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# Site and Soil Assessment for On-site Effluent Management System

**Client:** Ryan Jones  
**Site Address:** 1318 Henry Lawson Drive  
St Fillans, NSW 2850

23 September 2024

Our Reference : 45588-ER01\_A

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## DISCLAIMER

This report has been prepared solely for Ryan Jones in accordance with the scope provided by the client and for the purpose(s) as outlined throughout this report.

Installation must be by a licensed plumber and Barnson will not be liable for the incorrect installation and/or construction of the system. Installation and construction of the system must hold true to the design recommendations presented in this report. Installation should be in accordance with the prescriptions within AS 1547:2012.

Unless otherwise stated in this report, Barnson has not verified the accuracy or completeness of the data retrieved from online databases and guidance documents. The recommendations for the proposed system as presented in this report are based on historical data obtained for the area. Barnson will not be liable in relation to incorrect recommendations should any information provided by the client be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed.

The accuracy of the advice provided in this report may be limited by unobserved variations in ground conditions across the site in areas between and beyond test locations and by any restrictions in the sampling and testing which was able to be carried out, as well as by the amount of data that could be collected given the project and site constraints. These factors may lead to the possibility that actual ground conditions and materials behaviour observed at the test locations may differ from those which may be encountered elsewhere on the site. If the sub-surface conditions are found to differ from those described in this report, we should be informed immediately to evaluate whether recommendations should be reviewed and amended if necessary.

<b>Project:</b>	Lot 7 DP246916, 1318 Henry Lawson Drive, St Fillans NSW 2850	
<b>Client:</b>	Ryan Jones	
<b>Project Number:</b>	45588	
<b>Report Reference:</b>	45588-ER01_A	
<b>Date:</b>	19/09/2024	
Prepared by:	Reviewed by:	
		
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## 1.0 SYSTEM OVERVIEW

The following table provides a summary of the information for a sustainable onsite effluent management system proposed at Lot 7 DP246916, 1318 Henry Lawson Drive, St Fillans NSW 2850. The sections of this report that follow, provide site specific details justifying the recommended system.

**Table 1 : System Overview**

Site Assessor	Jeremy Wiatkowski
Client	Ryan Jones
Site Location	"Lot 7 DP246916", 1318 Henry Lawson Drive, St Fillans NSW
No. of Bedrooms	2 Bedrooms
Water Source	Rainwater roof collection
Estimated Daily Flow (L/day)	360L/Day based on 3 people at 120L/person/day
Tank Recommendation	Standard Septic Tank
Tank Capacity	As per section 6.3 the minimum size tank required is 3000L
Sub Soil Assessment Class	Field assessment and subsequent laboratory tests have classed the subsoil as category 1, as shown in section 3.5.
Sub Soil Recommended Hydraulic Loading mm/day (DIR/DLR)	Trench systems in category 1 soils have a design-loading rate of 20mm/day. (Refer to Table 7)
Recommended Effluent Application Type	Due to the category 1 soil (Gravel and Sands) it is recommended that a discharge control absorption trench be utilised to disperse onsite wastewater.
Effluent Design Criteria	<b><i>As per section 7.0 the minimum application area was determined by calculating the requirements of hydraulic loading. As shown 2 discharge control trenches of 15m long x 0.6m wide is required to dispose of the proposed hydraulic load.</i></b>

## 2.0 INTRODUCTION

### 2.1 Overview

Barnson Pty Ltd on behalf of Ryan Jones has prepared this report for submission to Mid-Western Regional Council. This report provides direction for sustainable on-site effluent management for a 2-bedroom residence, on Lot 7 DP246916, at 1318 Henry Lawson Drive, St Fillans NSW (refer **Figure 1 & 2**).

### 2.2 Key References

The following key references were utilised as part of this assessment:

- AS/NZS 1547:2012. *On-site Domestic Wastewater Management*;
- NSW Government 1998. *On site Sewerage Management for Single Households* (The Silver Book/OSMSH);
- NSW Government 2000. *The Easy Septic Tank Guide*. Developed by Social Change Media for the NSW Department of Local Government;
- NSW Health, 2001. ‘Septic Tank and Collection Well Accreditation Guidelines’;
- Mid-Western Regional Council Local Environment Plan, 2012;
- Mid-Western Local Environment Plan, 2011;
- Murphy B.W. & Lawrie J.W. 1998. Soil Landscapes of the Dubbo 1:250 000 Sheet Report, DLWC.
- Sydney Catchment Management Authority, 2019. *Designing and Installing On-Site Wastewater Systems*;

### 2.3 Onsite Effluent Management System

The proposed onsite effluent management system for this site consists of a standard septic tank pressure dosed into a discharge control trench. **Figure 1 & 2** illustrates the site location. **Figure 3** illustrates the proposed buffer, setback areas and proposed application area.

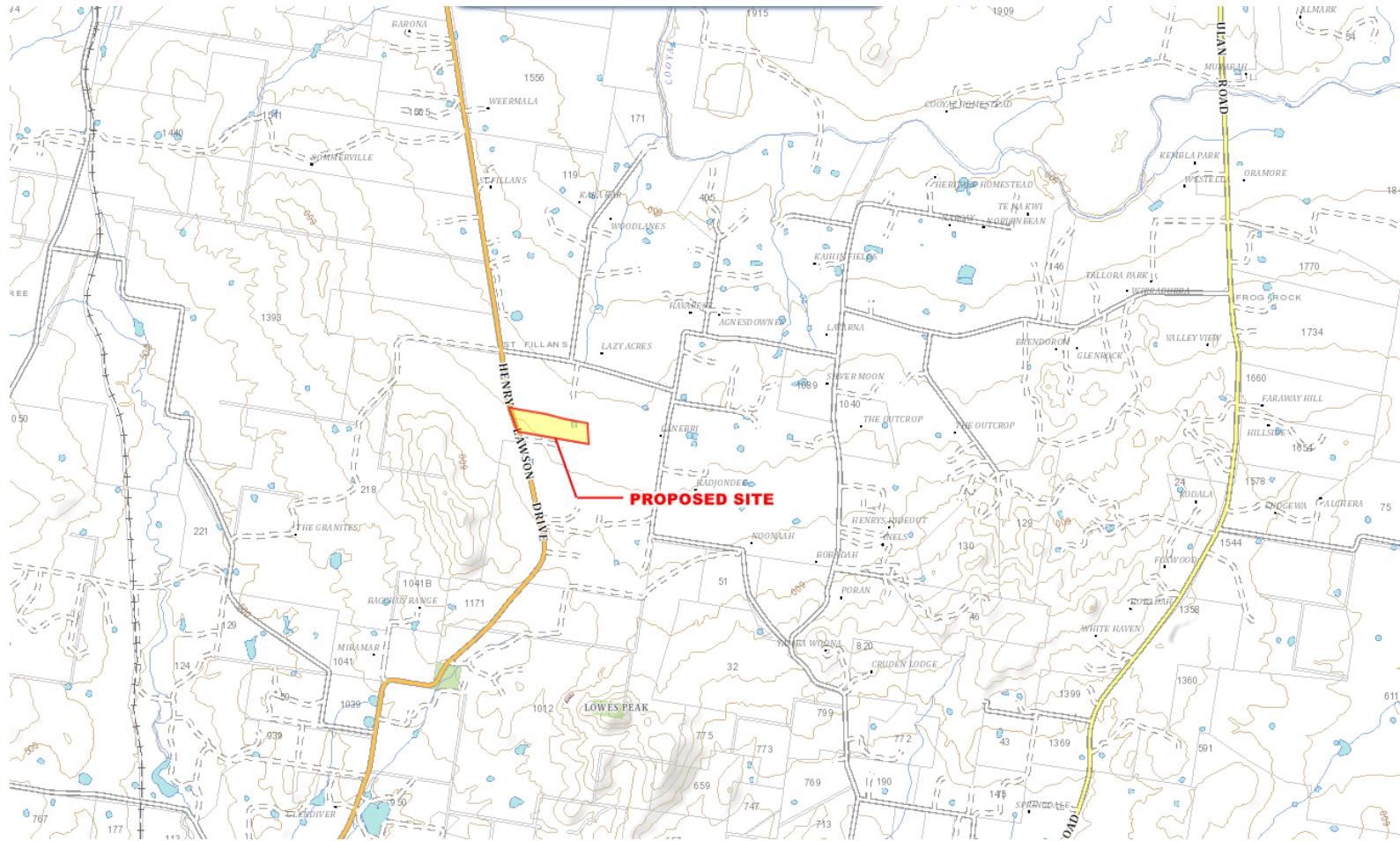


Figure 1 – Site Location Plan

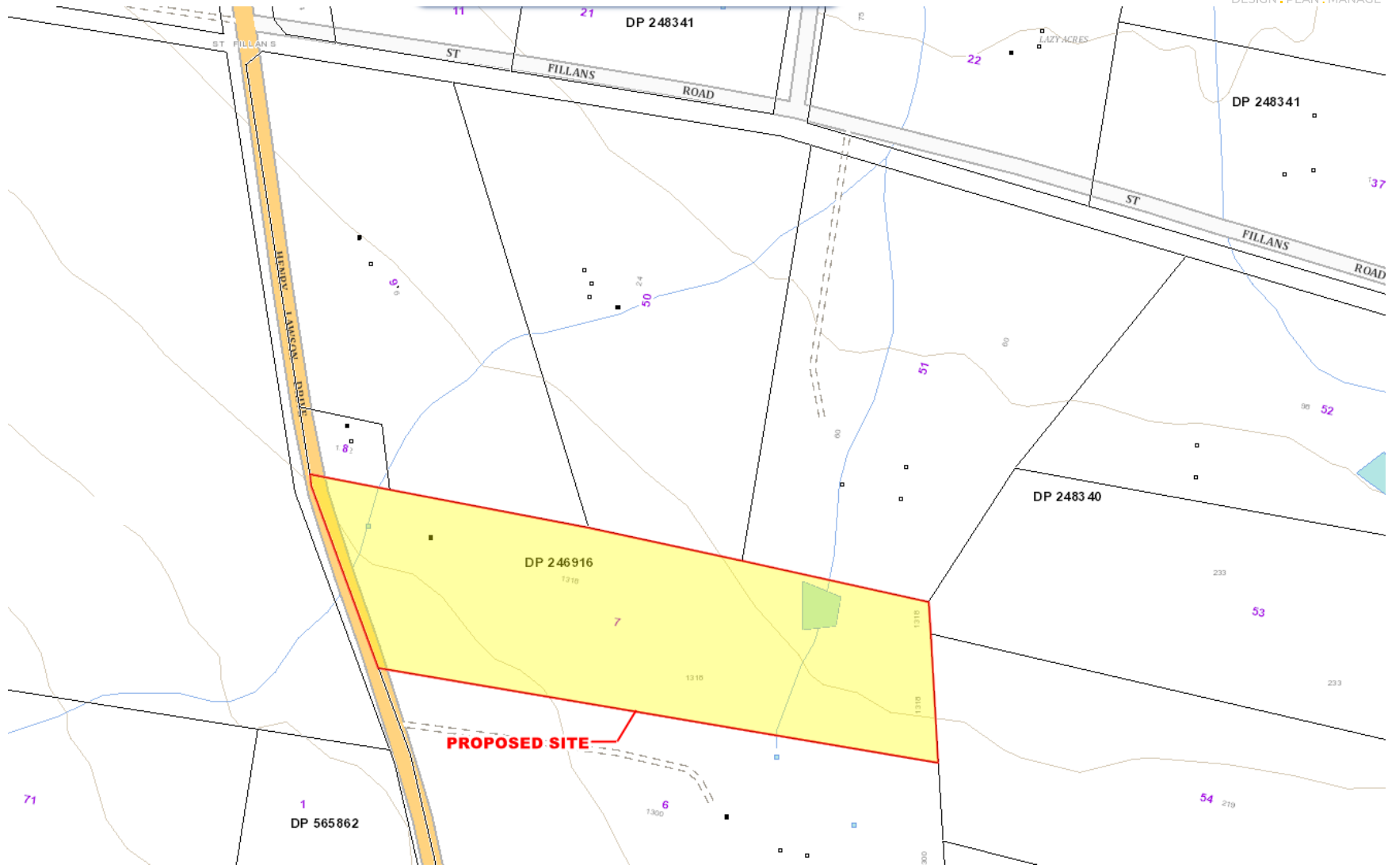


Figure 2 – Site Location Plan



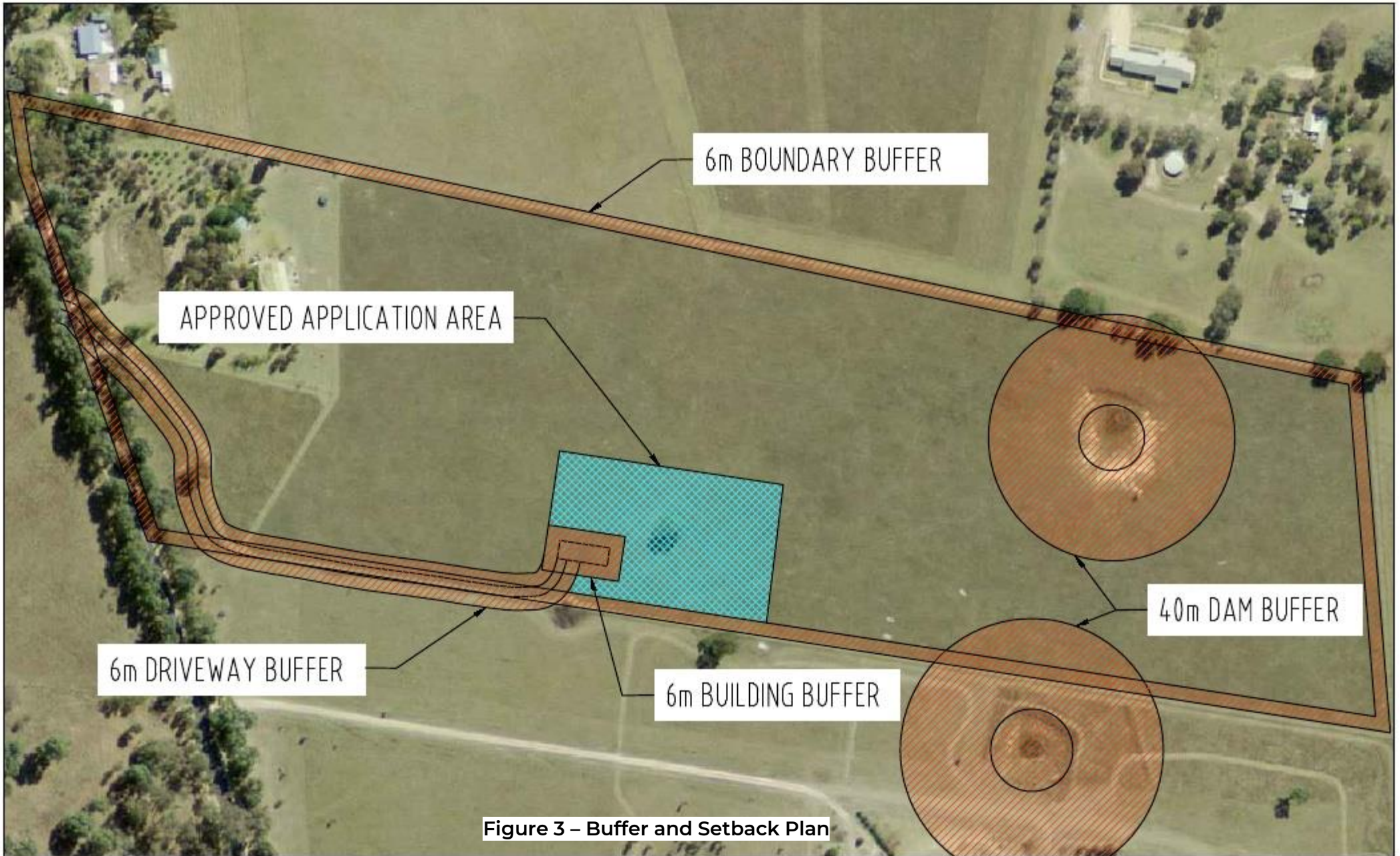


Figure 3 – Buffer and Setback Plan

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Project  
**ONSITE SEWAGE DISPOSAL**  
Client  
**RYAN JONES**  
Drawing Title  
**PROPOSED SITE BUFFERS**

Site Address  
**1318 HENRY LAWSON DRIVE  
ST FILLANS NSW**

Design: JW  
Drawn: JW  
Check: NP  
Original Size: A4  
Revision: A

Certification

Project No: **45588**  
Drawing No: **GD01**

## 3.0 SITE AND SOIL EVALUATION

### 3.1 Site Evaluators Details

The following table provides an overview of the evaluator’s particulars.

**Table 2: Details**

<b>Name / Role</b>	Jeremy Wiatkowski
<b>Role/ Qualifications</b>	Geotechnical Technician
<b>Company</b>	Barnson Pty Ltd
<b>Company Address</b>	1/36 Darling Street Dubbo NSW 2830
<b>Contact Details</b>	1300 BARNSON
<b>Date of Assessment</b>	27/8/2024

### 3.2 Site Information

The following table provides an overview of the site information.

**Table 3: Site Particulars**

<b>Address/Locality</b>	1318 Henry Lawson Drive, St Fillans NSW Lot 7 DP246916
<b>Local Government Area</b>	Mid-Western Regional Council
<b>Owner</b>	Ryan Jones
<b>Developer/Builder</b>	Owner/Builder
<b>Block Configuration</b>	Approximately 10 ha
<b>Intended Water Supply</b>	rainwater roof collection supplied
<b>Intended Power Supply</b>	Supplied
<b>Local Experience</b>	Care needs to be taken to minimise runoff and erosion. Systems commonly malfunction due to lack of ongoing maintenance. The system is to be inspected and maintained regularly in accordance with manufacturer details, Council requirements, and prescriptions identified in this report.

### 3.3 Desktop Assessment

The following information was obtained via desktop review of the site.

**Table 4: Desktop Assessment Details**

<b>Climate Overview<sup>1</sup></b>	Annual Average Rainfall for Mudgee is 664.9mm. Warm summers with large evaporative deficit, cool winters with small evaporative deficit. The mean summer monthly rainfall (January) is 67.9mm. The mean winter rainfall (July) is 46.7mm.	
<b>Soil Landscape Reference<sup>2</sup></b>	Area has been mapped within the 'Home Rule' Landscape Group. Siliceous Sands and Yellow Solodic Soils co-dominate the area.	
	Surface Conditions	Loose
	Drainage	Excessively Well Drained
	Available water holding capability	Low
	Water table depth	>150cm
	Depth to bedrock	100-300cm
	Flood hazard	Nil
	Expected Nutrient deficiencies	Nitrogen, Phosphorous
	Soil Salinity	Low
	Erosion Hazard	High
<b>Underlying Geology<sup>3</sup></b>	<i>"Leucocratic coarse-grained to megacrystic porphyritic quartz monzonite, minor granite".</i>	
<b>Groundwater Review</b>	Three water bores were found within 500m of the proposed site, as illustrated in <b>Figure 4</b> . The area is not mapped as being groundwater vulnerable as per the <a href="#">Mid-Western Regional Council LEP map GRV_006</a> <b>Figure 5</b> .	

<sup>1</sup> Bureau of Meteorology online Climate Data website

<sup>2</sup> NSW Soil and Land Information System

<sup>3</sup> Dubbo 1:250000

### 3.4 Groundwater Review

The following information was obtained via desktop review of available groundwater information in the local area. Information was obtained from the NSW Office of Water online groundwater mapping tool. Three water bores were identified as occurring within the general area of the allotment. Information relating to historic groundwater report details on water bearing zones and standing water levels is provided in the table below.

**Table 5: Groundwater Review**

Groundwater Bore Reference	Total Depth (m)	Water Bearing Zones (m)	Standing Water Level (m)	Yield (L/s)	Salinity Description
<b>GW800280</b> Bore Domestic & Stock Approx 350m North-West	30.00	22.80-27.50	Not Provided	Not Provided	Good
<b>GW057157</b> Bore Domestic & Stock Approx 350m North-West	67.50	48.00-48.30 61.00-61.60	48.00 61.00	0.03 0.04	Not Provided
<b>GW800339</b> Bore Domestic & Stock Approx 500m South-West	48.70	47.20-47.50	33.50	0.88	Good

Using available groundwater information from local bores, it can be determined that in the local vicinity the standing water level is greater than 33m below the ground surface and the water bearing zones are greater than 22m below the ground surface.

No groundwater was encounter during the site investigation. From this information it can be determined that in this locality, subsequent contamination by primary treated effluent is not a risk factor.

### 3.5 Surface Water Review

The proposed site drains towards the east. There is a dam situated approximately 200 meters to the northeast, and a neighboring dam located approximately 180 meters to the southeast.



Figure 4 – Groundwater Bore Locations

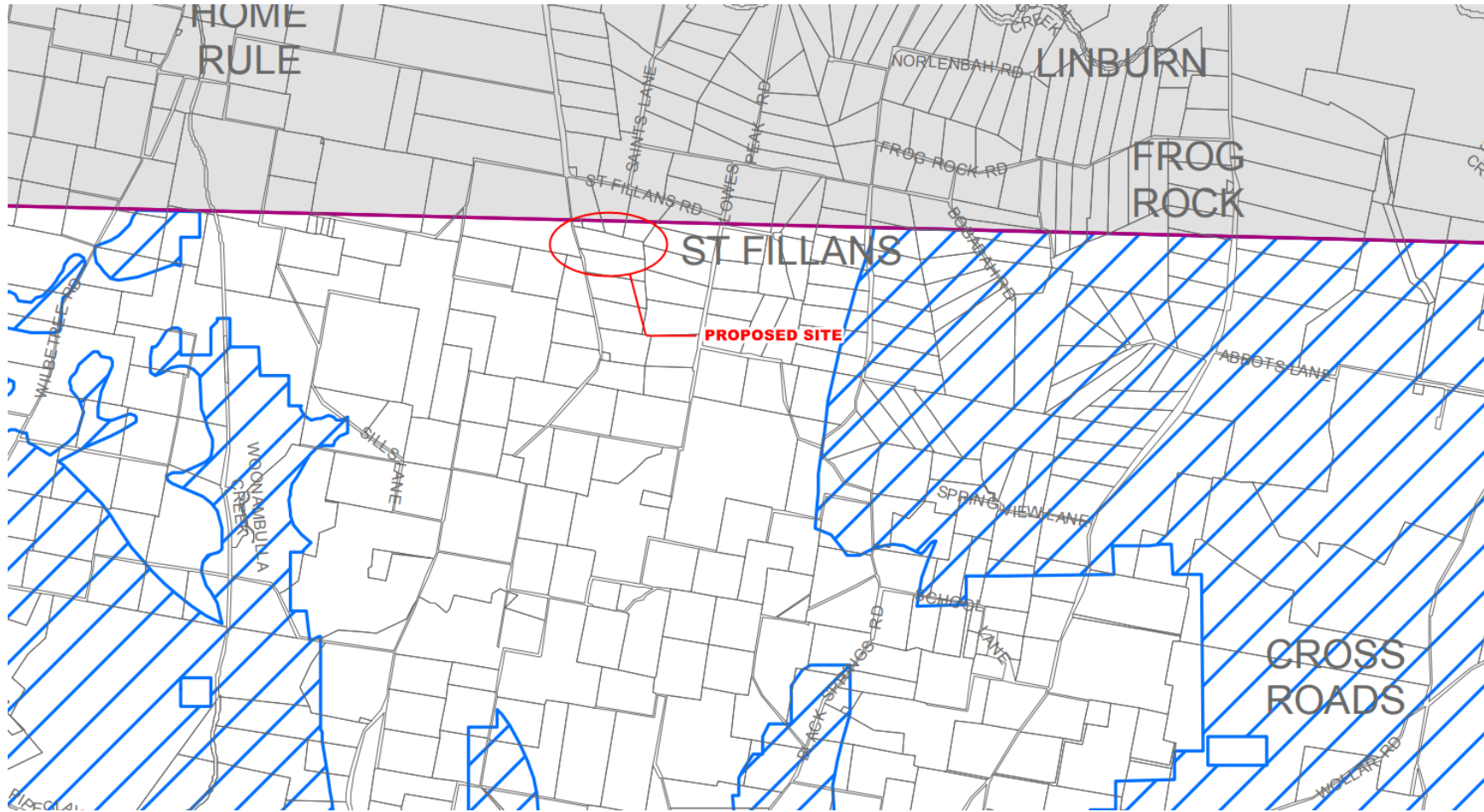


Figure 5 – Groundwater Vulnerability Map GRV\_006

### 3.6 Field Assessment Information

A field inspection was conducted on 27/8/2024. The following table provides detail on the site assessment as well as the field and laboratory results.

**Table 6: Site Assessment Details**

<b>Water Balance Attached</b>	See <i>Appendix A</i>	
<b>Exposure</b>	Good exposure.	
<b>Slope</b>	The site has a slight slope to the east	
<b>Run-On</b>	None	
<b>Seepage</b>	None	
<b>Erosion Potential</b>	Low due to vegetation cover.	
<b>Site Drainage</b>	The proposed site drains towards the east. There is a dam situated approximately 200 meters to the northeast, and a neighboring dam located approximately 180 meters to the southeast.	
<b>Fill</b>	None encountered	
<b>Surface rock/Outcrops</b>	None encountered	
<b>Is there sufficient land area for:</b>	Application system, including buffers	Yes
	Reserve application system	Yes

### 3.7 Soil Assessment

A soil sample was collected and returned to Barnson Pty Ltd for analysis on 27/8/2024. The sample was collected at a depth of 800mm during the site inspection as per AS1289.1.2.1.6.5.3. Laboratory report with results are provided at Appendix B. Field assessment parameters were also obtained. The following table provides detail on both field and laboratory assessment results.

**Table 7: Soil Assessment Details**

<b>Depth to bedrock or hardpan via field assessment</b>		>1.5m
<b>Depth to high soil water table via field assessment</b>		>1.5m
<b>Soil Analysis</b>	pH – subsoil CaCl <sub>2</sub> (lab), subsoil	5.6
	Electrical conductivity (dS/m) - E <sub>Ce</sub>	1.1
	Emerson Test Result –subsoils (Lab)	5
	Liquid Limit, Plastic Limit, Plasticity Index, Linear Shrinkage. (%)	LL = 15 PL = 13 PI = 2 LS = 1 See Borelog in <b>Appendix B</b>
	Estimated Soil Category–topsoil, subsoil A,	3,1
	Structure massive, weak, high, moderate, strong (Field)	Structureless
	Soil Profile description	See Borelog in Appendix B
	Sub soil Permeability (from table 5.2 of AS 1547:2012)	>3(k <sub>sat</sub> ) (m/d) >125 (mm/hr) (Infiltration is Fast)
	Recommended Hydraulic Loading for disposal system (from Table 5.2 of AS 1547:2012)	20mm per day (For effluent disposal trenches)



## 4.0 SITE AND SOIL LIMITATION ASSESSMENT

The following two limitation tables are a standardised guide to the site and soil characteristics which may limit the suitability of the site for effluent disposal and which require attention through specific management practises. The tables have been reproduced from the NSW Government endorsed 'On-Site Sewerage Management for Single Households' (1998), Tables 8 and 9. The highlighted categories represent site and soil conditions of the land covered in this report.

**Table 8: Site Limitation Assessment**

Site Feature	Relevant System	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Flood Potential	All land application systems	> 1 in 20 years		Frequent below 1 in 20 years	Transport in wastewater off site
	All treatment application systems	Components above 1 in 100 years		Components below 1 in 100 years	Transport in wastewater off site system failure
Exposure	All land application systems	High sun and wind exposure		Low sun and wind exposure	Poor evaporation transpiration
Slope %	Surface Irrigation	0-6	6-12	>12	Runoff, erosion potential
	Sub-surface irrigation	0-10	10-20	>20	Runoff, erosion potential
	Absorption	0-10	10-20	>20	Runoff, erosion potential
Landform	All systems	Hillcrests, convex side slopes and plains	Concave side slopes and foot slopes	Drainage plains and incised channels	Groundwater pollution hazard, resurfacing hazard
Run-on and upslope seepage	All land Application Areas	None-low	Moderate	High, diversion not practical	Transport of wastewater off site
Erosion potential	All land application systems	No sign of erosion potential		Indications of erosion e.g. rills, mass failure	Soil degradation and off-site impact
Site drainage	All land application systems	No visible signs of surface dampness		Visible signs of surface dampness, such as moisture-tolerant veg	Groundwater pollution hazard, resurfacing hazard
Fill	All systems	No fill	Fill present		Subsidence
Land area	All systems	Area available		Area not available	Health and pollution risk
Rock and rock outcrop	All land application systems	<10%	10-20%	>20%	Limits system performance
Geology	All land application systems	None		Major geological discontinuities, fractured or highly porous regolith	Groundwater pollution hazard

**Table 9: Soil Limitation Assessment**

Soil feature	Relevant system	Minor limitation	Moderate limitation	Major limitation	Restrictive feature
Depth to bedrock or hardpan (m)	Surface and sub-surface irrigation	> 1.0	0.5-1.0	< 0.5	Restricts plant growth
	Absorption	> 1.5	1.0-1.5	< 1.0	Groundwater pollution hazard
Depth to seasonal water table (m)	Surface and sub-surface irrigation	> 1.0	0.5-1.0	< 0.5	Groundwater pollution hazard
	Absorption	> 1.5	1.0-1.5	< 1.0	Groundwater pollution hazard
Permeability Category	Surface and sub-surface irrigation	2b, 3 and 4	2a, 5	1 and 6	Excessive runoff and waterlogging
	Absorption	3, 4		1, 2, 5 & 6	Percolation
Coarse fragments %	All systems	0-20	20-45	>40	Restricts plant growth, affects trench installation
Bulk density (g/cc) SL L, CL C	All land application systems	< 1.8		> 1.8	Restricts plant growth, indicator of permeability
		< 1.6		> 1.6	
		< 1.4		>1.4	
pH	All land application systems	> 6.0	4.5-6.0	-	Reduces plant growth
Electrical conductivity (dS/m)	All land application systems	<4	4-8	>8	Restricts plant growth
Sodicity (ESP)	Irrigation 0-40cm; absorption 0-1.2mtr	0-5	5-10	> 10	Potential for structural degradation
CEC mequiv/100g	Irrigation systems	> 15	5-15	< 5	Nutrient leaching
P sorption kg/ha	All land application systems	> 6000	2000-6000	< 2000	Capacity to immobilise P
Modified Emerson Aggregate Test – (dispersiveness)	All land application systems	Class 3,4	Class 2	Class 1	Potential for Structural degradation.

## 5.0 SYSTEM REQUIREMENTS

### 5.1 Mid-Western Regional Council Setback Requirements

The Mid-Western Regional Council 'On-Site Sewage Management Plan' (2008), provides recommended buffer distances. For this design, the following must be taken into consideration.

#### All Land Application Systems

- 80m to permanent surface waters (e.g. river, streams, lakes, etc.);
- 50m to domestic groundwater well on applicant's property and 200m to any groundwater well located on a neighbouring property;
- 40m to other waters (e.g. farm dams, intermittent waterways and drainage channels, etc.)

#### Absorption Systems

- 12m if area up-grade and 6m if area down gradient of property boundary;
- 6m if area is up-gradient and 3m if area is down gradient of swimming pools, driveways and building.

Other site setback requirement as per AS/NZS 1547:2012 are provided in **Appendix C**.

**The prescribed buffer areas/setbacks are to be adhered to unless specified by council otherwise.**

### 5.2 Design Allowances – AS/NZS1547:2012 Table H1

In accordance with AS/NZS1547:2012 Table H1, the recommended design flow allowance for use in Australia, using on site rainwater roof collection supply is 120L/person/day. Given the proposed residence is 2 bedrooms in total, the number of persons potentially occupying the residence assumed for the calculation of the design flow is calculated at 3.

## 6.0 SEPTIC TANK SELECTION AND CALCULATION

### 6.1 Silver Book/ NSW Health Guidelines

The 'On-Site Sewerage Management for Single Households' (1998) guideline is based on the NSW Health guideline for septic tank capacity. Therefore, the calculation is the same.

Primary effluent treated will be provided by a NSW Health accredited septic tank. The NSW Health 'Septic Tank and Collection Well Accreditation Guidelines' (2001), set a sludge allowance of 1550L irrespective of the number of persons or which the septic tank is to be designed. It should be noted that in accordance with this guideline, a septic tank designed for a minimum of 5 persons needs to be de-sludge approximately every 4 years.

The general formula to calculate the minimum septic tank capacity in litres is:

$$S + (DF \times N) = C$$

$$\text{Sludge} + (\text{Daily Flow} \times \text{No. of Persons}) = \text{Capacity of the tank}$$

Residence - When DF = 120L/person/per day and N =3, therefore DF x N =**360L**

$$1550L + 360L = 1910L$$

Table 2 in the NSW Health Guidelines provides a minimum of 2300L tank capacity.

### 6.2 AS/NZS 1547:2012 Requirements

A more conservative approach is outlined in AS/NZS1547:2012, Appendix J. A more conservative figure of 200L per person for all waste tanks is provided, giving a daily flow volume of 600L for the residence. Therefore, a minimum capacity tank of **3000L** is required for a residence with a design flow of up to 1000L. This conservative rate is to ensure that the unit has capacity to cope with peak discharge rates or for temporary or unusual overloads and includes no allowance for food waste disposal units. This tank design capacity also allows for the storage of sludge and scum at a rate of 80L/person/year. It should be noted that the higher cost of installing a larger septic tank may be offset by a reduced pump out frequency. Too frequent pump out removes microorganisms needed for degradation of wastewater solids. The longer pump out interval has beneficial implications for conservation of resources in that the volume of seepage requiring treatment and disposal can be reduced significantly.

## 6.3 System Recommendations

The following table provides details on the system selection.

**Table 10: System Selection Details**

<b>Consideration of connection to centralised sewerage system</b>	<b>Distance to sewer</b>	>10km
	<b>Potential for future connection?</b>	None planned
	<b>Potential for reticulated water?</b>	None planned
<b>Expected Wastewater volume (litres/day)</b>	<b>Residence</b> – 2-bedroom residence, potential occupancy of 3 people. Typical wastewater design flow is 120L/person per day in accordance with Table H3 of AS/NZS1547:2012 for households with full water reduction facilities, supplied by rainwater roof collection supply. Therefore, 3 people at 120L per person per day gives a total load of 360L/day	
<b>Type of Treatment system best suited</b>	3000L septic tank system– as per NSW Health accredited system ( <a href="http://www.health.nsw.gov.au/environment/domesticwastewater/Pages/stcw.aspx">http://www.health.nsw.gov.au/environment/domesticwastewater/Pages/stcw.aspx</a> ) with primary treated effluent to be distributed to an Discharge Control Trench	

Water conservation measures should be adapted to the greatest extent possible in the proposed residence, particularly in relation to the high water-use activities of showering, clothes washing and toilet flushing. AAA rated plumbing appliances and fittings should be used. Measures including use of front-loading washing machines, low volume shower roses and dual flush toilets can reduce water usage by 30-40%. Detergents low in phosphorous and sodium should be used as much as possible. Following these measures will ensure the greatest lifespan for this effluent treatment and disposal system.

## 7.0 EFFLUENT MANAGEMENT

Barnson Pty Ltd has analysed the proposed on site waste management system in accordance with the NSW Government endorsed 'Silver Book' (1998) and the ANZ Standard 1547:2012 On-site Domestic Wastewater Management', with additional advice sought from the Sydney Catchment Management Authority 'Designing and installing On-site Wastewater Systems' 2019 guideline. For this site, given the climate and soil constraints, absorption is considered the most appropriate effluent management device.

### 7.1 Hydraulic Loading Calculation

Given the proposed residence will be connected by rainwater roof collection supply, the daily flow (Q) for the system is calculated as 360L/per day.

The required trench area shall be determined from the following relationship:

$$\text{Length of Discharge Control Trench} = (Q) / (DLR \times W)$$

#### Proposed Residence

Where Q = 360L, DLR = 20 mm/day (Table L1 AS 1547:2012 –Conservative Rate),

W (Width) = 0.6m

$$\begin{aligned} \text{Length of Trench} &= \left( \frac{360}{20 \times 0.6m} \right) \\ &= 30m \end{aligned}$$

***Therefore, from the above calculation, 2 x 15m long, 0.6m wide trenches will be required for the proposed 2-bedroom residence with a maximum occupancy of 3 people.***

## 8.0 DESIGN RECOMMENDATIONS

Common failures of trenches are often caused by poor installation practices. In addition to specifications outlined in AS/NZS 1547:2012, the following points should also be considered in the trench design/construction which to meet the *minimum* dimensions of **2 discharge control trenches, 15m long and 0.6m wide with a minimum of 1.0m spacing between trenches.**

- Trenches are to be built along the contour to ensure even distribution and avoid any section being over loaded;
- Avoid cutting trenches into weakened ground;
- Construction is to take place during fine weather. If it rains trenches are to be completely covered to protect them from rain damage;
- Where the trenches are dug by an excavator in clay soils, the trench walls are to be scarified to remove any smearing caused by the excavator bucket;
- All distribution pipes and arches should be laid in accordance with the manufactures instructions;
- If two trenches or more are utilised, ensure effluent is distributed evenly via a splitter box or sequencing valve or other appropriate method;
- All distribution pipes and arches should be laid in accordance with the manufactures instructions;
- Consideration can be given to using a pressure dosed system, which would allow for a better, more even distribution of effluent along the trench, and prolong trench life;
- Inspection ports shall be provided for the trenches system. The inspection port shall be installed so as to facilitate monitoring of the effluent level in each trench;
- Trenches to be pressure dosed using pumps or dosing siphons;
- Vegetation cover must be well maintained to ensure strong growth for maximum uptake of transpiration. The surrounding landscape and vegetation must also be maintained to minimise shading and maximise exposure.
- The trenches should be in an enclosed area protected from vehicle movement or livestock that can cause compaction and premature trench failure;
- The trenches are to be constructed along the contour via laser levelling to ensure the base is exactly level;
- A diversion berm/bank/drain should be built upslope of the trench. This will reduce run on. A design sketch is provided at **Appendix D.**

## 9.0 RECOMMENDATIONS & CONCLUSIONS

As per the 'On-Site Sewerage Management for Single Households' (1998) publication, stakeholders should be aware that all on site systems and components have a finite life and at some point will require replacement. Septic tanks and AWTs' generally require replacement every 25 years, whereas effluent disposal systems can have an expected life between 5-15 years. The owner is encouraged to obtain a copy of the NSW Government "The Easy Septic Guide" (2000) available from - <https://www.olg.nsw.gov.au/wp-content/uploads/Easy-septic-guide.pdf>

*As stated in AS1547-2012 section 5.5.3.4, a reserve application area of similar size to the current design should be considered as part of the risk management process to be available on a site for expansion or for resting of the land application system.*

The option provided in this report is a primary treatment septic fed into a discharge control trench. This is to be designed to accept the discharge from the wastewater treatment unit and it convey it securely and evenly to the land application area. The aim is to ensure uniform distribution of the effluent over the design area to help achieve effective aerobic/anaerobic decomposition within the soil. Typical design sketches for a trench system as per AS 1547:2012 and *Design and Installation of On Site Wastewater Treatment (2019)* are provided at **Appendix D**.

Installation instructions shall be provided by the manufacturer or designer. Barnson will not be liable for the incorrect installation and/or construction of the system. Installation should be in accordance with the prescriptions within AS 1547:2012.

Barnson has not verified the accuracy or completeness of this data, except otherwise stated in this report. The recommendations for the proposed system as suggested in this report are based on historical data obtained for the area. Barnson will not be liable in relation to incorrect recommendations should any information provided by the client be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed.

The accuracy of geotechnical engineering advice provided in this report may be limited by unobserved variations in ground conditions across the site in areas between and beyond test locations and by any restrictions in the sampling and testing which was able to be carried out, as well as by the amount of data that could be collected given the project and site constraints.



These factors may lead to the possibility that actual ground conditions and materials behaviour observed at the test locations may differ from those which may be encountered elsewhere on the site.

If the sub-surface conditions are found to differ from those described in this report, we should be informed immediately to evaluate whether recommendations should be reviewed and amended if necessary.

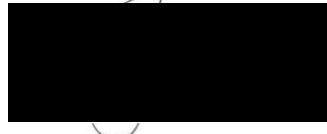
Please do not hesitate to contact the undersigned if you have enquires regarding this report.

Yours Faithfully



Jeremy Wiatkowski  
Laboratory Technician

Reviewed By



Nardus Potgieter  
MSc(Chem) BSc(Hons)(Env.Tech.)  
Senior Environmental Scientist



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**APPENDIX A**

# **Water Balances**

Barnson Job No	45588-ER01_A	
Location :	St Fillans	

Design Wastewater Flow	Q	l/day	360
Design Loading Rate	R	mm/day	20

Climate Zone	3 C	As per Soil Landscapes of Dubbo 1:250 000 Dropbox
--------------	-----	--

1	2	3	4	5	6	7	8	9	Days In Month
Month	Pan evap E (mm)	Evapo Transpiration Et (ET=0.75E)mm	Rainfall R (mm)	Retained Rainfall Rr (Rr=0.75R) mm	DLR per Month (mm)	Disposal Rate (3-5+6) mm	luent applied per mo (L)	Size of Area (8/7) m <sup>2</sup>	
Jan	229	171.75	94	70.5	620	721.25	11160	15.47313692	31
Feb	178	133.5	86	64.5	580	649	10440	16.08628659	29
Mar	155	116.25	76	57	620	679.25	11160	16.4298859	31
Apr	104	78	64	48	600	630	10800	17.14285714	30
May	51	38.25	70	52.5	620	605.75	11160	18.42344201	31
Jun	46	34.5	75	56.25	600	578.25	10800	18.6770428	30
Jul	41	30.75	60	45	620	605.75	11160	18.42344201	31
Aug	58	43.5	66	49.5	620	614	11160	18.17589577	31
Sep	89	66.75	60	45	600	621.75	10800	17.37032569	30
Oct	130	97.5	81	60.75	620	656.75	11160	16.99276742	31
Nov	165	123.75	78	58.5	600	665.25	10800	16.23449831	30
Dec	229	171.75	96	72	620	719.75	11160	15.50538381	31
<b>Mean area</b>								17.1m <sup>2</sup>	

Month	First trial area	Application rate	Disposal rate	mm	Increase in Depth of Stored Effluent	Depth of Effluent for Mo	Increase in Depth of Effluent	Computed	Reset if Et<0	Equiv Storage
Dec	18m <sup>2</sup>	620	719.75	-99.75	-332.5	0	-332.5	-332.5	0	0
Jan		620	721.25	-101.25	-337.5	0	-337.5	-337.5	0	0
Feb		580	649	-69	-230	0	-230.0	-230.0	0	0
Mar		620	679.25	-59.25	-197.5	0	-197.5	-197.5	0	0
Apr		600	630	-30	-100	0	-100.0	-100.0	0	0
May		620	605.75	14.25	47.5	0	47.5	47.5	47.5	855
Jun		600	578.25	21.75	72.5	47.5	120.0	120.0	120	2160
Jul		620	605.75	14.25	47.5	120	167.5	167.5	167.5	3015
Aug		620	614	6	20	167.5	187.5	187.5	187.5	3375
Sep		600	621.75	-21.75	-72.5	187.5	115.0	115.0	115	2070
Oct		620	656.75	-36.75	-122.5	115	-7.5	-7.5	0	0
Nov		600	665.25	-65.25	-217.5	0	-217.5	-217.5	0	0
Dec		620	719.75	-99.75	-332.5	0	-332.5	-332.5	0	0
Jan		620	721.25	-101.25	-337.5	0	-337.5	-337.5	0	0
Feb		580	649	-69	-230	0	-230.0	-230.0	0	0
Mar		620	679.25	-59.25	-197.5	0	-197.5	-197.5	0	0
Apr		600	630	-30	-100	0	-100.0	-100.0	0	0
May		620	605.75	14.25	47.5	0	47.5	47.5	47.5	855

Estimated area of effluent drainfield	18m <sup>2</sup>
Maximum depth of stored effluent (must not exceed 350mm)	187.5mm
Bed/Trench dimensions	600mm
Length of bed/trench required	30m
<20m lengths of bed/trench	1.5

Trench Depth	450
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**APPENDIX B**

# **Borehole Logs & Laboratory Results**

Latitude : Location : 1318 Henry Lawson Drive, St Fillians NSW Job Number : 45588  
 Longitude : Logged By : Gareth Williams Client : Ryan Jones  
 Total Depth : 3 m Date : 27/08/2024 Project : Site Classification & Septic Design

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	DCP graph	Samples	Remarks
						Disturbed sample	
Auger drill with TC bit	0.0 - 0.2		TS	Topsoil Sandy SILT soft, low plasticity, dark brown, medium grained sand, w ≈ pl.			
	0.2 - 0.6		SM	Residual Silty SAND loose, dark brown, medium grained, moist.			
	0.6 - 1.0		SM	Residual Silty SAND medium dense to dense, dark brown, medium grained, moist.		LS = 1.0%	
	1.0 - 3.0		SC	Residual Clayey SAND very dense, low to medium plasticity clay, orange, coarse grained, moist.		LS = 8.0%	
Borehole 1 Terminated at 3m							

Latitude : Location : 1318 Henry Lawson Drive, St Fillians NSW Job Number : 45588  
 Longitude : Logged By : Gareth Williams Client : Ryan Jones  
 Total Depth : 3 m Date : 27/08/2024 Project : Site Classification & Septic Design

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	DCP graph	Samples	Remarks
Auger drill with TC bit	0.0 - 0.2		TS	Topsoil Sandy SILT soft, low plasticity, dark brown, medium grained sand, w = pl.			
	0.2 - 0.6		SM	Residual Silty SAND loose, dark brown, medium grained, moist.			
	0.6 - 1.0		SM	Residual Silty SAND medium dense to dense, dark brown, medium grained, moist.			
	1.0 - 3.0		SC	Residual Clayey SAND very dense, low to medium plasticity clay, orange, coarse grained, moist.			
Borehole 2 Terminated at 3m							

Latitude : Longitude : Total Depth : 1.5 m Location : 1318 Henry Lawson Drive, St Fillians NSW Logged By : Gareth Williams Date : 27/08/2024 Job Number : 45588 Client : Ryan Jones Project : Site Classification & Septic Design

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	DCP graph	Samples	Remarks
						Disturbed sample	
Auger drill with TC bit	0.0 - 0.2		TS	Topsoil Sandy SILT soft, low plasticity, dark brown, medium grained sand, w = pl.			
	0.2 - 0.6		SM	Residual Silty SAND loose, dark brown, medium grained, moist.			
	0.6 - 1.0		SM	Residual Silty SAND medium dense to dense, dark brown, medium grained, moist.			LS=1.0% , PI=2%
	1.0 - 1.5		SM	Residual Silty SAND very dense, orange, coarse grained, moist.			
			Borehole 3 Terminated at 1.5m				
	2.0						

# Material Test Report

**Report Number:** 45588-1  
**Issue Number:** 1  
**Date Issued:** 05/09/2024  
**Client:** Ryan Jones  
1318 Henry Lawson Drive, St Fillians NSW 2850  
**Contact:** Ryan Jones  
**Project Number:** 45588  
**Project Name:** Site Classification & Septic Design  
**Project Location:** 1318 Henry Lawson Drive, St Fillians NSW  
**Work Request:** 11054  
**Sample Number:** D24-11054A  
**Date Sampled:** 27/08/2024  
**Dates Tested:** 27/08/2024 - 02/09/2024  
**Sampling Method:** AS 1289.1.2.1 6.5.3 - Power auger drilling  
**Sample Location:** Borehole 1, Depth: 800mm  
**Material:** Dark Brown Silty SAND

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Barnson Pty Ltd

Dubbo Laboratory

16 L Yarrandale Road Dubbo NSW 2830

Phone: 1300 BARNSON

Email: jeremy@barnson.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Jeremy Wiatkowski

Geotechnical Technician

NATA Accredited Laboratory Number: 9605

Atterberg Limit (AS 1289.3.1.2)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	15		
Plastic Limit (%)			
Plasticity Index (%)			

Linear Shrinkage (AS 1289.3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	1.0		
Cracking Crumbling Curling	None		



# Material Test Report

**Report Number:** 45588-1  
**Issue Number:** 1  
**Date Issued:** 05/09/2024  
**Client:** Ryan Jones  
1318 Henry Lawson Drive, St Fillians NSW 2850  
**Contact:** Ryan Jones  
**Project Number:** 45588  
**Project Name:** Site Classification & Septic Design  
**Project Location:** 1318 Henry Lawson Drive, St Fillians NSW  
**Work Request:** 11054  
**Sample Number:** D24-11054B  
**Date Sampled:** 27/08/2024  
**Dates Tested:** 27/08/2024 - 03/09/2024  
**Sampling Method:** AS 1289.1.2.1 6.5.3 - Power auger drilling  
**Sample Location:** Borehole 1, Depth: 2.0m  
**Material:** Orange Clayey SAND

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Approved Signatory: Jeremy Wiatkowski

Geotechnical Technician

NATA Accredited Laboratory Number: 9605

Atterberg Limit (AS 1289.3.1.2)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	27		
Plastic Limit (%)			
Plasticity Index (%)			

Linear Shrinkage (AS 1289.3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	8.0		
Cracking Crumbling Curling	None		

# Material Test Report

**Report Number:** 45588-1  
**Issue Number:** 1  
**Date Issued:** 05/09/2024  
**Client:** Ryan Jones  
1318 Henry Lawson Drive, St Fillians NSW 2850  
**Contact:** Ryan Jones  
**Project Number:** 45588  
**Project Name:** Site Classification & Septic Design  
**Project Location:** 1318 Henry Lawson Drive, St Fillians NSW  
**Work Request:** 11054  
**Sample Number:** D24-11054C  
**Date Sampled:** 27/08/2024  
**Dates Tested:** 27/08/2024 - 05/09/2024  
**Sampling Method:** AS 1289.1.2.1 6.5.3 - Power auger drilling  
**Sample Location:** Borehole 3, Depth: 800mm  
**Material:** Dark Brown Silty SAND

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Approved Signatory: Jeremy Wiatkowski

Geotechnical Technician

NATA Accredited Laboratory Number: 9605

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	15		
Plastic Limit (%)	13		
Plasticity Index (%)	2		
Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	1.0		
Cracking Crumbling Curling	None		
Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	5		
Soil Description	Dark Brown Silty SAND		
Nature of Water	Distilled		
Temperature of Water (°C)	20		

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**APPENDIX C**

# Site Setback Requirements

**TABLE R1**  
**GUIDELINES FOR HORIZONTAL AND VERTICAL SETBACK DISTANCES**

(to be used in conjunction with Table R2)

<b>Site feature</b>	<b>Setback distance range (m)</b> (See Note 1)	<b>Site constraint items of specific concern</b> (from Table R2) (see Note 1)
	<b><i>Horizontal setback distance (m)</i></b>	
<b>Property boundary</b>	1.5 – 50 (see Note 2)	A, D, J
<b>Buildings/houses</b>	2.0 – > 6 (see Note 3)	A, D, J
<b>Surface water</b> (see Note 4)	15 – 100	A, B, D, E, F, G, J
<b>Bore, well</b> (see Notes 5 and 6)	15 – 50	A, C, H, J
<b>Recreational areas (Children’s play areas, swimming pools and so on)</b> (see Note 7)	3 – 15 (see Notes 8 and 9)	A, E, J
<b>In-ground water tank</b>	4 – 15 (see Note 10)	A, E, J
<b>Retaining wall and Embankments, escarpments, cuttings</b> (see Note 11)	3.0 m or 45° angle from toe of wall (whichever is greatest)	D, G, H
	<b><i>Vertical setback distance (m)</i></b>	
<b>Groundwater</b> (see Notes 5, 6, and 12)	0.6 – > 1.5	A, C, F, H, I, J
<b>Hardpan or bedrock</b>	0.5 – ≥ 1.5	A, C, J

**NOTES:**

- 1 The overall setback distance should be commensurate with the level of risk to public health and the environment. For example, the maximum setback distance should be adopted where site/system features are on the high end of the constraint scale. The setback distance should be based on an evaluation of the constraint items and corresponding sensitive features in Table R2 and how these interact to provide a pathway or barrier for wastewater movement.
- 2 Subject to local regulatory rules and design by a suitably qualified and experienced person, the separation of a drip line system from an upslope boundary, for slopes greater than 5%, may be reduced to 0.5 m.

**TABLE R1**  
**GUIDELINES FOR HORIZONTAL AND VERTICAL SETBACK DISTANCES**  
(to be used in conjunction with Table R2) (continued)

3	Setback distances of less than 3 m from houses are appropriate only where a drip irrigation land application system is being used with low design irrigation rates, where shallow subsurface systems are being used with equivalent low areal loading rates, where the risk of reducing the bearing capacity of the foundation or damaging the structure is low, or where an effective barrier (designed by a suitably qualified and experienced person) can be installed. This may require consent from the regulatory authority.
4	Setback distance from surface water is defined as the areal edge of the land application system to the edge of the water. Where land application areas are planned in a water supply catchment, advice on adequate buffer distances should be sought from the relevant water authority and a hydrogeologist. Surface water, in this case, refers to any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.
5	Highly permeable stony soils and gravel aquifers potentially allow microorganisms to be readily transported up to hundreds of metres down the gradient of an on-site system (see R3, Table 1 in Pang et al. 2005). Maximum setback distances are recommended where site constraints are identified at the high scale for items A, C, and H. For reading and guidance on setback distances in highly permeable soils and coarse-grained aquifers see R3. As microbial removal is not linear with distance, data extrapolation of experiments should not be relied upon unless the data has been verified in the field. Advice on adequate buffer distances should be sought from the relevant water authority and a hydrogeologist.
6	Setback distances from water supply bores should be reviewed on a case-by-case basis. Distances can depend on many factors including soil type, rainfall, depth and casing of bore, direction of groundwater flow, type of microorganisms, existing quality of receiving waters, and resource value of waters.
7	Where effluent is applied to the surface by covered drip or spray irrigation, the maximum value is recommended.
8	In the case of subsurface application of primary treated effluent by LPED irrigation, the upper value is recommended.
9	In the case of surface spray, the setback distances are based on a spray plume with a diameter not exceeding 2 m or a plume height not exceeding 0.5 m above finished surface level. The potential for aerosols being carried by the wind also needs to be taken into account.
10	It is recommended that land application of primary treated effluent be down gradient of in-ground water tanks.
11	When determining minimum distances from retaining walls, embankments, or cut slopes, the type of land application system, soil types, and soil layering should also be taken into account to avoid wastewater collecting in the subsoil drains or seepage through cuts and embankments. Where these situations occur setback clearances may need to be increased. In areas where slope stability is of concern, advice from a suitably qualified and experienced person may be required.
12	Groundwater setback distance (depth) assumes unsaturated flow and is defined as the vertical distance from the base of the land application systems to the highest seasonal water table level. To minimise potential for adverse impacts on groundwater quality, minimum setback distances should ensure unsaturated, aerobic conditions in the soil. These minimum depths will vary depending on the scale of site constraints identified in Table R2. Where groundwater setback is insufficient, the ground level can be raised by importing suitable topsoil and improving effluent treatment. The regulatory authority should make the final decision in this instance. (See also the guidance on soil depth and groundwater clearance in Tables K1 and K2.)

**TABLE R2**

**SITE CONSTRAINT SCALE FOR DEVELOPMENT OF SETBACK DISTANCES**

(used as a guide in determining appropriate setback distances from ranges given in Table R1)

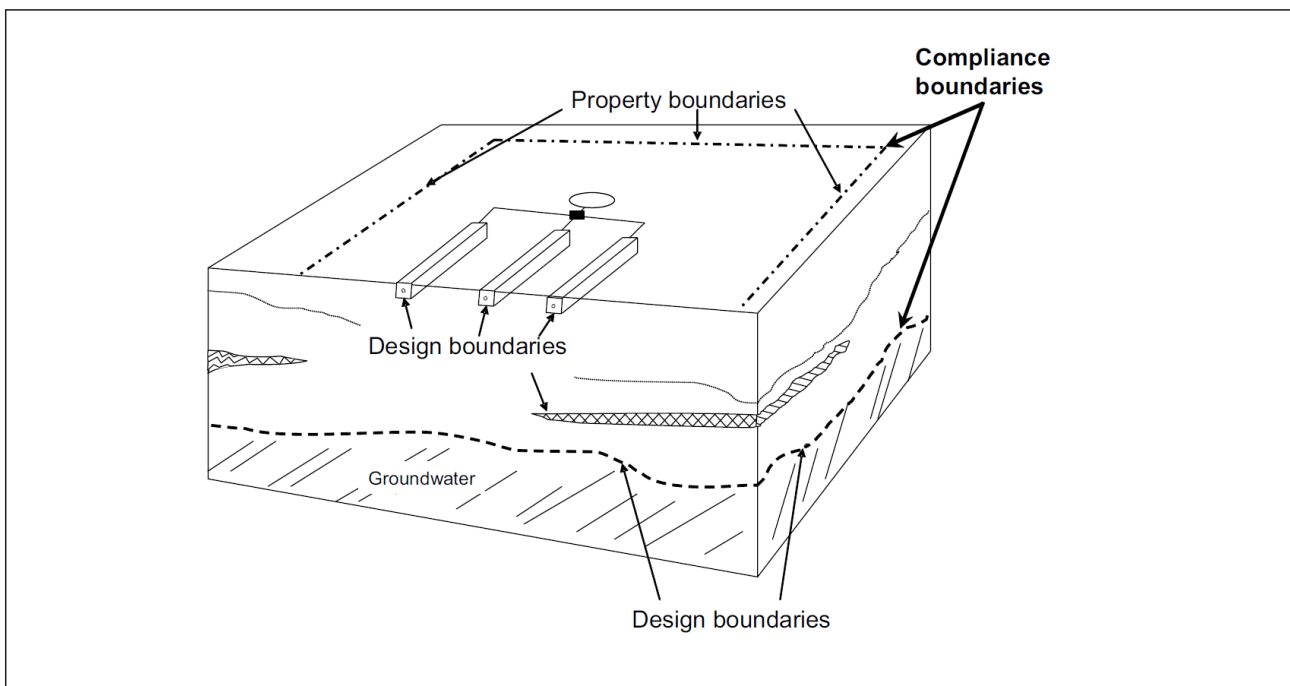
Item	Site/system feature	Constraint scale (see Note 1)		Sensitive features
		LOWER	HIGHER	
		←—————→ Examples of constraint factors (see Note 2)		
A	Microbial quality of effluent (see Note 3)	Effluent quality consistently producing $\leq 10$ cfu/100 mL <i>E. coli</i> (secondary treated effluent with disinfection)	Effluent quality consistently producing $\geq 10^6$ cfu/100 mL <i>E. coli</i> (for example, primary treated effluent)	Groundwater and surface pollution hazard, public health hazard
B	Surface water (see Note 4)	Category 1 to 3 soils (see Note 5) no surface water down gradient within > 100 m, low rainfall area	Category 4 to 6 soils, permanent surface water <50 m down gradient, high rainfall area, high resource/environmental value (see Note 6)	Surface water pollution hazard for low permeable soils, low lying or poorly draining areas
C	Groundwater	Category 5 and 6 soils, low resource/environmental value	Category 1 and 2 soils, gravel aquifers, high resource/environmental value	Groundwater pollution hazard
D	Slope	0 – 6% (surface effluent application) 0 – 10% (subsurface effluent application)	> 10% (surface effluent application), > 30% subsurface effluent application	Off-site export of effluent, erosion
E	Position of land application area in landscape (see Note 6).	Downgradient of surface water, property boundary, recreational area	Upgradient of surface water, property boundary, recreational area	Surface water pollution hazard, off-site export of effluent
F	Drainage	Category 1 and 2 soils, gently sloping area	Category 6 soils, sites with visible seepage, moisture tolerant vegetation, low lying area	Groundwater pollution hazard
G	Flood potential	Above 1 in 20 year flood contour	Below 1 in 20 year flood contour	Off-site export of effluent, system failure, mechanical faults
H	Geology and soils	Category 3 and 4 soils, low porous regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, highly porous regolith	Groundwater pollution hazard for porous regolith and permeable soils
I	Landform	Hill crests, convex side slopes, and plains	Drainage plains and incise channels	Groundwater pollution hazard, resurfacing hazard
J	Application method	Drip irrigation or subsurface application of effluent	Surface/above ground application of effluent	Off-site export of effluent, surface water pollution

**NOTES:**

- Scale shows the level of constraint to siting an on-site system due to the constraints identified by SSE evaluator or regulatory authority. See Figures R1 and R2 for examples of on-site system design boundaries and possible site constraints.
- Examples of typical siting constraint factors that may be identified either by SSE evaluator or regulatory authority. Site constraints are not limited to this table. Other site constraints may be identified and taken into consideration when determining setback distances.

**TABLE R2**  
**SITE CONSTRAINT SCALE FOR DEVELOPMENT OF SETBACK DISTANCES**  
(used as a guide in determining appropriate setback distances from ranges given in Table R1) (continued)

- 3 The level of microbial removal for any on-site treatment system needs to be determined and it should be assumed that unless disinfection is reliably used then the microbial concentrations will be similar to primary treatment. Low risk microbial quality value is based on the values given in ARC (2004), ANZECC and ARMCANZ (2000), and EPA Victoria (*Guidelines for environmental management: Use of reclaimed water* 2003).
- 4 Surface water, in this case, refers to any fresh water or geothermal water in a river, lake, stream, or wetland that may be permanently or intermittently flowing. Surface water also includes water in the coastal marine area and water in man-made drains, channels, and dams unless these are to specifically divert surface water away from the land application area. Surface water excludes any water in a pipe or tank.
- 5 The soil categories 1 to 6 are described in Table 5.1. Surface water or groundwater that has high resource value may include potable (human or animal) water supplies, bores, wells, and water used for recreational purposes. Surface water or groundwater of high environmental value include undisturbed or slightly disturbed aquatic ecosystems as described in ANZECC and ARMCANZ (2000).
- 6 The regulatory authority may reduce or increase setback distances at their discretion based on the distances of the land application up or downgradient of sensitive receptors.



(Adapted from USEPA 2002)

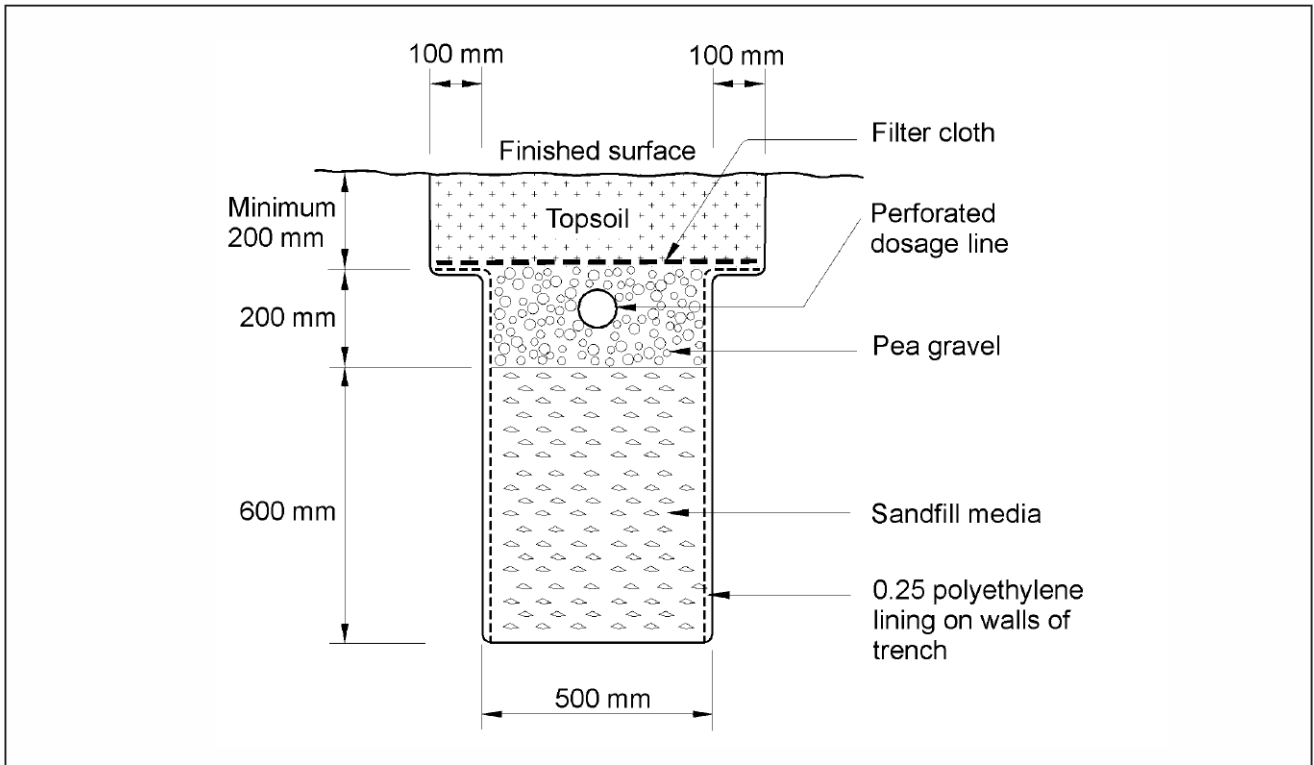
**FIGURE R1 EXAMPLE OF DESIGN AND COMPLIANCE BOUNDARIES FOR APPLICATION OF SETBACK DISTANCES FOR A SOIL ABSORPTION SYSTEM**

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**APPENDIX D**

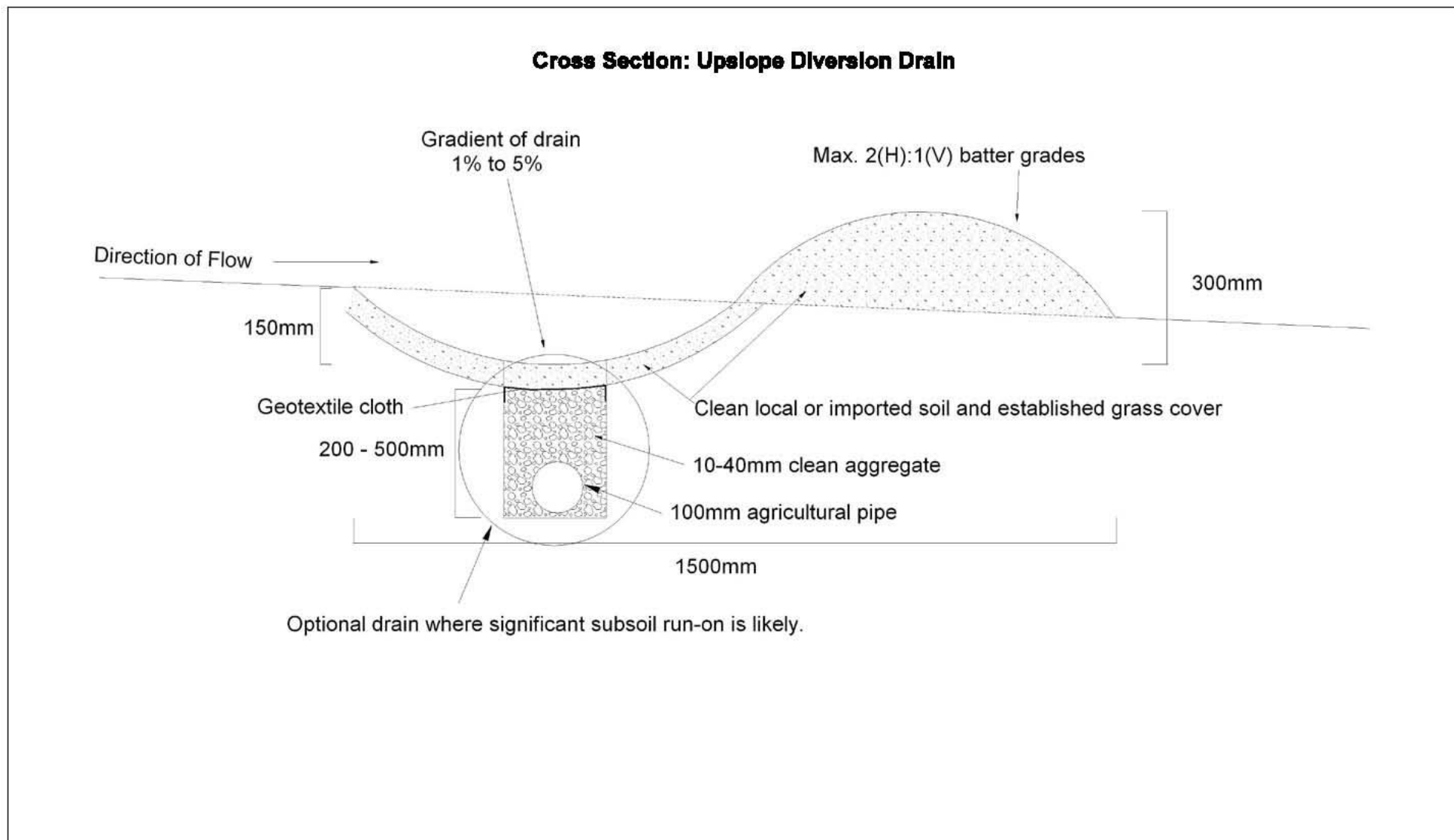
# **Discharge Control Trench Concept Plans**





NOTE: An LPED line can be used for dose loading instead of the perforated line.

**FIGURE L4 DISCHARGE CONTROL TRENCH**



**Standard Drawing 10A - Upslope Diversion Drain**  
(not to scale)

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**APPENDIX E**

# List of Plates



Plate 1 – Overview of proposed site



Plate 2 – Overview of proposed site