

**DOYLE**  
**SOIL**  
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**SITE AND SOIL EVALUATION REPORT**  
**FOUNDATION AND WINDLOADING ASSESSMENT**

**4550 Bruny Island Main Road**

**Lunawanna**

**October 2024**

Doyle Soil Consulting: 6/76 Auburn Rd Kingston Beach 7050 – 0488 080 455 – robyn@doylesoilconsulting.com.au

## SITE INFORMATION

**Client:** Frank Stokely

**Address:** 4550 Bruny Island Main Road, Lunawanna 7150 (CT 145345/2)

**Site Area:** Approximately 2536 m<sup>2</sup>

**Date of inspection:** 17/10/2024

**Building type:** New house

**Services:** Tank water and onsite wastewater

**Relevant Planning Overlays:**

**Mapped Geology** - Mineral Resources Tasmania 1:250 000 Southeast sheet:

**Jd** = Jurassic dolerite

**Soil Depth:** 3.0 m

**Subsoil Drainage:** Imperfectly drained

**Drainage lines/water courses:**

**Vegetation:** Grass and gardens

**Rainfall in previous 7 days:** Approximately 24 mm

**Slope:** Approximately 6° to the Northeast

## SITE ASSESSMENT AND SAMPLE TESTING

Site investigation and soil classification in accordance with AS 2870-2011 *Residential slabs and footings* and in accordance with AS 4055-2021 *Wind load for Housing*. Test holes were dug using a Christie Post Driver Soil Sampling Kit, comprising CHPD78 Christie Post Driver with Soil Sampling Tube (50 mm OD x 1600/2100 mm). For test hole and DCP locations, see Appendix 1.

- Three test hole (TH) cores:
  - TH1 with no refusal at 2.1+ m
  - TH2 with no refusal at 1.6+ m
  - TH3 with no refusal at 1.6+ m
- One Dynamic Cone Penetrometer (DCP) test:
  - DCP1 with refusal at 3.0 m
- Emerson Dispersion test on subsoils and linear shrinkage tests on all likely founding layers.
  - All clays found to Emerson class 8 (non-dispersive)

SOIL PROFILES – Test Hole 1



Depth (m)	Horizon	Description and field texture grade	USCS Class
0 – 0.15	A1	Brown (10YR 5/3), <b>Silty Sandy Clay Loam</b> , moist soft consistency, strong fine angular blocky structure, abundant roots.	<b>SC</b>
0.15 – 0.7	B2 <sub>1</sub>	Reddish yellow (7.5YR 6/6), <b>Silty Light Clay</b> , massive breaking to moderate medium angular blocky structure, slightly moist firm friable consistency.	<b>CH</b>
0.7 – 1.85	B2 <sub>2</sub>	Reddish yellow (7.5YR 7/8), <b>Silty Clay Loam +</b> , moist soft friable consistency, weak medium angular blocky structure.	<b>CH</b>
1.85 – 2.0	BC	Reddish yellow (7.5YR 7/8) with common medium red (2.5YR 5/8) mottles, <b>Silty Clay Loam</b> , weak medium angular blocky structure.  <u>No refusal.</u>	<b>SC</b>

SOIL PROFILES – Test Hole 2



Depth (m)	Horizon	Description and field texture grade	USCS Class
0 – 0.1	A1	Brown (10YR 5/3), <b>Silty Sandy Clay Loam</b> , moist soft consistency, strong fine angular blocky structure, abundant roots.	<b>SC</b>
0.1 – 0.8	B2 <sub>1</sub>	Yellowish brown (10YR 5/6), <b>Silty Light Clay</b> , moist soft friable consistency, massive breaking to weak medium angular blocky structure.	<b>CH</b>
0.8 – 1.6	B2 <sub>2</sub>	Brownish yellow (10YR 6/6) with common medium red (2.5YR 5/8) mottles and a few white (2.5Y 8/1) mottles, <b>Silty Light Clay</b> , massive breaking to weak medium blocky structure, slightly moist stiff consistency.  <u>No refusal.</u>	<b>CH</b>

SOIL PROFILES – Test Hole 3



Depth (m)	Horizon	Description and field texture grade	USCS Class
0 – 0.3	A1	Brown (10YR 5/3), <b>Silty Sandy Clay Loam</b> , moist soft consistency, strong fine angular blocky structure, abundant roots, charcoal rock at 0.25 – 0.3m.	<b>SC</b>
0.3 – 0.8	B2 <sub>1</sub>	Yellowish brown (10YR 5/6), <b>Silty Light Clay</b> , moist soft friable consistency, massive breaking to weak medium angular blocky structure.	<b>CH</b>
0.8 – 1.6	B2 <sub>2</sub>	Brownish yellow (10YR 6/6) with common medium red (2.5YR 5/8) mottles and a few white (2.5Y 8/1) mottles, <b>Silty Light Clay</b> , massive breaking to weak medium blocky structure, slightly moist stiff consistency.  <u>No refusal.</u>	<b>CH</b>

## SITE AND SOIL COMMENTS

The natural soil profiles are formed from deep clayey colluvium derived from Jurassic dolerite. The profiles are deep with no refusal occurring at approximately 3.0 m. The field textures of the soil profile are dominated by light clays, which is highly reactive (H-2), moderately structured and non-dispersive. The DCP indicates a low bearing capacity to at least 1.8 m. We recommend founding on the deeper, more competent, materials at and below approximately 2.3 m.

## LINEAR SHRINKAGE AND SOIL REACTIVITY

Samples of the clayey subsoils were tested for reactivity using the linear shrinkage test. Linear shrinkage provides an approximate guide to aid site classification (for foundations) based on the reactivity of clays. The results suggest the clays are highly reactive (refer to tables below and *AS2870-2011 clause 2.1.2 table 2.1*).

TH #	Depth (m)	Length of mould (mm)	Longitudinal Shrinkage (LS) in mm	LS (%)	Soil Class
1	0.15 - 0.7	125	28	22.4	H - 2
1	0.7 - 1.85	125	25	20	H - 2
2	0.1 - 0.8	125	23	18.4	H - 1
2	0.8 - 1.6	125	30	24	H - 2

## DCP TESTS AND ESTIMATED BEARING CAPACITY

A minimum bearing capacity of 100 kPa is required for strip and pad footings and under the edge footings and associated slab foundations (refer to tables below and *AS2870-2011 clause 2.4.5*). We provide estimated soil bearing strengths along with a variance range (+/-) based on a review of published literature relating field Dynamic Cone Penetrometer (DCP) readings to triaxial soil strength tests.

DCP testing is a method of estimating likely soil bearing capacity. However, surface layers (upper ~0.7 m) are subject to seasonal variation in soil moisture content, leading to possible higher DCP values in summer/drought conditions. Moisture-related variability in soil bearing capacity is most pronounced in coherent soils – i.e., clays and silty clays. These may be very stiff

or hard when dry, while only soft to firm when moist/slightly moist - refer to *soil consistency* in the above profile descriptions).

Soil moisture below ~0.7 m will vary less with the season, meaning DCP values; hence, soil-bearing capacity at these depths is likely to be representative of year-round conditions.

When estimating the suitable foundation depth, we take into account the interplay between soil bearing capacity and seasonally variable soil moisture conditions in the upper layers. The subsoils in the upper 0.7 m were slightly moist when tested (October '24).

The data from DCP1 indicate the bearing capacity of the soil is at a *suitable* strength below 1.9 m. However, the deeper, more competent material at and below approximately 2.3 m would be the *recommended* foundation material.

DCP 1				
Depth (mm)	DCP n-number (Blows/100 mm)	DCP Penetration Index (mm/Blow)	Estimated Bearing Capacity (kPa = n x 30)	Likely Variance (+/-)
0 - 100	1	100.0	30	10
100 - 200	2	50.0	60	20
200 - 300	6	16.7	180	60
300 - 400	5	20.0	150	50
400 - 500	2	50.0	60	20
500 - 600	3	33.3	90	30
600 - 700	2	50.0	60	20
700 - 800	1	100.0	30	10
800 - 900	2	50.0	60	20
900 - 1000	4	25.0	120	40
1000 - 1100	3	33.3	90	30
1100 - 1200	4	25.0	120	40
1200 - 1300	4	25.0	120	40
1300 - 1400	4	25.0	120	40
1400 - 1500	4	25.0	120	40
1500 - 1600	3	33.3	90	30
1600 - 1700	5	20.0	150	50
1700 - 1800	6	16.7	180	60
1800 - 1900	9	11.1	270	90
1900 - 2000	12	8.3	360	120
2000 - 2100	15	6.7	450	150
2100 - 2200	15	6.7	450	150
2200 - 2300	20	5.0	600	200
2300 - 2400	19	5.3	570	190
2400 - 2500	22	4.5	660	220
2500 - 2600	23	4.3	690	230
2600 - 2700	20	5.0	600	200
2700 - 2800	22	4.5	660	220
2800 - 2900	23	4.3	690	230
2900 - 3000	26	3.8	780	260

## WIND CLASSIFICATION

The AS 4055-2021 *Wind load for Housing* classification of the site is:

Region:	<b>A</b>
Terrain Category:	<b>TC1 – open water 100 m off</b>
Shielding Classification:	<b>NS – no shielding</b>
Topographic Classification:	<b>T0 – lower 3<sup>rd</sup> of slope feature</b>
Wind Classification:	<b>N3</b>
Design Wind Gust Speed ( $V_{h,u}$ ):	<b>50 m/sec</b>

## SITE CLASSIFICATION AND RECOMMENDATIONS

For standard foundations (100 kPa bearing capacity), the site meets the criteria for a **Class P** site classification, as set out in AS2870-2011 (construction). This classification is appropriate due to the presence of materials with low bearing capacity to approximately 1.8 m depth. While suitable below 1.9 m we recommend founding on the deeper, more competent material at depths of approximately 2.3 m.

**Note 1** – In addition to **Class P** the site also meets the clay reactivity levels of **Class H-2** or very highly reactive, with 60 – 75 mm the dominant reactivity of expected surface movement under normal soil moisture ranges for the location.

**Note 2** – All foundations require ongoing adequate drainage and vegetation management – please refer to the attached CSIRO foundation management BTF 18 sheet.

**Note 3** – If any foundations are placed on FILL that is > 0.5 m in depth, then **Class P** is applicable.

**Note 4** – Based on the upper 0.6 m of soil, all plumbing fixtures and fittings should be installed using **Class H-2** as per *Appendix G AS/NZS 3500.2.2021*.

**General Notes – Important points pertinent to the maintenance of foundation soil conditions**

This report relates to the soil and site conditions on the property at the time of the site assessment. The satisfactory long-term performance of footings is dependent upon ongoing site maintenance by the owner.

Examples of abnormal moisture conditions developing after construction include the following:

- A) The effect of trees too close to the footings.
- B) Excessive or irregular watering of gardens adjacent to the footings.
- C) Failure to maintain site drainage affecting footings.
- D) Failure to repair plumbing leaks affecting footings.
- E) Loss of vegetation from near the building.

All earthworks on site must comply with AS 3798-2007 Guidelines on Earthworks for commercial and residential developments.

## REPORT LIMITATIONS

Whilst every attempt is made to describe sub-surface conditions, natural variation will occur that cannot be determined by limited investigative soil testing. Therefore, discrepancies are possible between test results and observations during construction. It is our intention to accurately indicate the most probable soil type(s) and conditions for the area assessed. However, due to the nature of sampling an area, variations in soil type, soil depth and site conditions may occur.

We accept no responsibility for any differences between what we have reported and actual site and soil conditions for particular regions we could not directly assess at the time of inspection.

It is recommended that during construction, Doyle Soil Consulting and/or the design engineer be notified of any major variation to the foundation conditions as predicted in this report. Any changes to the site through excavations may alter the site classification.

In these cases, it is expected that the owner consults the author for a reclassification. This report requires certification via a form 55 certificate from Doyle Soil Consulting to validate its contents.

Because site discrepancies may occur between this report and actual site conditions, it is a condition of certification of this report that the builder be provided with a copy of this report.



**Rowan Mason**  
B.Agr.Sc.(Hons).  
**Soil Scientist**



**Assoc. Prof. Richard Doyle**  
B.Sc.(Hons), M.Sc.(Geol), Ph.D. (Soil Sci.),  
CPSS (Certified Prof Soil Scientist)  
**Geologist and Soil Scientist**



## APPENDIX 1 – Approximate test hole and DCP locations



## APPENDIX 2 – Definitions of Soil Horizons

Horizon name	Meaning
<b>A1</b>	Dark topsoils, zone of maximum organic activity
<b>A2 or E</b>	Leached, light/pale washed-out sandy layer
<b>A3 or AB</b>	Transition from A to B, more like A
<b>B1 or BA</b>	Transition from A to B, more like B
<b>B2</b>	Main subsoils layer with brown colouration, accumulations of clay, humus, iron oxide, etc
<b>B3</b>	Transitional from B2 to C
<b>C</b>	Weakly weathered soil parent materials

Subscript	Meaning
<b>r</b>	Reducing conditions (anaerobic)
<b>t</b>	Enriched in translocated clay
<b>s</b>	Iron/aluminium oxide accumulations in subsoil
<b>g</b>	Mottled, suggesting periodic/seasonal wetness
<b>m</b>	Cemented layer (oxides, carbonates, humus, silica etc)
<b>k</b>	Calcium carbonate (lime) accumulation
<b>h</b>	Humus accumulation in subsoil