QUALIFIED GEOTECHNICAL ENGINEERS

Aitken Rowe
TESTING LABORATORIES

SITE CLASSIFICATION & SITE ASSESSMENT FOR EFFLUENT DISPOSAL SYSTEM REPORT

CLIENT: [redacted]

PROJECT DESCRIPTION: PROPOSED RESIDENTIAL DWELLING & EFFLUENT DISPOSAL SYSTEM

LOCATION: LOT 1986, No. 40 REYNOLDS LANE, YOUNG, NSW

ACCREDITED CONSTRUCTION MATERIALS
TESTING LABORATORIES

SE25-203

21 JULY 2025

AITKEN ROWE TESTING LABORATORIES PTY LTD

Head Office: 1/5 Dangar Place, East Wagga Wagga, NSW, 2650 P: (02) 69395555 Email: admin@artl.com.au
17b Battista Street, Griffith, NSW, 2680 P: (02) 69645551 | 1/111 Kaitlers Road, Lavington, NSW, 2641 P: (02) 60401661

FIELD INVESTIGATION

At your request, a subsurface exploration was performed at the above location to assess the nature of the underlying soils in order to classify the site in accordance with AS 2870 - 2011 "Residential Slab and Footings". The following classification is derived from information gained in regard to the history of the site, the description of the natural material and the amount of swell and shrinkage the natural soils experience with variations of water content.

On 10 July 2025, our Geotechnical staff excavated two boreholes (BH1 to 3.0m and BH2 to 2.3m) using a powered drilling rig at the locations shown in the attached sketch. Disturbed samples were taken at various depths to represent various strata. The soil and groundwater conditions in these boreholes were assessed and the boreholes were logged in the field. Visual descriptions of moisture, plasticity and strength were also noted. The soil samples were tested at our NATA accredited laboratory in Wagga Wagga. Dynamic Cone Penetrometer (DCP) testing was performed at the location of BH1 and BH2 to assess the strength of the underlying material. The borehole logs with test results and DCP test reports are attached to this report.

Percolation tests were also carried out at the locations as shown in the attached diagram to assess the percolation rate of the underlying soil materials. An Emerson class test and soil grading were also performed to assess the condition of the underlying materials. The borehole logs with test results, Emerson class, soil grading and percolation test reports are attached to this report.

Site Photo 1 – Looking South-West (10/07/2025)

Site Photo 2 – Looking North-East (10/07/2025)

SITE CONDITIONS, CONCLUSIONS AND RECOMMENDATIONS

The site of the proposed construction is on the southern side of the road. The site has a general downward slope from north to south at approximately 1V:30H, however the site has been levelled with a recently constructed building pad as shown in the above site photos.

The borehole investigation performed for the proposed residence revealed that the site is underlain by fill material comprising medium plasticity clay to 0.8m in BH1 and 0.5m in BH2 overlying natural alluvial material comprising various medium, medium to high and high plasticity clays extending to the borehole termination depth at 3.0m in BH1 and 2.3m in BH2. The fill material encountered at the site appeared to have been placed "uncontrolled" and "poorly" compacted.

The moisture condition of the underlying material was generally greater than plastic limit throughout the clay-based fill profile and less than or equal to plastic limit throughout the natural clay-based profile at the time of the investigation. The underlying clays are considered "poorly drained" which may result in significant volume changes during the wet and dry climatic cycles. No groundwater or seepage was encountered during the drilling, however it should be noted that variations to the water table level could fluctuate with changes to the season, temperature and rainfall.

The DCP test results in BH1 (DCP1) indicate the underlying clay-based fill material to be soft to firm consistency to 0.8m with the underlying natural clay noted to be stiff and very stiff consistency throughout the tested profile in BH1 at the time of the investigation.

The DCP test results in BH2 (DCP2) indicate the underlying clay-based fill material to be firm consistency to 0.5m with the underlying natural clay noted to be stiff and very stiff consistency throughout the tested profile in BH2 at the time of the investigation.

It is noted that the fill material encountered at the site is considered "uncontrolled" and "not suitable" for any structural element of the footing system in its current state. Therefore based on available data, laboratory test results and estimated characteristic surface movements (ys), the site shall be classified as **"P-Problem site"** in accordance with the Australian Standard AS 2870. We recommend that all the footings shall be designed similar to those as recommended in the Standard for "Class P". However, if all the footings (i.e. edge beams internal beams and load support thickenings) are founded on the natural ground through filling, then **"Class 'H1-D' – Highly reactive deep drying"** classification may be adopted.

It should also be noted that the soft to firm consistency material encountered at the site is considered "not suitable" for any structural element of the footing system in its current state. Based on the type and condition of the subsoil at the time of the field investigation;

- The footing shall be founded on the **stiff consistency or better natural orange clay at or below the minimum depth of 0.55 to 0.85m** measured from the existing surface (refer to attached borehole logs), for which an allowable bearing capacity of **100kPa may be adopted**, provided proper drainage measures are incorporated in the design, during and after the construction.

- Alternatively, the deep footing system may be preferential for the proposed construction, and the **pier footing** system, if adopted, shall be founded on the **very stiff consistency or better natural brown clay at or below 1.5m** from the existing surface (refer borehole logs) for which an allowable bearing capacity of **250kPa and allowable side adhesion of 25kPa may be adopted**. The side adhesion within the top 1.5m of the natural material should be ignored.

- Due to the extent of "uncontrolled fill" material encountered at the location of BH1 and BH2, the slab panel should be **fully suspended** on the shallow footing or pier footing system.

It should be noted that the minimum footing depths for various footing systems are determined by the type of construction selected for the proposed dwelling and are presented in Section 3 of AS 2870 – 2011. **It is highly recommended to undertake Dynamic Cone Penetrometer testing at the time of construction to ensure the required bearing capacity can be achieved at the base of the footing system.**

It is noted several trees exist near the building pad at the subject site. Therefore the proposed dwelling should be sited away from these trees as recommended in the General Comment or the classification shall be reviewed and adopted as mentioned in the General Comment section. The applicable minimum setback distance for existing and future trees at this site is 100% of the mature tree height. If trees are to be retained or planted in close proximity, the site may be classified as "Class P – Problem site" in accordance with the Australian Standard AS 2870. Alternatively, a heavy-duty tree root barrier may be installed to the minimum depth of 1.5m along the perimeter of the dwelling or surrounding the affecting trees.

If any additional fill placement is required on site during the site preparation, it is highly recommended to remove the existing topsoil, fill, silt-based material, and unsuitable material, if any, and place granular fill comprising mainly sand and well graded gravel, but caution shall be exercised not to select a 'raw' or non-plastic material that may induce erosion. The fill shall be placed in accordance with Clause 6.4.1 & 6.4.2 of AS2870, or otherwise the site classification shall be reviewed.

The structural fill is to be prepared in such a way that it achieves 95% of Standard Maximum Dry Density in every 150mm thick compacted layer. The placed fill shall be certified by a relevant NATA accredited testing laboratory for which a safe allowable bearing pressure of 100kPa may be adopted, provided proper drainage measures are incorporated in the design, during and after the construction.

Care should be taken when selecting material for use as structural fill. Clay-based fill material is reactive to seasonal changes in moisture content which may result in shrink/swell problems and therefore should be avoided where possible. It should be noted that the placement of reactive clay-based fill material can reduce the cracking zone and adversely affect the estimated characteristic surface movements (ys) of the subject site. Similarly, the cracking zone can be reduced when site cuts are undertaken. **If any additional clay-based fill is placed, or greater than 0.5m of cut is undertaken, the site classification shall be reviewed in accordance with Clauses 2.3.2 and 2.5.2 of AS2870.**

It is noted that the site for the proposed treated effluent disposal area is to the south of the existing building pad.

The site at the location of the proposed effluent disposal system is generally underlain by topsoil and natural silt-based material, overlying natural medium to high plasticity clays.

There was no evidence of surface seepage and soaks and the surface soil was found moist at the time of the investigation. No sign of erosion was evident and therefore the site should not pose the problem of uncontrolled run-off and erosion. However, run-on and upslope and down slope seepage, if any, to the land application system should be avoided by using earthworks or a drainage system approved by Council.

A limited site assessment has also been undertaken in Table 1 below. The results show that the site features range from very good to very poor (Emerson Class) and is considered suitable for primary and secondary treated effluent disposal systems **with appropriate management practices undertaken.**

Table 1: Limited Site Assessment

General Characteristics		**Limited Site Assessment Rating**					
		Very Good (1)	**Good (2)**	**Fair (3)**	**Poor (4)**	**Very Poor (5)**	**Site Result**
Site drainage / runoff		Very Slow	Slow	Moderate	Rapid	Very Rapid	**3**
Flood / inundation potential (yearly return exceedances)		Never		<1 in 100	<1 in 20	>1 in 20	**1**
Slope (%)		0 - 2	2 - 8	8 - 12	12 - 20	>20	**2**
Landslip						Present or past failure	**1**
Seasonal watertable depth (m) (inc perched water tables)		>5	5 – 2.5	2.5 – 2.0	2.0 – 1.5	<1.5	**2**
Rainfall (mm/yr)		<450	450 - 650	650 - 750	750 - 1000	>1000	**2**
Pan Evaporation (mm/yr)		>1500	1250 - 1500	1000 - 1250	-	<1000	**1**
Soil Profile characteristics	Structure	High	Moderate	Weak	Massive	Single Grained	**1**
	Profile Depth	>2m	1.5 – 2m	-	1.5m – 1.0m	<1m	**1**
	Percolation (mm/hr)	50 - 75	20 - 50 75 - 150	15 - 20 150 - 300	- 300 - 500	<15 >500	**2**
	Stoniness (%)	<10		10 - 20	-	>20	**1**
	Emerson Class (dispersion/slaking)	5&6	4	3	2	1	**1**

[redacted]

FIELD AND LABORATORY RESULTS

The permeability of the underlying silt and clay-based material was assessed by carrying out a series of percolation tests at the site. The tests indicated an average permeability of 0.34m/day on the underlying material. This classifies the underlying soil as "Category 5" as per AS1547:2012 – "On-site domestic-wastewater management". A soil grading was performed on the underlying material and confirms the soil to be a "Category 5". An Emerson Class Test was also performed and indicated the material to be "potentially non-dispersive". The percolation, grading and Emerson class test reports are herewith attached.

DISPOSAL AREA SIZING

It is assumed the proposed septic will service the proposed four-bedroom dwelling and existing shed. Therefore the calculation rates are based on 150L/bedroom+1/day (allow 5 persons). This assumption is based on Appendix H in AS1547. It should be noted that if the above design flow rates are adopted then the minimum design capacity for the septic tank shall be determined by:

- Providing for around 24 hours settling volume plus 8 hours hydraulic buffering volume for the daily flows as adopted.

- Providing for scum and sludge accumulation over a 5 year period using the following rates;

1)	All waste	80L/person/year
2)	Greywater	40L/person/year
3)	Blackwater	50L/person/year

The required disposal area is calculated based on the soil data available for different types of land application system. The following assumptions are made in the calculation:

- Daily effluent flow rate per household - 750 litres*
- Design Loading Rate (DLR) - 6.0 & 10.0 mm/day**
- Design Irrigation Rate (DIR) - 21.0mm/week
- Width of the trench (where applicable) - 600mm
- Depth of trench (where applicable) - 700mm
- Depth of aggregate (where applicable) - 300mm
- Depth of topsoil (where applicable) - 300mm
- The underlying materials are assessed to be "potentially non-dispersive".
- "Soil Category 5" as per AS1547:2012
- Climatic data for Wagga Wagga provided by the Bureau of Meteorology is adopted.

Note: * - Assume 150 litres of waste water per bedroom + 1 per day.
** - DLR 6.0 mm/day for primary effluent and 10.0 mm/day for secondary effluent.

1. Absorption Trench (Primary Treated Effluent)

Based on the above assumptions, climatic data and water balance analysis undertaken, the following minimum dimensions for the disposal area for the absorption trench disposal system are recommended.

- Minimum Absorption Area (wetted area) - 300m²
- Minimum length of the trench - 231m (width 0.6m, depth 0.7m)

2. Evapotranspiration – ETA/ETS Bed (Secondary Treated Effluent)

Based on the above assumptions, climatic data and water balance analysis undertaken, the following minimum dimensions for the disposal area for the evapotranspiration disposal system are recommended provided that the Design Loading Rate does not exceed 10.0mm/day. **It should be noted that this system is considered suitable for secondary treated effluent only.**

- Wetted Area - 150m²
- Minimum Trench Length - 75m (width 0.6m, depth 0.7m)
- Minimum Bed Length from Water Balance - 58m (width 1.5m, depth 0.55m)
- Minimum Bed Length from AS1547:2012 - 60m (width 1.5m, depth 0.55m)

Vegetation planting on-site to encourage evapotranspiration is considered when calculating irrigation and absorption trench areas for this method of disposal.

3. Pressurised Irrigation System (Secondary Treated Effluent)

These systems may be used as alternatives to the conventional sub-surface disposal systems outlined in sections above. Consideration through consultation with the local authority will be required prior to choosing this method of disposal because the treatment system will need to conform to effluent quality standards to ensure protection of public health as such:

- Five days biochemical oxygen demand (BOD5) not greater than 20mg/L
- Suspended solids not greater than 30mg/L
- Thermotolerant coliforms not greater than 10 per 100mL.
- Where chlorine is used as a disinfectant, free residual chlorine measured by a field test at the first irrigation outlet, is not less than 0.5mg/L after a 30min contact period.
- Nutrients not more than authorised by the local authority.
- All other requirements are to be met as per AS1547:2012.

Based on the above assumptions, water balance analysis and soil data available, the following minimum irrigation area is recommended provided proper control of the effluent is maintained and the rate of irrigation does not exceed 21.0mm/week. If planting is to occur on-site then the evapotranspiration method and disposal areas as discussed in section 2 can be adopted provided that the rate of irrigation does not exceed 21.0mm/week.

- Area - 300m²

The area calculated above assumes there will be no or minimal vegetation planting on-site and evaporation only of the treated effluent is utilised for disposal.

COMMENTS AND RECOMMENDATIONS

- Land application shall be placed at least 40m away from any dams and 250m away from any domestic groundwater well.
- The irrigation system can only be used for secondary-treated effluent complying with the effluent-quality requirements of Part 5 and Appendix M of AS1547:2012.
- Primary effluent is normally not suitable for irrigation systems but may be permitted by the local authority under special circumstances.
- The proper drainage system should be incorporated with the land application system design as appropriate to ensure surface run-off does not enter into the system.

Should you have any queries, please do not hesitate to contact us.

Yours Faithfully,

Peter Forbes-Taber
Geotechnical Engineer

Attachments:

- Addendum
- Site Diagram showing Borehole, DCP and Percolation Test Locations
- Borehole Logs with Explanatory Note
- Dynamic Cone Penetrometer Test Reports
- Percolation, Emerson Class, and Soil Grading Reports
- Water Balance Calculation

EXAMPLES OF CONVENTIONAL DISPOSAL SYSTEMS

The following figures are taken from Appendix L of AS1547:2012. It should be noted that the below figures are examples of conventional systems only and therefore are **not site-specific.**

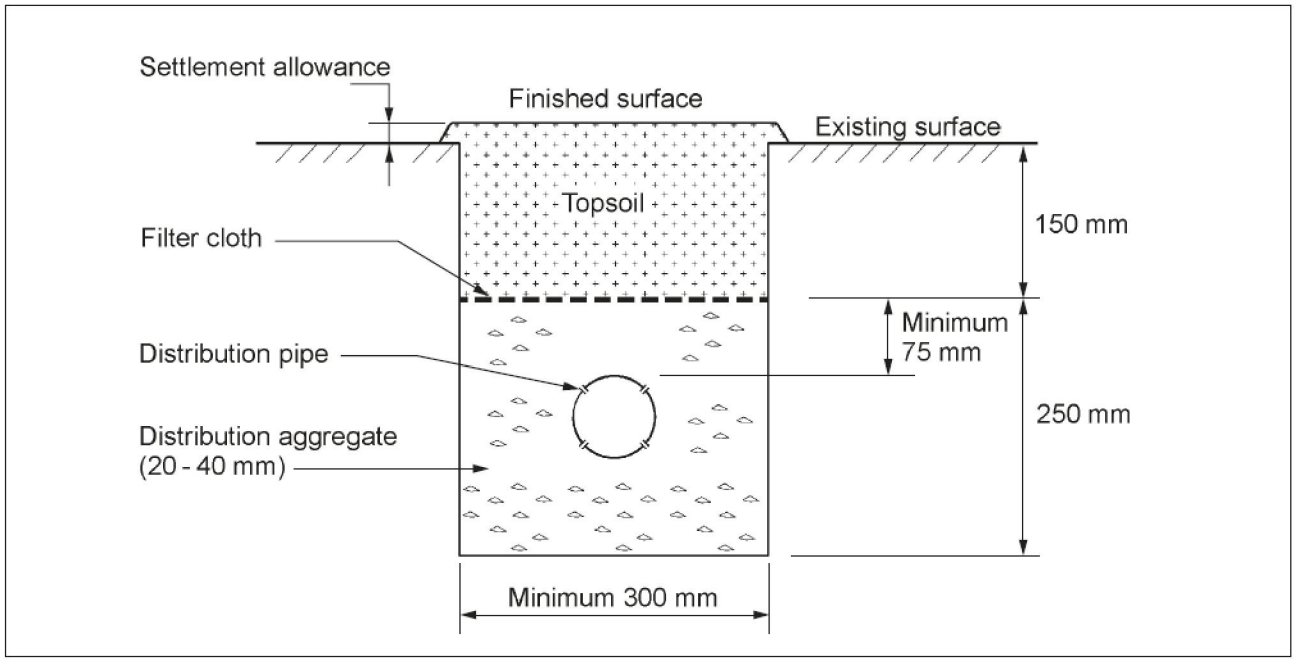


FIGURE L1 CONVENTIONAL PIPED TRENCH

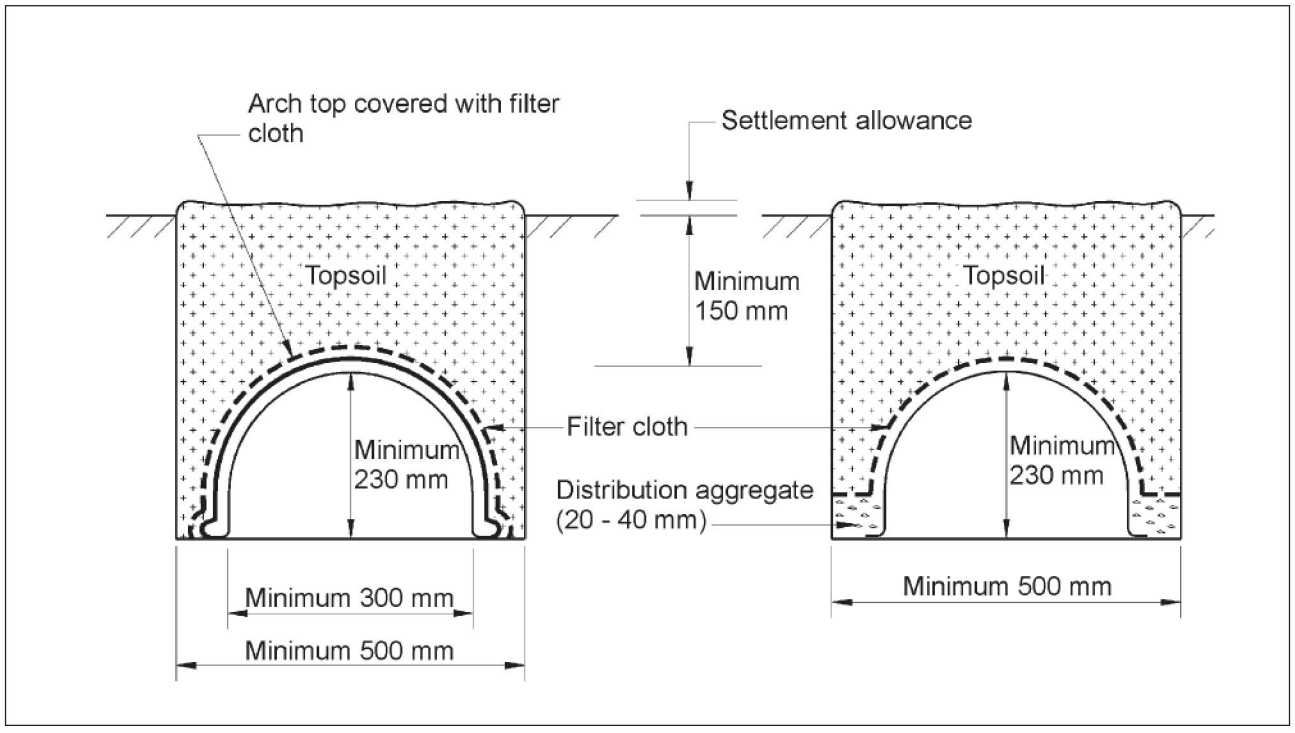


FIGURE L2 SELF-SUPPORTING ARCH TRENCH

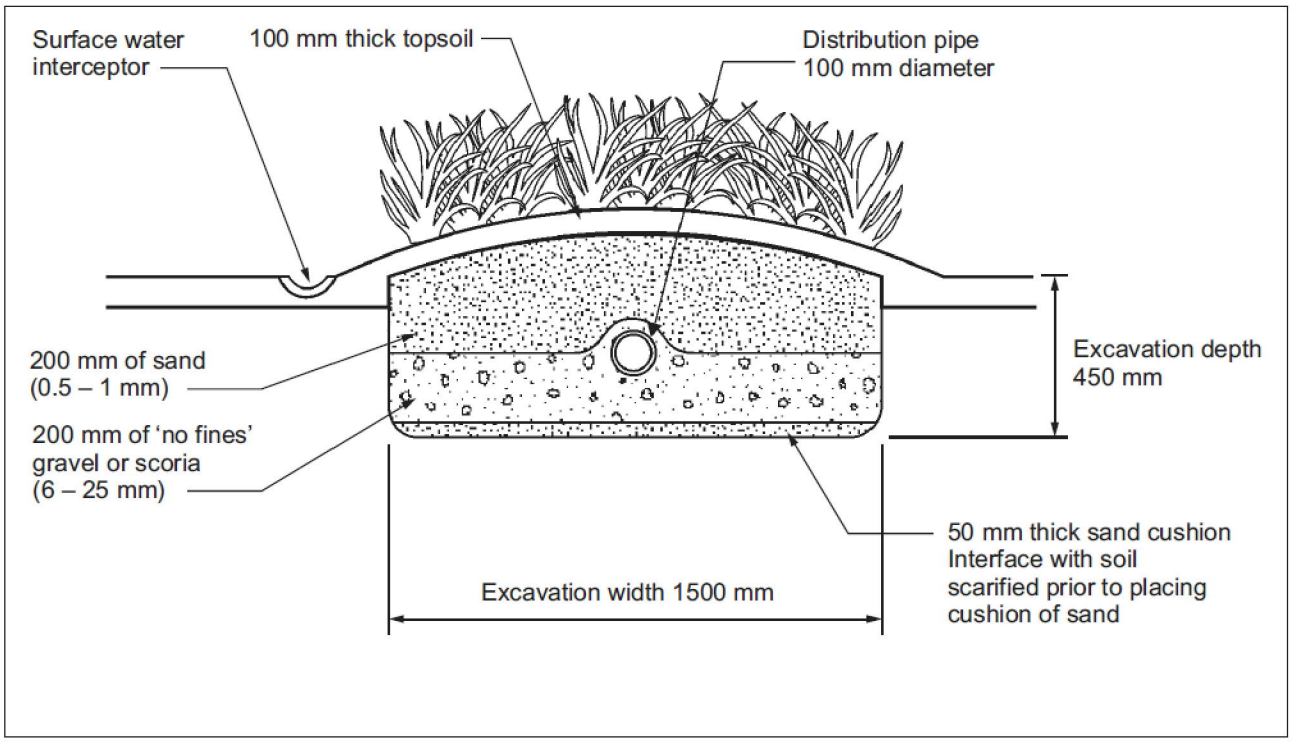
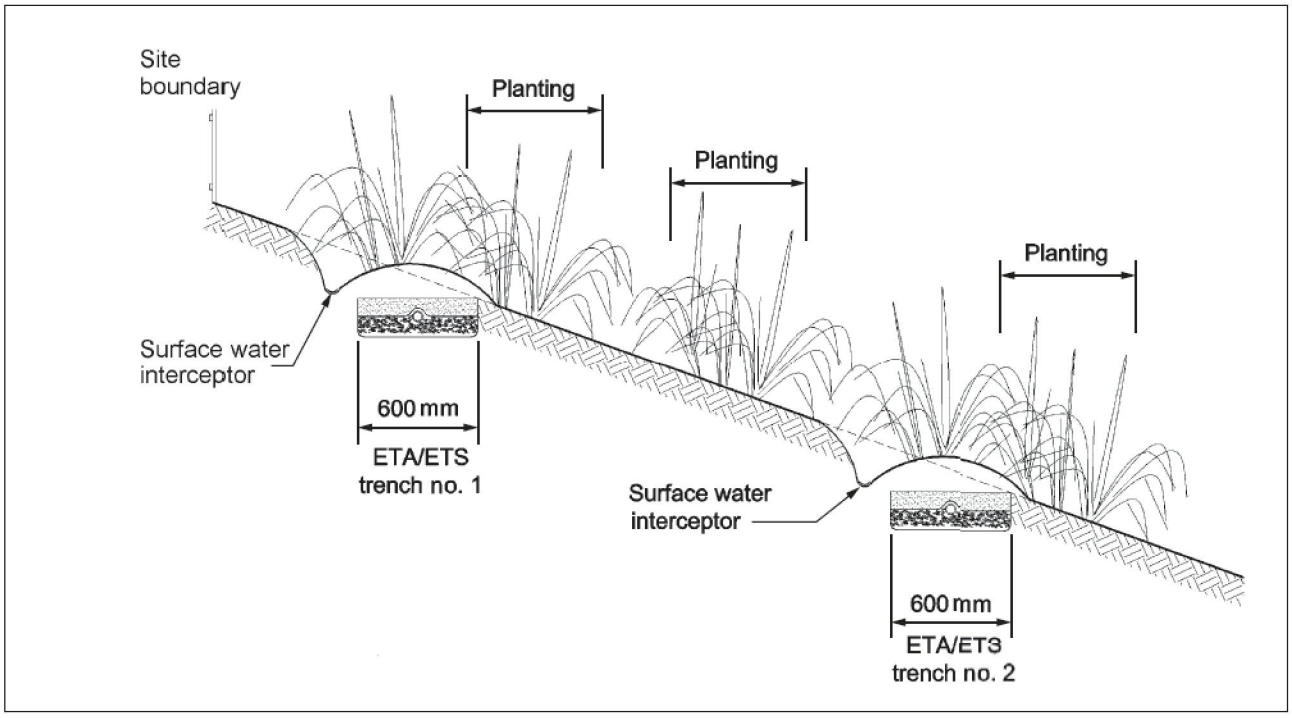


FIGURE L6 ETA/ETS BED DETAILS



NOTES:

1 An LPED line can be used to dose load the ETA/ETS trenches.

2 Each ETA/ETS trench is constructed to disperse effluent into downslope topsoil so that plantings can provide assistance by evapotranspiration.

FIGURE L7 ETA/ETS TRENCHES

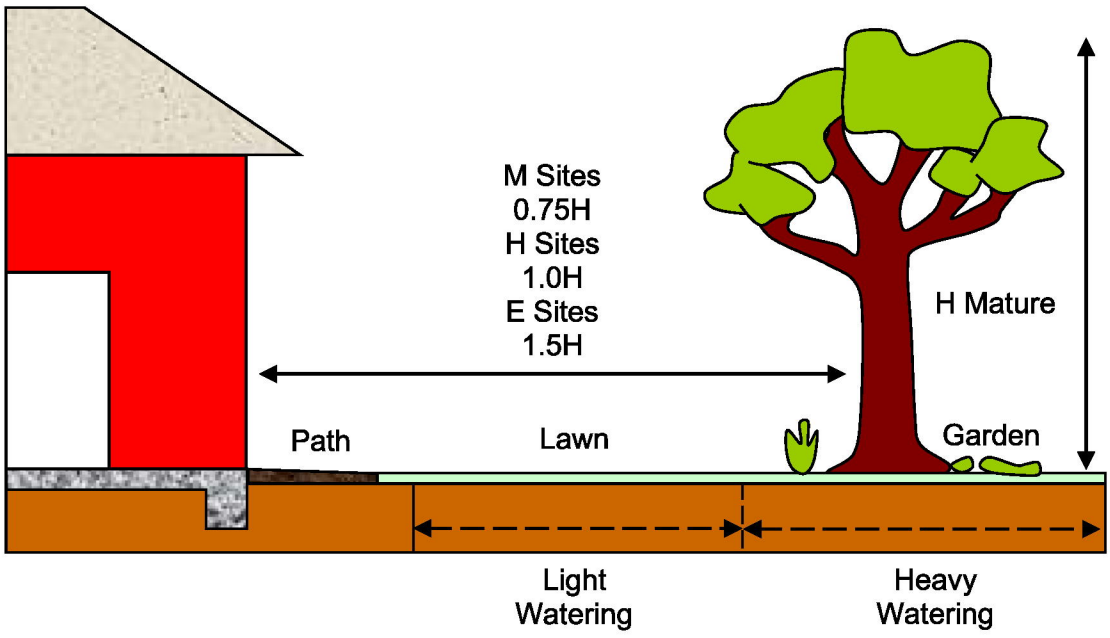
GARDENS AND TREES

Just as the building of a house changes the moisture conditions of the soil, so does the planting and establishment of a garden. The watering of the gardens increases moisture in the soil which can cause it to swell. Plants also draw moisture out of the soil, especially in long dry spells, causing the soil to shrink.

To avoid excessive moisture fluctuations around the home it is necessary to plan the garden so that only lightly watered areas such as lawns and small garden beds be located in close proximity to the house. Garden beds containing larger shrubs and trees should be kept well away from the building. Heavily watering of gardens near the house should be avoided, although uniform consistent watering of the gardens can be beneficial to prevent damage during long dry periods. Australian native plants generally require less water than exotic varieties. In any case, it is recommended to obtain information about the species to be planted in the garden prior to establishing the area.

If trees exist on site, it is highly recommended to site the proposed residential dwelling away from these trees at a distance equivalent to at least 75% (for Class M sites), 100% (for Class H sites) and 150% (for Class E sites) of the mature height of the tree. If the tree is to be removed, it is highly recommended to remove the entire tree including root system and allow the ground to achieve equilibrium moisture condition prior to construction. To assist with achieving equilibrium moisture content, the material used to backfill the removed tree site should be similar to the surrounding soil. If any trees are to be retained and the dwelling is to be built within the distance equivalent to 75% (for Class M sites), 100% (for Class H sites) and 150% (for Class E sites) of the mature height of the tree, then the footing system shall be designed for **"Class P – Problem site"** classification.

There are no recommendations within the standard for Class A and Class S sites for trees. To ensure that trees do not have a detrimental effect on the underlying materials of the dwelling it is recommended to take care when designing gardens for all soil classifications.



[redacted]

FOUNDATION EXCAVATION

The foundation excavation at times may expose soft or heaving areas at the base of the footing construction particularly if they are excavated after prolonged periods of rainfall. If such areas are encountered within the footing excavation, then such areas shall be excavated and treated before pouring the concrete. It is highly recommended to incorporate proper drainage measures around the perimeter of the building to ensure surface run-off does not ingress into the founding material.

RECOMMENDED FOUNDATION MATERIAL

Soil layer variations are common; we have therefore provided a description of the "Recommended foundation material" as a guide to the builder as to the correct foundation depths outside our test sites. In all cases the foundation soil chosen should have a similar consistency and strength to that recommended but need not be of the same type. The depth of the recommended foundation material may vary outside the test locations if the site is excavated or filled in any way after the date of our investigation. It is often difficult to distinguish fill from natural ground during investigation. If any significant variation from the borehole logs is noted during footing excavation i.e. 200mm or more, Aitken Rowe Testing Laboratories Pty Ltd should be consulted. Some allowances should be made for the removal of topsoil, organic matter, roots etc, which may be found in small, localised areas in the footing trenches. Also the effect of past and future trees should be considered in the selection of a design value for differential movement.

UNEXPECTED GROUND CONDITIONS

It is highly recommended to have experienced Geotechnical personnel inspect the site once the topsoil and unsuitable materials, if any, have been stripped to ensure that the exposed subgrade is consistent across the site. It is also recommended to proof roll the exposed subgrade. Isolated areas of "uncontrolled fill", silt-based material, tree roots, existing services trenches, tile drainage etc, may be identified and may require removal prior to construction. Care should be given to the site history, particularly where orchards/vineyards/trees or existing structures have been removed.

SITE ESTABLISHMENT

It is important to establish the site as soon as possible around the home as this will assist in stabilising the moisture content in the surrounding soil. The majority of soils expand (increase in volume) when wet, and shrink (decrease in volume) again when they dry out. The change in moisture and volume of soil can cause movement sufficient to damage the home. The more swelling and shrinkage the particular soil types on a site are likely to experience from changing moisture content, the more reactive that site will be. By quickly completing the stormwater drainage and paving around the home the moisture content in the vicinity of the home can be partially stabilised. With careful planting of trees, shrubs and garden beds and well planned watering, the expected soil movement and risk of damage to the home can be minimised.

SITE DRAINAGE

When initially drawing a plan it is recommended to include the general layout of the site and garden areas. This enables the required levels to be established and ensures that adequate drainage is provided to all areas. This site drainage includes roof stormwater and ground water that may accumulate around the site and result in a change of soil conditions that could cause damage to the building. Retaining walls generally require drainage provisions to be made around and behind the wall. These drains need to be co-ordinated with the total drainage system on the site.

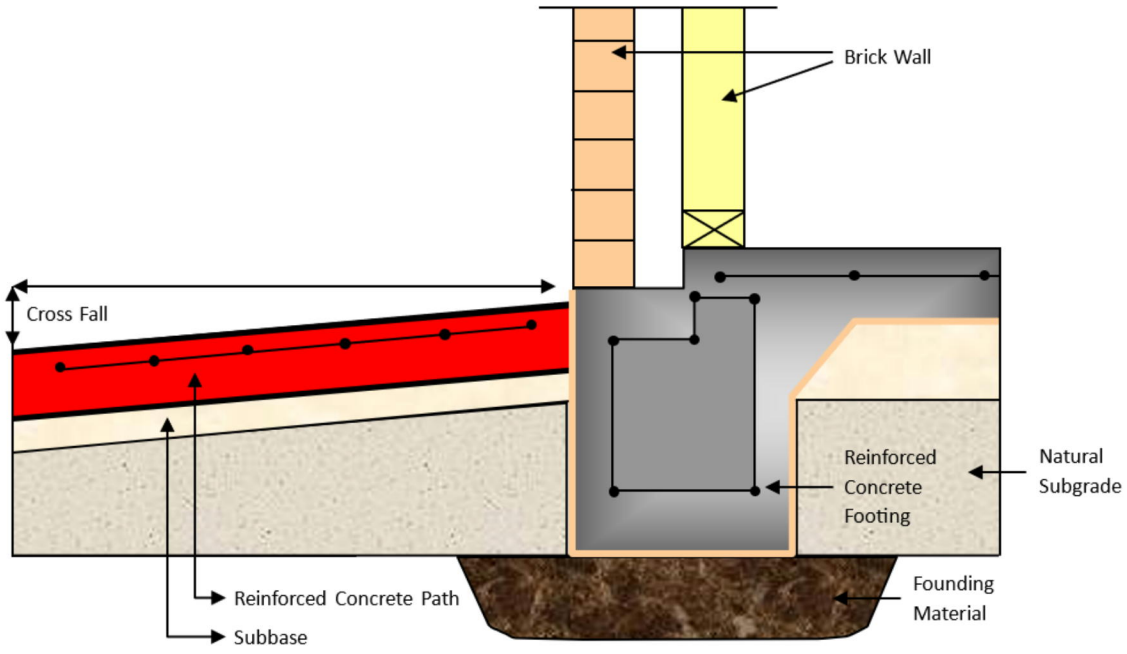
Paved areas also require adequate provision for stormwater runoff and should be graded to collection points that are both accessible for cleaning and connected to the stormwater system. All drains should be designed to prevent surface and subsurface water draining towards the house.

PAVING

The finished ground level (soil) around the home should be graded away from the house footing with a minimum fall of 50mm over the first metre. Any fill that has been placed during construction should also have the same fall and be well compacted.

Paving provides an excellent "buffer zone" around the house that assists in reducing fluctuations in the moisture conditions adjacent to the footings. If possible this paving should extend outwards from the building line a minimum of 900mm or more for highly reactive soils. It is essential that paving has the right crossfall for the expected reactivity (ground movement) of the site and all surface water is adequately drained. Care needs to be taken if laying pavements in the summer to ensure the crossfalls will not be reduced due to soils swelling in the winter. If it is not possible to construct paving immediately, plastic sheeting with gravel spread on top provides a practical temporary alternative to protect the home until concrete paths can be placed.

For Class A, S, M sites, a minimum 30mm cross fall per metre is advised. For Class H and E sites, a minimum 50mm cross fall per metre is advised.



DEFINITIONS OF SITE CLASSES

A Most sand or 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.

M-D Moderately reactive clay or silt sites with deep moisture changes.

H1 Highly reactive clay sites, which can experience high ground movement from moisture changes.

H2 Highly reactive clay sites, which can experience high ground movement from moisture changes.

H1-D Highly reactive clay sites with deep moisture changes.

H2-D Highly reactive clay sites with deep moisture changes.

E Extremely reactive sites, which can experience extreme ground movement from moisture changes.

E-D Extremely reactive sites with deep moisture changes.

P Sites which include "uncontrolled" fill; 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 with large trees adjacent to the footings or sites which cannot be classified otherwise.

MAINTENANCE

As it is important for the homeowner to maintain the building, it is also important to maintain the site around the home. The primary objective of the site and house footing maintenance is to prevent the soil from becoming too wet or too dry. By keeping the moisture content of the soil under and adjacent to the footing reasonably constant, the potential for the soil to experience significant movement that may damage the building will be limited.

Good site establishment and management is a vital part of the maintenance and protection of the home. Careful planning and detailing of the site around the concrete footing will protect your investment in the home and provide a low maintenance concrete footing for many years.

[redacted]

ADDENDUM

LIMITS OF INVESTIGATION

The recommendations made in this report are based on the assumption that the test results are representative of the overall subsurface conditions. However, it should be noted that even under optimum circumstances, actual conditions in some parts of the building site may differ from those said to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal all that is hidden by earth, rock and time. Because the investigation procedure generally includes sampling from either one, two or three boreholes, it may not be possible to conclusively establish the presence or extent the condition of the underlying soil and rock over the whole block until site work commences for the construction.

The client should also be aware that our recommendations refer only to our test site locations and the ground level at the time of testing.

The recommendations in this report are based on the following: -

a) The information gained from our investigation.
b) The present "state of the art" in testing and design.
c) The building type and site treatment conveyed to us by the client.
d) Historical Information

Should the client or their agent have omitted to supply us with the correct relevant information, or make significant changes to the building type and/or building envelope, our report may not take responsibility for any consequences and we reserve the right to make an additional charge if more testing is necessary.

Not withstanding the recommendations made in this report, we also recommend that whenever footings are close to any excavations or easements, that consideration should be given to deepening the footings.

Unless otherwise stated in our commission, any dimensions or slope direction and magnitude should not be used for any building costing calculations and/or positioning. Any sketch supplied should be considered as only an approximate pictorial evidence of our work.

ADDITIONAL INFORMATION

Refer also to the CSIRO Information Sheet: - BTF18 "Foundation Maintenance and Footing Performance: A Home Owner's Guide, which can be accessed through https://www.publish.csiro.au/book/7942/.

SITE PLAN

NOT DRAWN TO SCALE

Registration No: SE25-203
Location: Lot 1986, No. 40 Reynolds Lane, Young, NSW

[redacted]

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **1**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***10/07/2025***
GPS N: ***6205841***
E: ***619285***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Lab. Test L.S % -425µm	Remarks & Field Records
Cl	FILL: CLAY; medium plasticity, trace gravel, trace sand, orange brown	0.5	MC>PL	S-F	D	1A	11.0	FILL: Appears poorly compacted, "Uncontrolled"
Cl	CLAY; medium plasticity, with fine to coarse sand, orange	1.0	MC<PL	St. VSt.	D	1B	10.5	NATURAL
Cl	CLAY; medium plasticity, trace sand, brown	1.5			D	1C	9.0	
		2.0						
CH	CLAY; high plasticity, trace sand, orange brown yellow	2.5			D	1D	13.0	Iss = 2.3
		3.0						
	End of Borehole (BH1) @ 3.0m	3.5						
		4.0						

Registration No.: SE25-203

Location: Lot 1986, No. 40 Reynolds Lane, Young, NSW

[redacted]

Logged By: JAG

Scale: As shown

Dry on completion

AITKEN ROWE TESTING LABORATORIES PTY LTD

Borehole No.: **2**
Sheet No.: 1 of 1

Ground Level: Existing
Method: Auger Drilling with TC Bit

Date: ***10/07/2025***
GPS N: ***6205860***
E: ***619263***

USCS Symbol	Description	Depth (m)	Moisture Condition	Consistency/ Rel. Density	Sample Type	Sample No.	Lab. Test L.S % -425µm	Remarks & Field Records
CI	FILL: CLAY; medium plasticity, trace gravel, trace sand, orange brown	0.5	MC>PL	F	D	2A	10.5	FILL: Appears poorly compacted, "Uncontrolled"
CH	CLAY; high plasticity, trace sand, orange		MC=PL	St.	D	2B	13.5	Iss = 2.5
CH	CLAY; high plasticity, trace sand, orange yellow brown	1.0	MC<PL	VSt.				
CI-CH	CLAY; medium to high plasticity, trace sand, brown	1.5			D	2C	12.0	
		2.0						
	End of Borehole (BH2) @ 2.3m	2.5						
		3.0						
		3.5						
		4.0						

Registration No.: SE25-203

Location: Lot 1986, No. 40 Reynolds Lane, Young, NSW

[redacted]

Logged By: JAG

Scale: As shown

Dry on completion

AITKEN ROWE TESTING LABORATORIES PTY LTD

LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION
Groundwater Record	▼	Standing water level. Time delay following completion of drilling may be shown.
	▶	Groundwater seepage into borehole or excavation noted during drilling or excavation.
Samples	D	Disturbed bag sample taken between the depths indicated by lines.
	U	Undisturbed 50mm diameter tube sample taken between the depths indicated by lines
Field Tests	4, 7, 10 N=17	Standard Penetration Test (S.P.T.) performed between depths indicated by lines. Individual figures show blows per 150mm penetration driven by SPT hammer.
	5 7 3	Dynamic Cone Penetration Test performed between depths indicated by lines. Individual figures show blows per 100mm penetration for 60 degree solid cone driven by 9 kg hammer.
Moisture Condition (Silt or Clay based)	MC<PL	Moisture content estimated to be less than plastic limit.
	MC=PL	Moisture content estimated to be approx. equal to plastic limit.
	MC>PL	Moisture content estimated to be greater than plastic limit.
Moisture Condition (Gravel or Sand based)	D	DRY – runs freely through fingers.
	M	MOIST – does not run freely but no free water visible on soil surface.
	W	WET – free water visible on soil surface.
Consistency (Silt or Clay based)	VS	VERY SOFT – unconfined compressive strength less than 25kPa.
	S	SOFT – unconfined compressive strength 25-50 kPa.
	F	FIRM – unconfined compressive strength 50-100kPa.
	St.	STIFF – unconfined compressive strength 100-200kPa.
	VSt.	VERY STIFF – unconfined compressive strength 200-400kPa.
	H	HARD – unconfined compressive strength greater than 400kPa.

Relative Density (Gravel or Sand based)		Description	Density Index Range %	'N' Value Range Blows/300mm
	VL	VERY LOOSE	<15	0-5
	L	LOOSE	15-35	6-10
	MD	MEDIUM DENSE	35-65	11-30
	D	DENSE	65-85	31-50
	VD	VERY DENSE	>85	>50

Hand Penetrometer Readings	300 250 280	Numbers indicate individual test results in kPa on representative undisturbed material.
Laboratory Test	L.S. %	Linear Shrinkage (As per TfNSW Method T113)
	M.C. %	Field Moisture Content (As per Australian Standard AS1289.2.1.1 or TfNSW Method T120)
	Iss	Shrink-Swell Index (As per Australian Standard AS1289.7.1.1)

Piezometer Construction	Fill		Piezometer	
		Bentonite		Solid Pipe
		Washed Fine Graded Gravel		Slotted Screen

Remarks	'V' bit	Hardened steel 'V' shaped bit.
	'TC' bit	Tungsten Carbide wing bit.

Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 1/5 Dangar Place, East Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER TEST REPORT

CLIENT: [redacted]

PROJECT: SITE CLASSIFICATION & EFFLUENT DISPOSAL ASSESSMENT
PROPOSED RESIDENTIAL DWELLING

LOCATION: LOT 1986, No. 40 REYNOLDS LANE, YOUNG, NSW **DCP: 1 (BH1)**

SOIL DESCRIPTION: REFER TO BOREHOLE LOGS

DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A

PAGE: 1 OF: 2

REGISTRATION NO: **SE25-203**

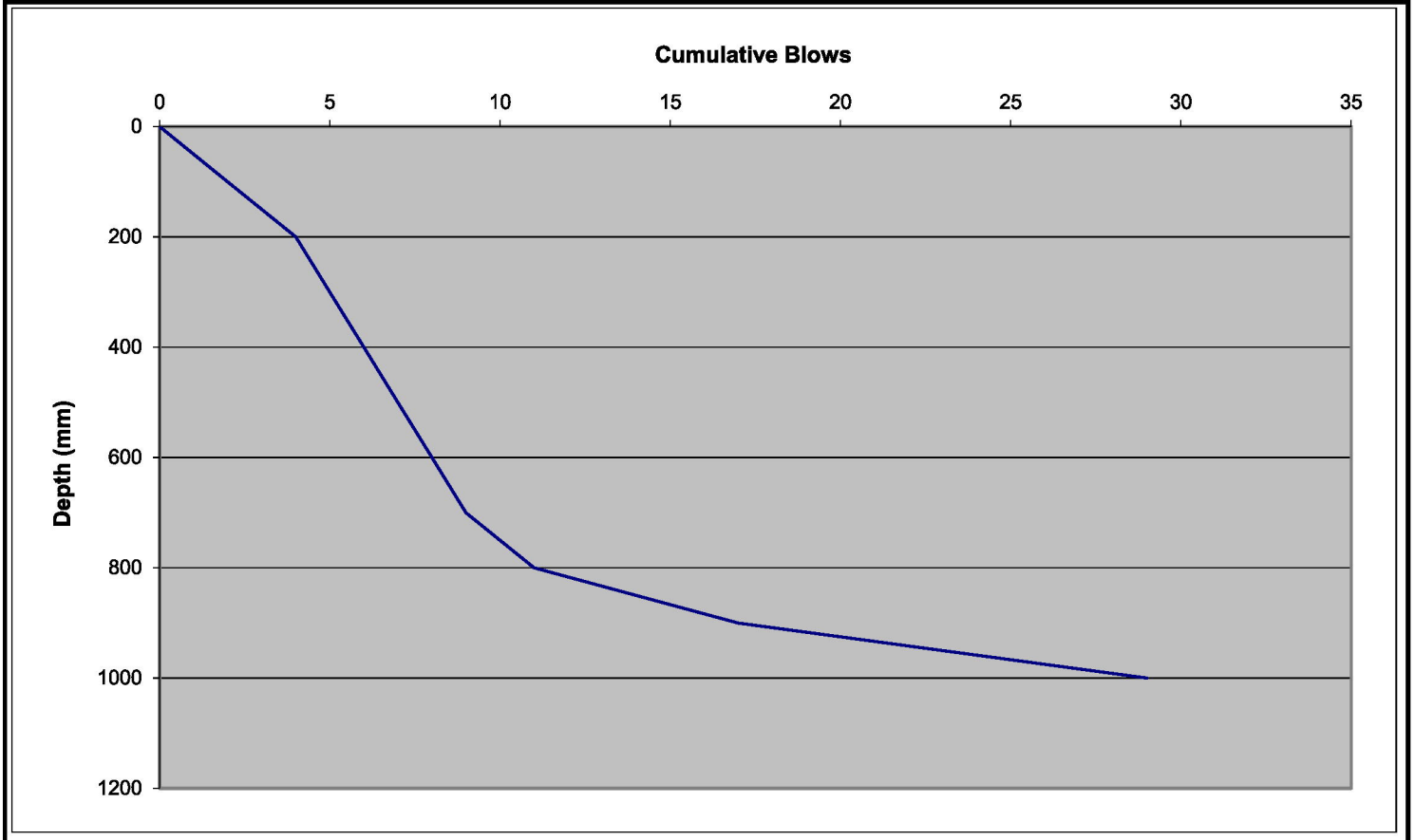
DATE OF TEST: 10/07/2025

DEPTH BELOW ESL (mm): NIL

MOISTURE CONDITION: REFER TO LOGS

TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	2	3	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	2	3	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	1	1	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	1	1	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	1	1	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	1	1	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	1	1	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	2	3	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	6	12	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	12	28	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	END	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Peter Forbes-Taber

DATE: 21/07/2025

R13 V7 14/02/2025

Aitken Rowe Testing Laboratories Pty Ltd

ARTL Wagga: 1/5 Dangar Place, East Wagga Wagga NSW 2650

DYNAMIC CONE PENETROMETER TEST REPORT

CLIENT: [redacted]

PROJECT: SITE CLASSIFICATION & EFFLUENT DISPOSAL ASSESSMENT
PROPOSED RESIDENTIAL DWELLING

LOCATION: LOT 1986, No. 40 REYNOLDS LANE, YOUNG, NSW **DCP: 2 (BH2)**

SOIL DESCRIPTION: REFER TO BOREHOLE LOGS

DEPTH OF GROUND WATER TABLE IF INTERSECTED: N/A

PAGE: 2 OF: 2

REGISTRATION NO: **SE25-203**

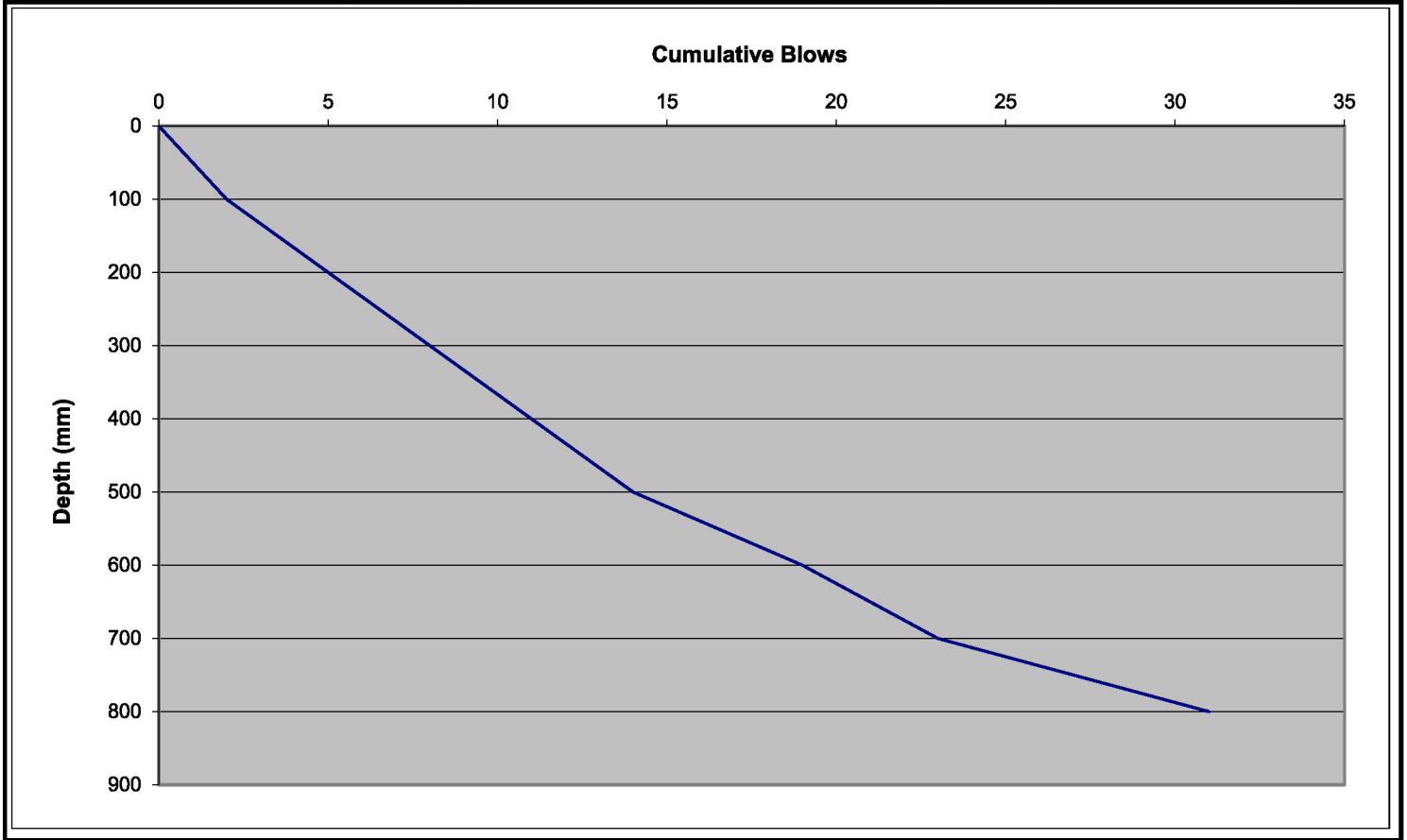
DATE OF TEST: 10/07/2025

DEPTH BELOW ESL (mm): NIL

MOISTURE CONDITION: REFER TO LOGS

TEST METHOD: AS 1289.6.3.2

Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR	Depth(m)	Blows	Est. CBR
0.0 - 0.1	2	3	1.5 - 1.6	*	*	3.0 - 3.1	*	*	4.5 - 4.6	*	*
0.1 - 0.2	3	5	1.6 - 1.7	*	*	3.1 - 3.2	*	*	4.6 - 4.7	*	*
0.2 - 0.3	3	5	1.7 - 1.8	*	*	3.2 - 3.3	*	*	4.7 - 4.8	*	*
0.3 - 0.4	3	5	1.8 - 1.9	*	*	3.3 - 3.4	*	*	4.8 - 4.9	*	*
0.4 - 0.5	3	5	1.9 - 2.0	*	*	3.4 - 3.5	*	*	4.9 - 5.0	*	*
0.5 - 0.6	5	9	2.0 - 2.1	*	*	3.5 - 3.6	*	*	5.0 - 5.1	*	*
0.6 - 0.7	4	7	2.1 - 2.2	*	*	3.6 - 3.7	*	*	5.1 - 5.2	*	*
0.7 - 0.8	8	17	2.2 - 2.3	*	*	3.7 - 3.8	*	*	5.2 - 5.3	*	*
0.8 - 0.9	END	*	2.3 - 2.4	*	*	3.8 - 3.9	*	*	5.3 - 5.4	*	*
0.9 - 1.0	*	*	2.4 - 2.5	*	*	3.9 - 4.0	*	*	5.4 - 5.5	*	*
1.0 - 1.1	*	*	2.5 - 2.6	*	*	4.0 - 4.1	*	*	5.5 - 5.6	*	*
1.1 - 1.2	*	*	2.6 - 2.7	*	*	4.1 - 4.2	*	*	5.6 - 5.7	*	*
1.2 - 1.3	*	*	2.7 - 2.8	*	*	4.2 - 4.3	*	*	5.7 - 5.8	*	*
1.3 - 1.4	*	*	2.8 - 2.9	*	*	4.3 - 4.4	*	*	5.8 - 5.9	*	*
1.4 - 1.5	*	*	2.9 - 3.0	*	*	4.4 - 4.5	*	*	5.9 - 6.0	*	*



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

REMARKS:

APPROVED SIGNATORY: Peter Forbes-Taber

DATE: 21/07/2025

R13 V7 14/02/2025

AITKEN ROWE TESTING LABORATORIES PTY LTD
ARTL Wagga: 1/5 Dangar Place, East Wagga Wagga NSW 2650

PAGE: 1
OF: 1

TEST REPORT

SOIL PERCOLATION & EMERSON CLASS

DATE OF TEST: 10/07/2025 -17/07/2025

CLIENT: [redacted]

JOB DESCRIPTION: SITE CLASSIFICATION & EFFLUENT DISPOSAL ASSESSMENT

PROPERTY LOCATION: LOT 1986, No. 40 REYNOLDS LANE, YOUNG, NSW

*

TEST METHOD: AS1547
AS1289.3.8.1

MATERIAL TYPE: REFER TO BOREHOLE LOGS

REGISTRATION No.: **SE25-203**

MEASUREMENT OF DROP IN WATER LEVEL

Time Elapsed (minutes)	Water Level (mm)					
	P1	P2	P3	P4	P5	P6
0	0	0	0	*	*	*
10	10	10	10	*	*	*
15	*	*	*	*	*	*
20	40	35	40	*	*	*
30	60	60	60	*	*	*
40	70	75	70	*	*	*
45	*	*	*	*	*	*
50	80	80	85	*	*	*
60	90	90	100	*	*	*
70	*	*	*	*	*	*

TIME TAKEN FOR 25mm WATER LEVEL FALL

Site	Absorption Rate (mins/25mm)
P1	16.7
P2	16.7
P3	15.0
P4	*
P5	*
P6	*

Permeability: 0.34 m/day

D.L.R.: 6 mm/day

D.I.R.: 3 mm/day

Emerson Class Number: 6

APPROVED SIGNATORY: Peter Forbes-Taber

DATE: 21/7/2025

AITKEN ROWE Testing Laboratories Pty Ltd

ARTL Wagga: 1/5 Dangar Place, East Wagga Wagga NSW 2650

*

SAMPLED BY: ARTL
DATE SAMPLED: 10/07/2025
DATE SUBMITTED: 10/07/2025
SAMPLING METHOD: AS1289.1.2.1
SAMPLING CLAUSE: 6.5.3
DATES TESTED: 14-17/07/2025
ORDER No.: *

TEST REPORT: GEOTECHNICAL INVESTIGATION - SOIL ANALYSIS

CLIENT [redacted]

JOB DESCRIPTION : SITE CLASSIFICATION & EFFLUENT DISPOSAL ASSESSMENT
PROPOSED RESIDENTIAL DWELLING
LOT 1986, No. 40 REYNOLDS LANE, YOUNG, NSW

MATERIAL SOURCE : IN-SITU BOREHOLES
MATERIAL TYPE : REFER TO BOREHOLE LOGS
PROPOSED USE : DESIGN

REGISTRATION No : R28 **SE25-203**

	SAMPLE NUMBER :	P1	*	*	*	*	*
	SAMPLING LOCATION :	PERC	*	*	*	*	*
	DEPTHS BETWEEN WHICH SAMPLES TAKEN (mm) :	*	*	*	*	*	*
TESTS	TEST ELEMENT	*	*	*	*	*	*
AS1289.3.6.1	PASS 100.0mm SIEVE %	*	*	*	*	*	*
	PASS 75.0mm SIEVE %	*	*	*	*	*	*
	PASS 53.0mm SIEVE %	*	*	*	*	*	*
	PASS 37.5mm SIEVE %	*	*	*	*	*	*
	PASS 26.5mm SIEVE %	*	*	*	*	*	*
	PASS 19.0mm SIEVE %	*	*	*	*	*	*
	PASS 13.2mm SIEVE %	*	*	*	*	*	*
	PASS 9.50mm SIEVE %	*	*	*	*	*	*
	PASS 6.70mm SIEVE %	*	*	*	*	*	*
	PASS 4.75mm SIEVE %	*	*	*	*	*	*
	PASS 2.36mm SIEVE %	100	*	*	*	*	*
	PASS 1.18mm SIEVE %	95	*	*	*	*	*
	PASS 600µm SIEVE %	89	*	*	*	*	*
	PASS 425µm SIEVE %	86	*	*	*	*	*
	PASS 300µm SIEVE %	83	*	*	*	*	*
	PASS 150µm SIEVE %	77	*	*	*	*	*
	PASS 75µm SIEVE %	72	*	*	*	*	*
AS1289.3.8.1 (AIR DRIED)	EMERSON CLASS	6	*	*	*	*	*
	TYPE OF WATER	DISTILLED	*	*	*	*	*

NATA
WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing.

ACCREDITATION NUMBER: 4679

*
*
*

All samples are oven dried and dry sieved during prep. unless otherwise stated

APPROVED SIGNATORY : ..... DATE: 21/07/2025

Peter Forbes-Taber

Aitken Rowe TESTING LABORATORIES

SIZE OF AREA FOR EACH MONTH (INCLUDING STORAGE OF EFFLUENT)

Month	Days per month	Pan Evaporation (mm)	Crop Factor S = 0.8 W = 0.6	Evapotrans-piration (mm)	Rainfall (mm)	Retained Rainfall	LTAR per day (mm)	LTAR per month (mm)	Disposal Rate per month (mm)	Effluent Applied per Month (L)	Size of Area (m^2)
	N	E_o	C_f	ET	R	R_r	P	Pm	ET-Rr+Bm	QxN	
Jan.	31	257.3	0.8	205.8	43.0	32.3	5	155	328.6	27900	85
Feb.	28	207.2	0.8	165.8	37.1	27.8	5	140	277.9	25200	91
Mar.	31	173.6	0.8	138.9	41.5	31.1	5	155	262.8	27900	106
Apr.	30	105.0	0.6	63.0	45.6	34.2	5	150	178.8	27000	151
May.	31	58.9	0.6	35.3	56.1	42.1	5	155	148.3	27900	188
Jun.	30	36.0	0.6	21.6	47.7	35.8	5	150	135.8	27000	199
Jul.	31	40.3	0.6	24.2	56.2	42.2	5	155	137.0	27900	204
Aug.	31	52.7	0.6	31.6	54.3	40.7	5	155	145.9	27900	191
Sep.	30	75.0	0.6	45.0	55.0	41.3	5	150	153.8	27000	176
Oct.	31	117.8	0.8	94.2	62.2	46.7	5	155	202.6	27900	138
Nov.	30	177.0	0.8	141.6	44.0	33.0	5	150	258.6	27000	104
Dec.	31	241.8	0.8	193.4	42.0	31.5	5	155	316.9	27900	88
	Sum	1542.6		1160.5	584.7					Average Area	143

Month	Days per month	First Trial Area (m^2)	Effluent Applied per Month (L)	Disposal Rate per month (mm)	Application Rate (mm)	Gain/Loss (mm)	Evaporation Deficit (mm)	Starting depth of Effluent (mm)	Increase in depth of stored effluent (mm)	Computed depth of Effluent (mm)
Dec.										0.0
Jan.	31	150	27900	328.6	186.0	-142.6	-173.6	0.0	-356.5	-356.5
Feb.	28	150	25200	277.9	168.0	-109.9	-137.9	-356.5	-274.8	-631.3
Mar.	31	150	27900	262.8	186.0	-76.8	-107.8	-631.3	-191.9	-823.2
Apr.	30	150	27000	178.8	180.0	1.2	-28.8	-823.2	3.0	-820.2
May.	31	150	27900	148.3	186.0	37.7	6.7	-820.2	94.3	-725.9
Jun.	30	150	27000	135.8	180.0	44.2	14.2	-725.9	110.4	-615.4
Jul.	31	150	27900	137.0	186.0	49.0	18.0	-615.4	122.4	-493.0
Aug.	31	150	27900	145.9	186.0	40.1	9.1	-493.0	100.3	-392.7
Sep.	30	150	27000	153.8	180.0	26.3	-3.8	-392.7	65.6	-327.1
Oct.	31	150	27900	202.6	186.0	-16.6	-47.6	-327.1	-41.5	-368.6
Nov.	30	150	27000	258.6	180.0	-78.6	-108.6	-368.6	-196.5	-565.1
Dec.	31	150	27900	316.9	186.0	-130.9	-161.9	-565.1	-327.4	-892.4

PRIMARY TREATMENT

CALCULATION OF ABSORPTION TRENCH

$A_w = Q_d/LTAR$ LTAR (P) = 3 mm/day

Q_d = 900 litres

A_W = 300m²

$L = A_w/b+d_w$

Trench width = 600mm

Trench depth = 700mm

Length, L = 231m

LTAR = Long Term Acceptance Rate (mm/day)

Q_d = daily effluent flow (L/day)

A_w= wetted area

b = trench width

L = trench length (m)

d_w = allowance for depth of wetted walls (m)

d_w = 2*0.5d

	DATA	
Flow Rate (Q_d)	**900**	L/day
LTAR (P)	**3**	$L/m^2/day$
LTAR (S)	**5**	$L/m^2/day$
Run off Coefficient	**0.75**	Retained
Soil Porosity	**0.4**	Estimate
Estimated Wetted Area	**150**	m^2
DLR (P)	**6**	
DLR (S)	**10**	
DIR	**3**	

SECONDARY TREATMENT

CALCULATION OF EVAPOTRANSPIRATION AREA - ETA TRENCH / ETS BED

ETA TRENCH

Water Balance Area = 150m²

Be = width +2depth

Length, L = Ae/Be

Trench width = 600mm

Trench depth = 700mm

ETA Length, L = 75m

ETS BED

Water Balance Area = 150m²

Be = width +2depth

Length, L = Ae/Be

Bed width = 1500mm

Bed depth = 550mm

ETS Length, L = 58m

ETS BED

(AS1547:2012 Calculation)

DLR (Secondary) = 10 mm/day

Length, L = Q_d/(DLR (S) x width)

Bed width = 1500mm

Bed depth = 550mm

ETS Length, L = 60m

CALCULATION OF IRRIGATION AREA - AS1547:2012

Area $A_i = Q_w/DIR$

Q_w = 6300 litres Q_w = weekly effluent flow

DIR = 21 mm/week DIR = Design Irrigation Rate

Irrigation A_i = 300m²