



Report on Final Site Classification & Construction Testing

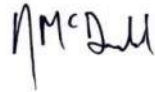
The Vintage Development – The Cedars
Pokolbin, NSW

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Vintage Developments Pty Ltd

12 September 2025

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1 Introduction

This report presents the findings of a geotechnical investigation for final site classification and a summary of construction testing and inspection services undertaken by Stantec Australia Pty Ltd (Stantec) for the 'The Cedars' residential development of 'The Vintage' development located at Pokolbin, NSW. The work was commissioned by Mr Michael Delbridge from ADW Johnson Pty Ltd on behalf of Vintage Developments Pty Ltd ('the client').

To assist with planning of the investigation and preparation of this report, Stantec were supplied with the following documents:

- Stamped construction issue subdivision works certificate plans prepared by ADW Johnson Pty Ltd (ADW) titled '*The Vintage – The Cedars – Engineering Plans – Subdivision Works Certificate, Lot 1603 D.P.1142579 and Lots 1014 & 1015 D.P.1298409 – Wine Country Drive, Pokolbin DA 8/2023/389*' (ref. 11634(20), dwg no. 11634(20)-ENG-001(1) to 11634(20)-ENG-804(1) rev. 1, dated. 26/02/2025) [1].
- Lot filling WAE prepared by Robson Civil Projects Pty Ltd (Robson) titled '*Cedars, The Vintage - Lot Fill Heat Map Showing Height Differs*' (dated. 11/09/2025) [2].

Based on the supplied plans, it is understood the The Cedars development comprises construction of the following:

- Creation of 35 residential allotments (Lots 2 - 36).
- Extension of Vintage Drive (MC10) from the existing extent of construction through to The Cedars (approximately Ch. 13-1017 m).
- Proposed access roads MD01 and MD02.
- Access road MD03 to the wastewater pump station (WWPS).
- Proposed roundabout within the Vintage Drive alignment at chainages 159 m and 495 m.
- Proposed turning head at the northern end of the Vintage Drive extension at chainage 1017 m.
- Creation of a north-east trending swale leading to the bio-retention basin.
- Installation of associated civil infrastructure (e.g. formalised stormwater, in ground utilities etc).

Geotechnical investigation was undertaken to provide site classification of residential allotments in accordance with Australian Standard AS 2870-2011 Residential Slabs and Footings [3].

It is also noted Stantec have overviewed geotechnical construction testing during the The Cedars development. Commentary on compaction testing and level 1 supervision within residential allotments has been included herein with reference to Australian Standard AS 3798-2007 Guidelines on Earthworks for Commercial and Residential Structures [4].

Stantec and Cardno (now Stantec) have previously conducted geotechnical investigation on several stages in the overall Vintage development and more recently for the current site to support the geotechnical recommendations for civil design and construction, detailed in the report titled "Report on Geotechnical Investigation – Vintage Drive Extension and Precinct G, The Vintage , Rothbury NSW" (ref. 304100678, rev. 1, dated 7/07/2022) [5].

Geotechnical data obtained from the previous investigations has been reviewed and utilised herein to support the current investigation, where appropriate.

Stantec have also previously provided a Bulk Earthworks Management Plan (BEMP) for construction of *The Cedars* development titled '*Bulk Earthworks Management Plan – The Cedars, The Vintage Pokolbin NSW*' (ref. 304100678-002.2, dated 1/08/2024) [6]. The BEMP provided recommendation on earthworks methodology to be adopted in order to manage reactive site clays.

2 Site Identification

The subject site is defined as *The Cedars of The Vintage* residential subdivision (the ‘site’), an irregularly shaped parcel of land situated within current Lot 1603 D.P.1142579 and Lots 1014 & 1015 D.P.1298409, located in Pokolbin, NSW, and is bounded by:

- Previous Stages of the Vintage development to the northeast of the site.
- The Vintage Pavillions development followed by future Hawkins Precinct to the south of the site.
- Wine country Drive east of the site.

The approximate extent of the development is outlined below in Figure 1:

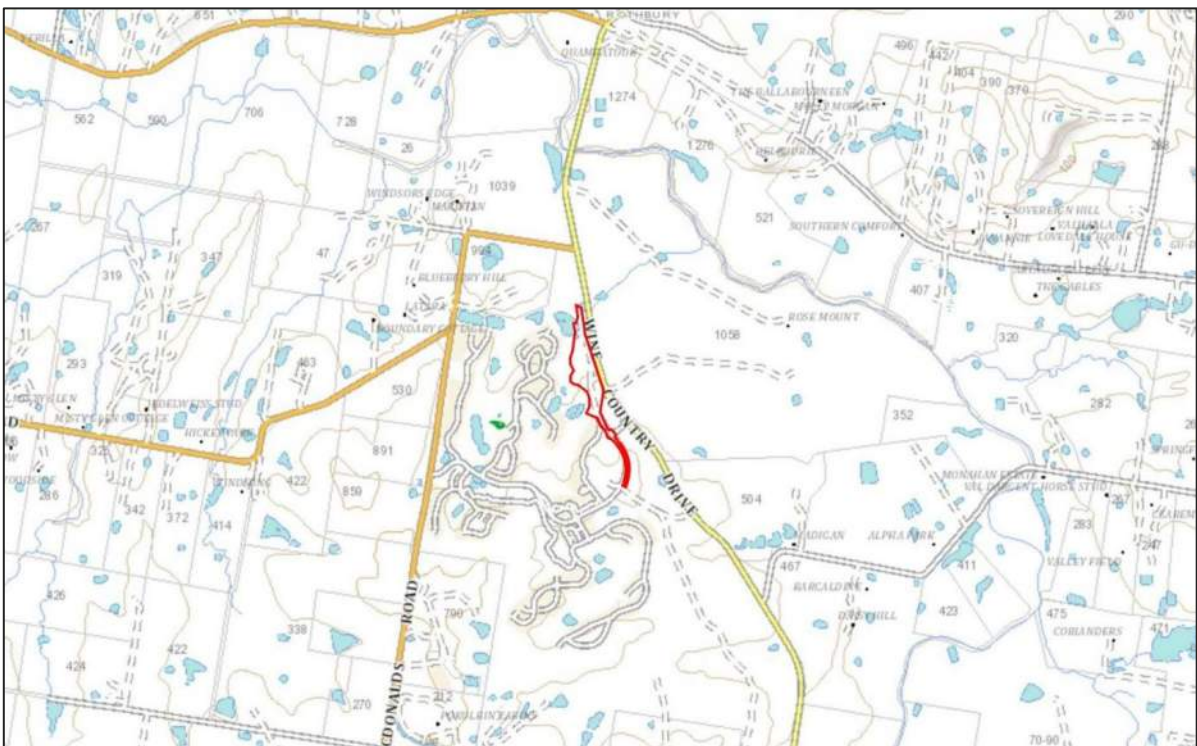


Figure 1: Site Locality

2.1 Site Description

Topographically the site is located within regionally undulating terrain. The proposed development traverses around the eastern portion of a west to east trending ridgeline, heading north along undulating terrain sloping to the north of the site with existing site slopes in the order of 1-10%. It is expected surface flows would generally follow these trends.

The following features were observed at the time of investigation:

- Lots had not been topsoiled.
- Portions of lots 7-17 had not been stripped of natural topsoil and remained on grade an grassed covered.

- Existing basin and wastewater pump station located to the north of the development.
- Various small temporary stockpiles of construction materials (gravel, trench sand, topsoil, and excavated material) scattered across the development.
- Miscellaneous construction materials stored on site across the development including RCP's, PVC pipes, pits and other smaller construction items
- Site shed compound located to the south of the development.
- Large stockpiles of material located adjacent the site shed compound to the southeast.
- Various gravel and dirt access tracks traversing the site.
- The majority of the site was cut to subgrade, with internal pavement construction in progress.
- Temporary open excavation located to the rear western allotments extending from lots 5 to 17, associated with the removal of an existing sewer line.

3 Earthworks & Construction Testing

3.1 Extent of Earthworks

Based on the supplied regrade plan, subsequent earthworks generally comprised:

Earthworks and civil construction for the overall *The Cedars* development commenced in February 2025 and was undertaken by Robson. Earthworks for the development were undertaken in general accordance with the stamped subdivision plans prepared by ADW [1], however additional earthworks were required in isolated locations across the development as detailed below.

With reference to the plans, earthworks for the development comprised a cut to fill operation, with both cut and fill undertaken to form allotments, and predominately cutting undertaken to form the road alignments. The majority of the lots were filled or remained on grade, with minor cut also noted in allotments across the development. Filling within allotments typically graded to depths of approximately 1.5 m across the development, with deeper filling noted within the northern allotments approaching depths of approximately 2.0 m. Cut within allotments was typically minor, with depths of cut less than 0.5 m. Cuts to form the road alignments typically ranged from approximately 0.3 to 0.9 m, with deeper cuts associated with the roundabout in the southern portion of the development in the order of approximately 2.4 m. Minor filling was required in discrete locations within road alignments, typically less than 1.0 m in depth.

The complete design regrade is detailed within the supplied bulk earthworks plans [1] and is shown overlaid in Figure 2, attached in Appendix A. The plans should be referenced for detailed overview of proposed earthworks.

Further filling depths and areal extent beyond the originally approved design were also required, related to the following:

- Additional stripping works to remove existing onsite uncontrolled filling, including surficial fill materials, in various isolated locations across the development i.e. to the north associated with an existing fill bund and access tracks, and to the south within lot 28 associated with existing uncontrolled filling from previous adjacent development.
- Additional excavations (minimum 0.3 m) undertaken where filling, and cut to fill transitions were proposed, followed by filling/replacement with lower reactive site won material to provide uniform founding conditions across the entire lot footprint, as detailed in Stantec's BEMP [6].
- Excavations following the removal of an existing sewer line located to the rear of lots 5-13 and 15-17 required backfilling to design levels. Fill depths were typically in the order of approximately 1.2 m.

The approximate extent of additional earthworks can be seen depicted in Figure 2, and Robsons WAE survey [2] depicting stripped surface vs. finished levels for allotments, attached in Appendix A.

For details on the regrade refer to the regrade plans attached in Appendix A. Testing was undertaken on filling in accordance with Section 8 of AS 3798-2007 [4].

3.2 Methodology

Regrade operations were generally undertaken by removing topsoil and unsuitable colluvial materials to expose natural in-situ soils that were free of significant organic matter.

Additionally, due to several days of inclement weather occurring during the stripping works, elevated moisture conditions were observed throughout the exposed stripped surface. As such, remedial works involving moisture reconditioning was undertaken to render the surface suitable to receive filling

Stripping and removal of uncontrolled fill where encountered to achieve a suitable foundation, followed by inspection of stripped surface by a geotechnical consultant from Stantec to assess suitability for placement of fill.

Generally, fill operations were undertaken by placing layers of approximately 200mm to 300mm thickness and compacting to specified limits. Compacted fill layers were tested for compaction in accordance with the guidelines indicated in AS 3798-2007 *Guidelines for Earthworks on Residential and Commercial Developments* (Australian Standard AS3798-2007) [4] under level 1 supervision by a NATA accredited laboratory.

Table 5.1 Item 1 of AS 3798-2007 [4] was adopted as the appropriate compaction for the work with a minimum relative compaction of 95% standard adopted for the residential lots.

Fill was tested in accordance with Table 8.1 Frequency of Field Density Tests for *Type 1 Large Scale Operations* as defined within AS 3798-2007 [4].

3.3 Material Quality

Materials used for filling were sourced from on-site cut areas, and dedicated stockpiles associated with previous stages of *The Vintage* development. On-site cut and stockpiled fill materials, other than stripped topsoil, were generally deemed suitable for use as general fill and generally comprised sandy / gravelly clays and clayey sands with variable gravel inclusions. Care was taken in the selection of excavated soil to select lower reactivity clays for use as lot filling. Given the stockpiled nature of the filled source, moisture conditioning was required in order to render the material suitable for use, with some blending of sandy colluvial soils undertaken to render them suitable for use as filling.

3.4 Lot Regrade and General Fill Test Results

Results of compaction testing of all structural fill areas undertaken by a NATA accredited construction materials laboratory indicate that the filling operations satisfy the compaction criteria for Level 1 '*structural fill*' as defined in Clause 1.2.13 of AS3798-2007 [4], '*controlled fill*' as defined in AS2870-2011 [3], and compaction requirements as per Cessnock City Council (CCC) guidelines.

All testing has either met with or exceeded the specification adopted compaction level at moisture contents of generally 85% to 115% of Standard Optimum Moisture Content (SOMC) at the time of placement. Some tests returned values dry of this range; however, as specified compaction was achieved this is expected to have minimal adverse impacts on proposed residential structures.

Geotechnical services provided during regrade comply with AS 3798-2007 [4] with testing undertaken to the minimum frequency as indicated in Table 8.1 for Type 1 – Large Scale Operations.

A total of thirty-five (35) compaction tests were conducted on structural fill placed during earthworks (identified as lot fill on test reports or those tests deemed as general fill), with results shown on NATA accredited test certificates attached in Appendix C.

4 Final Site Classification

4.1 Investigation Methodology

4.1.1 Site Investigation

On completion of the bulk earthworks to the lot areas site investigation was undertaken on 5th June 2025 and comprised the drilling of 13 boreholes (BH001-BH013) within the proposed allotment areas. Boreholes were advanced utilising a 4WD ute mounted drill rig fitted with either a 300 mm solid flight auger (SFA) with tc-bit or 125 mm SFA with v-bit to a target depth of 2.5 m below ground level (bgl), with prior v-bit refusal encountered within BH005-BH013 at depths ranging 1.5 to 2.2 m bgl.

Dynamic cone penetrometer tests (DCP) were conducted at each test bore location where possible to aid in the assessment of subsurface strength conditions. Thin wall tube (50 mm diameter) samples of natural and fill materials encountered within the lots were collected for subsequent laboratory testing.

All fieldwork including logging of subsurface profiles and collection of samples was conducted by a geotechnical consultant from Stantec. Test locations are shown overlaid on aerial imagery and client supplied plans in Figures 1 and 2, attached as Appendix A.

4.1.2 Laboratory Testing

Laboratory testing on selected samples recovered during fieldwork comprised six (6) shrink swell tests on representative samples of the encountered natural and fill clayey soils at the site.

The geotechnical testing was conducted at a NATA accredited construction materials testing laboratory. Results of laboratory testing are detailed in the reports sheets attached in Appendix C and summarised in Section 4.2.3.

4.2 Investigation Findings

4.2.1 Published Data

Reference to the New South Wales Seamless Geology dataset [7] indicates the site is underlain by the *Farley Formation (Pdaf)* of the *Dalwood group*, known to comprise ‘poorly sorted, light- and dark-grey, micaceous sandy siltstone, silty sandstone, mudstone and shale; sporadic thin limestone near Pokolbin; abundant marine fossils’.

4.2.2 Subsurface Conditions

The subsurface conditions encountered across the site can be generally summarised as follows:

Topsoil	Silty CLAY / Clayey SILT surficial material, variable brown in colour. Topsoil was encountered to depths ranging approximately 150 to 200 mm in thickness, encountered in BH004-BH005 and BH007.
Controlled Fill	Silty / Sandy CLAY ranging from low to medium plasticity, of variable brown colour, encountered at all test bore locations (with exception of BH004-BH005 and BH007) to depths ranging to 0.1 m to 1.5 m BGL. Fill clay materials ranged from less than to greater than the plastic limit in moisture condition, and stiff to hard consistency (based on dcp blow counts), with fill depths generally consistent with those anticipated based on supplied regrade plans and generally well compacted (based on DCP testing).
Alluvium	Silty CLAY ranging from medium to high plasticity, typically mottled red or dark brown in colour, encountered at all test bore locations to depths ranging to 0.55 m BGL to investigation limits. Alluvial clay materials ranged from less than to greater than the plastic limit in moisture condition, and firm to hard in consistency (based on dcp blow counts); overlying
Residual	Silty / Sandy CLAY ranging from medium to high plasticity, of variable mottled orange, red, brown and grey colour, encountered at all test bore locations to depths ranging to 0.55 m BGL to investigation limits. Residual clay materials ranged from less than to greater than the plastic limit in moisture condition, and firm to hard in consistency (based on dcp blow counts); overlying
Extremely Weathered Material	Silty / Sandy CLAY of low to medium plasticity, typically grey in colour with variable red, yellow and orange mottling, with varying components of gravel, and moisture condition ranging from less than to greater than the plastic limit, very stiff to hard in consistency (based on dcp blow counts), to investigation limits of 2.5 m encountered in all test pits except BH001.

No groundwater or seepage was encountered within any of the test bore locations at the time of fieldwork. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

The subsurface conditions are detailed in the engineering logs attached in Appendix B, together with explanatory notes.

4.2.3 Laboratory Results

The results of the laboratory shrink swell tests undertaken on representative clayey soils of the site are summarised below in Table 4-1, with the test report sheets attached in Appendix C.

Table 4-1 Summary of Shrink Swell Results

Test Location	Depth (m)	Material Description	E _{sw} (%)	E _{sh} (%)	I _{ss} (%)
BH001	0.65 – 0.96	FILL: Silty CLAY	1.8	1.4	1.3
BH002	0.35 – 0.66	FILL: Silty CLAY	2.1	4.8	3.2
BH005	0.50 – 0.75	Silty CLAY	2.7	7.3	4.8
BH007	0.90 – 1.27	Silty CLAY	1.5	2.1	1.6
BH010	0.35 – 0.69	FILL: Silty Sandy CLAY	1.4	4.2	2.7
BH012	0.25 – 0.59	Silty CLAY	0.8	6.1	3.6

Notes to table:

E_{sw}: Swelling Strain

E_{sh}: Shrinkage Strain

I_{ss}: Shrink Swell Index

The results of the laboratory shrink-swell testing indicate that the tested natural and fill clayey soils generally range from moderately to highly, and slightly to highly reactive respectively.

4.3 Site Classification

Australian Standard AS 2870-2011 [3] establishes performance requirements and specific designs for common foundation conditions as well as providing guidance on the design of footing systems using engineering principles. Site classes as defined on Table 2.1 and 2.3 of AS 2870 are presented on Table 4-2 below.

Table 4-2 General Definition of Site Classes

Site Class	Foundation	Characteristic Surface Movement
A	Most sand and rock sites with little or no ground movement from moisture changes	
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes	0 - 20mm
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture changes	20 - 40mm
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes	40 - 60mm
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes	60 - 75mm
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes	> 75mm
A to P	Filled sites (refer to clause 2.4.6 of AS 2870)	
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise.	

Reactive sites are sites consisting of clay soils that swell on wetting and shrink on drying, resulting in ground movements that can damage lightly loaded structures. The amount of ground movement is related to the physical properties of the clay and environmental factors such as climate, vegetation and watering. A higher probability of damage can occur on reactive sites where abnormal moisture conditions occur, as defined in AS 2870, due to factors such as:

- Presence of trees on the building site or adjacent site, removal of trees prior to or after construction, and the growth of trees too close to a footing. The proximity of mature trees and their effect on foundations should be considered when determining building areas within each allotment (refer to AS 2870);
- Failure to provide adequate site drainage or lack of maintenance of site drainage, failure to repair plumbing leaks and excessive or irregular watering of gardens;
- Unusual moisture conditions caused by removal of structures, ground covers (such as pavements), drains, dams, swimming pools, tanks etc.

In regard to the performance of footings systems, AS 2870 states “footing systems designed and constructed in accordance with this Standard on a normal site (see Clause 1.3.1) [3] that is:

(a) not subject to abnormal moisture conditions; and

(b) maintained such that the original site classification remains valid and abnormal moisture conditions do not develop;

are expected to experience usually no damage, a low incidence of damage category 1 and an occasional incidence of damage category 2.”

Damage categories are defined in Appendix C of AS 2870, which is reproduced in CSIRO Information Sheet BTF 18, Foundation Maintenance and Footing Performance: A Homeowner’s Guide.

The laboratory shrink-swell test results summarised in Table 4-1 indicate that the tested cohesive soils at the site from the current and previous investigations are as follows;

- Controlled filling – slightly to highly reactive with I_{ss} values ranging 1.3 - 3.2%.
- Natural Silty CLAYs – moderately to highly reactive with I_{ss} values in the range of 1.6 - 4.8%.

The classification of sites with controlled fill more than 0.40 m deep of material other than sand would be Class P. An alternative classification may however be given to sites with controlled fill where consideration is made to the potential for movement of the fill and underlying soil based on the moisture conditions at the time of construction and the long-term equilibrium moisture conditions.

The following classifications are provided under the assumption that all topsoil, slopewash and deleterious materials are removed prior to construction as well as removal of any stockpiled material on the lots. This includes addressing any surficial soils negatively impacted by inclement weather and ponding of stormwater.

Calculations of reactive surface movement are significantly impacted by which the depth of weathered rock is encountered. Based on site observations and subsurface profiles encountered during the investigation and laboratory shrink swell test results, and in accordance with the AS2870-2011 [5] *The Cedars* lots in their existing condition, and in the absence of abnormal moisture conditions would be classified as **Class M – Moderately Reactive**. It should be noted calculations are on the higher end of Class M with calculated surface movements within the range of **35 to 39 mm**. Where highly reactive clay and weathered rock is encountered at greater depths than those observed during investigation, classifications may fall into Class H – Highly Reactive.

It should be noted that Footings for residential structures shall be designed and constructed in accordance with Section 4.4 below. The classifications assume that all footings (edge beams, internal beams and load support thickenings) are founded below any topsoil, uncontrolled fill or deleterious materials.

It should be appreciated that the site classifications provided above are based on discrete test bores, compaction test results, laboratory results and tactile assessment of multiple layers over the depth of total soil suction change in the soil profile. It should also be noted that individual lot development can include other geotechnical studies and care should be taken that single laboratory results are not allocated to the full depth of the soil profile; as biased site classifications can result.

The above site classifications and footing recommendations are for the site conditions present at the time of fieldwork and consequently the site classification may need to be reviewed with consideration of any site works that may be undertaken subsequent to the investigation and this report.

Site works may include:

- Changes to the existing soil profile by cutting and filling;
- Landscaping, including trees removed or planted in the general building area; and
- Drainage and watering systems.

Design methods presented in AS 2870-2011 [3] are based on the performance requirement that significant damage can be avoided provided that site conditions are properly maintained. Performance requirements and foundation maintenance are outlined in Appendix B of AS 2870. The above site classification assumes that the performance requirements as set out in Appendix B of AS 2870 are acceptable and that site foundation maintenance is undertaken to avoid extremes of wetting and drying.

Details on appropriate site and foundation maintenance practices are presented in Appendix B of AS 2870-2011 and in CSIRO Information Sheet BTF 18, Foundation Maintenance and Footing Performance: A Homeowner's Guide, which is attached as Appendix D of this report.

Adherence to the detailing requirement outlined in Section 5 of AS 2870-2011 [3] is essential, in particular Section 5.6, additional requirements for Classes S, M and H1 sites, including architectural restrictions, plumbing and drainage requirements.

4.4 Footings

All foundations should be designed and constructed in accordance with AS 2870-2011, Residential Slabs and Footings [3] with reference to the site classifications within Section 4.3.

All footings should be founded below any topsoil, deleterious soils, uncontrolled fill (if encountered) or residual soils with a significant organic component. The residual profile and general controlled fill profiles encountered was of reasonable consistency at the time of fieldwork and would generally be suitable for the foundation of footings, subject to inspection at the time of construction.

All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements.

All footing excavations should be inspected prior to installation of structural steel by Stantec or a qualified geotechnical consultant to confirm that the founding conditions are as described in this report. All loose material should be cleared from the footing excavations before concrete is poured.

4.4.1 High-Level Footings

High-level footing alternatives could be expected to comprise slabs on ground with edge beams or pad footings for the support of concentrated loads. Such footings designed in accordance with engineering principles and founded in stiff or better natural soils (below topsoil, uncontrolled fill (if encountered), deleterious material or soils affected by tree roots) or in controlled fill (placed and compacted in accordance with AS3798-2007 [4]) may be proportioned on an allowable bearing capacity of 150 kPa.

It is noted lots have been constructed with minimal grade, and as such may be subject to ponding during inclement weather events. Where lots are subject to inclement weather, rectification works may be required prior to slab foundation construction.

If preparation for ground slabs encounters materials affected by organics such as tree roots, over excavation to remove the materials may be required.

The founding conditions should be assessed by a geotechnical consultant or experienced engineer to confirm suitable conditions.

4.4.2 Piered Footings

Piered footings are considered as an alternative to deep edge beams or high-level footings. It is suggested that piered footings, founded in stiff or better clay soils or controlled fill could be proportioned on an end bearing pressure of 150 kPa. Where uniformly founded in the underlying bedrock, an end bearing pressure of 500 kPa could be adopted.

Where piered footings are utilised, the potential for volume change in the subsurface profile should be taken into consideration by the designer, along with potential settlement.

All footings should be founded below any topsoil, deleterious soils, uncontrolled fill (if encountered) or soils affected by tree roots. All footings for the same structure should be founded on strata of similar stiffness and reactivity to minimise the risk of differential movements.

Inspection of high level or pier footings excavations should be undertaken to confirm the founding conditions and the base should be cleared of fall-in prior to the formation of the footing.

5 Limitations

Stantec have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The extent of testing was limited to discrete test locations and variations in ground conditions can occur between test locations that cannot be inferred or predicted.

An environmental consultant or qualified engineer shall provide inspections during construction to confirm assumed conditions in this assessment. If subsurface conditions encountered during construction differ from those given in this report, further advice shall be sought without delay.

Stantec, or any other reputable consultant, cannot provide unqualified warranties nor does it assume any liability for the site conditions not observed or accessible during the investigations. Site conditions may also change subsequent to the investigations and assessment due to ongoing use.

This report and associated documentation were undertaken for the specific purpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by Vintage Developments Pty Ltd and any reliance assumed by other parties on this report shall be at such parties' own risk.

References

- [1] ADW Johnson Pty Ltd, “The Vintage – The Cedars – Engineering Plans – Subdivision Works Certificate, Lot 1603 D.P.1142579 and Lots 1014 & 1015 D.P.1298409 – Wine Country Drive, Pokolbin DA 8/2023/389,” 26 February 2025.
- [2] Robson Civil Projects Pty Ltd, Cedars, The Vintage - Lot Fill Heat Map Showing Height Diffs, September 2025.
- [3] Australian Standard AS2870-2011, “Residential Slabs and Footings,” Standards Australia, 2011.
- [4] Australian Standard AS3798-2007, “Guidelines on Earthworks for Commercial and Residential Structures,” Standards Australia, 2007.
- [5] Cardno now Stantec Australia Pty Ltd, Report on Geotechnical Investigation – Vintage Drive Extension and Precinct G, The Vintage , Rothbury NSW, 7 July 2022.
- [6] Stantec Australia Pty Ltd, Bulk Earthworks Management Plan – The Cedars, The Vintage Pokolbin NSW, August 2024.
- [7] NSW Department of Planning, Industry & Environment, “MinView,” 2022.8.3. [Online]. Available: <https://minview.geoscience.nsw.gov.au/>. [Accessed November 2022].

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Appendix A Drawings





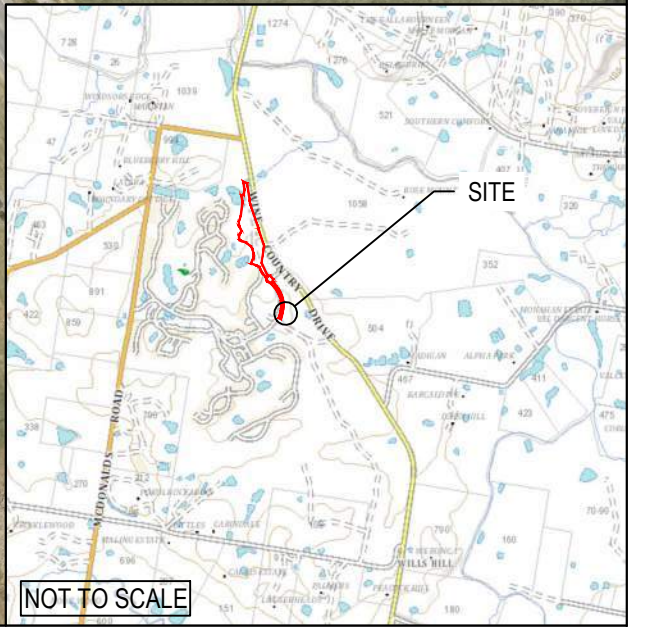
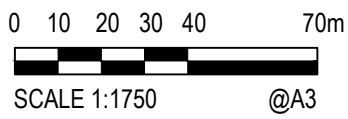
DATE PLOTTED: 30 JUL 2025 2:09 PM BY: MCDONALD, NICK

NOTES:

Image underlay adapted from metromaps aerial imagery.

LEGEND:

-  BHXX Proposed test bore locations and numbers for current investigation.
-  TPXXX Approximate test bore locations and numbers from previous investigation (ref. 304100678, dated. 6/07/2022).



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Drawn	JH	Date	12/05/2025
Checked	NM	Date	16/07/2025
Designed		Date	
Verified		Date	
Approved		Date	

Client	VINTAGE DEVELOPMENTS PTY LTD C/- ADW JOHNSON PTY LTD
Project	GEOTECHNICAL INVESTIGATION THE VINTAGE - PRECINCT G 1023 WINE COUNTRY DRIVE, POKOLBIN NSW
Title	FINAL SITE CLASSIFICATION TEST LOCATION PLAN



Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Project Number	304001563	Scale	1:1750
Figure Number	Site Plan Figure 1	Size	A3
Revision	A		

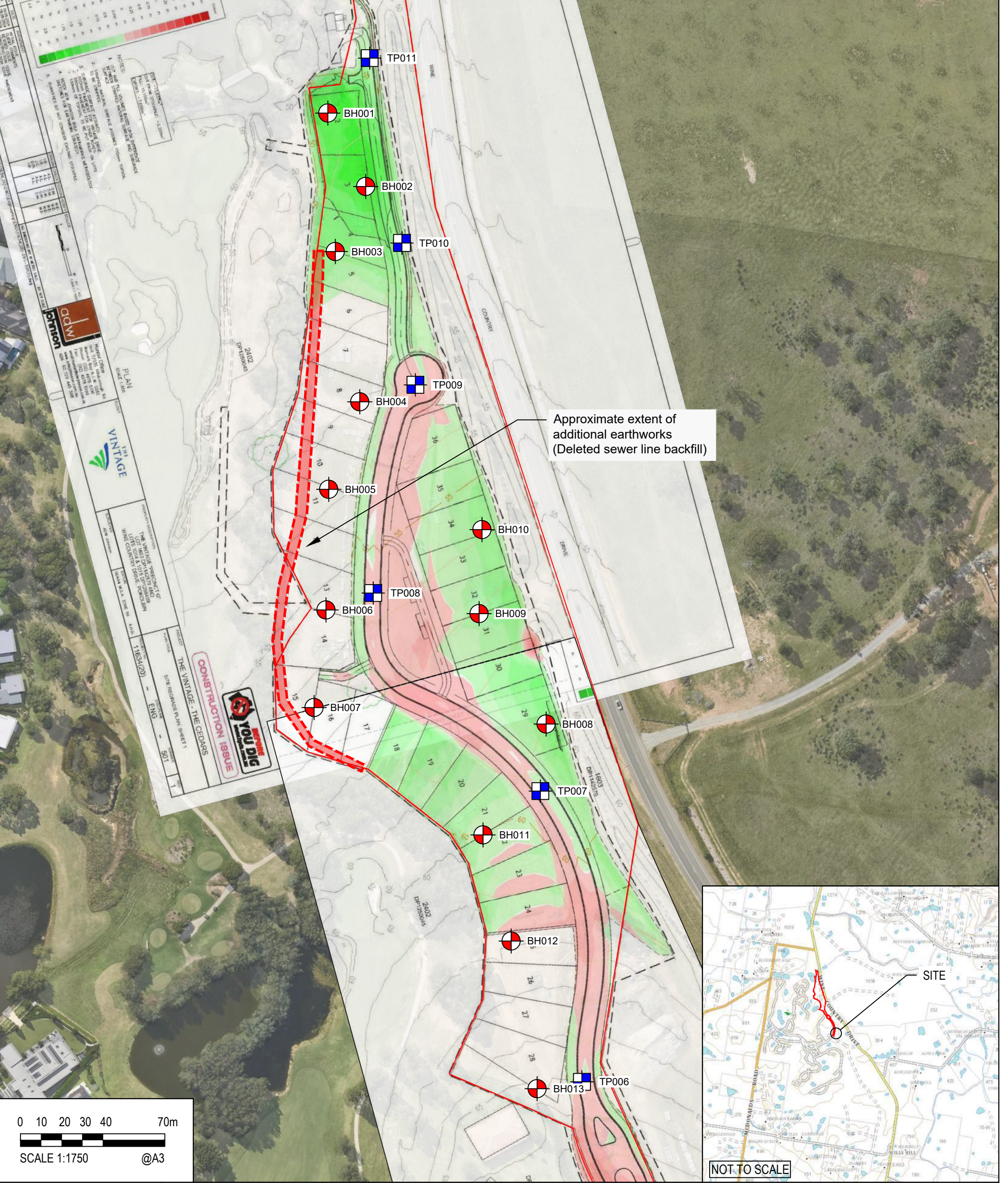
DATE PLOTTED: 30 JULY 2025 2:10 PM BY: MCDONALD, NICK

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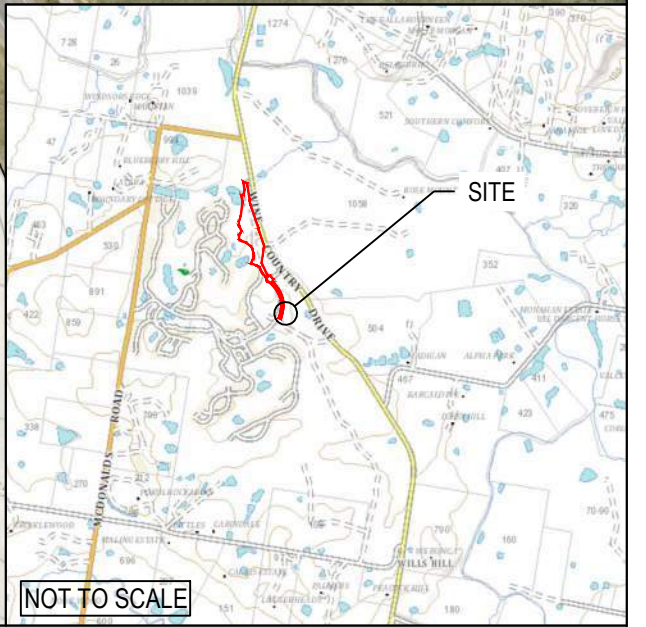
Image underlay adapted from metromaps aerial imagery.

LEGEND:

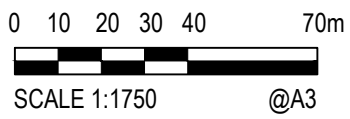
-  BHXX Proposed test bore locations and numbers for current investigation.
-  TPXX Approximate test bore locations and numbers from previous investigation (ref. 304100678, dated. 6/07/2022).



Approximate extent of additional earthworks (Deleted sewer line backfill)



NOT TO SCALE



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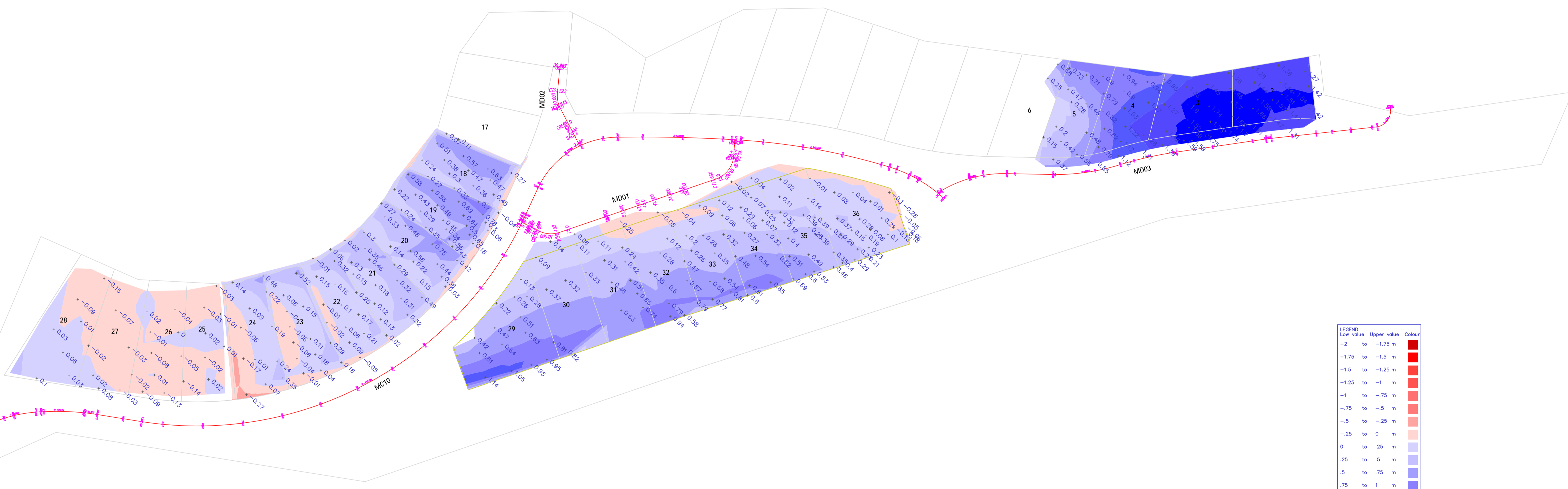
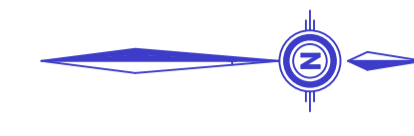
Stantec
Stantec Australia Pty Ltd | ABN 17 007 820 322
Level 2 Suite 202, 22 Honeysuckle Drive
Newcastle, NSW 2300
Tel: 02 4965 4555 Fax: 02 4965 4666
Web: www.stantec.com

Drawn	JH	Date	12/05/2025
Checked	NM	Date	16/07/2025
Designed		Date	
Verified		Date	
Approved		Date	

Client	VINTAGE DEVELOPMENTS PTY LTD C/- ADW JOHNSON PTY LTD
Project	GEOTECHNICAL INVESTIGATION THE VINTAGE - PRECINCT G 1023 WINE COUNTRY DRIVE, POKOLBIN NSW
Title	FINAL SITE CLASSIFICATION TEST LOCATION PLAN

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES			
Project Number	304001563	Scale	1:1750	
Figure Number	Site Plan Figure 2		Size	A3
Revision			Revision	A

XREFS: CAD File: U:\304001563\technical\drawing\dwg\vintage_precinct_g_site_plan_as_drafted.dwg



WINE COUNTRY DRIVE

Low value	Upper value	Colour
-2	to -1.75 m	Dark Red
-1.75	to -1.5 m	Red
-1.5	to -1.25 m	Light Red
-1.25	to -1 m	Orange-Red
-1	to -.75 m	Orange
-.75	to -.5 m	Light Orange
-.5	to -.25 m	Yellow-Orange
-.25	to 0 m	Yellow
0	to .25 m	Light Yellow
.25	to .5 m	Light Green
.5	to .75 m	Green
.75	to 1 m	Light Blue
1	to 1.25 m	Blue
1.25	to 1.5 m	Dark Blue
1.5	to 1.75 m	Very Dark Blue
1.75	to 2 m	Black

Heights shown are stripped surface to finished level
+ve = fill
-ve = cut

Appendix B Engineering Logs



Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method

Test Pitting: excavation/trench

BH	Backhoe bucket
EX	Excavator bucket
R	Ripper
H	Hydraulic Hammer
X	Existing excavation
N	Natural exposure

Manual drilling: hand operated tools

HA	Hand Auger
----	------------

Continuous sample drilling

PT	Push tube
PS	Percussion sampling
SON	Sonic drilling

Hammer drilling

AH	Air hammer
AT	Air track

Spiral flight auger drilling

AS	Auger screwing
AD/V	Continuous flight auger: V-bit
AD/T	Continuous spiral flight auger: TC-Bit
HFA	Continuous hollow flight auger

Rotary non-core drilling

WB	Washbore drilling
RR	Rock roller

Rotary core drilling

PQ	85mm core (wire line core barrel)
HQ	63.5mm core (wire line core barrel)
NMLC	51.94mm core (conventional core barrel)
NQ	47.6mm core (wire line core barrel)
DT	Diatube (concrete coring)

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method

Soil sampling

B	Bulk disturbed sample
D	Disturbed sample
C	Core sample
ES	Environmental soil sample
SPT	Standard Penetration Test sample
U	Thin wall tube 'undisturbed' sample

Water sampling

WS	Environmental water sample
----	----------------------------

Field testing may be conducted as a means of assessment of the in situ conditions of materials.

Field testing

SPT	Standard Penetration Test
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows per noted increment)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
VS	Vane Shear
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Photo Ionization Detector

If encountered, refusal (R), virtual refusal (VR) or hammer bouncing (HB) of penetrometers may be noted.

The quality of the rock can be assessed by the degree of natural defects/fractures and the following.

Rock quality description

TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater

Not Encountered	Excavation is dry in the short term
Not Observed	Water level observation not possible
Seepage	Water seeping into hole
Inflow	Water flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions

Stable	No obvious/gross short term instability noted
Spalling	Material falling into excavation (minor/major)
Unstable	Collapse of the majority, or one or more face of the excavation

Explanatory Notes: General Soil Description

The methods of description and classification of soils used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, a material is described as a soil if it can be remoulded by hand in its field condition or in water. The dominant component is shown in upper case, with secondary components in lower case. In general descriptions cover: soil type, plasticity or particle size/shape, colour, strength or density, moisture and inclusions.

In general, soil types are classified according to the dominant particle on the basis of the following particle sizes.

Soil Classification		Particle Size (mm)
CLAY		< 0.002
SILT		0.002 to 0.075
SAND	fine	0.075 to 0.21
	medium	0.21 to 0.6
	coarse	0.6 to 2.36
GRAVEL	fine	2.36 to 6.7
	medium	6.7 to 19
	coarse	19 to 63
COBBLES		63 to 200
BOULDERS		> 200

Soil types may be qualified by the presence of minor components on the basis of field examination methods and/or the soil grading.

Terminology	In coarse grained soils		In fine soils
	% fines	% coarse	% coarse
Trace	≤5	≤15	≤15
With	>5, ≤12	>15, ≤30	>15, ≤30

The strength of cohesive soils is classified by engineering assessment or field/lab testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	≤12kPa
Soft	S	12kPa to ≤25kPa
Firm	F	25kPa to ≤50kPa
Stiff	St	50kPa to ≤100kPa
Very Stiff	VSt	100kPa to ≤200kPa
Hard	H	>200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	<15%
Loose	L	15% to ≤35%
Medium Dense	MD	35% to ≤65%
Dense	D	65% to ≤85%
Very Dense	VD	>85%

The plasticity of cohesive soils is defined by the Liquid Limit (LL) as follows.

Plasticity	Silt LL	Clay LL
Low plasticity	≤ 35%	≤ 35%
Medium plasticity	N/A	> 35% ≤ 50%
High plasticity	> 50%	> 50%

The moisture condition of soil (*w*) is described by appearance and feel and may be described in relation to the Plastic Limit (PL), Liquid Limit (LL) or Optimum Moisture Content (OMC).

Moisture condition and description

Dry	Cohesive soils: hard, friable, dry of plastic limit. Granular soils: cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure of soil layers may include: defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description

Fill	Anthropogenic deposits or disturbed material
Topsoil	Zone of soil affected by roots and root fibres
Peat	Significantly organic soils
Colluvial	Transported down slopes by gravity/water
Aeolian	Transported and deposited by wind
Alluvial	Deposited by rivers
Estuarine	Deposited in coastal estuaries
Lacustrine	Deposited in freshwater lakes
Marine	Deposits in marine environments
Residual soil	Soil formed by in situ weathering of rock, with no structure/fabric of parent rock evident
Extremely weathered material	Formed by in situ weathering of geological formations, with the structure/fabric of parent rock intact but with soil strength properties

The origin of the soil generally cannot be deduced solely on the appearance of the material and the inference may be supplemented by further geological evidence or other field observation. Where there is doubt, the terms 'possibly' or 'probably' may be used

Explanatory Notes: General Rock Description

The methods of description and classification of rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, if a material cannot be remoulded by hand in its field condition or in water, it is described as a rock. In general, descriptions cover: rock type, grain size, structure, colour, degree of weathering, strength, minor components or inclusions, and where applicable, the defect types, shape, roughness and coating/infill.

Rock types are generally described according to the predominant grain or crystal size, and in groups for each rock type as follows.

Rock type	Groups
Sedimentary	Deposited, carbonate (porous or non), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate, or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing mineralogy (iron oxides or hydroxides, silica, calcium carbonate, gypsum)

Reference should be made to AS1726 for details of the rock types and methods of classification.

The classification of rock weathering is described based on definitions in AS1726 and summarised as follows.

Term and symbol	Definition
Residual Soil RS	Soil developed on rock with the mass structure and substance of the parent rock no longer evident
Extremely weathered XW	Weathered to such an extent that the rock has 'soil-like' properties. Mass structure and substance still evident
Distinctly weathered DW	The strength is usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores. May be distinguished into MW (Moderately Weathered) and HW (Highly Weathered).
Slightly weathered SW	Slightly discoloured; little or no change of strength from fresh rock
Fresh Rock FR	The rock shows no sign of decomposition or staining

The rock material strength can be defined based on the point load index as follows.

Term and symbol	Point Load Index I_{s50} (MPa)
Very Low VL	0.03 to 0.1
Low L	0.1 to 0.3
Medium M	0.3 to 1.0
High H	1.0 to 3
Very High VH	3 to 10
Extremely High EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength which can be significantly weaker due to the effect of defects.

A preliminary assessment of rock strength may be made using the field guide detailed in AS1726, and this is conducted in the absence of point load testing.

The defect spacing measured normal to defects of the same set or bedding, is described as follows.

Definition	Defect Spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Terms for describing rock and defects are as follows.

Defect Terms			
Joint	JT	Sheared zone	SZ
Bedding Parting	BP	Seam	SM
Foliation	FL	Vein	VN
Cleavage	CL	Drill Lift	DL
Crushed Seam	CS	Handling Break	HB
Fracture Zone	FZ	Drilling Break	DB









The shape and roughness of defects in the rock mass are described using the following terms.

Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulose	UN	Smooth	S
Irregular	IR	Slickensided	SL
Stepped	ST	Polished	POL
Discontinuous	DIS		

The coating or infill associated with defects in the rock mass are described as follows.

Infill and Coating		
Clean	CN	
Stained	SN	
Carbonaceous	X	
Minerals	MU	Unidentified mineral
	MS	Secondary mineral
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
Veneer	VNR	Thin or patchy coating
Coating	CT	Infill up to 1mm

Graphic Symbols Index

	CLAY		SILT		SAND		GRAVEL
	Silty CLAY		Clayey SILT		Clayey SAND		Clayey GRAVEL
	Sandy CLAY		Sandy SILT		Silty SAND		Silty GRAVEL
	Gravelly CLAY		Gravelly SILT		Gravelly SAND		Sandy GRAVEL
	Silty Gravelly CLAY		Clayey Sandy SILT		Clayey Silty SAND		Clayey Silty GRAVEL
	Silty Sandy CLAY		Clayey Gravelly SILT		Clayey Gravelly SAND		Clayey Sandy GRAVEL
	Sandy Gravelly CLAY		Sandy Gravelly SILT		Silty Gravelly SAND		Silty Sandy GRAVEL
	COBBLES & BOULDERS		Sedimentary rock: fine, mostly clay (CLAYSTONE)		Igneous rock: Felsic, fine (RHYOLITE)		
	PEAT, highly organic soil		Sedimentary rock: fine, mostly silt (SILTSTONE)		Igneous rock: Felsic, coarse (GRANITE)		
	TOPSOIL		Sedimentary rock: fine, silt and clay (MUDSTONE, SHALE, LAMINITE)		Igneous rock: Mafic, fine to medium (BASALT, DOLERITE)		
	FILL		Sedimentary rock: medium (SANDSTONE, GREYWACKE)		Igneous rock: Mafic, coarse (GABBRO)		
	FILL: Asphalt or Bituminous Seal		Sedimentary rock: fine to coarse, angular (BRECCIA)		Metamorphic rock: Foliated, fine to medium (SLATE, PHYLLITE, SHIST)		
	FILL: Ballast		Sedimentary rock: coarse, rounded (CONGLOMERATE)		Metamorphic rock: Foliated, coarse (GNEISS)		
	FILL: Concrete		Sedimentary rock: Organic (COAL)		Metamorphic rock: Non-foliated (QUARTZITE, HORNFELS, MARBLE)		
	FILL: Roadbase		Sedimentary rock: Carbonate (LIMESTONE, DOLOMITE)				
			Sedimentary rock: Volcanic (TUFF, VOLCANIC BRECCIA, AGGLOMERATE)				

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH002 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
200mm AS					0.5		0.10m	FILL: Silty CLAY; medium plasticity, dark brown	M (>PL)		FILL
							0.25m	FILL: Silty Sandy CLAY; low plasticity, yellow-brown, fine to medium grained sand	M (<PL) - M (=PL)	VSt	
E-F			U50 0.35 - 0.66 m		1.0		1.20m	FILL: Silty CLAY; medium plasticity, brown, with fine to medium grained sand, trace fine to coarse angular to sub-angular gravel	M (=PL) - M (>PL)	VSt	
								As above, boulder/cobbles			1.00 m: Teeth grinding on possible fill layer, switched auger to get through
125mm AD/T					2.0		2.00m	Silty CLAY; medium plasticity, dark green to dark brown, with fine to medium grained sand	M (=PL) - M (>PL)	VSt - H	Possibly ALLUVIUM
							2.40m	Silty Sandy CLAY; low to medium plasticity, red mottled grey and orange, fine to medium grained sand	M (<PL) - M (=PL)		RESIDUAL SOIL
					2.5		2.50m	Sandy CLAY; low plasticity, yellow mottled grey and orange, fine to medium grained sand	M (<PL)		EXTREMELY WEATHERED
								TERMINATED AT 2.50 m Target depth			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd
 Project: Vintage Precinct G Final Site Classification
 Location: Wine Country Drive, Polkobin

Job No: 304001563

Sheet: 1 of 1

Position: Refer to site plan

Angle from Horizontal: 90°

Surface Elevation:

Rig Type: Ute Mounted Drill Rig

Mounting:

Driller: MH

Casing Diameter:

Contractor: Stantec

Date Started: 5/6/25

Date Completed: 5/6/25

Logged By: NM

Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
200mm AS E-F				3 6 9 12	11 10 9 9 5 15	[Cross-hatched]	0.10m	FILL: Silty CLAY; low to medium plasticity, dark brown, with fine to coarse grained sand, trace fine to medium angular to sub-angular	M (<PL) - M (=PL)		FILL
								FILL: Silty Sandy CLAY; low to medium plasticity, yellow-brown, fine to coarse grained sand	M (<PL) - M (=PL)	St - Vst	
125mm AD/T F					15 14 13 15 12	[Blue diagonal lines]	0.90m	FILL: Silty CLAY; low to medium plasticity, dark brown, with fine to coarse grained sand, trace fine to medium angular to sub-angular, trace cobbles	M (=PL) - M (>PL)	Vst - H	
							1.30m	Silty CLAY; medium plasticity, brown, with fine to medium grained sand, trace fine sub-angular to sub-rounded gravel	M (<PL)	H	ALLUVIUM
							1.50m	Silty CLAY; medium to high plasticity, grey mottled red and brown, trace fine to medium grained sand	M (=PL) - M (>PL)	H	RESIDUAL SOIL
							1.70m	Silty Sandy CLAY; medium plasticity, grey mottled red and orange, fine grained sand, trace fine to medium angular to sub-angular gravel, parent rock fragments	M (>PL)	Vst - H	EXTREMELY WEATHERED
							2.50m	TERMINATED AT 2.50 m Target depth			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff Vst - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Angle from Horizontal: 90° Mounting:	Sheet: 1 of 1 Surface Elevation: Driller: MH Contractor: Stantec
Position: Refer to site plan		Date Started: 5/6/25
Rig Type: Ute Mounted Drill Rig		Date Completed: 5/6/25
Casing Diameter:		Logged By: NM
Date Started: 5/6/25		Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
200mm AS E					0.5 6 5 6 8			TOPSOIL; Silty CLAY; low to medium plasticity, dark brown, with fine to medium grained sand, trace organics	M (>PL)		TOPSOIL
								Silty CLAY; medium plasticity, red mottled brown, with fine grained sand	M (≈PL) - M (>PL)	St - Vst	RESIDUAL SOIL
125mm SFA ADV F					1.0 8 7 10 9 11 10			Silty Sandy CLAY; medium plasticity, orange mottled grey, fine grained sand	M (<PL)	Vst	EXTREMELY WEATHERED
								Silty Sandy CLAY; medium plasticity, orange mottled grey, fine grained sand As above, with fine to coarse grained angular parent rock fragments	M (≈PL) - M (>PL)	Vst	
					2.5 2.50m			TERMINATED AT 2.50 m Target depth			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Hole No: BH005 Job No: 304001563 Sheet: 1 of 1
Position: Refer to site plan Rig Type: Ute Mounted Drill Rig Casing Diameter:	Angle from Horizontal: 90° Mounting: Contractor: Stantec
Date Started: 5/6/25 Date Completed: 5/6/25 Logged By: NM	Surface Elevation: Driller: MH Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
125mm SFA ADV F Not Encountered F					0			TOPSOIL: Silty CLAY/Clayey SILT; low plasticity, dark brown, with fine to medium grained sand, with fine to coarse angular gravel	M (>PL)		TOPSOIL
					0.15m			Silty CLAY; medium to high plasticity, dark green to dark brown, with fine to coarse grained sand, trace fine sub-angular to sub-rounded gravel	M (>PL)	F	ALLUVIUM
				U50 0.50 - 0.75 m	0.5			Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand			RESIDUAL SOIL
					1.0			As above, red mottled grey, trace fine to coarse sub-angular gravel	M (>PL)	St - VSt	
					1.10m			Silty CLAY; medium plasticity, grey mottled red and orange, with fine grained sand			EXTREMELY WEATHERED 1.10 m: Borderline Silty Sandy CLAY
					1.5				M (≈PL) - M (>PL)	H	
					2.0						
					2.10m			TERMINATED AT 2.10 m V-bit refusal			
					2.5						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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STANTEC 2.02.0 LIB:GLB Log CARDNO NON-CORED 304001563.GPJ <<DrawingFile>> 29/07/2025 16:28 10.03.00.09 Daigel AGS RTA Photo Monitoring Tools

Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH006 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Graphic Log	Classification	Material Description	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm								
125mm SFA ADV E-F	Not Encountered			3	5			0.10m	M (≡PL)		Possibly FILL	
				6	6				M (>PL)	VSt	RESIDUAL SOIL	
				7	7			As above, red mottled orange				
				11	11				1.30m	M (≡PL) - M (>PL)	VSt - H	EXTREMELY WEATHERED 1.30 m: Borderline Silty Sandy CLAY
				13	13			1.80m			TERMINATED AT 1.80 m Slow Progress	
				19	19							
				23	23							
				VR	VR							

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH008 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description			
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition Consistency Relative Density
125mm SFA AD/V E-F Not Encountered				3	0.15m		FILL: Silty CLAY; medium plasticity, dark brown, with fine to medium grained sand	M (≅PL) - M (>PL)	FILL
				6			FILL: Silty Sandy CLAY; low to medium plasticity, yellow-brown, fine to medium grained	M (≅PL) - M (>PL)	VSt - H
				9	0.5		U50 0.45 - 0.61 m		
				12					
				16		1.00m		Silty CLAY; medium plasticity, red, trace fine to medium sub-angular to sub-rounded gravel	M (<PL)
			18				As above, red mottled brown	M (<PL)	VSt - H
			20		1.50m		Silty CLAY; medium plasticity, grey mottled red and orange, with fine grained sand	M (<PL) - M (≅PL)	H
			20		1.70m		TERMINATED AT 1.70 m Slow Progress/Practical Refusal		
			VR		2.0				
					2.5				

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH009 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Material Description							
Method	Resistance	Casing	Water	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
125mm SFA AD/V E-F	Not Encountered	Not Encountered	Not Encountered	3	6	9	12		0.60m FILL: Silty Sandy CLAY; low to medium plasticity, yellow-brown, fine to medium grained	M (≡PL)	VSt - H	FILL
				13	10	12	11					
				6	7	10	13					
				21	26	1.30m	Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand					
28	1.50m	Silty CLAY; medium plasticity, grey mottled red and orange, with fine grained sand	M (<PL) - M (≡PL)	H	EXTREMELY WEATHERED 1.30 m: Borderline Silty Sandy CLAY							
				VR		1.5		1.50m TERMINATED AT 1.50 m V-bit refusal				
						2.0						
						2.5						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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STANTEC 2.02.0 LIB:GLB Log_CARDNO NON-CORED 304001563.GPJ <<DrawingFile>> 29/07/2025 16:28 10.03.00.09 Daigel AGS RTA - Photo, Monitoring Tools

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH010 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description						
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
125mm SFA ADV FF-FF Not Encountered				3	9.1		0.20m	FILL: Silty CLAY; medium plasticity, dark brown, with fine to medium grained sand	M (<PL)		FILL	
			U50 0.35 - 0.69 m	6	9.8		0.60m	FILL: Silty Sandy CLAY; low to medium plasticity, yellow-brown, fine to medium grained	M (<PL) - M (=PL)	VSt		
				9	10.5		1.30m	Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand	M (=PL)	VSt - H		RESIDUAL SOIL
				13	15.0		1.60m	Silty CLAY; medium plasticity, pale brown mottled grey and red, with fine grained sand	M (<PL) - M (=PL)	H		EXTREMELY WEATHERED
			VR	20	1.5		1.60m	TERMINATED AT 1.60 m Slow Progress/Practical Refusal			1.60 m: Drill bit smoking	
					2.0							
					2.5							

STANTEC 2.02.0 LIB:GLB Log CARDNO NON-CORED 304001563.GPJ <<DrawingFile>> 29/07/2025 16:28 10.03.00.09 Daigel AGS RTA - Photo, Monitoring Tools

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH011 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description				
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density
200mm AS E-F Not Encountered				3 6 9 12	0.08m		FILL: Silty Sandy CLAY; low to medium plasticity, brown, fine to coarse grained sand, trace fine to medium angular to sub-angular FILL: Silty Sandy CLAY; low to medium plasticity, yellow-brown, fine to medium grained sand, trace fine to medium angular to sub-angular gravel	M (<PL)		FILL
					0.45m		Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand	M (<PL) - M (=PL)	St	RESIDUAL SOIL
					0.55m		Silty Sandy CLAY; low to medium plasticity, grey mottled orange and pale brown, fine to medium grained sand	M (<PL) - M (=PL)	St	EXTREMELY WEATHERED
					1.50m		Silty Sandy CLAY; low to medium plasticity, grey mottled orange and pale brown, fine to medium grained sand	M (<PL)	VSt	
				24 blows/125 mm HB	1.50m		TERMINATED AT 1.50 m Slow Progress		H	

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd
 Project: Vintage Precinct G Final Site Classification
 Location: Wine Country Drive, Polkobin

Job No: 304001563

Sheet: 1 of 1

Position: Refer to site plan

Angle from Horizontal: 90°

Surface Elevation:

Rig Type: Ute Mounted Drill Rig

Mounting:

Driller: MH

Casing Diameter:

Contractor: Stantec

Date Started: 5/6/25

Date Completed: 5/6/25

Logged By: NM

Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
200mm AS E-F	Not Encountered	U50 0.25 - 0.59 m	3	6	0.12m	[Cross-hatched pattern]	0.12m	FILL: Silty Sandy CLAY; low to medium plasticity, dark brown, fine to medium grained sand, trace fine to medium angular to sub-angular	M (>PL)		FILL
			9	12				Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand	M (>PL)	F - St	RESIDUAL SOIL
200mm AS E-F	Not Encountered	U50 0.25 - 0.59 m	4	4	0.90m	[Diagonal lines pattern]	0.90m	Silty CLAY; medium plasticity, grey mottled yellow and orange, with fine grained sand	M (=PL)		EXTREMELY WEATHERED 0.90 m: Borderline Silty Sandy CLAY
			6	11				As above, grey mottled yellow-orange	VSt - H		
200mm AS E-F	Not Encountered	U50 0.25 - 0.59 m	15	15	2.20m	[Diagonal lines pattern]	2.20m	TERMINATED AT 2.20 m Slow Progress	M (<PL)		
			16	17							
200mm AS E-F	Not Encountered	U50 0.25 - 0.59 m	17	17	2.5m	[Diagonal lines pattern]	2.5m				
			17	15							

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Robson Civil Projects Pty Ltd Project: Vintage Precinct G Final Site Classification Location: Wine Country Drive, Polkobin	Job No: 304001563 Logged By: NM	Hole No: BH013 Sheet: 1 of 1
Position: Refer to site plan	Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Ute Mounted Drill Rig	Mounting:	Driller: MH
Casing Diameter:	Contractor: Stantec	
Date Started: 5/6/25	Date Completed: 5/6/25	Checked By: JH

Drilling			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Casing	Sample or Field Test	DCP TEST (AS 1289.6.3.2-1997) Blows/150 mm		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
125mm SFA AD/V E F		Not Encountered		3 6 9 12			0.20m	FILL: Silty CLAY; low to medium plasticity, dark brown, with fine to coarse grained sand, with fine to medium angular to sub-angular gravel	M (≈PL) - M (>PL)		FILL
				3 3 3 3 5 10 16 14 18	0.5	1.30m	Silty CLAY; medium to high plasticity, red mottled brown, trace fine to medium grained sand		M (>PL)	F - St	RESIDUAL SOIL
				8 blows/25 mm VR	1.5	1.75m	Silty Sandy CLAY; medium plasticity, grey mottled red, fine grained sand		M (≈PL)	VSt - H	EXTREMELY WEATHERED
					2.0	2.20m	Silty CLAY; medium plasticity, grey mottled red and orange, with fine grained sand				
					2.5			TERMINATED AT 2.20 m Slow Progress			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Appendix C Laboratory Test Reports



Material Test Report

Report Number: SC25364-61
Issue Number: 1
Date Issued: 03/07/2025
Client: Stantec Australia Pty Ltd



**QUALITY
GEOTECHNICAL
SERVICES**

QGS Quality Geotechnical Services Pty Ltd
 1/34 Alliance Avenue Morisset NSW 2264
 Phone: 0475 008 651
 Email: steve.waugh@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10859
Date Sampled: 05/06/2025
Dates Tested: 20/06/2025 - 26/06/2025
Sampling Method: Sampled by Client - Tested as Received
The results apply to the sample as received
Location: The Vintage FSC
Material: Refer to Client logs
Material Source: insitu



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Steve Waugh

Managing Director

NATA Accredited Laboratory Number: 21234

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	M25-10859A	M25-10859B	M25-10859C	M25-10859D	M25-10859E
Date Sampled	05/06/2025	05/06/2025	05/06/2025	05/06/2025	05/06/2025
Date Tested	26/06/2025	26/06/2025	26/06/2025	26/06/2025	26/06/2025
Material Source	insitu	insitu	insitu	insitu	insitu
Sample Location	BH001 (0.65-0.96m)	BH002 (0.35-0.66m)	BH005 (0.5-0.75m)	BH007 (0.9-1.27m)	BH010 (0.35-0.69m)
Inert Material Estimate (%)	6	0	0	4	2
Pocket Penetrometer before (kPa)	**	**	**	**	**
Pocket Penetrometer after (kPa)	**	**	**	**	**
Shrinkage Moisture Content (%)	16.0	22.4	25.3	16.3	19.6
Shrinkage (%)	1.4	4.8	7.3	2.1	4.2
Swell Moisture Content Before (%)	16.6	20.7	22.9	15.7	19.5
Swell Moisture Content After (%)	22.2	25.8	27.2	19.7	21.6
Swell (%)	1.8	2.1	2.7	1.5	1.4
Shrink Swell Index I _{ss} (%)	1.3	3.2	4.8	1.6	2.7
Visual Description	Refer to Client logs	Refer to Client logs	Refer to Client logs	Refer to Client logs	Refer to Client logs
Cracking	SC	SC	SC	UC	UC
Crumbling	No	No	No	No	No
Remarks	**	**	**	**	**

Shrink Swell Index (I_{ss}) reported as the percentage vertical strain per pF change in suction.

Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.

NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-61
Issue Number: 1
Date Issued: 03/07/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
 1/34 Alliance Avenue Morisset NSW 2264
 Phone: 0475 008 651
 Email: steve.waugh@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10859
Date Sampled: 05/06/2025
Dates Tested: 20/06/2025 - 26/06/2025
Sampling Method: Sampled by Client - Tested as Received
The results apply to the sample as received
Location: The Vintage FSC
Material: Refer to Client logs
Material Source: insitu



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Steve Waugh
 Managing Director
 NATA Accredited Laboratory Number: 21234

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	M25-10859F				
Date Sampled	05/06/2025				
Date Tested	26/06/2025				
Material Source	insitu				
Sample Location	BH012 (0.25-0.59m)				
Inert Material Estimate (%)	0				
Pocket Penetrometer before (kPa)	**				
Pocket Penetrometer after (kPa)	**				
Shrinkage Moisture Content (%)	22.2				
Shrinkage (%)	6.1				
Swell Moisture Content Before (%)	21.5				
Swell Moisture Content After (%)	25.7				
Swell (%)	0.8				
Shrink Swell Index I _{ss} (%)	3.6				
Visual Description	Refer to Client logs				
Cracking	UC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (I_{ss}) reported as the percentage vertical strain per pF change in suction.
 Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
 NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-2
Issue Number: 1
Date Issued: 24/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: james.obrien@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10129
Date Sampled: 04/02/2025
Dates Tested: 05/02/2025 - 07/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: 1023 Wine Country Road, Pokolbin
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: James O'Brien
Managing Director
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1					
Sample Number	M25-10129A	M25-10129B	M25-10129C	M25-10129D	M25-10129E
Test Number	1	2	3	4	5
Date Tested	04/02/2025	04/02/2025	04/02/2025	04/02/2025	04/02/2025
Time Tested	**	**	**	**	**
Test Request #/Location	TR-1 Lot 4	TR-1 Lot 2	TR-1 Lot 2	TR-1 Lot 3	TR-1 Lot 3
Easting	343196.8	343179.9	343177.5	343185.0	343178.9
Northing	6377279.4	6377332.4	6377349.8	6377322.0	6377320.5
Elevation (m)	51.19	49.89	49.70	50.64	50.89
Layer / Reduced Level	N/A	N/A	N/A	N/A	N/A
Thickness of Layer (mm)	300	300	300	300	300
Soil Description	Sandy CLAY with trace gravel, brown.	Gravelly sandy CLAY, brown.	Sandy CLAY with trace gravel, brown.	Gravelly sandy CLAY, brown.	Gravelly sandy CLAY, brown.
Test Depth (mm)	300	300	300	300	300
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	0	0	1	0
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	**	**	**	0
Field Wet Density (FWD) t/m ³	2.03	2.17	2.06	2.16	2.12
Field Moisture Content %	17.1	16.7	18.6	14.7	19.1
Field Dry Density (FDD) t/m ³	1.73	1.86	1.73	1.88	1.78
Peak Converted Wet Density t/m ³	1.99	2.10	2.00	**	2.03
Adjusted Peak Converted Wet Density t/m ³	**	**	**	2.10	**
Adj. Optimum Moisture Content % (AS1289.5.4.1)	**	**	**	17.0	18.8
Adj. Field Moisture Content % (AS1289.5.4.1)	17.1	16.7	18.6	14.6	19.1
Moisture Ratio % (AS1289.5.4.1)	90.0	91.0	90.5	**	101.5
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	**	86.0	**
Moisture Variation (Wv) %	2.0	1.5	2.0	**	-0.5
Adjusted Moisture Variation %	**	**	**	2.5	**
Hilf Density Ratio (%)	102.0	103.0	102.5	103.0	104.0
Compaction Method	Standard	Standard	Standard	Standard	Standard
Remarks	**	**	**	**	**

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-3
Issue Number: 2 - This version supersedes all previous issues
Reissue Reason: Amended data.
Date Issued: 24/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
 1/34 Alliance Avenue Morisset NSW 2264
 Phone: 0475 008 651
 Email: peter.redman@qgslabs.com



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
 Senior Geotechnician
 NATA Accredited Laboratory Number: 21234

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10138
Date Sampled: 05/02/2025
Dates Tested: 05/02/2025 - 07/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage- the Cedars 1023 Wine Country Drive, Pokolbin
Material: Lot Fill
Material Source: Site Won

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10138A		
Test Number	6		
Date Tested	05/02/2025		
Time Tested	09:40		
Test Request #/Location	TR-1 Lot 3		
Easting	343182.1		
Northing	6377312.5		
Elevation (m)	51.03		
Layer / Reduced Level	N/A		
Thickness of Layer (mm)	300		
Soil Description	Sandy CLAY, trace of gravel, brown		
Test Depth (mm)	300		
Sieve used to determine oversize (mm)	19.0		
Percentage of Wet Oversize (%)	0		
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0		
Field Wet Density (FWD) t/m ³	2.08		
Field Moisture Content %	18.2		
Field Dry Density (FDD) t/m ³	1.76		
Peak Converted Wet Density t/m ³	2.05		
Adjusted Peak Converted Wet Density t/m ³	**		
Adj. Optimum Moisture Content % (AS1289.5.4.1)	20.2		
Adj. Field Moisture Content % (AS1289.5.4.1)	18.2		
Moisture Ratio % (AS1289.5.4.1)	90.0		
Adjusted Moisture Ratio % (AS1289.5.4.1)	**		
Moisture Variation (Wv) %	2.0		
Adjusted Moisture Variation %	**		
Hilf Density Ratio (%)	101.5		
Compaction Method	Standard		
Remarks	**		

Moisture Variation Note:

Positive values = test is dry of OMC
 Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-4
Issue Number: 1
Date Issued: 24/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10139
Date Sampled: 05/02/2025
Dates Tested: 05/02/2025 - 07/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage- The Cedars- 1023 Wine Country Drive, Pokolbin
Material: General Fill
Material Source: Site Won



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10139A	M25-10139B	
Test Number	7	8	
Date Tested	05/02/2025	05/02/2025	
Time Tested	09:00	12:00	
Test Request #/Location	TR-1 Northern Verge of Lot 2	TR-1 Northern Verge of Lot 2	
Easting	343181.3	343179.5	
Northing	6377361.7	6377359.3	
Elevation (m)	49.86	50.1	
Layer / Reduced Level	N/A	N/A	
Thickness of Layer (mm)	300	300	
Soil Description	Gravelly Sandy CLAY, brown	CLAY, brown	
Test Depth (mm)	300	300	
Sieve used to determine oversize (mm)	19.0	19.0	
Percentage of Wet Oversize (%)	1	0	
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	0	
Field Wet Density (FWD) t/m ³	2.10	2.03	
Field Moisture Content %	13.7	20.5	
Field Dry Density (FDD) t/m ³	1.85	1.69	
Peak Converted Wet Density t/m ³	**	1.99	
Adjusted Peak Converted Wet Density t/m ³	2.08	**	
Adj. Optimum Moisture Content % (AS1289.5.4.1)	16.5	22.5	
Adj. Field Moisture Content % (AS1289.5.4.1)	13.6	20.5	
Moisture Ratio % (AS1289.5.4.1)	**	91.5	
Adjusted Moisture Ratio % (AS1289.5.4.1)	82.5	**	
Moisture Variation (Wv) %	**	2.0	
Adjusted Moisture Variation %	3.0	**	
Hilf Density Ratio (%)	101.0	102.0	
Compaction Method	Standard	Standard	
Remarks	**	**	

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-6
Issue Number: 1
Date Issued: 24/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10144
Date Sampled: 07/02/2025
Dates Tested: 07/02/2025 - 07/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars - 1023 Wine Country Drive, Pokolbin
Material: General Fill
Material Source: On Site



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10144A		
Test Number	12		
Date Tested	07/02/2025		
Time Tested	09:00		
Test Request #/Location	TR-1 Northern Verge of Lot 2		
Easting	343175.9		
Northing	6377358.8		
Elevation (m)	50.45		
Layer / Reduced Level	N/A		
Thickness of Layer (mm)	300		
Soil Description	CLAY, brown		
Test Depth (mm)	300		
Sieve used to determine oversize (mm)	19.0		
Percentage of Wet Oversize (%)	0		
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0		
Field Wet Density (FWD) t/m ³	2.01		
Field Moisture Content %	20.5		
Field Dry Density (FDD) t/m ³	1.67		
Peak Converted Wet Density t/m ³	2.00		
Adjusted Peak Converted Wet Density t/m ³	**		
Adj. Optimum Moisture Content % (AS1289.5.4.1)	20.3		
Adj. Field Moisture Content % (AS1289.5.4.1)	20.5		
Moisture Ratio % (AS1289.5.4.1)	101.0		
Adjusted Moisture Ratio % (AS1289.5.4.1)	**		
Moisture Variation (Wv) %	0.0		
Adjusted Moisture Variation %	**		
Hilf Density Ratio (%)	101.0		
Compaction Method	Standard		
Remarks	**		

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-8
Issue Number: 1
Date Issued: 24/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10216
Date Sampled: 15/02/2025
Dates Tested: 20/02/2025 - 25/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10216A	M25-10216B	
Test Number	15	16	
Date Tested	15/02/2025	15/02/2025	
Time Tested	12:30	12:45	
Test Request #/Location	TR-1 Lot 5	TR-1 Lot 2	
Easting	343198.3	343179.7	
Northing	6377266.5	6377341.6	
Elevation (m)	51.78	50.65	
Layer / Reduced Level	N/A	N/A	
Thickness of Layer (mm)	300	300	
Soil Description	Clayey SAND, brown.	Clayey SAND, brown.	
Test Depth (mm)	300	300	
Sieve used to determine oversize (mm)	19.0	19.0	
Percentage of Wet Oversize (%)	0	1	
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	**	
Field Wet Density (FWD) t/m ³	2.05	2.10	
Field Moisture Content %	11.1	18.1	
Field Dry Density (FDD) t/m ³	1.85	1.78	
Peak Converted Wet Density t/m ³	2.04	**	
Adjusted Peak Converted Wet Density t/m ³	**	2.08	
Adj. Optimum Moisture Content % (AS1289.5.4.1)	13.5	16.5	
Adj. Field Moisture Content % (AS1289.5.4.1)	11.1	18.0	
Moisture Ratio % (AS1289.5.4.1)	82.0	**	
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	108.5	
Moisture Variation (Wv) %	2.5	**	
Adjusted Moisture Variation %	**	-1.5	
Hilf Density Ratio (%)	100.5	100.5	
Compaction Method	Standard	Standard	
Remarks	**	**	

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: SC25364-10
Issue Number: 1
Date Issued: 25/03/2025
Client: Stantec Australia Pty Ltd



**QUALITY
GEOTECHNICAL
SERVICES**

QGS Quality Geotechnical Services Pty Ltd
 1/34 Alliance Avenue Morisset NSW 2264
 Phone: 0475 008 651
 Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10223
Date Sampled: 19/02/2025
Dates Tested: 20/02/2025 - 05/03/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman

Senior Geotechnician

NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1

Sample Number	M25-10223A	M25-10223B	M25-10223C	M25-10223D	M25-10223E
Test Number	27	28	29	30	31
Date Tested	19/02/2025	19/02/2025	19/02/2025	19/02/2025	19/02/2025
Time Tested	08:30	09:15	10:45	13:45	14:30
Test Request #/Location	TR-1 Lot 23	TR-1 Lot 21	TR-1 Lot 29	TR-1 Lot 19	TR-1 Lot 18
Easting	343266.7	343244.6	343281.1	343224.3	343202.5
Northing	6376977.4	6377003.6	6377056.5	6377028.8	6377041.6
Elevation (m)	60.61	59.73	58.86	58.79	58.05
Layer / Reduced Level	N/A	N/A	N/A	N/A	N/A
Thickness of Layer (mm)	300	300	300	300	300
Soil Description	Clayey SAND trace gravel, brown.	Clayey SAND trace gravel, brown.	Clayey SAND trace gravel, brown.	Clayey SAND trace gravel, brown.	Clayey SAND trace gravel, brown.
Test Depth (mm)	300	300	300	300	300
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	3	1	2	2	0
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	**	**	**	0
Field Wet Density (FWD) t/m ³	2.09	2.14	2.11	2.12	2.07
Field Moisture Content %	12.4	13.9	13.5	12.8	14.5
Field Dry Density (FDD) t/m ³	1.86	1.88	1.87	1.88	1.81
Peak Converted Wet Density t/m ³	**	**	**	**	2.09
Adjusted Peak Converted Wet Density t/m ³	2.06	2.13	2.11	2.13	**
Adj. Optimum Moisture Content % (AS1289.5.4.1)	14.6	15.9	15.3	14.9	17.2
Adj. Field Moisture Content % (AS1289.5.4.1)	12.0	13.9	13.2	12.6	14.5
Moisture Ratio % (AS1289.5.4.1)	**	**	**	**	84.0
Adjusted Moisture Ratio % (AS1289.5.4.1)	82.0	87.0	86.5	84.5	**
Moisture Variation (Wv) %	**	**	**	**	2.5
Adjusted Moisture Variation %	2.5	2.0	2.0	2.0	**
Hilf Density Ratio (%)	101.0	100.5	100.0	99.5	99.0
Compaction Method	Standard	Standard	Standard	Standard	Standard
Remarks	**	**	**	**	**

Moisture Variation Note:

Positive values = test is dry of OMC

Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-11
Issue Number: 1
Date Issued: 25/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10225
Date Sampled: 20/02/2025
Dates Tested: 20/02/2025 - 05/03/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars - 1023 Wine Country Drive, Pokolbin
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10225A	M25-10225B	
Test Number	32	33	
Date Tested	20/02/2025	20/02/2025	
Time Tested	08:45	10:00	
Test Request #/Location	TR-1 Lot 18	TR-1 Lot 6	
Easting	343214.4	343171.2	
Northing	6377046.6	6377261.7	
Elevation (m)	58.13	51.17	
Layer / Reduced Level	N/A	N/A	
Thickness of Layer (mm)	300	300	
Soil Description	Clayey SAND, trace of gravel, brown	Clayey SAND, trace of gravel, brown	
Test Depth (mm)	300	300	
Sieve used to determine oversize (mm)	19.0	19.0	
Percentage of Wet Oversize (%)	0	0	
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	0	
Field Wet Density (FWD) t/m ³	2.08	2.00	
Field Moisture Content %	12.5	11.2	
Field Dry Density (FDD) t/m ³	1.85	1.80	
Peak Converted Wet Density t/m ³	2.05	2.02	
Adjusted Peak Converted Wet Density t/m ³	**	**	
Adj. Optimum Moisture Content % (AS1289.5.4.1)	14.2	12.5	
Adj. Field Moisture Content % (AS1289.5.4.1)	12.5	11.2	
Moisture Ratio % (AS1289.5.4.1)	88.0	90.0	
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	
Moisture Variation (Wv) %	1.5	1.5	
Adjusted Moisture Variation %	**	**	
Hilf Density Ratio (%)	101.5	99.5	
Compaction Method	Standard	Standard	
Remarks	**	**	

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



QUALITY
GEOTECHNICAL
SERVICES

Report Number: SC25364-12
Issue Number: 1
Date Issued: 25/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10220
Date Sampled: 14/02/2025
Dates Tested: 19/02/2025 - 19/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10220A	M25-10220B	
Test Number	19	20	
Date Tested	14/02/2025	14/02/2025	
Time Tested	09:00	13:10	
Test Request #/Location	TR-1 Lot 34	TR-1 Lot 35	
Easting	343253.8	343242.9	
Northing	6377127.6	6377166.9	
Elevation (m)	56.10	54.92	
Layer / Reduced Level	N/A	N/A	
Thickness of Layer (mm)	300	300	
Soil Description	Clayey SAND, brown.	Clayey SAND, brown.	
Test Depth (mm)	300	300	
Sieve used to determine oversize (mm)	19.0	19.0	
Percentage of Wet Oversize (%)	0	0	
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	0	
Field Wet Density (FWD) t/m ³	2.02	2.02	
Field Moisture Content %	13.4	11.6	
Field Dry Density (FDD) t/m ³	1.78	1.81	
Peak Converted Wet Density t/m ³	1.99	1.99	
Adjusted Peak Converted Wet Density t/m ³	**	**	
Adj. Optimum Moisture Content % (AS1289.5.4.1)	16.6	15.9	
Adj. Field Moisture Content % (AS1289.5.4.1)	13.4	11.6	
Moisture Ratio % (AS1289.5.4.1)	81.0	73.0	
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	
Moisture Variation (Wv) %	3.0	4.0	
Adjusted Moisture Variation %	**	**	
Hilf Density Ratio (%)	101.5	101.5	
Compaction Method	Standard	Standard	
Remarks	**	**	

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report

Report Number: SC25364-14
Issue Number: 1
Date Issued: 25/03/2025
Client: Stantec Australia Pty Ltd



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SERVICES**

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Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10222
Date Sampled: 18/02/2025
Dates Tested: 20/02/2025 - 04/03/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman

Senior Geotechnician

NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1

Sample Number	M25-10222A	M25-10222B	M25-10222C
Test Number	24	25	26
Date Tested	18/02/2025	18/02/2025	18/02/2025
Time Tested	09:30	12:20	16:30
Test Request #/Location	TR-1 Lot 24	TR-1 Lot 32	TR-1 Lot 31
Easting	343270.9	343265.3	343269.7
Northing	6376958.7	6377102.1	6377085.5
Elevation (m)	61.22	56.78	57.60
Layer / Reduced Level	N/A	N/A	N/A
Thickness of Layer (mm)	300	300	300
Soil Description	Clayey SAND trace of gravel, brown.	Clayey SAND trace of gravel, brown.	Clayey SAND trace of gravel, brown.
Test Depth (mm)	300	300	300
Sieve used to determine oversize (mm)	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	2	1
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	**	**
Field Wet Density (FWD) t/m ³	2.05	2.10	2.06
Field Moisture Content %	14.9	14.0	13.1
Field Dry Density (FDD) t/m ³	1.79	1.84	1.82
Peak Converted Wet Density t/m ³	2.05	**	**
Adjusted Peak Converted Wet Density t/m ³	**	2.04	1.99
Adj. Optimum Moisture Content % (AS1289.5.4.1)	16.8	16.5	17.7
Adj. Field Moisture Content % (AS1289.5.4.1)	14.9	13.8	13.0
Moisture Ratio % (AS1289.5.4.1)	89.0	**	**
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	83.5	73.5
Moisture Variation (Wv) %	2.0	**	**
Adjusted Moisture Variation %	**	2.5	4.5
Hilf Density Ratio (%)	100.5	103.0	103.5
Compaction Method	Standard	Standard	Standard
Remarks	**	**	**

Moisture Variation Note:

Positive values = test is dry of OMC

Negative values = test is wet of OMC

Material Test Report



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Report Number: SC25364-15
Issue Number: 1
Date Issued: 25/03/2025
Client: Stantec Australia Pty Ltd

QGS Quality Geotechnical Services Pty Ltd
1/34 Alliance Avenue Morisset NSW 2264
Phone: 0475 008 651
Email: peter.redman@qgslabs.com

Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10221
Date Sampled: 17/02/2025
Dates Tested: 18/02/2025 - 18/02/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Remarks: Test Request No. 1
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars
Material: Lot Fill



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10221A	M25-10221B	M25-10221C
Test Number	21	22	23
Date Tested	17/02/2025	17/02/2025	17/02/2025
Time Tested	08:00	13:00	15:50
Test Request #/Location	TR-1 Lot 32	TR-1 Lot 33	TR-1 Lot 36
Easting	343243.5	343228.8	343218.1
Northing	6377120.5	6377116.9	6377183.8
Elevation (m)	56.43	56.16	53.79
Layer / Reduced Level	N/A	N/A	N/A
Thickness of Layer (mm)	300	300	300
Soil Description	Clayey SAND trace of gravel, brown.	Clayey SAND trace of gravel, brown.	Clayey SAND trace of gravel, brown.
Test Depth (mm)	300	300	300
Sieve used to determine oversize (mm)	19.0	19.0	19.0
Percentage of Wet Oversize (%)	1	0	0
Percentage of Dry Oversize (%) (AS1289.5.4.1)	**	0	0
Field Wet Density (FWD) t/m ³	2.06	2.09	2.06
Field Moisture Content %	12.4	13.8	14.4
Field Dry Density (FDD) t/m ³	1.83	1.84	1.80
Peak Converted Wet Density t/m ³	**	2.05	2.02
Adjusted Peak Converted Wet Density t/m ³	2.00	**	**
Adj. Optimum Moisture Content % (AS1289.5.4.1)	16.3	15.7	16.7
Adj. Field Moisture Content % (AS1289.5.4.1)	12.2	13.8	14.4
Moisture Ratio % (AS1289.5.4.1)	**	88.0	86.5
Adjusted Moisture Ratio % (AS1289.5.4.1)	75.5	**	**
Moisture Variation (Wv) %	**	2.0	2.0
Adjusted Moisture Variation %	4.0	**	**
Hilf Density Ratio (%)	103.0	102.0	102.0
Compaction Method	Standard	Standard	Standard
Remarks	**	**	**

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



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Report Number: SC25364-45
Issue Number: 1
Date Issued: 07/05/2025
Client: Stantec Australia Pty Ltd

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Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10561
Date Sampled: 11/04/2025
Dates Tested: 14/04/2025 - 16/04/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars - 1023 Wine Country Drive, Pokolbin
Material: Lot Fill
Material Source: On Site



Accredited for compliance with ISO/IEC 17025 - Testing

P. Redman
Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10561A	M25-10561B	
Test Number	136	137	
Date Tested	11/04/2025	11/04/2025	
Time Tested	11:00	11:10	
Test Request #/Location	Lot 28	Lot 27	
Easting	343276.3	343264.8	
Northing	6376875.6	6376911.6	
Elevation (m)	65.08m	63.13m	
Layer / Reduced Level	N/A	N/A	
Thickness of Layer (mm)	300	300	
Soil Description	Clayey SAND, brown	Clayey SAND, brown	
Test Depth (mm)	300	300	
Sieve used to determine oversize (mm)	19.0	19.0	
Percentage of Wet Oversize (%)	0	0	
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	0	
Field Wet Density (FWD) t/m ³	2.03	1.97	
Field Moisture Content %	9.7	10.1	
Field Dry Density (FDD) t/m ³	1.85	1.79	
Peak Converted Wet Density t/m ³	2.04	2.02	
Adjusted Peak Converted Wet Density t/m ³	**	**	
Adj. Optimum Moisture Content % (AS1289.5.4.1)	13.3	13.6	
Adj. Field Moisture Content % (AS1289.5.4.1)	9.7	10.1	
Moisture Ratio % (AS1289.5.4.1)	73.0	74.0	
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	
Moisture Variation (Wv) %	3.5	3.5	
Adjusted Moisture Variation %	**	**	
Hilf Density Ratio (%)	99.5	97.5	
Compaction Method	Standard	Standard	
Remarks	**	**	

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



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Report Number: SC25364-50
Issue Number: 1
Date Issued: 08/05/2025
Client: Stantec Australia Pty Ltd

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Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10626
Date Sampled: 07/05/2025
Dates Tested: 07/05/2025 - 07/05/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars - 1023 Wine Country Drive, Pokolbin
Material: Lot Fill
Material Source: On Site



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Redman

Senior Geotechnician

NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1

Sample Number	M25-10626A		
Test Number	152		
Date Tested	07/05/2025		
Time Tested	09:00		
Test Request #/Location	Lot 27		
Easting	343263.6		
Northing	6376909.4		
Elevation (m)	62.88		
Layer / Reduced Level	N/A		
Thickness of Layer (mm)	300		
Soil Description	Sandy CLAY, brown		
Test Depth (mm)	300		
Sieve used to determine oversize (mm)	19.0		
Percentage of Wet Oversize (%)	0		
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0		
Field Wet Density (FWD) t/m ³	2.01		
Field Moisture Content %	12.9		
Field Dry Density (FDD) t/m ³	1.78		
Peak Converted Wet Density t/m ³	2.03		
Adjusted Peak Converted Wet Density t/m ³	**		
Adj. Optimum Moisture Content % (AS1289.5.4.1)	15.2		
Adj. Field Moisture Content % (AS1289.5.4.1)	12.9		
Moisture Ratio % (AS1289.5.4.1)	84.5		
Adjusted Moisture Ratio % (AS1289.5.4.1)	**		
Moisture Variation (Wv) %	2.5		
Adjusted Moisture Variation %	**		
Hilf Density Ratio (%)	99.0		
Compaction Method	Standard		
Remarks	**		

Moisture Variation Note:

Positive values = test is dry of OMC

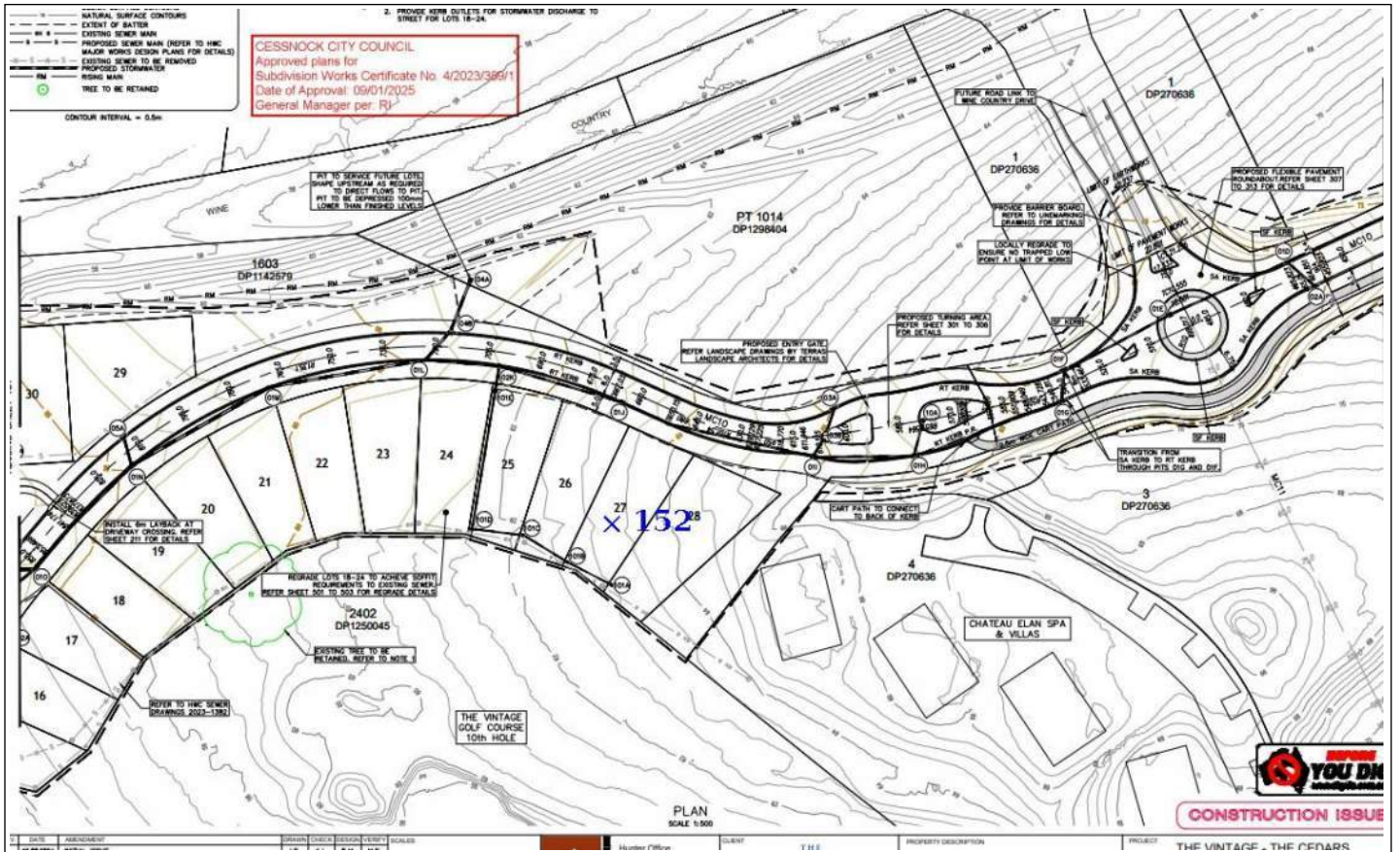
Negative values = test is wet of OMC

Sample Locations Plan

x - approximate test location



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Material Test Report



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Report Number: SC25364-59
Issue Number: 1
Date Issued: 01/07/2025
Client: Stantec Australia Pty Ltd

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Phone: 0475 008 651
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Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10795
Date Sampled: 16/06/2025
Dates Tested: 17/06/2025 - 19/06/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars, Pokolbin.
Material: General Fill

Accredited for compliance with ISO/IEC 17025 - Testing



P. Redman

Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1					
Sample Number	M25-10795A	M25-10795B	M25-10795C	M25-10795D	M25-10795E
Test Number	186	187	188	189	190
Date Tested	16/06/2025	16/06/2025	16/06/2025	16/06/2025	16/06/2025
Time Tested	10:50	11:05	11:20	11:35	11:50
Test Request #/Location	General Fill - Deleted Sewer Line Backfill	General Fill - Deleted Sewer Line Backfill (Lot 8)	General Fill - Deleted Sewer Line Backfill (Lot 8)	General Fill - Deleted Sewer Line Backfill (Lot 8)	(Retested by #195) General Fill - Deleted Sewer Line Backfill (Lot 7)
Easting	343157	343167	343165	343167	343158
Northing	6377053	6377225	6377230	6377230	6377142
Elevation (m)	N/A	N/A	N/A	N/A	N/A
Layer / Reduced Level	0.3m Below FL	1.2m Below FL	0.9m Below FL	0.6m Below FL	0.3m Below FL
Thickness of Layer (mm)	300	300	300	300	300
Soil Description	CLAY, Trace Sand: Red mottled white	CLAY, Trace Sand: Red mottled white	CLAY, Trace Sand: Red mottled white	CLAY, Trace Sand: Red mottled white	CLAY, Trace Sand: Red mottled white
Test Depth (mm)	300	300	300	300	300
Sieve used to determine oversize (mm)	19.0	19.0	19.0	19.0	19.0
Percentage of Wet Oversize (%)	0	0	0	0	0
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0	0	0	0	0
Field Wet Density (FWD) t/m ³	1.89	1.98	2.00	2.02	1.80
Field Moisture Content %	22.4	26.5	18.6	17.8	18.5
Field Dry Density (FDD) t/m ³	1.54	1.57	1.68	1.72	1.52
Peak Converted Wet Density t/m ³	1.98	2.05	2.05	2.06	1.92
Adjusted Peak Converted Wet Density t/m ³	**	**	**	**	**
Adj. Optimum Moisture Content % (AS1289.5.4.1)	25.5	26.1	20.4	18.4	21.2
Adj. Field Moisture Content % (AS1289.5.4.1)	22.4	26.5	18.6	17.8	18.5
Moisture Ratio % (AS1289.5.4.1)	87.5	101.0	91.0	96.5	87.0
Adjusted Moisture Ratio % (AS1289.5.4.1)	**	**	**	**	**
Moisture Variation (Wv) %	3.0	-0.5	2.0	0.5	2.5
Adjusted Moisture Variation %	**	**	**	**	**
Hilf Density Ratio (%)	95.5	97.0	97.5	98.0	93.5
Compaction Method	Standard	Standard	Standard	Standard	Standard
Remarks	**	**	**	**	**

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Material Test Report



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Report Number: SC25364-60
Issue Number: 1
Date Issued: 01/07/2025
Client: Stantec Australia Pty Ltd

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Contact: Ian Piper
Project Number: SC25364
Project Name: The Vintage - The Cedars
Project Location: 1023 Wine Country Drive, Pokolbin
Work Request: 10853
Date Sampled: 20/06/2025
Dates Tested: 20/06/2025 - 26/06/2025
Sampling Method: AS 1289.1.2.1 6.4 (b) - Sampling from layers in earthworks or pavement - compacted
Specification: Minimum 95% Standard
Location: The Vintage - The Cedars, Pokolbin.
Material: General Fill



Accredited for compliance with ISO/IEC 17025 - Testing

P. Redman
Approved Signatory: Peter Redman
Senior Geotechnician
NATA Accredited Laboratory Number: 21234

Compaction Control AS 1289 5.7.1 & 5.8.1 & 2.1.1			
Sample Number	M25-10853A		
Test Number	195		
Date Tested	20/06/2025		
Time Tested	08:15		
Test Request #/Location	(Retest of #190) General Fill - Deleted Sewer Line Backfill (Lot 7)		
Easting	343156		
Northing	6377145		
Elevation (m)	N/A		
Layer / Reduced Level	0.3m below FFL		
Thickness of Layer (mm)	300		
Soil Description	CLAY/Trace Sand:Red/Brown		
Test Depth (mm)	300		
Sieve used to determine oversize (mm)	19.0		
Percentage of Wet Oversize (%)	0		
Percentage of Dry Oversize (%) (AS1289.5.4.1)	0		
Field Wet Density (FWD) t/m ³	1.96		
Field Moisture Content %	19.6		
Field Dry Density (FDD) t/m ³	1.63		
Peak Converted Wet Density t/m ³	1.98		
Adjusted Peak Converted Wet Density t/m ³	**		
Adj. Optimum Moisture Content % (AS1289.5.4.1)	20.2		
Adj. Field Moisture Content % (AS1289.5.4.1)	19.6		
Moisture Ratio % (AS1289.5.4.1)	97.0		
Adjusted Moisture Ratio % (AS1289.5.4.1)	**		
Moisture Variation (Wv) %	0.5		
Adjusted Moisture Variation %	**		
Hilf Density Ratio (%)	99.0		
Compaction Method	Standard		
Remarks	**		

Moisture Variation Note:

Positive values = test is dry of OMC
Negative values = test is wet of OMC

Appendix D Sheet BTF 18



Foundation Maintenance and Footing Performance: A Homeowner's Guide



CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpend).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.

Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.

- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage

In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter

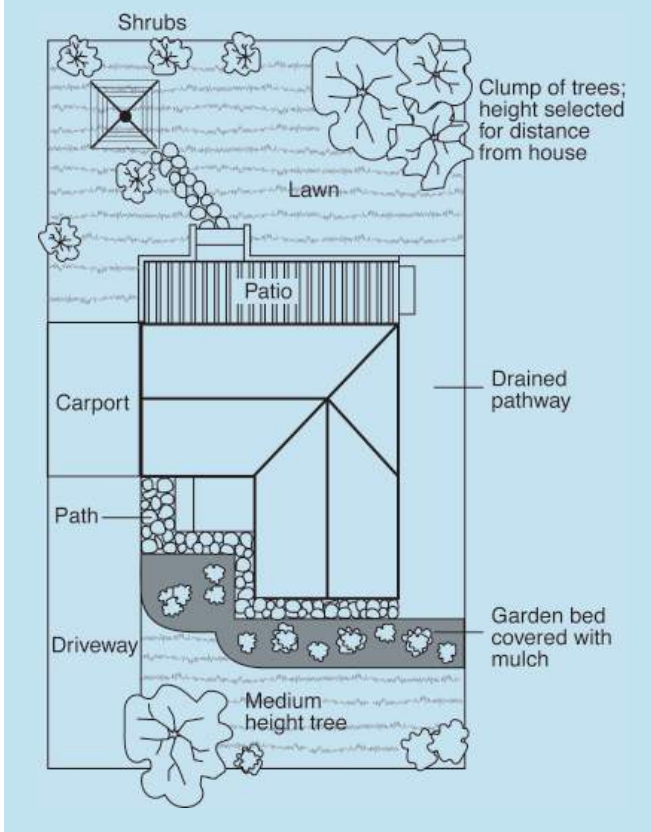
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

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