Soil profile of Test Pit 2 after cave in.

Figure 4: Material excavated from Test Pit 2.

Figure 5: Soil profile of Test Pit 3.

Figure 6: Material excavated from Test Pit 3.

Figure 7: Soil profile of Test Pit 4.

Figure 8: Material excavated from Test Pit 4.

Figure 9: Soil profile of Test Pit 5.

Figure 10: Material excavated from Test Pit 5.

Figure 11: Soil profile of Test Pit 6.

Figure 12: Material excavated from Test Pit 6.

Figure 13: Soil profile of Test Pit 7.

Figure 14: Material excavated from Test Pit 7.

Figure 15: Soil profile of Test Pit 8.

Figure 16: Material excavated from Test Pit 8.

Figure 17: Soil profile of Test Pit 9.

Figure 18: Material excavated from Test Pit 9.

Figure 19: Soil profile of Test Pit 10.

Figure 20: Material excavated from Test Pit 10.

Figure 21: Soil profile of Test Pit 11.

Figure 22: Material excavated from Test Pit 11.

Appendix C: Soil Test Certificates.

25BME4118 Test Pit 1 @ 300-500mm

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PO Box 1018 Geraldton WA 6531
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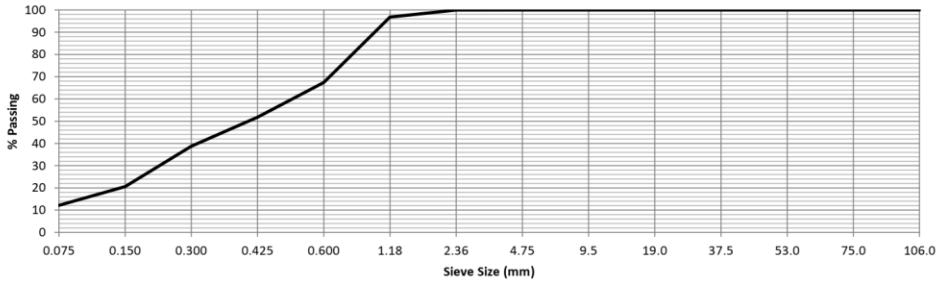
PHONE: (08) 9921 1878
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4118**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4118
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 1, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	97
0.600	67
0.425	52
0.300	39
0.150	21
0.075	12

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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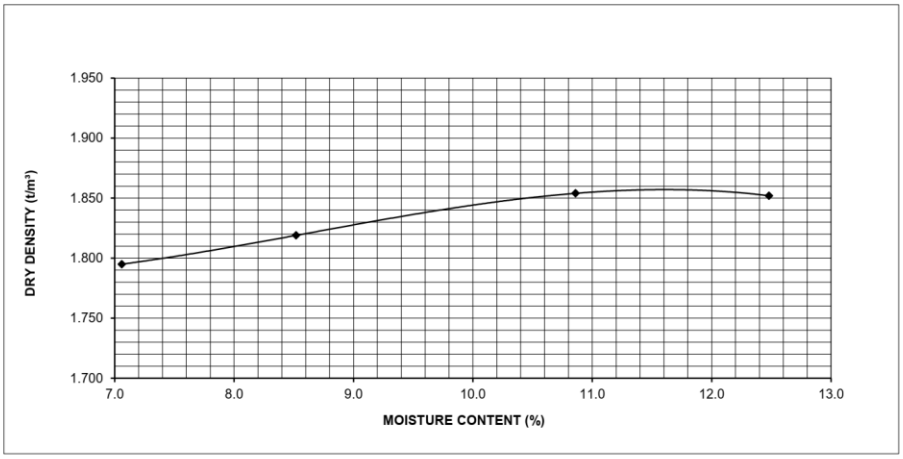
LOCATION:	Test Pit 1, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.86

OPTIMUM MOISTURE CONTENT (%) = 11.5

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 1, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.77
Specimen after Soaking (t/m^3)	1.77
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.3
MOISTURE CONTENT	
Specimen at Compaction (%)	11.2
Top 30 mm Layer of Specimen After Penetration (%)	13.8
Remainder of Specimen After Penetration (%)	13.3
MOISTURE RATIO	
Specimen at Compaction (%)	96.0
Top 30 mm Layer of Specimen After Penetration (%)	118.5
Remainder of Specimen After Penetration (%)	114.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.86
OPTIMUM MOISTURE CONTENT (%):	11.5
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**25**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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LOCATION:	Test Pit 1, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4118**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4118
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 1, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index I_{ss} = **Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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MATERIALS CONSULTANTS

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www.matcons.com.au

Material Test Report

Report No: MAT:MC25-02912-S01
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S01
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4118
Field ID	Test Pit 1
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	235	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.77	
Mean Moisture content (%)		17.5	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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25BME4119 Test Pit 2 @ 2000-2200mm

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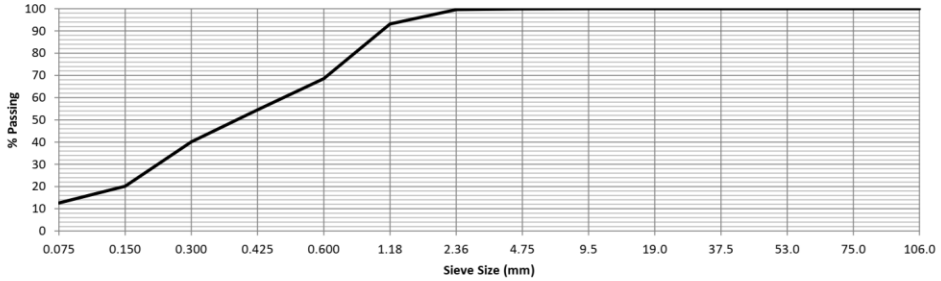
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	93
0.600	69
0.425	54
0.300	40
0.150	20
0.075	13

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.2)	**20**	**%**
Plastic Limit (*3.2.1)	**Non Plastic**	**%**
Plasticity Index (*3.3.2)	**Non Plastic**	**%**
Linear Shrinkage (*3.4.1)	**0.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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Accreditation No 14505.

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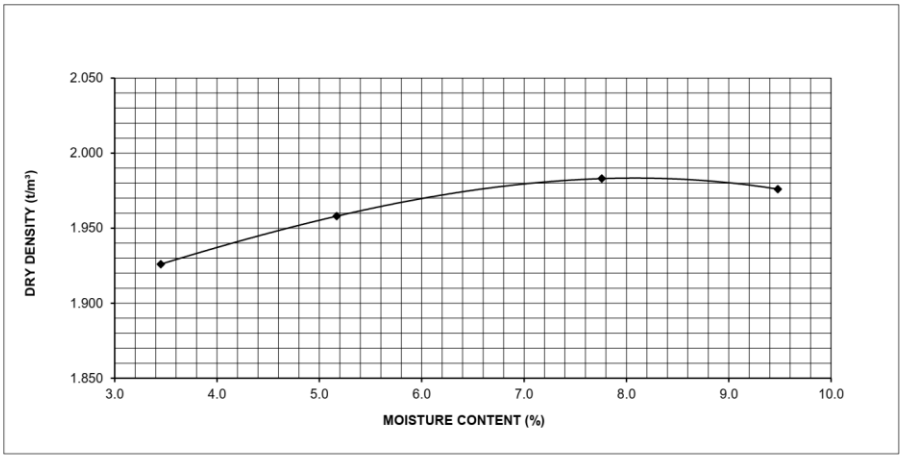
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.98

OPTIMUM MOISTURE CONTENT (%) = 8.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.89
Specimen after Soaking (t/m^3)	1.89
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.2
MOISTURE CONTENT	
Specimen at Compaction (%)	8.0
Top 30 mm Layer of Specimen After Penetration (%)	11.7
Remainder of Specimen After Penetration (%)	11.2
MOISTURE RATIO	
Specimen at Compaction (%)	97.5
Top 30 mm Layer of Specimen After Penetration (%)	143.0
Remainder of Specimen After Penetration (%)	136.5
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.98
OPTIMUM MOISTURE CONTENT (%):	8.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**30**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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Accreditation No 14505.

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CONSTANT HEAD PERMEABILITY

- in accordance with AS 1289.6.7.1 & AS 1289.2.1.1

Compaction Details

Compactive Effort:	**Modified**
Compaction Method:	**AS 1289.5.2.1**
Rammer Mass (kg):	**4.9**
Retained on 9.5 mm Sieve and discarded (%):	**0**
Maximum Dry Density (t/m3):	**1.98**
Optimum Moisture (%):	**8.0**
Desired Dry Density Ratio (%):	**90.0**
Desired Moisture Content Ratio (%):	**100.0**

Specimen Conditions at Compaction

Specimen Dry Density Ratio (%):	**90.1**
Specimen Moisture Content Ratio (%):	**102.8**
Surcharge (kg):	**2.3**
Pressure Applied during test (kPa):	**3**
Hydraulic Gradient:	**2.9**

Coefficient of Permeability (m/s)	**7E-07**
Coefficient of Permeability (m/day)	**6E-02**

Note:
Tested as received. Sample supplied by Flow Consulting Engineers.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

NATA
WORLD RECOGNISED ACCREDITATION

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4119**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4119
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 2, Depth: 2000 - 2200 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Silty Sand	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index I_{ss} = **Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***25/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S02
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S02
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4119
Field ID	Test Pit 2
Sample Location	Depth: 2000-2200mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	315	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.81	
Mean Moisture content (%)		18.4	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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DIRECT SHEAR TEST

REPORT CERTIFICATE

According to AS1289 6.2.2-1998

CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707

PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project

LOCATION:

Sample Id: Penagri – Lefroy Farm / Test Pit 2 / Foundation, Sample No : 25BME4119 , Dep **Lab No.:** 25-MT-7671

Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 17/11/2025

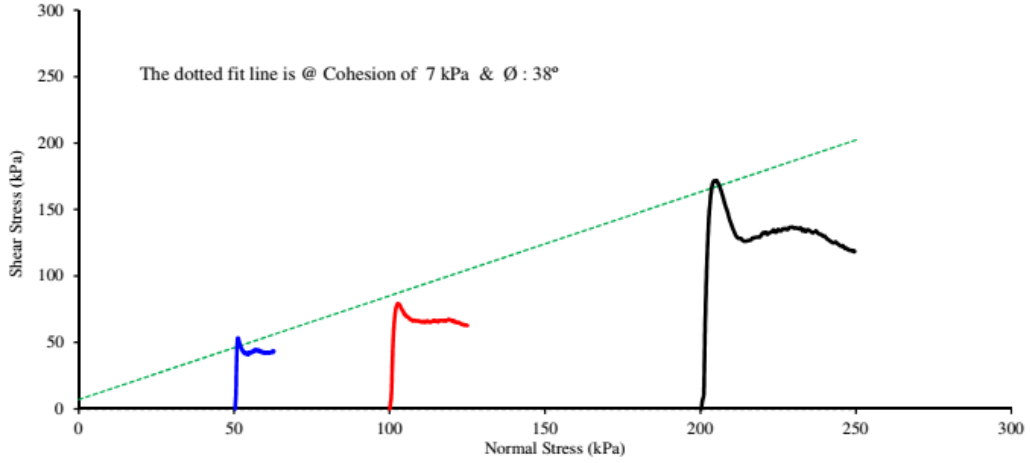
Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	41.8	41.9	41.8
Dry Density (t/m^3):	1.883	1.883	1.883	1.918	1.914	1.920
Moisture Content (%):	8.3	8.3	8.3	11.5	11.9	11.3

Sample Description: Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 101.2%

SHEAR STRESS Vs NORMAL STRESS



SHEAR STAGE DATA

Stage No	Strain Rate (mm/min)	Δ_{sf} (mm)	ε_f (%)	Normal Stress σ_{no} (kPa)	Normal Stress σ_{nf} (kPa)	Shear Stress τ_f (kPa)
1	0.1	0.80	1.26	50	51	53
2	0.1	1.20	1.89	100	103	79
3	0.1	1.20	1.89	200	205	172

PEAK **Cohesion, C** (kPa) : 7 **Friction Angle, Ø** (degrees) : 38

RESIDUAL **Cohesion, C** (kPa) : - **Friction Angle, Ø** (degrees) : -

CONSOLIDATION TEST DATA (σ_n of 25, 50 ,100 kPa used during initial saturation stage)

Stage No	$\Delta\sigma'_3$ (kPa)	c_v (m^2/year)	M_v (m^2/MN)	k (m/sec)	Drainage Condition
1	25	-	-	-	Both Ends
2	50	-	-	-	Both Ends
3	100	-	-	-	Both Ends

Note: Sampled by Client

Authorised Signatory : _____ (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7671 / Z614B

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DIRECT SHEAR TEST
REPORT CERTIFICATE

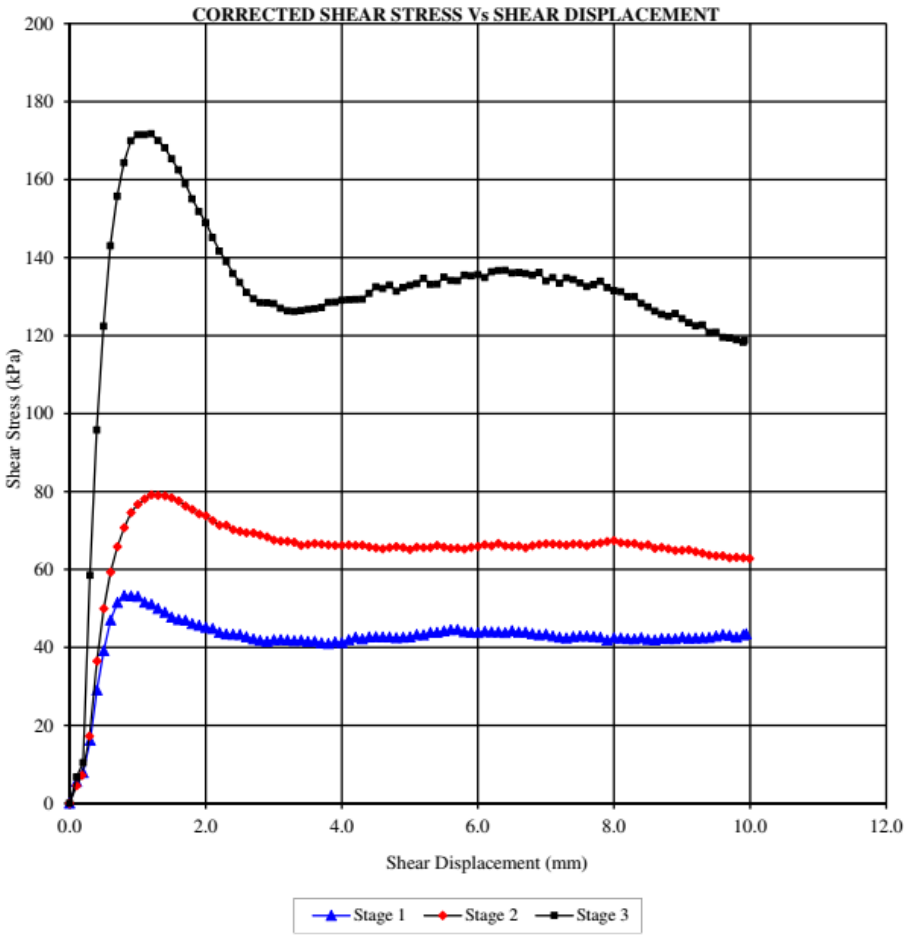
CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 2 / Foundation, Sample No : 25BME4119 **Lab No.:** 25-MT-7671
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 17/11/2025

Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	41.8	41.9	41.8
Dry Density (t/m³):	1.883	1.883	1.883	1.918	1.914	1.920
Moisture Content (%):	8.3	8.3	8.3	11.5	11.9	11.3

Sample Description: Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 101.2%



Authorised Signatory : _____ (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7671 / Z614B

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DIRECT SHEAR TEST
REPORT CERTIFICATE

CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 2 / Foundation, Sample No : 25BME4119 **Lab No.:** 25-MT-7671
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 17/11/2025

Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	41.8	41.9	41.8
Dry Density (t/m³):	1.883	1.883	1.883	1.918	1.914	1.920
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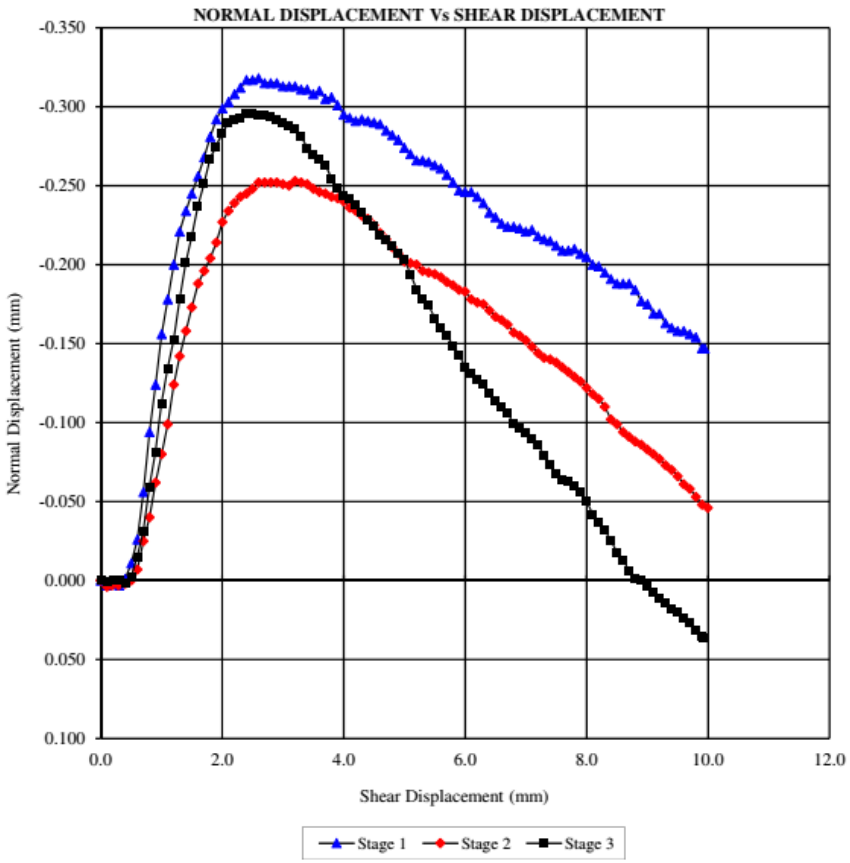
Sample Description: Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 101.2%



Authorised Signatory : _____ (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7671 / Z614B

ilac-MRA NATA
Accreditation No. 2418
Accredited for compliance with ISO/IEC 17025 - Testing

Site No. 2411
Client Address: PO Box 1018 Geraldton WA 6531

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All results relate only to items tested and if applicable sampled.

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ABN: 44 000 964 278

DIRECT SHEAR TEST
REPORT CERTIFICATE

CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 2 / Foundation, Sample No : 25BME4119 , **Lab No.:** 25-MT-7671
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 17/11/2025

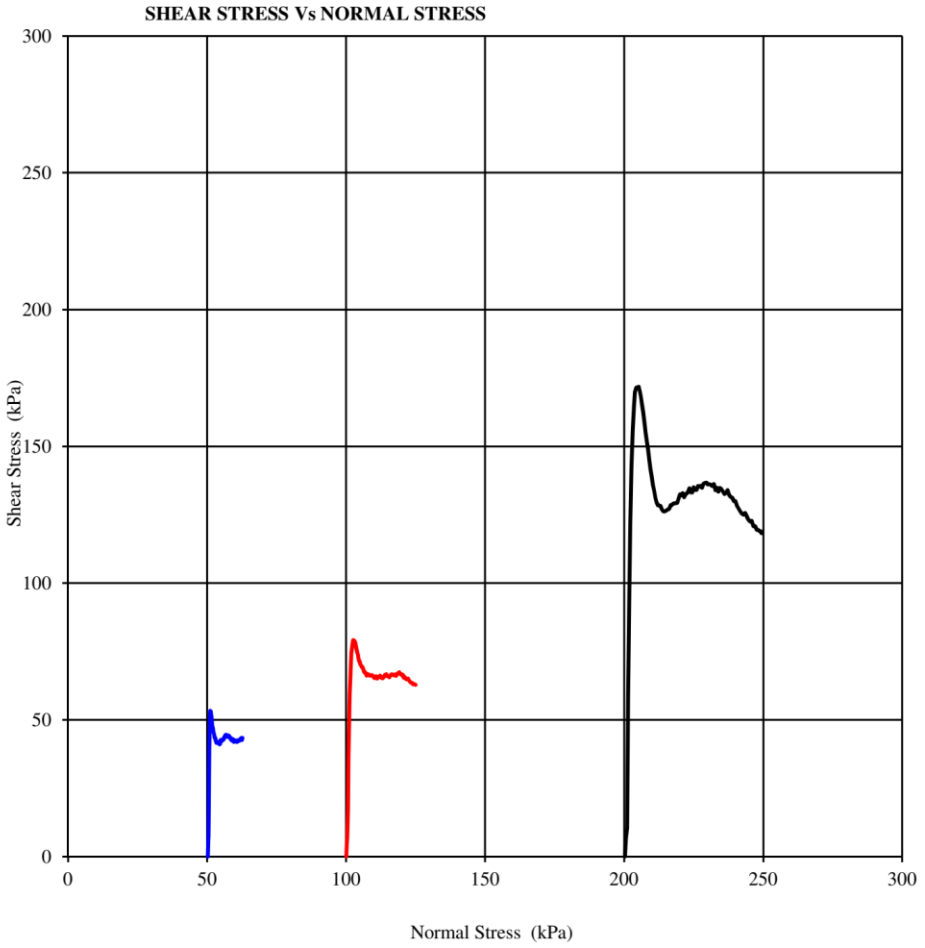
Specimen Details:

	Placement			Final		
Thickness (mm):	42.0	42.0	42.0	41.8	41.9	41.8
Dry Density (t/m^3):	1.883	1.883	1.883	1.918	1.914	1.920
Moisture Content (%):	8.3	8.3	8.3	11.5	11.9	11.3

Sample Description:
Sand

Shear Box Details:
Circular (63.6 mm) box

Sampling Details : 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 101.2%



Authorised Signatory : _____ (Tyler Lakin **Date :** 27/11/25

25BME4120 Test Pit 3 @ 300-500mm

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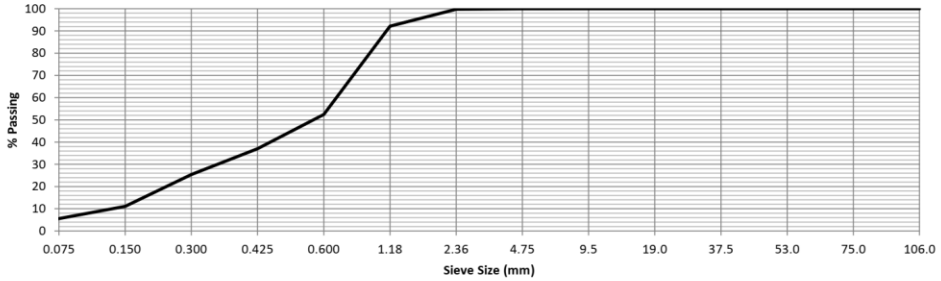
PHONE: (08) 9921 1878
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4120**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4120
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 3, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	92
0.600	52
0.425	37
0.300	25
0.150	11
0.075	6

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)
SP-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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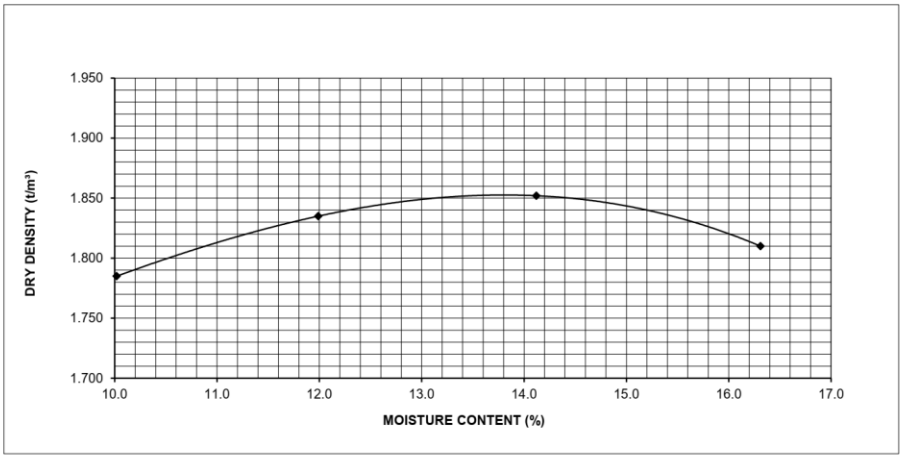
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4120**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4120
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 3, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.85

OPTIMUM MOISTURE CONTENT (%) = 14.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4120**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4120
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 3, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.76
Specimen after Soaking (t/m^3)	1.77
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.4
MOISTURE CONTENT	
Specimen at Compaction (%)	13.5
Top 30 mm Layer of Specimen After Penetration (%)	14.2
Remainder of Specimen After Penetration (%)	13.7
MOISTURE RATIO	
Specimen at Compaction (%)	97.0
Top 30 mm Layer of Specimen After Penetration (%)	102.0
Remainder of Specimen After Penetration (%)	99.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.85
OPTIMUM MOISTURE CONTENT (%):	14.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**30**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4120**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4120
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 3, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4120**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4120
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 3, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index I_{ss} = **Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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MATERIALS CONSULTANTS

300 Collier Road, Bassendean, WA 6054
PO Box 3090, Bassendean DC, WA 6942
Telephone: 08 6278 3755
Email:admin@matcons.com.au
www.matcons.com.au

Material Test Report

Report No: MAT:MC25-02912-S03
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample ID	MC25-02912-S03
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4120
Field ID	Test Pit 3
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	360	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.84	
Mean Moisture content (%)		17.8	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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25BME4121 Test Pit 4 @ 300-500mm

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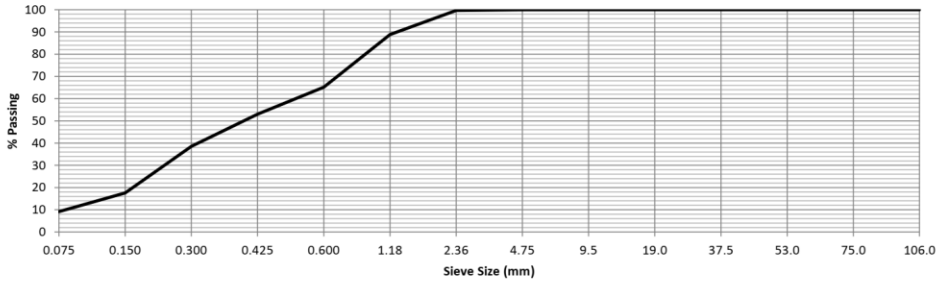
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	89
0.600	65
0.425	53
0.300	39
0.150	18
0.075	9

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.2)	**20**	**%**
Plastic Limit (*3.2.1)	**Non Plastic**	**%**
Plasticity Index (*3.3.2)	**Non Plastic**	**%**
Linear Shrinkage (*3.4.1)	**0.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SW-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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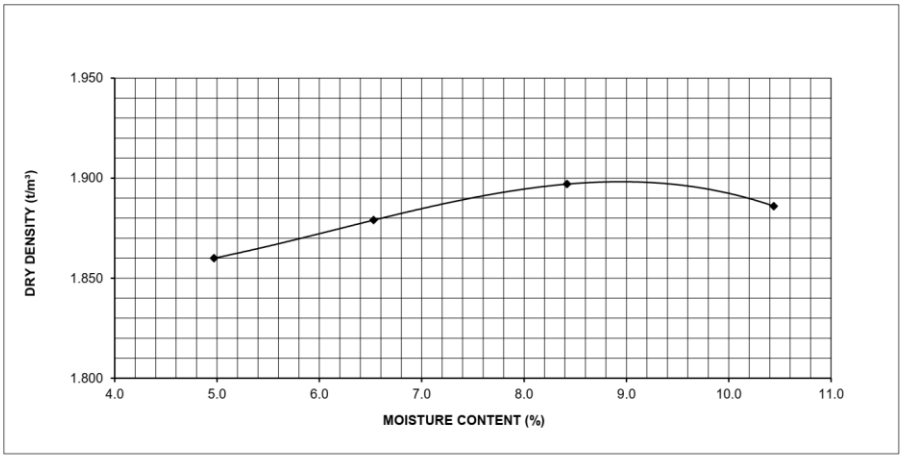
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = **1.90**

OPTIMUM MOISTURE CONTENT (%) = **9.0**

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	10
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.80
Specimen after Soaking (t/m^3)	1.80
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	94.9
MOISTURE CONTENT	
Specimen at Compaction (%)	9.0
Top 30 mm Layer of Specimen After Penetration (%)	13.9
Remainder of Specimen After Penetration (%)	13.5
MOISTURE RATIO	
Specimen at Compaction (%)	100.5
Top 30 mm Layer of Specimen After Penetration (%)	155.0
Remainder of Specimen After Penetration (%)	150.5
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.90
OPTIMUM MOISTURE CONTENT (%):	9.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**25**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

ASH CONTENT AND ORGANIC MATERIAL OF PEAT AND OTHER ORGANIC SOILS IN ACCORDANCE WITH ASTM D2974 - METHOD A

Ash Content %	**99.6**
Organic Material %	**0.4**

Notes:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested by: C. Allan / D. Thornborough
Furnace Temperature: 440 °C .
Period of time sample was in the furnace: 2 hours and 0 minutes.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

NATA
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email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4121**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4121
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 4, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index	I_{ss} =	**Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S04
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S04
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4121
Field ID	Test Pit 4
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	365	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.86	
Mean Moisture content (%)		18.3	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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25BME4122 Test Pit 5 @ 300-500mm

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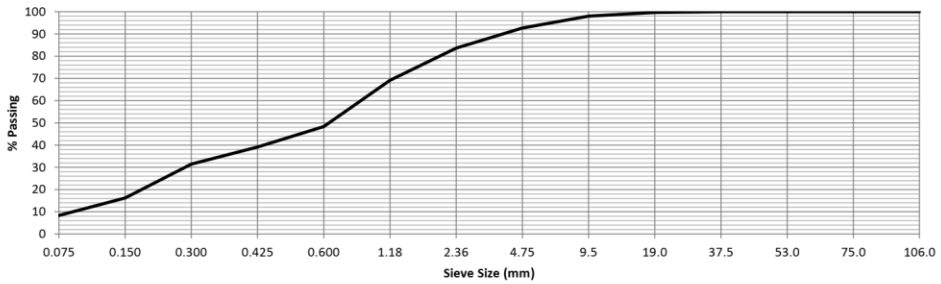
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4122**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4122
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 5, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	98
4.75	93
2.36	84
1.18	69
0.600	48
0.425	39
0.300	31
0.150	16
0.075	8

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.2)	**20**	**%**
Plastic Limit (*3.2.1)	**Non Plastic**	**%**
Plasticity Index (*3.3.2)	**Non Plastic**	**%**
Linear Shrinkage (*3.4.1)	**0.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SW-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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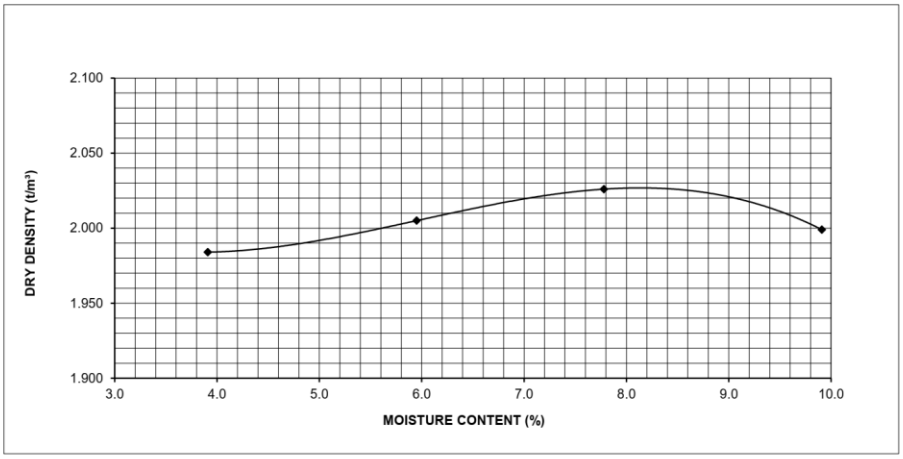
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4122**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4122
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 5, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = **2.03**

OPTIMUM MOISTURE CONTENT (%) = **8.0**

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4122**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4122
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 5, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.93
Specimen after Soaking (t/m^3)	1.93
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.2
MOISTURE CONTENT	
Specimen at Compaction (%)	8.1
Top 30 mm Layer of Specimen After Penetration (%)	11.2
Remainder of Specimen After Penetration (%)	10.7
MOISTURE RATIO	
Specimen at Compaction (%)	98.5
Top 30 mm Layer of Specimen After Penetration (%)	136.0
Remainder of Specimen After Penetration (%)	130.5
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	2.03
OPTIMUM MOISTURE CONTENT (%):	8.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**40**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4122**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4122
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 5, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4122**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4122
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 5, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index	I_{ss} =	**Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S05
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S05
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4122
Field ID	Test Pit 5
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	430	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.94	
Mean Moisture content (%)		15.2	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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25BME4123 Test Pit 6 @ 300-500mm

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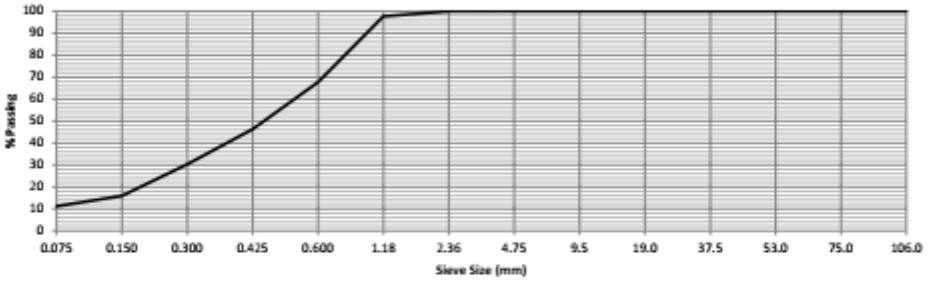
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**26BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	88
0.600	68
0.425	46
0.300	30
0.150	16
0.075	11

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)
SW-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : *24/11/2025*

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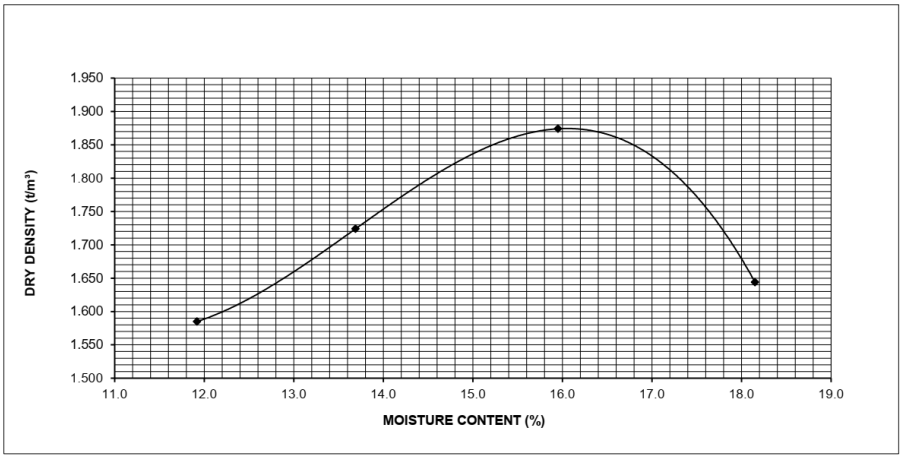
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4123**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = **1.87**

OPTIMUM MOISTURE CONTENT (%) = **16.0**

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4123**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	15
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.78
Specimen after Soaking (t/m^3)	1.78
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	94.9
MOISTURE CONTENT	
Specimen at Compaction (%)	16.2
Top 30 mm Layer of Specimen After Penetration (%)	17.6
Remainder of Specimen After Penetration (%)	17.2
MOISTURE RATIO	
Specimen at Compaction (%)	101.0
Top 30 mm Layer of Specimen After Penetration (%)	109.0
Remainder of Specimen After Penetration (%)	106.5
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.87
OPTIMUM MOISTURE CONTENT (%):	16.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**40**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4123**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Accreditation No 14505.

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email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4123**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

ASH CONTENT AND ORGANIC MATERIAL OF PEAT AND OTHER ORGANIC SOILS IN ACCORDANCE WITH ASTM D2974 - METHOD A

Ash Content %	**99.5**
Organic Material %	**0.5**

Notes:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested by: C. Allan / D. Thornborough
Furnace Temperature: 440 °C .
Period of time sample was in the furnace: 2 hours and 0 minutes.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4123**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4123
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 6, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index	I_{ss} =	**Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S06
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S06
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4123
Field ID	Test Pit 6
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	560	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.77	
Mean Moisture content (%)		19.9	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		13/11/2025	

Comments

N/A

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25BME4124 Test Pit 7 @ 1000-1500mm

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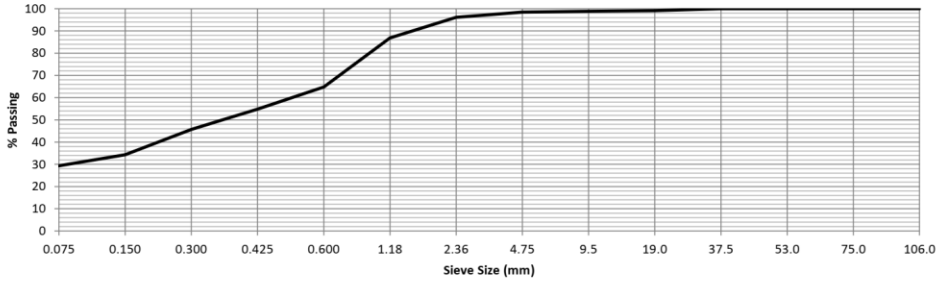
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4124**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4124
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 7, Depth: 1000 - 1500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	99
4.75	98
2.36	96
1.18	87
0.600	65
0.425	55
0.300	46
0.150	34
0.075	29

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.1)	**35**	**%**
Plastic Limit (*3.2.1)	**21**	**%**
Plasticity Index (*3.3.2)	**14**	**%**
Linear Shrinkage (*3.4.1)	**5.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SC

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Accreditation No 14505.

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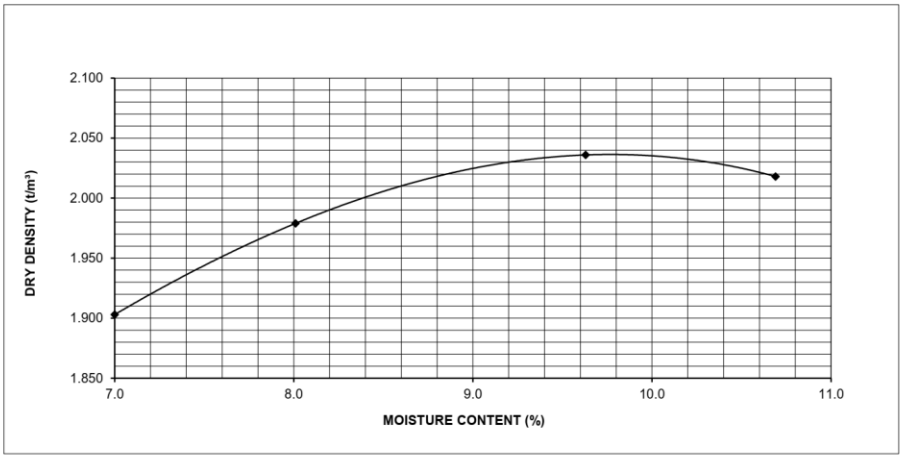
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4124**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4124
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 7, Depth: 1000 - 1500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 2.04

OPTIMUM MOISTURE CONTENT (%) = 10.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
1% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4124**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4124
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 7, Depth: 1000 - 1500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	11
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.94
Specimen after Soaking (t/m^3)	1.94
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.1
MOISTURE CONTENT	
Specimen at Compaction (%)	9.7
Top 30 mm Layer of Specimen After Penetration (%)	12.3
Remainder of Specimen After Penetration (%)	11.9
MOISTURE RATIO	
Specimen at Compaction (%)	98.5
Top 30 mm Layer of Specimen After Penetration (%)	125.5
Remainder of Specimen After Penetration (%)	121.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	2.04
OPTIMUM MOISTURE CONTENT (%):	10.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**20**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
1% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4124**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4124
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 7, Depth: 1000 - 1500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**6**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4124**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4124
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 7, Depth: 1000 - 1500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Clayey Sand minor Gravel	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		Swell Specimen	
Moisture Content - Initial	9.5%	Moisture Content - Initial	9.7%
Extent of Crumbling	N/A	Moisture Content - Final	11.8%
Extent of Cracking	N/A	Significate Inert Inclusions	1%

Shrink - Swell Index I_{SS} = **0.0%** Verticle strain per pF change in total suction

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S07
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S07
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4124
Field ID	Test Pit 7
Sample Location	Depth: 1000-1500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	90	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.62	
Mean Moisture content (%)		21.9	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		14/11/2025	

Comments

N/A

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25BME4125 Test Pit 8 @ 300-500mm

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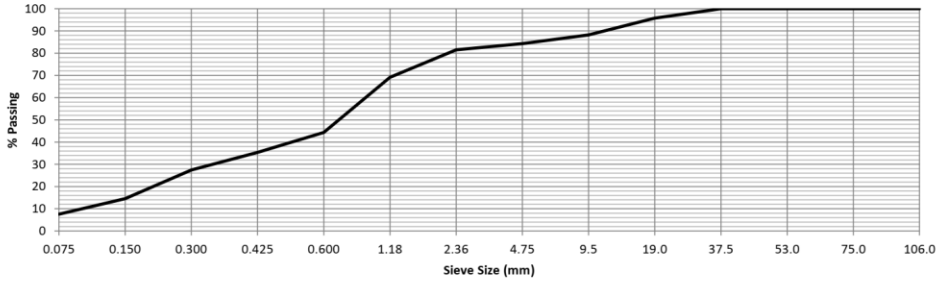
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4125**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4125
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 8, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	96
9.5	88
4.75	84
2.36	82
1.18	69
0.600	44
0.425	35
0.300	27
0.150	15
0.075	8

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.2)	**20**	**%**
Plastic Limit (*3.2.1)	**Non Plastic**	**%**
Plasticity Index (*3.3.2)	**Non Plastic**	**%**
Linear Shrinkage (*3.4.1)	**0.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SW-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

NATA WORLD RECOGNISED ACCREDITATION

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Accreditation No 14505.

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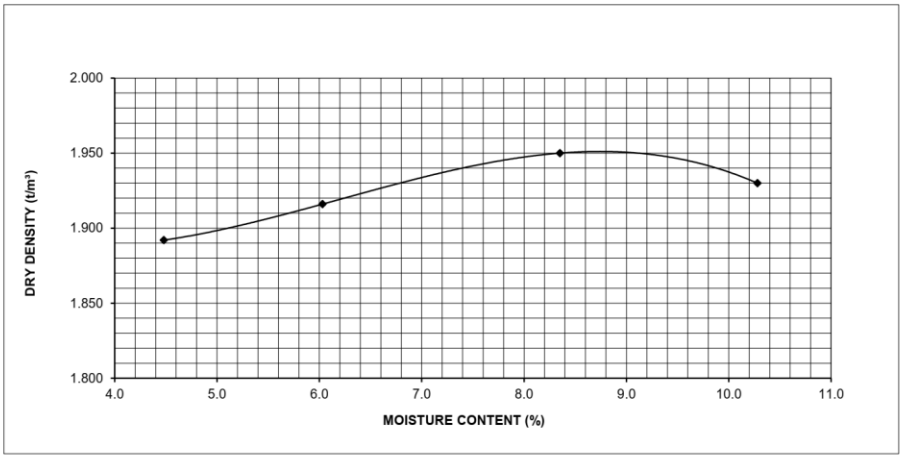
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4125**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4125
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 8, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = **1.95**

OPTIMUM MOISTURE CONTENT (%) = **9.0**

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
4% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4125**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4125
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 8, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.85
Specimen after Soaking (t/m^3)	1.85
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.0
MOISTURE CONTENT	
Specimen at Compaction (%)	8.6
Top 30 mm Layer of Specimen After Penetration (%)	12.7
Remainder of Specimen After Penetration (%)	12.5
MOISTURE RATIO	
Specimen at Compaction (%)	97.5
Top 30 mm Layer of Specimen After Penetration (%)	144.0
Remainder of Specimen After Penetration (%)	142.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.95
OPTIMUM MOISTURE CONTENT (%):	9.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**40**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
4% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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PHONE: (08) 9921 1878
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4125**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4125
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 8, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4125**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4125
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 8, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index I_{ss} = **Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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MATERIALS CONSULTANTS

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Material Test Report

Report No: MAT:MC25-02912-S08
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S08
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4125
Field ID	Test Pit 8
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	235	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.84	
Mean Moisture content (%)		17.3	
Percentage Oversize Retained 2.36mm Sieve (%)		0.2	
Type of Water Used		Distilled	
Date Tested		14/11/2025	

Comments

N/A

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25BME4126 Test Pit 9 @ 300-500mm

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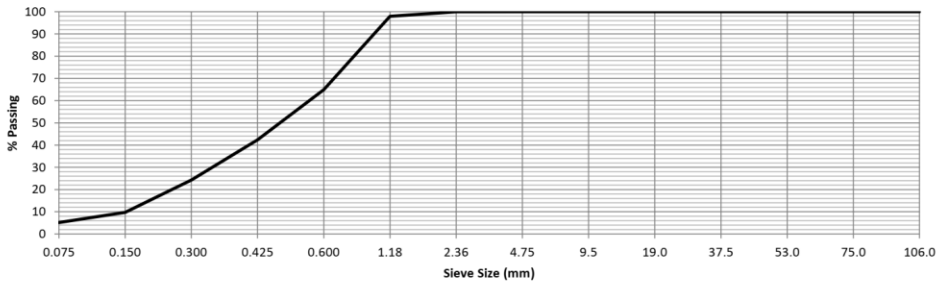
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4126**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4126
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 9, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	100
9.5	100
4.75	100
2.36	100
1.18	98
0.600	65
0.425	42
0.300	24
0.150	10
0.075	5

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)
SP-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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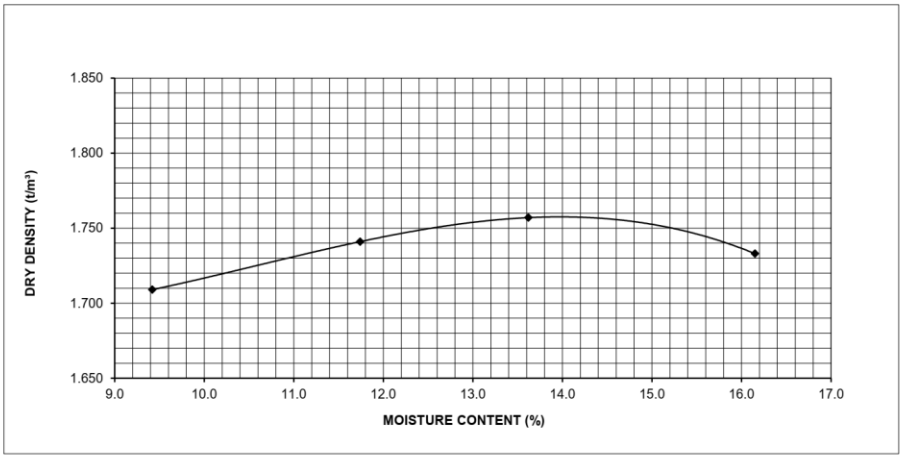
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4126**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4126
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 9, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.76

OPTIMUM MOISTURE CONTENT (%) = 14.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
0% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

NATA WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.
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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4126**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4126
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 9, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.67
Specimen after Soaking (t/m^3)	1.67
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.2
MOISTURE CONTENT	
Specimen at Compaction (%)	13.7
Top 30 mm Layer of Specimen After Penetration (%)	16.5
Remainder of Specimen After Penetration (%)	16.0
MOISTURE RATIO	
Specimen at Compaction (%)	97.0
Top 30 mm Layer of Specimen After Penetration (%)	117.0
Remainder of Specimen After Penetration (%)	113.5
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.76
OPTIMUM MOISTURE CONTENT (%):	14.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	
At 5.0mm penetration:	**19**

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
0% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4126**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4126
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 9, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4126**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4126
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 9, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index	I_{ss} =	**Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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www.matcons.com.au

Material Test Report

Report No: MAT:MC25-02912-S09
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S09
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4126
Field ID	Test Pit 9
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	765	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.77	
Mean Moisture content (%)		19.8	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		14/11/2025	

Comments

N/A

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25BME4127 Test Pit 10 @ 300-500mm

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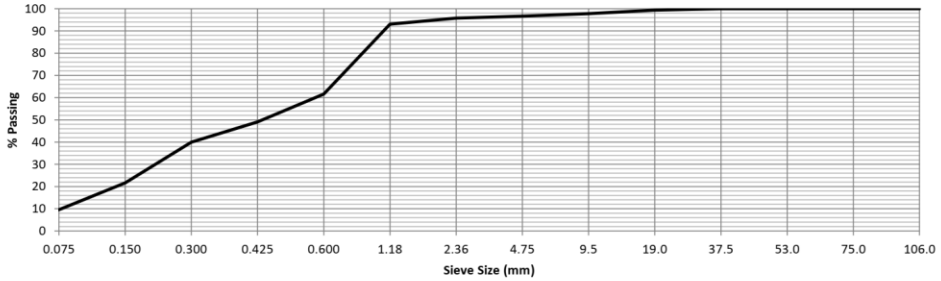
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4127**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4127
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 10, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	99
9.5	98
4.75	97
2.36	96
1.18	93
0.600	62
0.425	49
0.300	40
0.150	22
0.075	10

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.2)	**20**	**%**
Plastic Limit (*3.2.1)	**Non Plastic**	**%**
Plasticity Index (*3.3.2)	**Non Plastic**	**%**
Linear Shrinkage (*3.4.1)	**0.0**	**%**

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SP-SM

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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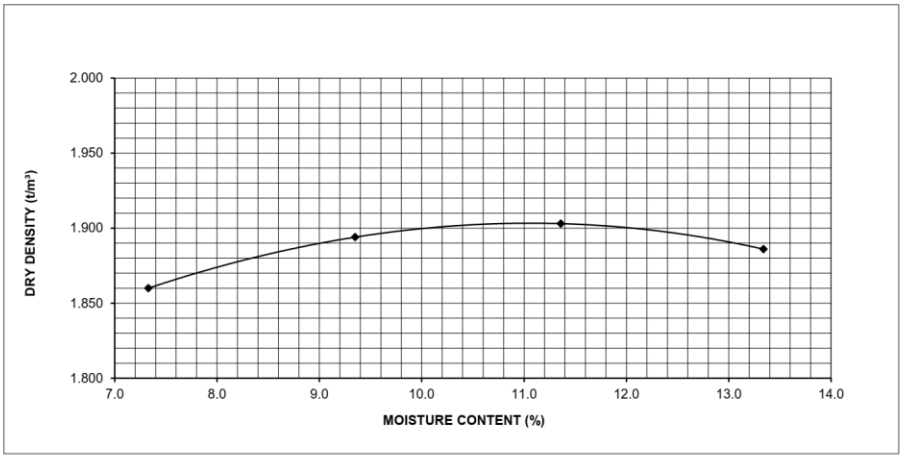
email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4127**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4127
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 10, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 1.90

OPTIMUM MOISTURE CONTENT (%) = 11.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
1% retained on 19.0 mm sieve.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

Accredited for compliance with ISO/IEC 17025 - Testing.
Accreditation No 14505.

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4127**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4127
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 10, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt minor Gravel	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	9
DRY DENSITY	
Specimen at Compaction (t/m^3)	1.81
Specimen after Soaking (t/m^3)	1.81
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.0
Specimen after Soaking (%)	95.3
MOISTURE CONTENT	
Specimen at Compaction (%)	11.3
Top 30 mm Layer of Specimen After Penetration (%)	12.7
Remainder of Specimen After Penetration (%)	12.2
MOISTURE RATIO	
Specimen at Compaction (%)	100.5
Top 30 mm Layer of Specimen After Penetration (%)	113.5
Remainder of Specimen After Penetration (%)	109.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	1.90
OPTIMUM MOISTURE CONTENT (%):	11.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**35**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Tested at clients request if minimum blows per layer is less than 11.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
1% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Accreditation No 14505.

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email: laboratory@blacktopengineering.com.au

TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4127**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4127
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 10, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt minor Gravel	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	28
Emerson Class Number	**3**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4127**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4127
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 10, Depth: 300 - 500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Sand with Silt minor Gravel	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		**Swell Specimen**	
Moisture Content - Initial	**N/A**	**Moisture Content - Initial**	**N/A**
Extent of Crumbling	**N/A**	**Moisture Content - Final**	**N/A**
Extent of Cracking	**N/A**	**Significate Inert Inclusions**	**N/A**

Shrink - Swell Index I_{ss} = **Unobtainable**

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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MATERIALS CONSULTANTS

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Material Test Report

Report No: MAT:MC25-02912-S10
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S10
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4127
Field ID	Test Pit 10
Sample Location	Depth: 300-500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	340	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.86	
Mean Moisture content (%)		16.5	
Percentage Oversize Retained 2.36mm Sieve (%)		0.0	
Type of Water Used		Distilled	
Date Tested		14/11/2025	

Comments

N/A

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25BME4128 Test Pit 11 @ 2000-2500mm

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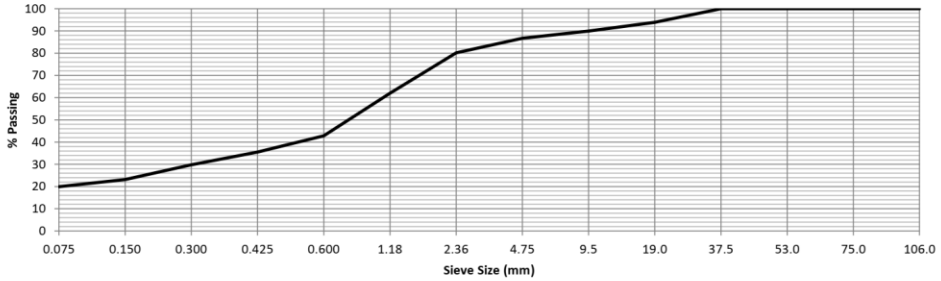
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

SOIL CLASSIFICATION TESTS



PARTICLE SIZE DISTRIBUTION

in accordance with Test Method AS 1289 3.6.1

Sieve Size (mm)	% Passing
106.0	100
75.0	100
53.0	100
37.5	100
19.0	94
9.5	90
4.75	87
2.36	80
1.18	62
0.600	43
0.425	36
0.300	30
0.150	23
0.075	20

ATTERBERG LIMITS

in accordance with Test Method AS 1289*

Liquid Limit (*3.9.1)	32	%
Plastic Limit (*3.2.1)	19	%
Plasticity Index (*3.3.2)	13	%
Linear Shrinkage (*3.4.1)	5.0	%

UNIFIED SOIL CLASSIFICATION

in accordance with AS 1726, Table 9 & 10
(laboratory classification elements only)

SC

Note:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory 111 Anderson St Geraldton WA 6530.
Moisture contents determined by method AS 1289 2.1.1.
Tested as received. Sample supplied by Flow Consulting Engineers.

Particle Size Distribution
No upper and lower grading curve guides provided by client.
Atterberg Limits
Cone penetrometer method. Sample air dried. Preparation dry sieved.
No cracking, crumbling or curling with Linear Shrinkage.

Approved Signatory : _____ D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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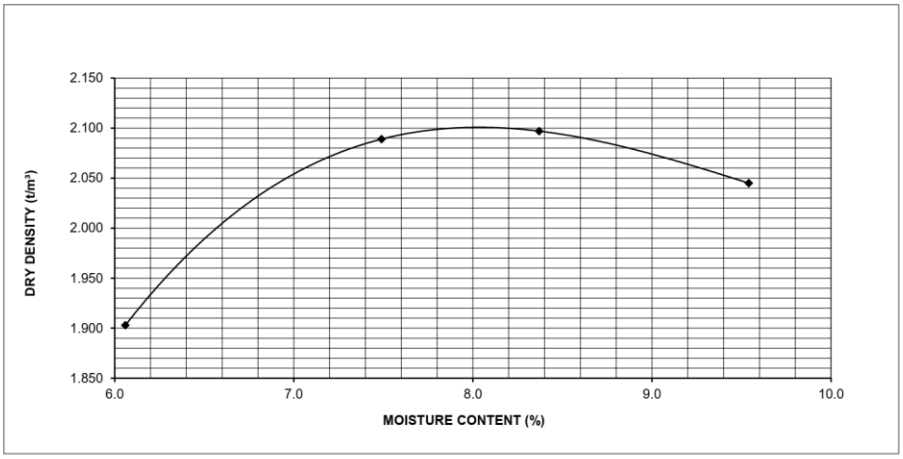
TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

-in accordance with Test Method AS 1289.5.2.1 (Modified Compaction)



MAXIMUM DRY DENSITY (t/m³) = 2.10

OPTIMUM MOISTURE CONTENT (%) = 8.0

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 96 hours.
6% retained on 19.0 mm sieve.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

CALIFORNIA BEARING RATIO

- in accordance with Test Method AS 1289.6.1.1 & AS 1289.2.1.1

COMPACTIVE EFFORT	Modified
Rammer mass (kg):	4.9
Drop Height (mm):	450
No. of layers:	5
No. of blows / layer:	11
DRY DENSITY	
Specimen at Compaction (t/m^3)	2.00
Specimen after Soaking (t/m^3)	2.01
DRY DENSITY RATIO	
Desired Dry Density Ratio (%)	**95.0**
Specimen at Compaction (%)	95.5
Specimen after Soaking (%)	95.5
MOISTURE CONTENT	
Specimen at Compaction (%)	7.7
Top 30 mm Layer of Specimen After Penetration (%)	10.0
Remainder of Specimen After Penetration (%)	9.6
MOISTURE RATIO	
Specimen at Compaction (%)	96.5
Top 30 mm Layer of Specimen After Penetration (%)	125.5
Remainder of Specimen After Penetration (%)	120.0
SURCHARGE (kg):	4.50
CONDITION OF SPECIMEN:	**Soaked 4 days**
SWELL (%):	0.0
MDD DATA (AS1289.5.2.1)	
MAXIMUM DRY DENSITY (t/m^3);	2.10
OPTIMUM MOISTURE CONTENT (%):	8.0
CALIFORNIA BEARING RATIO, (%)	
At 2.5mm penetration:	**30**
At 5.0mm penetration:	

Note:
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530
Tested as received. Sample supplied by Flow Consulting Engineers.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 24 hours.
6% retained on 19.0 mm sieve and excluded from test.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED:**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CONTRACT No.:**	Not Supplied
PROPOSED USE:	Foundation	**CLIENT LOT No:**	Not Supplied
		PURCHASE ORDER No:	Not Supplied
		TEST REQUEST No:	Not Supplied

FALLING HEAD PERMEABILITY

- in accordance with AS 1289.6.7.2 & AS 1289.2.1.1

Compaction Details

Compactive Effort:	**Modified**
Compaction Method:	**AS 1289.5.2.1**
Rammer Mass (kg):	**4.9**
Retained on 9.5 mm Sieve and discarded (%):	**10**
Maximum Dry Density (t/m3):	**2.10**
Optimum Moisture (%):	**8.0**
Desired Dry Density Ratio (%):	**90.0**
Desired Moisture Content Ratio (%):	**100.0**

Specimen Conditions at Compaction

Specimen Dry Density Ratio (%):	**90.0**
Specimen Moisture Content Ratio (%):	**100.0**
Surcharge (kg):	**2.3**
Pressure Applied during test (kPa):	**3**

Coefficient of Permeability (m/s)	**1E-07**
Coefficient of Permeability (m/day)	**1E-02**

Note:
Tested as received. Sample supplied by Flow Consulting Engineers.
Testing performed at Blacktop Materials Engineering Laboratory 111 Anderson St Geraldton WA 6530.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**PURCHASE ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

DETERMINATION OF EMERSON CLASS NUMBER OF A SOIL

AS 1289.3.8.1

Type of Water Used for Testing	Distilled Water
Temperature of Water (°C)	26.2
Emerson Class Number	**6**

Notes:
Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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TEST CERTIFICATE

CLIENT:	Hancock Energy (PBN) Pty Ltd	**CERTIFICATE No.:**	**25BME4128**
ADDRESS:	Level 3, 28-42 Ventnor Avenue, West Perth, WA 6005	**SAMPLE No.:**	25BME4128
PROJECT:	Geotechnical Investigation – Belisama Conventional Gas Project	**DATE SAMPLED**	4/11/2025
LOCATION:	Penagri – Lefroy Farm	**DATE TESTED:**	6-24/11/2025
LOCATION:	Test Pit 11, Depth: 2000 - 2500 mm	**PROJECT No.:**	Not Supplied
DESCRIPTION:	Gravelly Clayey Sand	**CLIENT LOT No:**	Not Supplied
COURSE / LAYER:	Foundation	**CLIENT ORDER No:**	Not Supplied
		TEST REQUEST No:	Not Supplied

Determination of the Shrinkage Index of a Soil / Shrink - Swell Index

in accordance with test method AS 1289.7.1.1 - (Remoulded)

Shrinkage Specimen		Swell Specimen	
Moisture Content - Initial	7.9%	Moisture Content - Initial	8.0%
Extent of Crumbling	N/A	Moisture Content - Final	11.2%
Extent of Cracking	N/A	Significate Inert Inclusions	1%

Shrink - Swell Index I_{SS} = **0.1%** Verticle strain per pF change in total suction

Testing performed at Blacktop Materials Engineering Geraldton Laboratory WA 6530.
Sample recompacted to 95% compaction at 100% OMC as requested by client.
Shrink-Swell Index remoulded Specimens result are not equivalent to one obtained “undisturbed soil” using AS 1289.7.1.1.
NATA accreditation does not cover the performance of this method AS1289.7.1.1.
Liquid limit estimate has been based on a visual/tactile assessment by a competent person.
Minimum period of sample curing time - 48 hours
Tested as received. Sample supplied by Flow Consulting Engineers.

Approved Signatory : D. Thornborough (Senior Materials Technician)

Date : ***24/11/2025***

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Material Test Report

Report No: MAT:MC25-02912-S11
Issue No: 1

Client: Blacktop Materials Engineering Pty Ltd
PO Box 1018 Geraldton WA 6531
Project: Geotechnical Investigation – Belisama Conventional Gas Project

Location: Penagri – Lefroy Farm

Accredited for compliance with ISO/IEC 17025-Testing
The results in this report relate only to the items/samples that were tested.

NATA Accredited Laboratory Number:1763

Signatory:Alex Briggs
(Laboratory Manager)
Date of Issue: 17/11/2025

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Sample Details

Sample ID	MC25-02912-S11
Date Sampled	4/11/2025
Sampling Method	Tested as received
Source	Foundation
Material	Sand
Client ID	25BME4128
Field ID	Test Pit 11
Sample Location	Depth: 2000-2500mm

Test Results

Description	Method	Result	Limits
Mean Resistivity (Ω.m)	AS 1289.4.4.1	125	
Water Resistivity (Ω.m)		1810	
Mean Dry Density (t/m³)		1.61	
Mean Moisture content (%)		24.1	
Percentage Oversize Retained 2.36mm Sieve (%)		0.2	
Type of Water Used		Distilled	
Date Tested		14/11/2025	

Comments

N/A

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All results relate only to items tested and if applicable sampled.

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ABN: 44 000 964 278

DIRECT SHEAR TEST
REPORT CERTIFICATE

According to AS1289 6.2.2-1998

CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 11 / Foundation, Sample No : 25BME4128, De **Lab No.:** 25-MT-7672
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 21/11/2025

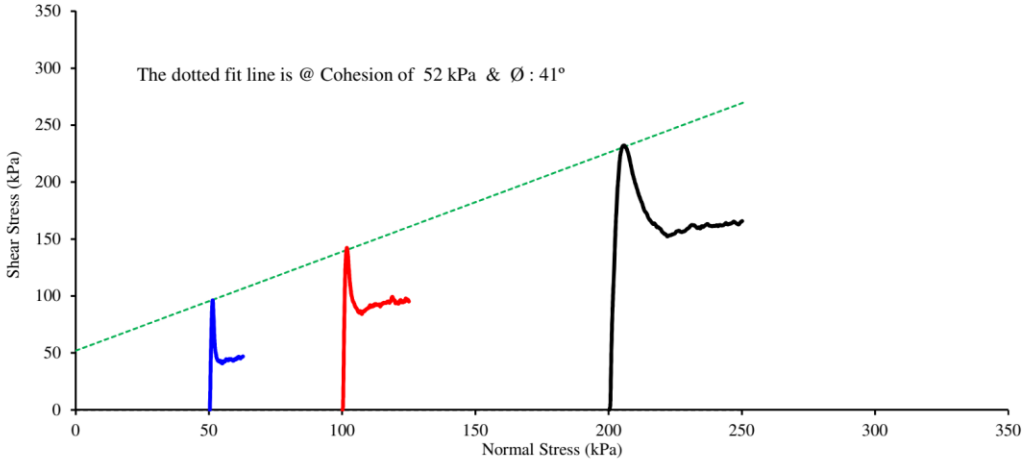
Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	42.1	42.0	41.2
Dry Density (t/m^3):	1.995	1.995	1.995	2.033	2.039	2.045
Moisture Content (%):	8.1	8.1	8.1	9.7	9.6	10.3

Sample Description: Silty Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 100.7%

SHEAR STRESS Vs NORMAL STRESS



SHEAR STAGE DATA

Stage No	Strain Rate (mm/min)	Δ_{sf} (mm)	ε_f (%)	Normal Stress σ_{no} (kPa)	Normal Stress σ_{nf} (kPa)	Shear Stress τ_f (kPa)
1	0.1	1.00	1.57	50	51	96
2	0.1	0.80	1.26	100	102	142
3	0.1	1.30	2.04	200	206	232

PEAK **Cohesion, C** (kPa) **:** 52 **Friction Angle, Ø** (degrees) **:** 41
RESIDUAL **Cohesion, C** (kPa) **:** - **Friction Angle, Ø** (degrees) **:** -

CONSOLIDATION TEST DATA (σ_n of 25, 50 ,100 kPa used during initial saturation stage)

Stage No	$\Delta\sigma'_3$ (kPa)	c_v (m^2/year)	M_v (m^2/MN)	k (m/sec)	Drainage Condition
1	25	-	-	-	Both Ends
2	50	-	-	-	Both Ends
3	100	-	-	-	Both Ends

Note: Sampled by Client

Authorised Signatory : (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7672 / Z614B

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All results relate only to items tested and if applicable sampled.

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DIRECT SHEAR TEST
REPORT CERTIFICATE

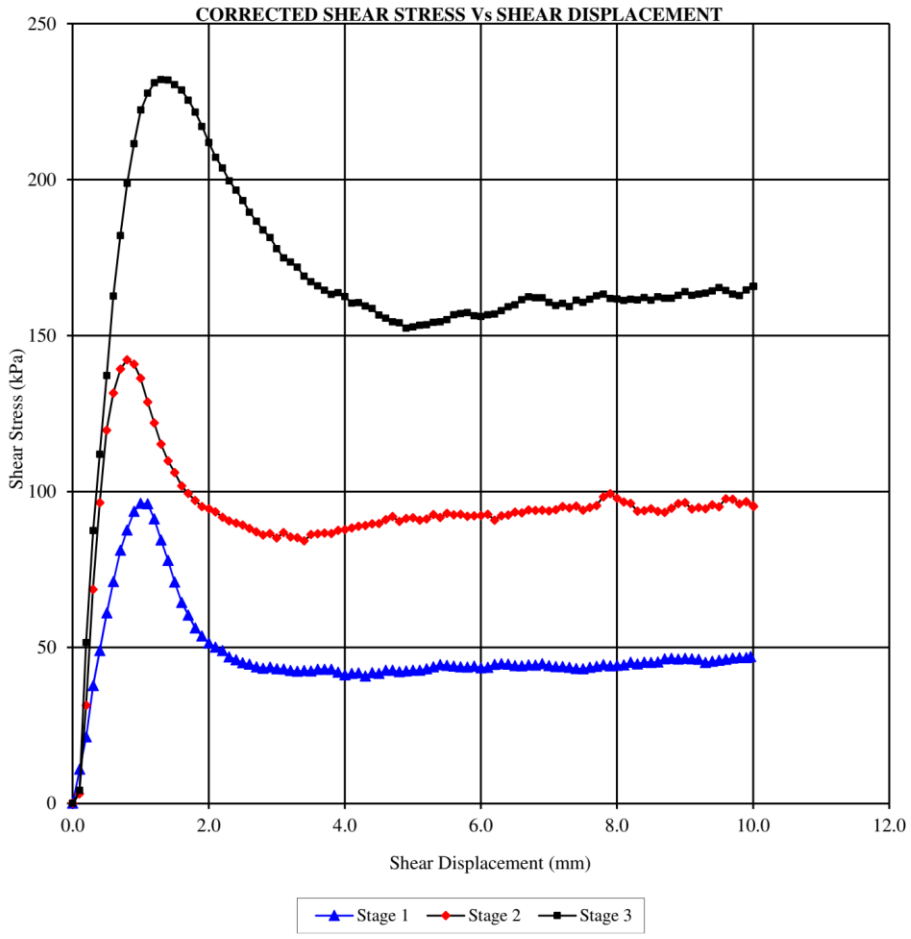
CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 11 / Foundation, Sample No : 25BME412 **Lab No.:** 25-MT-7672
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 21/11/2025

Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	42.1	42.0	41.2
Dry Density (t/m^3):	1.995	1.995	1.995	2.033	2.039	2.045
Moisture Content (%):	8.1	8.1	8.1	9.7	9.6	10.3

Sample Description: Silty Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 100.7%



Authorised Signatory : _____ (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7672 / Z614B

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ABN: 44 000 964 278

DIRECT SHEAR TEST
REPORT CERTIFICATE

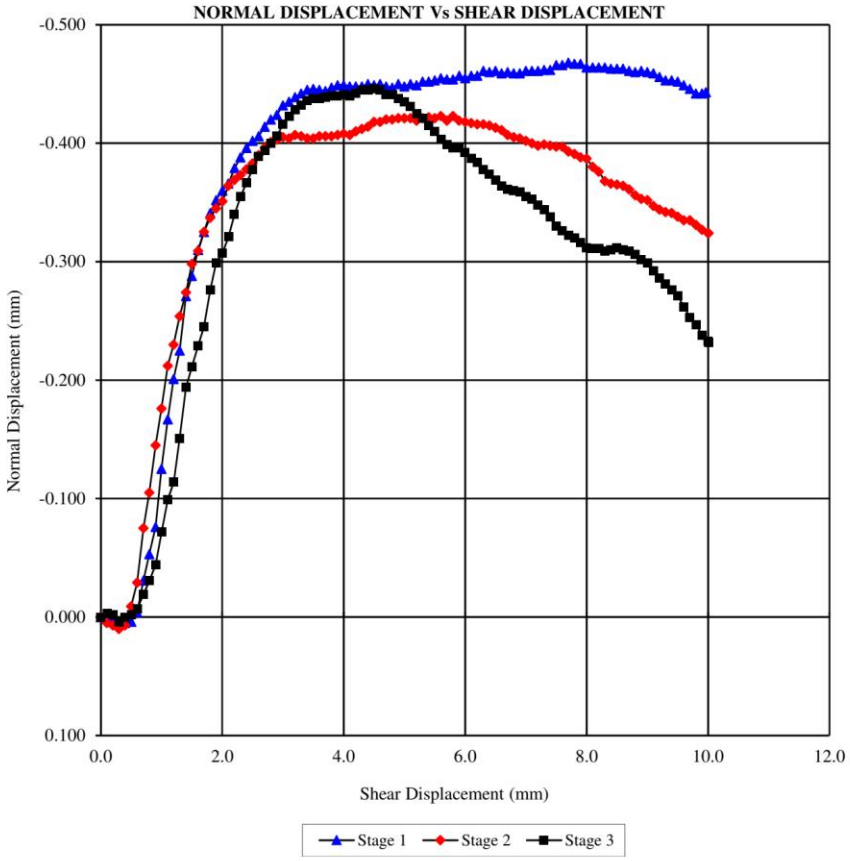
CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 11 / Foundation, Sample No : 25BME412 **Lab No.:** 25-MT-7672
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 21/11/2025

Specimen Details:	**Placement**			**Final**		
Thickness (mm):	42.0	42.0	42.0	42.1	42.0	41.2
Dry Density (t/m³):	1.995	1.995	1.995	2.033	2.039	2.045
Moisture Content (%):	8.1	8.1	8.1	9.7	9.6	10.3

Sample Description: Silty Sand

Shear Box Details: Circular (63.6 mm) box

Sampling Details: 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 100.7%



Authorised Signatory : _____ (Tyler Lakin) **Date :** 27/11/25

Certificate No. : 25-MT-7672 / Z614B

ilac-MRA NATA
Accreditation No. 2418
Accredited for compliance with ISO/IEC 17025 - Testing

Site No. 2411
Client Address: PO Box 1018 Geraldton WA 6531

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All results relate only to items tested and if applicable sampled.

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Perth Laboratory
111 Mulgul Road
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Email: AU.IE.Admin@sgs.com
ABN: 44 000 964 278

DIRECT SHEAR TEST
REPORT CERTIFICATE

CLIENT: Blacktop Materials Engineering (Job #) **JOB NO:** 25-01-1707
PROJECT: Geotechnical Investigation – Belisama Conventional Gas Project
LOCATION:
Sample Id: Penagri – Lefroy Farm / Test Pit 11 / Foundation, Sample No : 25BME4128, **Lab No.:** 25-MT-7672
Test Type: Soil/Soil. Single Stage x 3. Consolidated. Drained. Inundated. Saturated. **Date Tested:** 21/11/2025

Specimen Details:

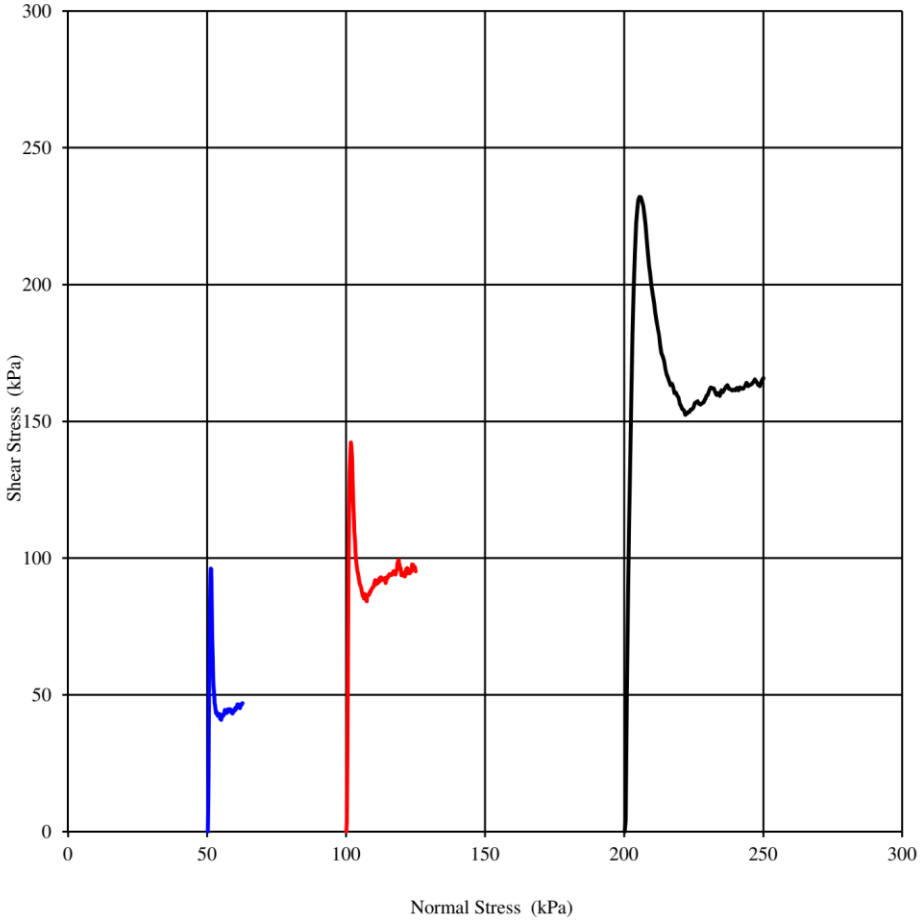
	Placement			Final		
Thickness (mm):	42.0	42.0	42.0	42.1	42.0	41.2
Dry Density (t/m^3):	1.995	1.995	1.995	2.033	2.039	2.045
Moisture Content (%):	8.1	8.1	8.1	9.7	9.6	10.3

Sample Description:
Silty Sand

Shear Box Details:
Circular (63.6 mm) box

Sampling Details : 64mm Ø specimen at dry density ratio: 95.0% at moist ratio: 100.7%

SHEAR STRESS Vs NORMAL STRESS



Authorised Signatory : _____ (Tyler Lakin **Date :** 27/11/25

pH and Chloride Results from TP1 to TP11

CERTIFICATE OF ANALYSIS

Work Order	: **EP2518846**	Page	: 1 of 5
Client	: **BLACKTOP MATERIALS ENGINEERING**	Laboratory	: Environmental Division Perth
Contact	: MR MARK EDWARDS	Contact	: Customer Services EP
Address	: PO Box 1018 Geraldton 6531	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 08 9921 1878	Telephone	: +61-8-9406 1301
Project	: Geotechnical Investigation - Belisama Conventional Gas Project	Date Samples Received	: 12-Nov-2025 10:00
Order number	: ----	Date Analysis Commenced	: 14-Nov-2025
C-O-C number	: ----	Issue Date	: 19-Nov-2025 09:47
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 11		
No. of samples analysed	: 11		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Perth - State Manager	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)

Compound	*CAS Number*	*LOR*	*Unit*	*Sample ID*	25BME4118 Penagri – Lefroy Farm / Test Pit 1 / Foundation / Depth: 300-500 mm	25BME4119 Penagri – Lefroy Farm / Test Pit 2 / Foundation / Depth: 2000-2200 mm	25BME4120 Penagri – Lefroy Farm / Test Pit 3 / Foundation / Depth: 300-500 mm	25BME4121 Penagri – Lefroy Farm / Test Pit 4 / Foundation / Depth: 300-500 mm	25BME4122 Penagri – Lefroy Farm / Test Pit 5 / Foundation / Depth: 300-500 mm
				Sampling date / time	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00
					EP2518846-001	EP2518846-002	EP2518846-003	EP2518846-004	EP2518846-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	-----	0.1	pH Unit		**6.3**	**6.3**	**6.3**	**6.2**	**6.3**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	-----	0.1	%		**1.1**	**3.3**	**1.6**	**0.8**	**1.1**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Sample ID	25BME4123 Penagri – Lefroy Farm / Test Pit 6 / Foundation / Depth: 300-500 mm	25BME4124 Penagri – Lefroy Farm / Test Pit 7 / Foundation / Depth: 1000-1500 mm	25BME4125 Penagri – Lefroy Farm / Test Pit 8 / Foundation / Depth: 300-500 mm	25BME4126 Penagri – Lefroy Farm / Test Pit 9 / Foundation / Depth: 300-500 mm	25BME4127 Penagri – Lefroy Farm / Test Pit 10 / Foundation / Depth: 300-500 mm
				Sampling date / time	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00	04-Nov-2025 00:00
					EP2518846-006	EP2518846-007	EP2518846-008	EP2518846-009	EP2518846-010
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	-----	0.1	pH Unit		**6.4**	**6.2**	**6.4**	**6.4**	**6.6**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	-----	0.1	%		**1.3**	**6.8**	**1.2**	**1.4**	**1.3**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Sample ID	25BME4128 Penagri – Lefroy Farm / Test Pit 11 / Foundation / Depth: 2000-2500 mm	-----	-----	-----	-----
				Sampling date / time	04-Nov-2025 00:00	-----	-----	-----	-----
					EP2518846-011	--------	--------	--------	--------
					Result	-----	-----	-----	-----
EA002: pH 1:5 (Soils)									
pH Value	-----	0.1	pH Unit		**6.2**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	-----	0.1	%		**6.8**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	----	----	----	----

Appendix D: Electrical Resistivity Testing Results.

TP1	Location TP1 - North/South - 4 November 2025, Sunny 30° C							
	Spacing a of electrodes (m)	Distance X to potential probes (m)	Distance y to current probes (m)	Max depth P of probes (mm)	Resistance reading from instrument R (Ω)	Soil resistivity depth d (m) (3/4 of 'a')	Constant 2 Pi a (m)	Average soil resistivity p to depth d (Ω.m)
	0.5	0.25	0.75	25	3380.00	0.375	3.142	10619
	1	0.5	1.5	50	1130.00	0.75	6.283	7100
	2	1	3	100	322.00	1.5	12.566	4046
	3	1.5	4.5	150	113.00	2.25	18.850	2130
	4	2	6	200	75.20	3	25.133	1890
	5	2.5	7.5	200	50.40	3.75	31.416	1583
	10	5	15	200	5.30	7.5	62.832	333
	15	7.5	22.5	200	2.22	11.25	94.248	209
	20	10	30	200	2.17	15	125.664	273
	30	15	45	200	4.07	22.5	188.496	767
	Location TP1 - East/West - 4 November 2025, Sunny 30° C							
	Spacing a of electrodes (m)	Distance X to potential probes (m)	Distance y to current probes (m)	Max depth P of probes (mm)	Resistance reading from instrument R (Ω)	Soil resistivity depth d (m) (3/4 of 'a')	Constant 2 Pi a (m)	Average soil resistivity p to depth d (Ω.m)
	0.5	0.25	0.75	25	2830.0	0.375	3.142	8891
	1	0.5	1.5	50	1260.0	0.75	6.283	7917
	2	1	3	100	316.0	1.5	12.566	3971
	3	1.5	4.5	150	110.0	2.25	18.850	2073
	4	2	6	200	42.6	3	25.133	1071
	5	2.5	7.5	200	16.8	3.75	31.416	528
	10	5	15	200	4.9	7.5	62.832	306
	15	7.5	22.5	200	1.6	11.25	94.248	152
	20	10	30	200	3.1	15	125.664	386
	30	15	45	200	19.0	22.5	188.496	3581

Appendix E: Calibration Certificates

Figure 1: Earth resistivity tester used for investigations.

testrix

Calibration Certificate: Resistance Meter for Ground Resistance Testing

Calibration certificate No.: AC-10512 | Page: 1/1

Service Request / Work Order No.: TEX-1372

Description identification of instrument to be calibrated

Name: AEMC 6471 Resistivity Meter	Tag no	N/A
Serial Number: 107089YGDV	Make:	AEMC
Model Number: 6471	Range:	0-99.9 kΩ
Sensor: N/A	Resolution:	Range dependant

Location: Cleveland Calibration Laboratory

Applicable specification of instrument to be calibrated: Manufacturer stated accuracy & National Standards

Date of receipt of item:	8-Nov-2024	Date of calibration:	8-Nov-2024
Calibration valid upto:	7-Nov-2025	Frequency of calibration:	12 Monthly
Environmental condition during calibration	Temperature:	23 degrees Celsuis (+/- 1 degree Celsius)	
	Humidity:	50% RH (+/- 5%)	

Details of standard instruments Used:

Name of the instrument	Serial Number	Make/Model	Valid up to	Report no: / Certificate no:
Time Electronics 5025 Multifunction Calibrator	1254'G13	Time Electronics 5025	15-Feb-25	45799_008
Time Electronics 5030 Electrical Calibrator	1017'E13	Time Electronics 5030	15-Feb-2025	45799_007

Basis of calibration: New Instrument Compliance to Manufacturer Declared Specifications

Applied Procedure no : 6471/6472 Ground Resistance Tester

Input (Ω)	As found		As left		Expected Output(Ω)	Error (Ω)	Error in %
	Input(Ω)	Output(Ω)	Input(Ω)	Output(Ω)			
0	0.12	0	0.00	0.00	0.00	0.00	0.00
1	1.06	1.07	1.00	1.01	1.00	-0.01	1.00
30	30.1	30.0	30.0	30.0	30.0	0.00	0.00
50	50.1	50.1	50.0	50.0	50.0	0.00	0.00
100	99.9	100.0	100.0	100.0	99.9	-0.10	-0.01
150	150.0	150.0	150.0	150.0	150.0	0.00	0.00
300	299	299	300	300	300	-0.10	-0.01
1.00K	1.03	1.03	1.00	1.00	1.00	1.00	0.08
90.0K	89.84	89.98	90.0	90.0	90.0	0.00	0.00

Remarks: Calibration completed and all the output values are wtihin the decared manufactuer specifications.

Calibrated by	Checked & approved by
Name: James Osborne	Name: James Osborne
Signature:	Signature:
Date: 8 November 2024	Date: 8 November 2024

Figure 2: Calibration certificate.

Appendix F: Site Works for Roads and Hardstands.

Earthworks shall be carried out in accordance with the principles set out in “AS3798:2007 Guidelines on earthworks for commercial and residential developments”.

1. **Pre-Earthwork Requirements**
    - Before starting any excavation, locate and mark all buried services within and near the proposed earthworks envelope.
    - Confirm the design levels:
        - The Designer shall confirm the finished road/hardstand level.
        - Establish the road/hardstand level on site relative to the existing ground level.
2. **Clear and Strip the Site**
    - Strip topsoil to a depth of 100 mm.
    - Remove:
        - All exposed buried materials revealed during stripping.
        - Any organic material (grass, shrubs, root matter).
    - Stripped soil may be reused for landscaping or removed from site.
3. **Subgrade**
    - Each area of the road/hardstand envelope at the site shall be levelled where it is to be filled or cut down to accommodate any required fill depth. The exposed material is expected to be cream/grey sand with silt or gravelly sand in most locations if the cut is not extreme.
    - Moisture-condition the foundation surface and compact with a 20-tonne vibrating drum roller with a minimum 10 passes.
    - The compaction of the floor of the excavation shall be confirmed at 95% modified maximum dry density in accordance with AS1289 to a depth of 600mm below the finished surface. Testing shall be completed in two layers (0-300mm and 300-600mm depth). Testing frequency shall be 1 test per 500m^2 with sites chosen randomly across the site. Verification of soil compaction shall be undertaken by a NATA accredited agency using a nuclear densometer.
    - All results must indicate a minimum 95% MMDD. If any test fails to achieve the minimum compaction, recondition and recompact the material.
    - Do not place road/hardstand layers until the underlying layer meets the compaction requirements.

4. Imported Basecourse

- Calculate the basecourse volume required based on the required basecourse depth.
- The contractor shall provide a sample of the proposed basecourse material to the FCE Engineer for approval prior to carting material to site. Do not import basecourse material until written approval is provided.
- Imported basecourse gravel material should conform to the Main Roads Specification 501 “PAVEMENTS” and City of Greater Geraldton Land Development Guidelines which both stipulate that the gravel shall have:
    - Soaked CBR (96%MDD & 100%OMC) of minimum 80%.
    - Linear shrinkage not exceeding 2%.

5. Placement and Compaction of Basecourse

- Condition the gravel with moisture and spread it in layers not exceeding 200mm compacted thickness.
- Compact the gravel with a minimum of 10 passes with a 20t a motorised flat drum vibe roller.
- The compaction of the constructed gravel layer shall be confirmed at 98% modified maximum dry density in accordance with AS1289 to a depth of 150mm. Testing frequency shall be one test per 500m^2. Verification of basecourse and subgrade compaction is required be undertaken by a NATA accredited agency using a nuclear densometer to Australian Standard 1289 5.8.1 “Soil compaction and density tests using nuclear density gauge”.
- The finished thickness of the compacted gravel basecourse shall not be less than 180mm.

6. Asphalt (Optional)

- The basecourse shall achieve dry back of 85% before applying spray seal or 70% before applying asphalt prime coat and 7mm aggregate.
- Install prime coat and primer seal and lay 40mm compacted AC7 asphalt.
- Asphalt shall be compacted to density not less than 97% of the Marshall density.
- The finished surface shape shall be such that water cannot pond at any point.
- The road pavements and car parks shall be designed to drain and capture stormwater away from the buildings and plant infrastructure.

Appendix G: Site Works for Building.

In line with AS2870:2011 suggestions, FCE suggest the following scope of works to prepare the site for building. Earthworks shall be carried out in accordance with the principles set out in “AS3798:2007 Guidelines on earthworks for commercial and residential developments.” The recommendations for building foundation soil preparation shall be completed one metre beyond the perimeter of the proposed building envelopes.

1. Pre-Earthwork Requirements

- Before starting any excavation, locate and mark all buried services within and near the proposed building envelope.
- Confirm the design levels:
    - The Designer shall confirm the finished floor level (FFL). FFL shall be located above any Shire predicted flood level.
    - Establish the finished slab level on site relative to the existing ground level.

2. Clear and Strip the Site

- Strip topsoil to a depth of 100 mm, extending 1m beyond the building envelope.
- Remove:
    - All exposed buried materials revealed during stripping.
    - Any organic material (grass, shrubs, root matter).
- Stripped soil may be reused for landscaping or removed from site.

3. Subgrade

- Each area of the building envelope at the site shall be levelled where it is to be filled or cut down to accommodate the required fill depth below the footing / slab. The exposed material is expected to be cream/grey sand with silt or gravelly sand in most locations if the cut is not extreme.
- Moisture-condition the foundation surface and compact with a 20-tonne vibrating drum roller with a minimum 10 passes.
- The compaction of the floor of the excavation beneath footing locations shall be confirmed at 95% modified maximum dry density in accordance with AS1289 to a depth of 600mm below the finished surface. Testing shall be completed in two layers (0-300mm and 300-600mm depth). Testing frequency shall be 1 test per 50m^2 with sites chosen randomly across the site. Verification of soil compaction shall be undertaken by a NATA accredited agency using a nuclear densometer.
- All results must indicate a minimum 95% MMDD. If any test fails to achieve the minimum compaction, recondition and recompact the material.
- Do not place additional fill until the underlying layer meets the compaction requirements.

4. Imported Fill

- Calculate the sand volume required based on the required pad depth.
- The contractor shall provide a sample of the proposed fill material to the FCE Engineer for approval prior to carting material to site. Do not import fill until written approval is provided.
- Imported fill shall be:
    - Clean, non-plastic sand
    - Free of particles > 2 mm
    - With less than 15% passing the 75-micron sieve

5. Placement and Compaction of Fill

- Place approved sand fill in compacted lifts no less than 100mm and no greater than 300mm.
- Moisture-condition and compact each lift.
- Confirm compaction of each lift to the full depth of the lift to ≥95% MMDD using a NATA-accredited agency and a nuclear density gauge to AS1289.5.8.1.
- Do not place further lifts until the previous lift has passed testing.
- Testing frequency: minimum 1 test per 50 m² per lift, randomly located.

6. Certification Requirements

- Prior to commencement of building works, the builder must provide FCE with:
    - All compaction results for the subgrade, each lift, and each reconstructed layer. All compaction results shall show that the soil has been compacted to ≥ 95% Modified MDD.
- FCE will certify the site areas as either Class “A” or Class “S” in accordance with Table 14 of this report based on compliant compaction results.

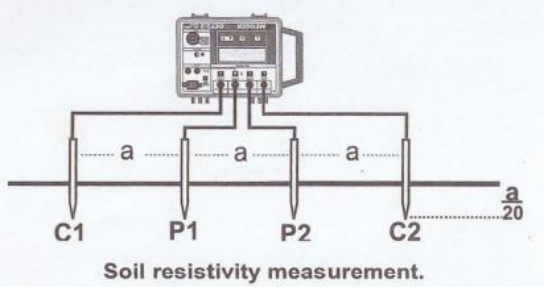
Appendix H: Explanation of Materials Tests Used in This Report.

1 EARTH RESISTIVITY TESTING

Broadly speaking earth resistance is the resistance of a soil to the passage of electrical current. Earth resistivity is expressed in ohm-metres (abbreviated ohm.m). Measurements of earth resistivity are useful also for finding the best location and depth for low resistance electrodes. Such studies are made, for example, when a new electrical unit is being constructed, a generating station, substation, transmission tower, or telephone central office. Earth resistivity may also be used to indicate the degree of corrosion to be expected in underground pipelines for water, oil, gas, gasoline, etc. In general, spots where the resistivity values are low tend to increase corrosion. This same kind of information is a good guide for installing cathodic protection.

1.1 *How earth resistivity is measured - Line Traverse*

The most common method of measuring soil resistivity is often referred to as the line traverse. Four test spikes are inserted into the ground in a straight line at equal distances 'a' and to a depth of not more than 1/20 of 'a'. The instrument is connected to the test spikes as shown.



Soil resistivity measurement.

The instrument is operated, and the measurement made in the normal way. The resistivity may be calculated from the formula given below or from a nomogram. This is the average soil resistivity to a depth 'a'. The four test spikes are then re-positioned for further tests along a different line. If both the spacing 'a' and the depth a/20 are maintained, a directly comparable reading will be obtained each time, and thus regions of lowest resistivity can be located over a given area (at the constant depth 'a').

Re-spacing the test spikes at separations 'b', 'c', 'd', etc. will yield results from which a profile of the resistivity at new depths b/20, C/20, d/20, etc. can be obtained. If the same line for the test spikes is maintained, but the separation of them is progressively widened, resistivity values at various depths can be obtained. By this means depth surveys may be made.

1.2 *Calculation of resistivity*

Dr. Frank Wenner of the U.S. Bureau of Standards (now NISI) developed the theory behind this test in 1915. He showed that, if the electrode depth is kept small compared to the distance between the electrodes and assuming that the tests are carried out in homogeneous soil the resistivity is given by the formula:

$$\rho = 2\pi AR$$

Where p is the average soil resistivity in ohm-m. For non-homogeneous soils, the formula will give an apparent resistivity which is very approximately the average value to a depth equal to the test spike spacing. In other words, if the distance between the electrodes is 4m you can obtain the average earth resistivity to a depth of 4m.

1.3 *Effect of soil type on resistivity*

The resistance to earth of an earth electrode is influenced by the resistivity of the surrounding soil. The resistivity depends upon the nature of the soil and can vary enormously between soil types as seen in the tables below:

Material	Specific resistance in Ω-cms	Information source
Ashes	350	Higgs
Coke	20 - 800	
Peat	4500 - 20000	
Garden earth - 50% moisture	1400	Ruppel
Garden earth - 20% moisture	4800	Ruppel
Clay soil - 40% moisture	770	Ruppel
Clay soil - 20% moisture	3300	
London clay	400 - 2000	
Very dry clay	5000 - 15000	
Sand - 90% moisture	13000	Ruppel
Sand - normal moisture	300000 - 800000	
Chalk	5000 - 15000	
Consolidated Sedimentary rocks	1000 - 50000	Broughton Edge & Laby

Table II: Resistivities of Different Soils*

Soil	Resistivity Ohm-cm (Range)
Surface soils, loam, etc.	100 - 5,000
Clay	200 - 10,000
Sand and gravel	5,000 - 100,000
Surface limestone	10,000 - 1,000,000
Shales	500 - 10,000
Sandstone	2,000 - 200,000
Granites, basalts, etc.	100,000
Decomposed gneisses	5,000 - 50,000
Slates, etc.	1,000 - 10,000

*Evershed & Vignoles Bulletin 245

[3] By "salt" we don't mean the kind used to season food (sodium chloride), though this kind can occur in soil. Other kinds include copper sulphate, sodium carbonate, and others (see "Treatment of Soil," Section II, page 40).

There exists a wide range in values between various reference books of various soil type resistivity's and a spread in reported values for the same general types of soil.

1.4 *Effect of moisture and dissolved salts on earth resistivity*

In soil, conduction of current is largely electrolytic. Therefore, the amount of moisture and salt content of soil radically affects its resistivity. The amount of water in the soil varies, of course, with the weather, time of year, nature of sub-soil, and depth of the permanent water table. Table IV below shows typical effects of water in soil; note that when dry, the two types of soil are good insulators. With a moisture content of 15 percent, however, note the dramatic decrease in resistivity (by a factor of 1 00,000). Actually, pure water has an infinitely high resistivity. Naturally occurring salts in the earth, dissolved in water, lower the resistivity. Only a small amount of salt can reduce earth resistivity quite a bit. (See Table IV.) As noted in the following section this effect can be useful to provide a good low-resistance electrode, in place of an expensive, elaborate electrode system.

Table III: Effect of Moisture Content on Earth Resistivity*

Moisture Content, Percent by Weight	Resistivity (Ohm-cm)	
	Top Soil	Sandy Loam
0.0	1,000 x 10^6	1,000 x 10^6
2.5	250,000	150,000
5.0	165,000	43,000
10.0	53,000	22,000
15.0	21,000	13,000
20.0	12,000	10,000
30.0	10,000	8,000

**From "An Investigation of Earthing Resistance" by P.J. Higgs, I.E.E. Journal, vol. 68, p. 736, February 1930*

Table IV: Effects of Salt Content on Earth Resistivity*

Added Salt Percent by Weight of Moisture	Resistivity, (Ohm-cm)
0.0	10,700
0.1	1,800
1.0	460
5.0	190
10.0	130
20.0	100

**For sandy loam; moisture content, 15% by weight; temperature 63° F (17° C)*

1.5 *Effect of temperature on earth resistivity*

Not much information has been collected on the effects of temperature. Two facts lead to the logical conclusion that an increase in temperature will decrease resistivity: (1) water present in soil mostly determines the resistivity, and (2) an increase in temperature markedly decreases the resistivity of water. The results shown in Table VI confirm this. Note that when water in the soil freezes, the resistivity jumps appreciably; ice has a high resistivity. The resistivity continues to increase as temperatures go below freezing.

Table V: Effect of Temperature on Earth Resistivity*

Temperature		Resistivity (Ohm-cm)
C	F	
20	68	7,200
10	50	9,900
0	32 (water)	13,800
0	32 (ice)	30,000
-5	23	79,000
-15	14	330,000

**For sandy loam; 15.2% moisture*

1.6 *Seasonal variations in earth resistivity*

We have seen the effects of temperature, moisture, and salt content upon earth resistivity. It makes sense, therefore, that the resistivity of soil will vary considerably at different times of year. This is particularly true in locations where there are more extremes of temperature, rainfall, dry spells, and other seasonal variations. From the preceding discussion, you can see that earth resistivity is a very variable quantity. If you want to know what the value is at a given location, at a given time of year, the only safe way is to measure it. When you use this value for survey work, the change in the value, caused by changes in the nature of the sub-soil, is the important thing; from the variations in resistivity, you can obtain useful survey results.

The curves of Fig. 4 below illustrate several worthwhile points. They show the expected change in earth resistance (due to resistivity changes) over a 1-1/2-year period; they also show that the deeper electrode gives a more stable and lower value. We conclude that the moisture content and temperature of the soil become more stable at greater distances below the earth's surface. Therefore, the earth electrode should reach a deep enough level to provide:

- Permanent moisture content (relatively speaking).
- Constant temperature (below frost line; again, relatively speaking).

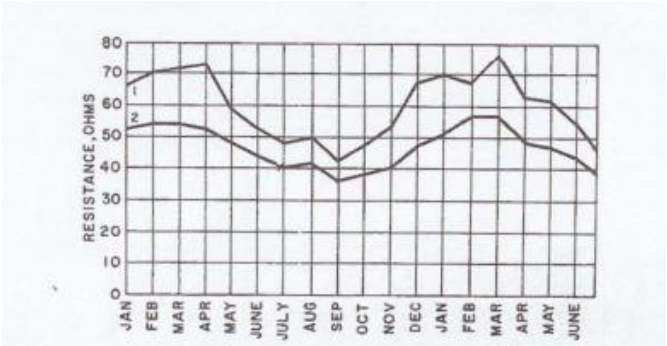


Fig. 4: Seasonal variation of earth resistance with an electrode of 3/4" pipe in stony clay soil. Depth of electrode in earth is 3 ft for Curve 1 and 10 ft for Curve 2 (source: Ref. 9, page 76)

1.7 *Variations in soil resistivity*

Because it is impossible to forecast the resistivity of the soil with any degree of accuracy it is important to measure the resistance of an earth electrode when it is first laid down and thereafter at periodic intervals. Before sinking an electrode into the ground for a new installation it is often advantageous to make a preliminary survey of the soil resistivity of the surrounding site. This will enable decisions to be made on the best position for the electrode(s) and to decide whether any advantage can be gained by driving rods to a greater depth. Such a survey may produce considerable savings in electrode and installation costs incurred trying to achieve a required resistance.

1.8 *Methods to improve earth resistivity.*

When you find that your earth electrode resistance is not low enough, there are several ways you can improve it:

- Lengthen the earth electrode in the earth.
- Use multiple rods.
- Treat the soil.

1.8.1 *Effect of Rod Size*

As you might suspect, driving a longer rod deeper into the earth, materially decreases its resistance. In general, doubling the rod length reduces resistance by about 40 percent. The curve of Fig.15 shows this effect. For example, note that a rod driven 2 ft. down has a resistance of 88ohms; the same rod driven 4 ft. down has a resistance of about 50ohms. Using the 40 percent reduction rule, 88 x 0.4 = 35 Q reduction. By this calculation, a 4-ft deep rod would have a resistance of 88 - 35 or 53 Ω - comparing closely with the curve values.

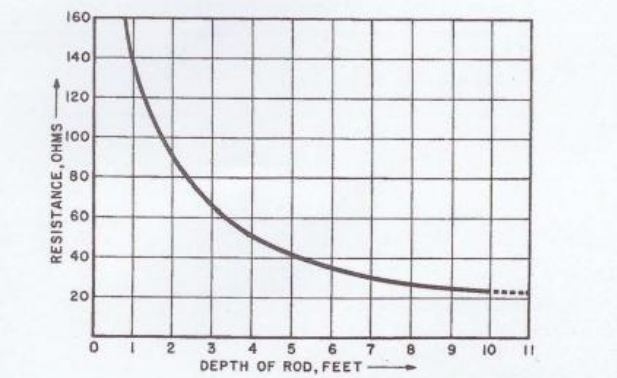
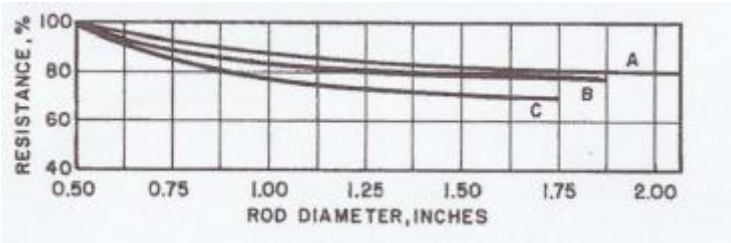


Fig. 15: Earth resistance decreases with depth of electrode in earth (Source: Ref 19)

You might also think that increasing the electrode diameter would lower the resistance. It does, but only a little. For the same depth, doubling the rod's diameter reduces the resistance only about 10 percent. Fig. 16 shows this relationship. For example, a 10-ft deep rod, 5/8 in. in diameter, has a resistance of 6.3ohms; increasing its diameter to 1-1/4 in. lowers the resistance o to 5.6ohms. For this reason, you normally only consider increasing the rod diameter if you have to drive it into hard terrain.

1.8.2 *Use of Multiple Rods*

Two well-spaced rods driven into the earth provide parallel paths. They are, in effect, two resistances in parallel. The rule for two resistances in parallel does not apply exactly; that is, the resultant resistance is not one-half the individual rod resistances (assuming they are of the same size and depth). Actually, the reduction for two equal resistance rods is about 40 percent. If three rods are used, the reduction is 60 percent; if four, 66 percent (see Fig. 17).



When you use multiple rods, they must be spaced apart further than the length of their immersion. There are theoretical reasons for this, but you need only refer to curves such as Fig. 18. For example, if you have two rods in parallel and 1O-ft spacing, resistance is lowered about 40 percent. If the spacing is increased to 20 percent, reduction is about 50 percent.

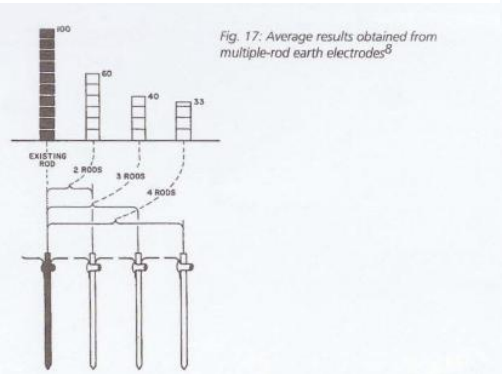


Fig. 17: Average results obtained from multiple-rod earth electrodes[8]

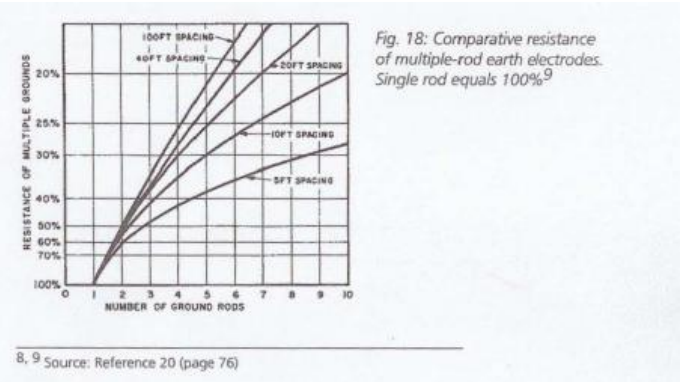


Fig. 18: Comparative resistance of multiple-rod earth electrodes. Single rod equals 100%[9]

8, 9 Source: Reference 20 (page 76)

1.8.3 *Treatment of the Soil:*

Chemical treatment of soil is a good way to improve earth electrode resistance when you cannot drive deeper ground rods because of hard underlying rock, for example. It is beyond the scope of this report to recommend the best treatment chemicals for all situations. You have to consider the possible corrosive effect on the electrode as well as EPA and local environmental regulations. Magnesium Sulfate, copper Sulfate, and ordinary rock salt are suitable noncorrosive materials. Magnesium Sulfate is the least corrosive, but rock salt is cheaper and does the job if applied in a trench dug around the electrode (see Fig. 19). It should be noted that soluble sulphates attack concrete and should be kept away from building foundations. Another popular approach is to backfill around the electrode with a specialized conductive concrete. A number of these products, like bentonite, are available on the market.

Chemical treatment is not a permanent way to improve your earth electrode resistance. The chemicals are gradually washed away by rainfall and natural drainage through the soil. Depending upon the porosity of the soil and the amount of rainfall, the period for replacement varies. It may be several years before another treatment is required.

Chemical treatment also has the advantage of reducing the seasonable variation on resistance that results from periodical wetting and drying out of the soil. However, you should only consider this method when deep or multiple electrodes are not practical.

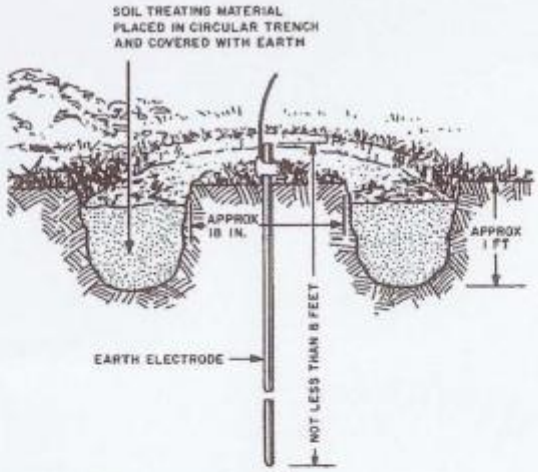


Fig. 19: Trench method of soil treatment [10]

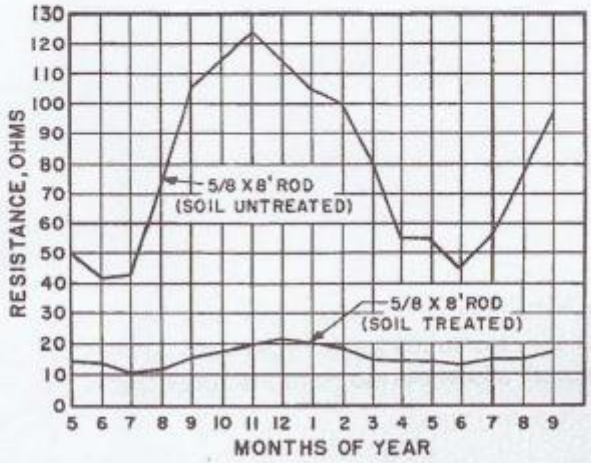


Fig. 20: Chemical treatment of soil lessens seasonal variation of electrodes' earth resistance [11]

[10, 11] Source: Reference 20 (page 77)

1 EXPLANATION RESULTS OF LABORATORY MATERIALS TESTING

1.1 *Particle Size Distribution (PSD), Atterberg Limit & Unified Soil Classification Symbol (USC) Testing*

The particle size distribution of a material is determined by screening a material over sieves and calculating the mass passing each. The effect of grading on density, internal friction (stability when wet) and permeability justifies its use as an indicator of likely performance. Particle size distribution tests were completed in accordance with Test Method AS1289 3.6.1.

Atterberg Limits are conceptual limits when it may be considered a material proceeds through a semi solid, plastic, and liquid states as its moisture increases. These limits are determined using empirical procedures in the laboratory. The consistency limits are related to the type and amount of clay in a material. The objection to material with a high clay content is that clay increases in volume and decreases in strength with increase in moisture content. The volume change tends to destroy the mechanical interlock and reduce internal friction and stability and results in inferior performance. Atterberg Limit tests were completed in accordance with Test Methods AS1289 3.9.1, AS1289 3.2.1, AS1289 3.3.2 & AS1289 3.4.1.

The Unified Soil Classification Symbol (USC) symbol for the site soils was determined in accordance with AS1726, Table 9 & 10. The silt / clay fraction of the sample is the fraction passing the 75micron sieve. As a guide, usually soils are preferred for foundation material which do not contain more than 5% fraction passing the 75micron sieve as the silt and clay gives the soil poor strength characteristics when the soil becomes wet.

1.2 *Maximum Dry Density / Optimum Moisture Content*

Method AS 1289 (5.2.1) Soil compaction and density tests – Determination of the dry density/moisture content relation of a soil using modified compactive effort has been used to determine the maximum modified dry density (MMDD) of the soil samples.

1.3 *Moisture Content*

Test Method AS 1289 2.1.1 Soil moisture content tests – Determination of the moisture content of a soil – Oven drying method (standard method) has been used to determine the moisture content of the soil samples.

1.4 *California Bearing Ratio (CBR) Test*

The California Bearing Ratio (CBR) Test was originally devised to provide a method of comparing natural granular materials and crushed rock base and subsequently developed as a means of assessing subgrades for pavement design purposes. The CBR is a strength test which describes the effort of a standard piston to penetrate a compacted confined soil specimen. The results are expressed as a ratio of the loads to cause the same penetration in a standard crushed rock material.

The CBR is an empirical value and does not accurately relate to any of the fundamental properties governing material strength. Since the material in the test is predominantly subject to shear deformation, the test can be regarded as an indirect measure of the shear strength. The test has been successfully used over a long period of time and for a wide range of conditions.

Where soils may be affected by moisture a soaked CBR test is completed. This test provides an indication of material strength when then the specimen is saturated. An Unsoaked CBR test indicates material strength at optimum moisture content, or an unsaturated state.

As a reference, Main Roads Specification 501 “PAVEMENTS” table 501.09 stipulates that for gravel basecourse, suitable for all pavements except freeways and controlled access highways, the Soaked CBR (96%MDD & 100%OMC) shall be 80% minimum.

The City of Greater Geraldton (CGG) land development guidelines stipulate that subgrade shall have a soaked CBR exceeding 7% and a PI less than 15. Generally, for gravels (basecourse) a soaked CBR of >80 is considered good and for sands (subgrade) a soaked CBR of >20 is considered good.

Test Method AS 1289 (6.1.1) Soil strength and consolidation tests – Determination of the California Bearing Ratio of a soil – Standard laboratory method for a remoulded specimen has been used. The test has been conducted on soils compacted per AS1289 5.2.1. The subgrade samples were modelled at 95% maximum modified dry density and 100% optimum moisture content. This is in line with most land development guidelines. A 4.5kg surcharge was placed on the samples during modelling to replicate weight of overlying layers which occur in pavement construction.

1.5 *Shrink-Swell Index*

The shrink–swell index of soil refers to the extent certain clay minerals will expand when wet and retract when dry. Soil with a high shrink–swell capacity is problematic and is known as shrink–swell soil, or expansive soil.

The test completed to determine soil reactivity is AS 1289 7.1.1. Shrink-Swell Index. Soil reactivity tests - Determination of the shrinkage index of a soil - Shrink-swell index is the preferred method prescribed in AS2870-2011 to calculate expected ground surface movement and classify the site based on soil reactivity.

1.6 *Soil Reactivity Tests*

The test completed to determine soil reactivity AS 1289 7.1.1 Soil reactivity tests – Determination of the shrinkage index of a soil – Shrink-swell index is the preferred method prescribed in AS2870-2011 Residential slabs and footings to calculate expected ground surface movement and classify the site based on soil reactivity.

1.7 *Permeability*

Permeability is a measure of the rate at which fluid passes through a porous medium. The permeability of slow-moving water through a soil varies with, the ratio of voids in the soil (soil compaction), the shape and arrangement of the particles contained in the soil (the particle size distribution and silt and clay fraction contained in the soil) and the degree of saturation of the soil. There are a few methods to measure soil permeability but essentially these can be broken into either Laboratory tests or Field tests.

Soils with permeability coefficients 10^{-1} - 10^{-4}m/s are generally considered as quite permeable and generally comprise sands and gravels. For drainage purposes these soils are well regarded. Soils with permeability coefficients 10^{-4} - 10^{-6}m/s are generally considered as poorly drained and comprised of very fine sands, organic and inorganic silts, mixtures of sand, silt, and clay. Soils with permeability coefficients 10^{-6} - 10^{-9}m/s are generally considered practically impervious.

1.8 *Soil Organic Content*

When materials contain greater than 1% organic matter compaction can be very difficult to achieve. 1% of decomposed vegetation is a considerable quantity in soil and it can have a significant effect on the physical characteristics of the soil when it is mixed through the soil. Organic matter which has entered the soil from stands of native Acacia vegative species tends to suppress the ability of soils to take on moisture and hence can make the process of soil moisture conditioning and the achievement of 95% MMDD compaction very difficult. FCE experience in the past suggests that if the material contains greater than 1-2% organic matter this could be grounds to replace the material or to entertain a compaction concession in the engineering specification.

1.9 *Soil pH*

Soil pH is the measure of alkalinity or acidity. FCE have completed test method EA002: pH (Soils). Soil pH is an indicator of the soils ability to corrode construction materials. Acidic ground conditions can be caused by dissolved “aggressive” carbon dioxide, pure and very soft waters, organic and mineral acids, and bacterial activity. Care is required in assessment of pH underground structure and lifetime conditions since pH can change over the lifetime of the member. Therefore, the pH should not be assessed only based on a present-day test result, rather the ground chemistry should be considered over the design life of the ground structure. In concrete the acids attack the calcium hydroxide, which is a component of cement and dissolves them into a soluble state. They are then transported from the concrete which leaves the concrete porous. This weakens the structure of the concrete and can lead to failure. AS3600 Concrete structures provides exposure classifications for concrete in sulfate rich soils in Table 4.8.1. The criteria for “non-aggressive” soil conditions (low permeability soils or soils above the groundwater table) is >5.5.

1.10 *Soil Chloride Content*

Chlorides can be considered as negatively charged particles or anions. FCE have completed method EDO45G: Chloride by Discrete Analyser. Chlorides can be considered as negatively charged particles or anions. These chlorides are corrosive to building materials, in particular steel. In reinforced concrete the chlorides react with the steel causing corrosion. The chlorides also cause the steel to expand resulting in an increase in concrete stresses. Salt crystals can also add further stresses and expand in the voids within the concrete. These stresses result in the opening of cracks, exposing the concrete and reinforcement. Generally, chloride ion content % by weight of <0.02 is preferred.

2 EXPLANATION RESULTS OF NUCLEAR DENSOMETER TESTING

Measurement of soil compaction has been undertaken using a nuclear densometer to Australian Standard 1289 5.8.1 “Soil compaction and density tests using nuclear density gauge”.

3 EXPLANATION AS2870 – 2011 SITE CLASSIFICATION FOR THE SITE

The ground surface movement has been calculated by the preferred method prescribed in AS2870-2011 using laboratory tests for soil reactivity AS1289.7.1.1 Shrinkage Index of a Soil completed on samples. The expected surface movement for each site has been classified in accordance with Table 2.1 in AS 2870-2011. For reference:

1. AS2870-2011 stipulates that, sites which experience between 0 – 20mm expected surface movement may be classified as Class “S”. AS2870 –2011 defines these sites as slightly reactive clay sites but stable.

2. AS2870-2011 stipulates that, sites which experience between 20 – 40mm expected surface movement may be classified as Class “M”. AS2870 –2011 considers this to be a moderately reactive site.

3. AS2870-2011 stipulates that, sites which experience between 40 – 60mm expected surface movement may be classified as Class “H1”. AS2870 –2011 considers this to be a highly reactive site.

The calculation of expected surface movement does not make any allowance for movements caused by soil densification settlement. Calculations assume that the site is compacted to 95% modified maximum dry density in accordance with AS1289, and that the foundation soils are protected from excessive moisture ingress. Site drainage design shall ensure a stable moisture content regime in the soils near and beneath the building envelope.

4 EXPLANATION OF SOIL COMPACTION & SUITABLE COMPACTION MEASUREMENT TECHNIQUES

To avoid the likelihood of settlement, it is required by the Building Code of Australia and Australian Design Standards that for domestic structures, soils shall be compacted to 95% MMDD in accordance with AS1289. It is understood that soils at this level of compaction will resist further settlement, under residential construction loading, and hence provide a reliable and sound foundation.

In Quartzose sand soils which contain less than 5% often silt the measurement of eight blows per 300mm depth of penetration using a 16 mm diameter 9.0 kg Perth Sand Penetrometer (PSP) in accordance with AS1289 6.3.3 is an indication that the sand exists at 95% modified maximum dry density. For this reason, eight blows per 300mm depth of penetration using a PSP is the compaction requirement, which most local authorities stipulate a building pad shall achieve prior to building commencement. AS 1289 6.3.3 provides the specific method for completing PSP tests. AS1289 6.3.3 stipulates that the soil for PSP measurement shall be:

1. Non-cohesive.
2. Not contain particles greater than 2mm diameter.

Such material is classified as non-cohesive sand.

Blacktop suggest that a useful guide for identifying non-cohesive sand shall be the amount of silt and clay contained in the sample. Silt and clay content is indicated by the fraction of sample passing the 75-micron sieve. If the material exceeds 5% passing the 75micron sieve, then the material should be considered cohesive. Such material, when dry, will cement together in lumps when excavated. The PSP cannot accurately measure the compaction in soils which exceed this silt and clay content.

5 EXPLANATION OF ACID SULFATE SOILS (ASS)

The classification of ASS includes both actual acid sulfate soils (AASS) and potential acid sulfate soils (PASS). AASS are soils that are generating acidity, whereas PASS are soils that have the potential to generate acidity. ASS are soils containing naturally occurring, fine-grained metal sulfides typically pyrite (FeS_2), formed under saturated, anoxic/reducing conditions. They generally occur in Quaternary (1.8 Ma – Present) marine or estuarine sediments, predominantly confined to coastal lowlands (elevations generally below 5mAHD). Within these sediments, most soils that present an environmental risk are generally confined to Holocene aged material (<10 000 years). Where these materials have oxidised, they commonly have a mottled appearance (orange and yellow discolouration) due to the presence of oxidised iron minerals. Although soils described above represent typical conditions where ASS occurs, the presence of ASS materials is not limited to these soil types. In Western Australia, ASS materials have been identified in other soil types such as leached sands and silts. Accordingly, for areas where no data is available, the extent of ASS materials should be established through field investigations.

When PASS are disturbed, either by excavation or lowering of the water table below natural seasonal levels, sulfides present are exposed to air, allowing oxidisation and consequently, the formation of sulfuric acid (H_2SO_4). AASS can generate acidity in situ in their natural state; disturbance is not required for acidic discharges to develop. As a result of the presence of AASS, or the oxidation of PASS, surrounding land (soil) and nearby waterways may become acidic (pH <6.5). Under acidic conditions, metals such as aluminium (generally at pH <4.5) and iron, as well as trace heavy metals (including arsenic), become more mobile in the environment and can be taken up by infiltrating waters. As a result, surface and/or groundwater concentrations of these metals may reach concentrations which have the potential to cause acute or chronic toxicity to sensitive terrestrial and aquatic plants and animals. Acidic conditions generated by ASS can also corrode concrete and steel (pipes, bridge abutments, underground services, and other infrastructure) and can result in the rapid deterioration of asphalt surfaces where they overlie AASS or PASS.

6 EXPLANATION OF VISUAL IDENTIFICATION OF ASBESTOS, HYDROCARBON & UNCONTROLLED FILL

Asbestos cement building products were used up until 1987. If buildings at the site pre-dated 1987 there is a chance that building materials containing asbestos were brought to site.