Earthwise Environmental

Soil · Water · Geotechnical

On-site Wastewater Management Report

Land capability assessment for new dwelling

Prepared for:	Client:	Metricon Homes
	Site Address:	8440 New England Highway Muswellbrook
	Project No:	305
	Version:	V.1.0
	Report Date:	02/04/25

Cover photo description:

Photograph showing the topography and ground cover at a location of the proposed effluent disposal area (EDA). Photo: B. Enman. Or T.Brown

Determination of potential bedroom:

A potential bedroom is a room that could reasonably be used as a bedroom. A potential bedroom is a room with a closable door, at least one window and a minimum of 8 square metres. A room in a separate building such as a studio could be considered a potential bedroom if it has a toilet and washing facilities or close access to same. This is the criteria used by Water NSW.

Report conditions of use:

This report is for the exclusive use of the client named above. It cannot be used or quoted without the complete document, including all appendices. The limitations of this report are stipulated in Section 9 and the copyright notice below.

This report is to be used in conjunction with the client's application to local council (under section 68) to install and/or alter and operate an Onsite Sewage Management System (OSMS) within their property boundaries. The client nor the plumber should not proceed with the installation of the OSMS recommended in this report until the local consenting authority has given approval. For those properties located within the Sydney drinking water catchment area additional approvals from Water NSW may also apply. This report does not outline of the OSMS as this is to be undertaken by the installer.

Document revision history

Date	Version	Author	Reviewer	Comment
12.08.24	v.1.0 (draft)	Tyler Brown	Brett Enman	Draft report sent to client for comments
13.08.24	v.1.0	Tyler Brown	Brett Enman	Report made final
02.04.25	v.1.1	Tyler Brown	Brett Enman	Floor plans updated

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Signature:

Date: 02.04.2025

Table of Contents

1. Executive summary

Owner	Mrs Reggie Milkellides
Client	Metricon Homes
Address	8440 New England Highway, Muswellbrook (Figure 1)
Lot and DP	Lot 30 in DP 815308
Investigation	This on-site wastewater management report outlines the results of a recent site and soil inspection. As the property is not serviced by a reticulated sewerage system effluent treatment and disposal is to be managed via an on-site sewage management system (OSMS). This wastewater report sets out a design of the OSMS to ensure it meets the objectives and scope set out below in section 2.
Proposed development	Four-bedroom dwelling with two guest bedrooms and study (Appendix 2).
Power supply	Mains ☒ | Solar with battery ☐ | Solar + battery + generator ☐
Water supply	Town ☐ | Tank ☒ | Bore water & tank ☐
No potential rooms	Seven (7)
Equivalent persons	8 (assume two persons in main bedroom and then one person per bedroom thereafter.)
Wastewater flow allowance (Q)	960L /day (8 persons x 120 L/day).
Design Loading Rate (DLR)	5 mm/day (AS/NZS1547:2012 soil category 6).
Proposed effluent treatment	NSW Health accredited septic tank with a minimum tank capacity of 4,500 L. (See section 6.1)
Proposed effluent disposal method	Conventional absorption beds. A low pressure pump may be required to ensure an even application across the two beds.
Total bed length	48 m (assume 4m width)
Minimum basal area	192 m^2 (see section 6.3)
No. of beds and proposed dimensions	2 beds at 24 x 2 m

2. Introduction

Earthwise Environmental (EE) was engaged by the client named above to undertake a site and soil assessment with the aim of designing an on-site sewage management system (OSMS) to treat and dispose of wastewater from a new proposed domestic dwelling to be built by Metricon Homes on a rural property in Muswellbrook (Figure 1). EE understands that the existing dwelling will be demolished, and its associated OSMS will be decommissioned. Additionally, EE notes that there is a quarry on the property, operated by Wild Quarry, which has workers regularly on-site. There is a separate OSMS for the workers, and an assessment of that system is outside the scope of this report.

2.1. Objective

The key objectives of this on-site site wastewater management study are:

- To protect public health and meet NSW Health statutory requirements.
- To maintain and enhance the quality of the environment by ensuring the on-site disposal of treated effluent will have a neutral or beneficial effect (NorBE) on water quality.
- To maintain and enhance community amenity.
- To protect natural resources.

Regarding this wastewater assessment the following standards, guidelines and local council requirements were followed:

1. Australian/New Zealand Standard (AS/NZS 1547:2012) for on-site domestic wastewater management (Standards Australia, 2012).
2. Australian/New Zealand Standard (AS/NZS 1546.1:2008) On-site domestic wastewater treatment units – Septic tanks (Standards Australia, 2008)
3. Australian/New Zealand Standard (AS/NZS 3500:2018) Plumbing and drainage - Part 2: Sanitary plumbing and drainage (Standards Australia, 2018).
4. NSW Environment and Health Protection Guidelines, On-site sewage management for single households "The Silver Book" (NSW Health, 1998).
5. Designing and Installing On-Site Wastewater Systems. 'The manual'. A Water NSW Current Recommended Practice (Water NSW, 2019).
6. Muswellbrook Shire Council Development Control Plan.
7. Local Government (General) Regulation 2021.

2.2. Scope

EE undertook the following scope of works to achieve the above objectives.

- A desktop study to collate relevant information about the site, the area and proposed development.
- Visual and desktop assessment of any existing OSMS (as required) to determine feasibility and suitability for re-use;
- A site inspection to record land surface, site features, identify potential site constraints and identify the most appropriate effluent disposal area (EDA).
- An intrusive soil investigation [by a certified professional soil scientist (CPSS)] to characterize the soil profile and determine depth of bedrock and limiting layers
- Submit soils samples to a NATA (National Association of Testing Authorities) to determine potential soil limitations.
- An evaluation of the expected wastewater flow rates, site, and soil limitations.
- Recommend a suitable effluent treatment system, disposal method and the sizing of the EDA or effluent management area (EMA) required to meet to industry standards.

3. Site Information

Owner	Mrs Reggie Milkellides
Client	Metricon Homes
Site Address	8440 New England Highway Muswellbrook Figure 1
Lot and DP	Lot 30 in DP 815308
Current allotment Size	80 ha
Local Council	Muswellbrook Shire Council
Land use zoning	C3: Environmental Management
Existing dwelling(s)	None
Proposed development	Four-bedroom dwelling with two guest bedrooms and study (Appendix 2).
No potential rooms	7
Equivalent persons	8 (assume two persons in main room and one person thereafter)
Water supply	Town ☒ | Tank ☒ | Bore water & tank ☐
Daily wastewater flow	960 L/day (8 persons x 120 L/day)
Decile 5 annual rainfall	636 mm Scone Airport AWS (Bureau of Meterology, 2024)
Mean annual evaporation	1,141 mm Cessnock (Nulkaba) (Bureau of Meterology, 2024)
Annual Moisture deficit	505 mm
Crop factor	0.4 to 0.8

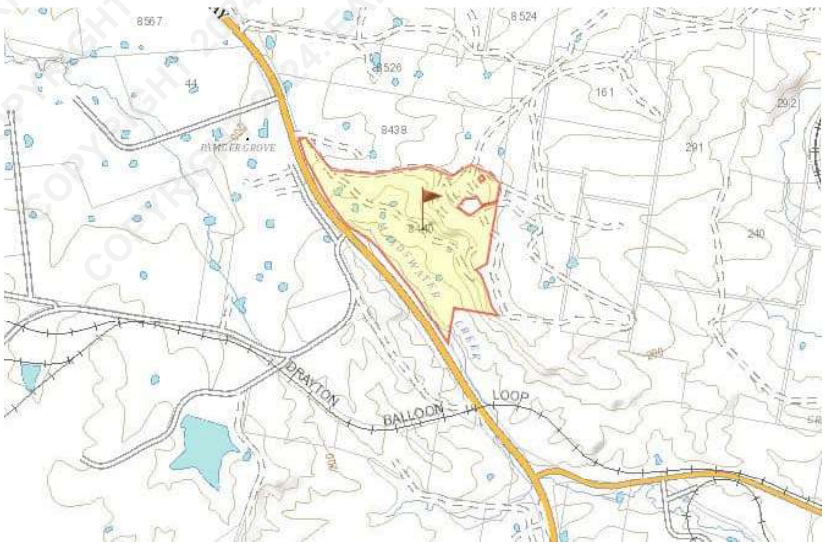

Figure 1: 8440 New England Highway Muswellbrook 2333 (Source: SIX Maps)

4. Site Assessment

Details of the site assessment for the proposed effluent disposal area (EDA) are summarized in Table 1 with the EDA depicted in Appendix 1.

Table 1: Site assessment findings with constraint ratings according to The Silver Book (NSW Health, 1998).

Site Feature	Comment	Constraint rating
Inspection date	11.06.24	-
Rainfall (mm)	Week prior < 5 ☐ | 5 - 10 ☐ | 10-20 ☐ | 20-30 ☐ | > 30 ☒	-
Water balance	Wet weather storage: Y ☐ | N ☐ See Appendix 4	-
Proposed vegetation	Good ☐ Poor ☐ woodland | Managed Lawn ☒ | Unmanaged Lawn ☐ | Improved Pasture ☐ | Perennial Pasture ☐ | Trees & scrubs ☐ | Trees & Shrubs (unmanaged) ☐	N/A
Flood Potential:	EDA above 1:20 yr. Y ☒ | N ☐	minor
	Treatment system above 1:100 yr contour Y ☒ | N ☐	minor
Exposure	Solar exposure: Poor ☐ | Moderate ☐ | Excellent ☒ Wind exposure. Poor ☐ | Moderate ☐ | Excellent ☒	minor
Slope	Waxing: Divergent ☐ | Planar ☐ | Convergent ☐ Linear: Divergent ☐ | Planar ☒ | Convergent ☐ Waning: Divergent ☐ | Planar ☐ | Convergent ☐ Estimated slope grade <5 % ☒ | 5-10 % ☐ | 10-20 % ☐ | > 20 ☐ DIR Reduction required: None ☐ | 20 % ☐ | 50% ☐	minor
Landform	Hill Crest, convex side slopes & plains ☒ Concave side slope and foot slope ☐ Drainage line or incised channel ☐	minor
Run-on and seepage	Run-on potential: Low ☒ | Medium ☐ | High ☐ Seepage potential: Low ☒ | Medium ☐ | High ☐ Upslope diversion: Y ☐ | N ☒ | Assess after wet period & install as required ☐	minor
Site drainage	Surface water: Y ☐ | N ☒, if yes, temporary ☐ or long term ☐ Wet boggy ground. Y ☐ N ☒ Natural spring Y ☐ N ☒	minor
Erosion potential	Visual signs of erosion within or adjacent to EDA? Y ☐ | N ☒ Erosion potential: Low ☒ | Moderate ☐ | Major ☐	major
Fill	Fill material within proposed EDA? Y ☒ | N ☐ Potential impact on effluent disposal: Low ☒ | Moderate ☐ | Major ☐	moderate
Rocks & outcrops	Surface rocks: < 10% ☒ | 10-20 % ☐ | > 20% ☐ Rocky outcrops: < 10% ☒ | 10-20 % ☐ | > 20% ☐	minor
Bore water (100 m radius)	Y ☐ | N ☒ | Stock and garden use ☐ drinking water ☐ Disused ☐ (See Appendix 6)	minor

5. Soil Assessment

5.1. Site geology

Geological Unit: Singleton Coal Measures. Parent Rock: Lithic sandstone, shale, mudstone, conglomerate, siltstone and coal seams. Parent Material: In situ weathered parent rock and some derived colluvium. (NSW Department of Planning & Environment, 2024).

5.2. Desktop soil research

This soil landscape covers undulating low hills and undulating hills in the Liddell Power Station area. The main soils are Yellow Soloths (Dy2.41, Dy3.81) on slopes with some Yellow Solodic Soils (Dy3.32, Dy2.42, Dy3.42) on concave slopes. There are Earthy and Siliceous Sands (Uc5.22, Uc5.11) on mid to lower slopes where the parent material is more sandy. There are some Red Soloths (Dr2.41), Red Solodic Soils (Dr2.41) and Red Podzolic Soils (Dr5.11). (NSW Department of Planning & Environment, 2024).

5.3. On-site soil findings and test results

Two boreholes (BH1 and BH2) were taken in close location to the existing absorption bed to assess the characteristics of the soil and determine a suitable location to situate the new effluent disposal area (EDA). The soil inspection was carried out with the aid of a pneumatic post driver to ram a 50 mm steel tube to target depth or refusal.

The relatively undisturbed soil cores were laid out, photographed, and described in terms of soil horizons, colour, texture, structure and other notable features (see soil profile description in Appendix 3).

The indicative permeability (Ksat) has been inferred using the soil category type and structure of the most limiting layer (LL). From this a design loading rate (DLR) has been selected using the recommended DLRs outlined in Table L1 of AS/NSZ 1546:2012 (Standards Australia, 2012).

Two soil samples from BH1 underwent acidity (pH 1:5 soil-water extract) and Electrical Conductivity (EC, 1:5 soil-water extract) tests using a calibrated EZDO pH/EC meter. The pH 1:5 results were adjusted to pHca levels for comparison with NSW Health (1998) guidelines. The phosphorus sorption capacity results were derived from the generic texture-based values provided in Water NSW (2019).

Additionally, two soil aggregates (natural and remoulded) were assessed for stability by observing their reaction in deionized water over two hours, to identify slaking or dispersion. Detailed soil assessment and laboratory test results, including assessment ratings, are presented in Table 2 and table 3 below.

Table 2: Summary of the physical soil characteristics compared to the assessment ratings for on-site systems given in the Silver Book (NSW Health, 1998).

Soil Feature	Units	BH1	Constraint level	BH2	Constraint level
Bedrock depth	m	>1.1	minor	>1.5	minor
Water table depth	m	>1.1	minor	>1.5	minor
LL	unitless	Sandy clay	N/A	Sandy clay	N/A
Depth of LL	m	0.2	N/A	0.3	N/A
LL soil category	unitless	6	major	5	major
Structure of LL	unitless	Strong	N/A	Strong	N/A
Ksat	m/d	0.06-0.5	N/A	0.12-0.5	N/A
DLR	mm/day	5	N/A	5	N/A
Course fragments	%	<20%	minor	<20%	minor
Bulk density	g/cm^3	1.5	minor	1.5	minor

Table 3: Summary of the soil test results (with ratings) compared to NSW Health (1998) soil constraints.

Laboratory soil test results	Units	BH 2 0-0.2 m	Constraint level	BH 2 0.6-0.75 m	Constraint level
$pH_{1:5\ water}$	pH units	6.58	N/A	8.46	N/A
pH_{ca}	pH units	7.38	minor	9.26	minor
Acidity rating	unitless	Ideal	N/A	Alkaline	N/A
EC (1:5)	dS/m	0.216	minor	0.0859	minor
ECe	dS/m	2.052	minor	0.73874	minor
Salinity rating	unitless	Slightly saline	N/A	Non-saline	N/A
ESP	%	NT	N/A	NT	N/A
Sodicity rating*	unitless	N/A	N/A	N/A	N/A
CEC $_{(effective)}$	cmol (+)/kg	NT	N/A	NT	N/A
Phosphorus Sorption^	mg/kg	400	N/A	500	N/A
	kg/ha	6,000	N/A	7,500	N/A
Emerson aggregate	Class/subclass	7	minor	7	minor

Note: NT = Not tested, N/A = not applicable

* Sodic soils are defined as having an ESP > 5% (Hazelton & Murphy, 2007).

^ Where no P sorption testing was performed, the soil texture-based P-sorption values given in Water NSW (2019) are used

6. On-site Wastewater Management System

6.1. Existing OSMS

The existing septic tank volume is estimated to be approximately 3,000 L, and no baffle was observed within the tank. Based on the new estimated daily wastewater flow rates, the septic tank is considered to be undersized with respect to AS/NZS1547:2012. Additionally, the absence of a baffle indicates that it does not meet AS/NZS 1546:2008 requirements (Standards Australia, 2008). This tank should be desludged and decommissioned in accordance with NSW Health Advisory Note 3 (NSW Health, 2017).

According to the owner, wastewater disposal occurs via an absorption bed approximately 20 metres in length and 4 to 5 metres wide (80 to 100 m^2). Any intrusive investigation to verify the construction of the absorption bed could potentially damage it; therefore, construction details could not be verified to ensure it meets current AS/NZS1547:2012 specifications. Based on the minimum size requirement outlined below in section 6.3, it is concluded that the absorption bed is likely undersized.

6.2. Proposed wastewater treatment system

Based on Table J1 of AS/NZS 1547:2012, a 4,000 L septic tank is required for an equivalent population of eight persons (Standards Australia, 2012). However, for conservative reasons, EE recommends a 4,500 L NSW Health accredited septic tank that complies with AS/NZS 1546.1:2008 (Standards Australia, 2008).

6.3. Treated wastewater disposal method and sizing

The recommended wastewater disposal method is via a conventional absorption bed (Appendix 5). Sizing of the bed is given as follows:

$$\text{Minimum bed length } (L) = \frac{\text{Mean Daily Wastewater volume (Q)}}{\text{Design loading rate (DLR)} \times \text{Bed width (W)}}$$

$$\mathrm{L} = \frac{960}{5 \times 4}$$

$$\mathrm{L} = 48\ m$$

$$\text{Minimum basal Area } (A) = 48\ \mathrm{m} \times 4\ \mathrm{m}$$

$$\mathrm{A} = 192 m^2$$

Individual bed length shall be limited to 20 m; however, a longer bed is permitted provided the installer can guarantee a level bottom over the base of the bed (Standards Australia, 2012).

Assuming a bed length of twenty-four (24 m) are installed, a total of two (2) beds will be required. Alternative bed dimensions and configurations are given in Table L2 of AS/NZS 1547:2012 (see recommendations).

The two beds should be spaced a minimum of one metre apart; however, if space permits, a two-metre spacing with lawn in between is recommended to provide an effluent disposal area (EDA). Assuming 2 m spacing between the beds and a 1 m buffer around the outside of the beds, this configuration would provide an area of 312 m^2 (26 x 12).

A full water balance was undertaken over the entire year (Appendix 4) using the hydraulic area of 192 m^2. The results indicate there could potentially to be excess moisture during the cooler and wetter months. Based on the NSW Health guidance (p157) “if the cumulative storage does not return to zero or a negative value after summing the monthly values over the entire year, then the nominated irrigation/disposal area is not large enough and should be increased before repeating

the water balance" (NSW Health, 1998). As the monthly water balance calculations returned to zero the irrigation/disposal area does not need to be increased.

6.4. Location of EDA and reserve area

The site layout plan in Appendix 1 identifies a proposed location for the bed(s) situated within a designated EDA with room remaining below and beside this for expansion (if required) or a reserve area.

6.5. Set back distances

Recommended buffer distances for various systems are shown in Table 4.

Table 4: Recommended set back (buffer) distances for the site.

Feature	Set back distance (Absorption bed)	Comments
Property boundary	12 m (upgradient) 6 m (downgradient)	Easily achievable. The Silver Book.
Drainage line and dam	40 m	Easily achievable. The Silver Book.
Bed walls	2 m	
Dwelling/buildings and driveways	6 m (upgradient) 3 m (downgradient)	Easily achievable. The Silver Book.
In ground water tanks	4 m	Water tanks should be upgradient of EDA.

7. Conclusion

The purpose of this wastewater report was to assess site and soil conditions for a new OSMS to service the proposed residential dwelling. The OSMS associated with the quarry was excluded from this study.

There is an existing septic tank and absorption bed which, according to the client, is council approved. During the site inspection, there was no visual or olfactory evidence to indicate that the existing OSMS was failing. However, given that the proposed dwelling will be much larger than the existing one, this wastewater management investigation concludes that the existing OSMS is undersized and therefore does not meet current AS/NZS 1547:2012 specifications.

The recommended wastewater treatment option for the new dwelling is a NSW Health accredited septic tank with a minimum tank capacity of 4,500 L. The site assessment found no moderate or major constraints.

The recommended wastewater disposal method is to continue using a conventional absorption bed built to AS/NZS 1547:2012 and Water NSW specifications. No heavy machinery should be driven over the location of the effluent disposal area (EDA) to prevent damage to the system.

The client is encouraged to use cleaning agents low in phosphorus (P) and sodium to help reduce phosphorus loads and maintain soil properties. According to Robert Patterson, using laundry products low in phosphorus can lead to total P reductions within the effluent by up to 30% (Patterson, 2001).

It is concluded that a sustainable OSMS can safely treat and dispose of the proposed wastewater loads generated on-site. The recommendations outlined below will help the OSMS align with the objectives outlined above.

8. Recommendations

- Where possible, install water saving devices such as AA or AAA rated plumbing all water fixtures within the dwelling as this will help reduce the effluent loading volume for disposal area.
- A licensed plumber or experienced installer should be consulted for the installation of the new proposed OSMS. Installation must comply with the manufacturer's recommendations, AS/NZS 1547:2012, Water NSW (2019) and AS/NZS 3500.2:2018 specifications and local council requirements.
- Decommission the existing septic tank in accordance to NSW Health Advisory Note 3; Destruction, Removal or Reuse of Septic Tanks, Collection Wells, Aerated Wastewater Treatment Systems (AWTS) and other Sewage Management Facilities (SMF) (NSW Health, 2017).
- Install a NSW Health accredited septic tank which complies with AS/NZS1546:2008 specifications. Minimum tank volume should be 4,500 L.
- A proposed location for the septic tank is given in the SLP however the exact location should be decided in consultation between the client/owner and the installer.
- AWTS/septic tank should be downgradient of the wastewater source(s) and be at least 3 m setback from property boundary and dwelling. Ease of access for servicing and desludging should be considered. Additional notes are provided in the SLP (Appendix 1).
- Any new untreated sewer pipes laid should be in accordance with the Water NSW (2019) document "Designing and Installing On-Site Wastewater Systems (Water NSW, 2019) and AS/NZS 3500.2.2018 (Table 5).

Table 5: Minimum pipe diameter calculations and minimum grades.

Nominal pipe size (DN)	Minimum grade %	Minimum grade ratio
65	2.5	1:40
80	1.65	1:60
100	1.65*	1:60
125	1.25	1:80
150	1.00	1:100

* Except for drains from septic tanks, sewage treatment plants and unvented discharge pipes from tundishes, which may have a minimum grade of 1%

- All sewer pipes between the plumbing amenities, AWTS and/or septic tank and EMA must be buried at a depth that provides protection against mechanical damage or deformation. Table 6 shows the minimum pipe depth for trafficable areas.

Table 6: Minimum pipe depth for trafficable and non-trafficable areas (Standards Australia, 2018).

Location	Minimum depth of cover (mm) for all pipematerials other than cast iron
subject to vehicular traffic	500
elsewhere	300

- Effluent disposal is to occur via a conventional absorption bed, running parallel to the slope contour and placed no deeper than 400 to 450 mm. A total basal area of 192 m^2 is required to

satisfy AS/NZS 1547:2012. Assuming an absorption bed width of 4 m, 48 linear metres would be required. Detailed design of the absorption beds is up to the installer.

- Proposed configuration is two (2) absorption beds spaced two (2) metres apart with lawn in between. Beds can be side by side or place on either side of the existing bed which is to be disconnected. Only grasses or small scrubs should be planted over the beds (see Appendix 8) to prevent root ingress of absorption beds.
- Alternative bed dimensions (to allow for a different configuration) are permitted as per AS/NZS 1547:2012 (Table 7).

Table 7. Absorption bed dimensions and depths. Source Table L2 of AS/NZS 1547:2012 (Standards Australia, 2012). * Note: Min requirement is 1000 mm.

Bed dimensions	Typical dimensions (mm)	Maximum (mm)	Minimum (mm)
Width	1000-4000	4000	1000
Depth of aggregate	300-600	600	300
Depth of topsoil	100-150	150	100
Spacing between adjacent beds (sidewall to sidewall)	-	N/A	2000

- A standard drawing of an absorption bed is given in Appendix 5. The base of the absorption beds should not exceed more than 0.4 m depth and ≥ 0.6 m of soil depth is required below the base of the bed.
- Individual absorption bed/trench lengths shall be limited to 20 m (AS/NZS 1547:2012) with longer bed/trench length possible provided the installer can guarantee a level bottom over the entire bed length (Standards Australia, 2012). A laser or dumpy level will be required.
- Apply gypsum to the base of the absorption bed at a rate of 1kg/m^2 before aggregate and pipe work is laid (Standards Australia, 2012).
- The reserve area will consist of the area remaining within the EDA (Appendix 1) No buildings or structures should be built over this location.
- The reserve area will consist of the area remaining within the EDA (Appendix 1) No buildings or structures should be built over this location.
- Erosion and sediment controls (all excavation work) should be put in place, as per the NSW Department of Planning and Environment publication "Managing Urban Stormwater: Soils and construction - Volume 1 (NSW DECC, 2004).
- Where beds are dug by an excavator in more clayey soils, scarify the bed walls to remove any smearing caused by the excavator bucket.
- Care should be taken not to smear the bottom or side walls of the beds as this could block the soil pores and prevent infiltration. If there are any tree roots or trench cuttings dissected during excavation work the holes/trench should be plugged with a medium clay or bentonite clay to prevent preferential flows.
- Excavated topsoil and clay subsoil material should be separated. The light to medium clay subsoil should not be re-used in the construction of the absorption bed.
- Any stormwater or rainwater overflows from the proposed dwelling or other buildings should be diverted away from the proposed EDA.
- Further site-specific details regarding bed construction (e.g., effluent line positioning within the beds, inspection holes, if required, may be determined in consultation with the plumber / installer.

- Up to 100 to 200 millimetres of local topsoil at the site can be re-used to cover the top of the absorption beds. It is a good idea to leave it slightly mounded above ground level to allow it to settle.
- The absorption bed(s) should be fenced off or clearly delineated so that no weight bearing vehicles (e.g., truck, tractor or car) or cattle can pass over the EDA as this may cause crush and damage the beds.
- All pipes and fittings should comply with AS2439.2, AS2698.2, AS/NZS 4129, AS/NZS 4130 or AS/NZS 1477.
- Apply aglime to the topsoil at a rate of 2.5 t/ha. Further details are outlined in the NSW DPI Soil acidity and Liming Agfact (Upjohn, Fenton, & Conyers, 2005).
- Ground cover should be quickly established on any area which experiences disturbance to the soil.
- Use of low phosphorus and low sodium (liquid) detergents to improve effluent quality and maintain soil properties.
- No bleaches or harmful chemicals should be used for cleaning sanitary devices nor tipped down sink or toilet.
- Baby wipes, tampons, cotton buds should not be disposed down toilet where a septic/AWTS is in use. Both owners and tenants of the property should be made aware of this.
- Leaking taps or toilets should be repaired immediately as this can lead to an overload of the absorption bed/trench and cause failure.
- Operation and management of the treatment and disposal system in accordance with manufacturer's recommendations and the recommendations made in this report. An operator's manual incorporating service records is to be kept by the owner.

9. Disclaimer, Assumptions, and Intellectual Property

This report provides information about the design of an on-site wastewater management system. The information is based on the best available knowledge and practices at the time of writing, but it is not a guarantee of the performance of any particular system. The results may vary depending on the specific site conditions and the way the system is installed and operated.

The property owner(s) are responsible for ensuring that your system is installed, operated, and maintained in accordance with all applicable laws and regulations. You are also responsible for any damages or injuries that may result from the improper installation, operation, or maintenance of your system.

Earthwise Environmental and the authors of this report are not liable for any damages or injuries that may result from the use of this report.

The soil assessment data used to design the on-site wastewater management system is based on a limited number of borehole inspection locations and soil sample. However, the actual soil conditions at the site may differ from the borehole inspection or the sample tested, and there is no guarantee that the system will perform as expected. The performance of the system is also affected by how it is operated and maintained. All components of the system have a limited lifespan.

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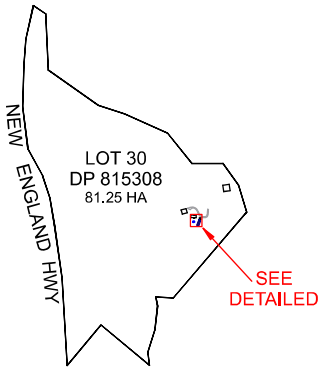
Appendix 1
Site layout plan

ONSITE WASTEWATER MANAGEMENT SITE LAYOUT PLAN & BOREHOLE LOCATIONS



GENERAL NOTES

1. ALL PLUMBING WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH AS/NZS1547:2012, WATER NSW (2019), NSW HEALTH (1998) & AS/NZS 3500.2.2018.

2. ANY EFFLUENT DISTRIBUTION LINES FOR THE ABSORPTION SYSTEM LAID UNDER DRIVEWAYS SHOULD BE AT LEAST 0.45 M (LIGHT VEHICULAR TRAFFIC) OR 0.5M UNDERGROUND (HEAVY VEHICULAR TRAFFIC). NO TRAFFIC SHOULD DRIVE ON THE ABSORPTION BED.

3. LOCATION OF ANY NEW ATWS / SEPTIC TANK(S) TO BE DECIDED BETWEEN OWNER AND INSTALLER. THE TANK(S) MUST BE ANCHORED, POSITIONED ON STABLE, LEVEL BASE AND BE DOWNSLOPE OF THE BUILDINGS FROM WHERE WASTEWATER IS GENERATED SO THERE IS SUFFICIENT FALL (I.E., >1%). CLEANOUTS ALONG THE SEWER PIPE SHOULD BE SPACED AT LEAST EVERY 30 M AND NO 90 DEGREE BENDS. AWTS AND/OR SEPTIC TANK TO BE:
- AT LEAST 3 M AWAY FROM THE BUILDING
- AT LEAST 3 M FROM THE PROPERTY BOUNDARY
- AT LEAST 6 M DOWNSLOPE FROM ANY IN-GROUND WATER STORAGE TANKS.

4. PIPE AND FITTINGS TO COMPLY WITH AS/NZ 3500, AS 2439.1:2007, AS 2698.2:2000, AS/NZS 4129, AS/NZS 4130:2018 OR AS/NZS 1477:2017.

5. MINIMUM SET BACK REQUIREMENTS BETWEEN EDA AND SELECTED SITE FEATURES ARE OUTLINED IN THE REPORT. OTHER GENERAL DISTANCES ARE GIVEN IN DRAWING.

6. ANY STORMWATER DRAINS/OVERFLOW OUTLETS OR RETENTION TRENCHS/PITS SHOULD BE NOT BE POSITIONED UPGRADIENT OF EDA (I.E. IRRIGATION AREA, TRENCHES, BEDS).

7. EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH LOCAL COUNCIL DCP AND NSW DEPARTMENT OF PLANNING AND ENVIRONMENT PUBLICATION "MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION - VOLUME 1 (NSW DECC, 2004).

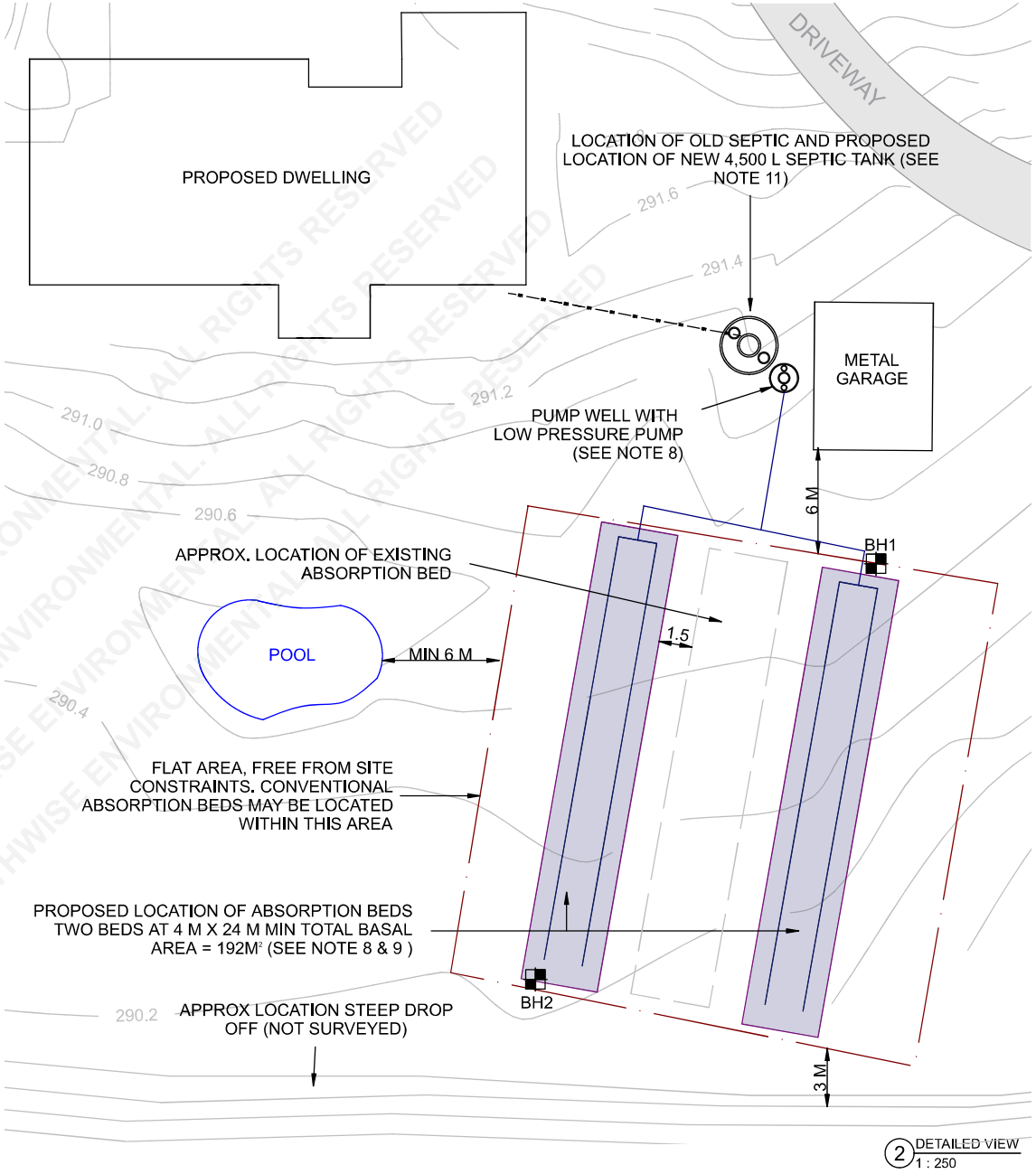
8. WASTEWATER DISPOSAL IS TO BE VIA A CONVENTIONAL ABSORPTION BED(S) WHICH MAY BE GRAVITY-FED OR USE A SMALL LOW PRESSURE PUMP. THE DECISION BETWEEN GRAVITY-FED OR LOW-PRESSURE PUMP SHOULD BE MADE BY THE OWNER AND PLUMBER.

9. THE BEDS SHOULD BE LOCATED IN THE HASHED AREA IDENTIFIED AS BEING FREE FROM CONSTRAINTS (LOCATION BETWEEN OWNWR AND INSTALLER). NEW BEDS SHOULD BE AT LEAST 1.5 M SETBACK FROM OLD BED. EFFLUENT SHOULD BE EVENLY APPLIED THROUGHOUT ENTIRE LENGTH OF BEDS, THE BASE SHOULD BE COMPLETELY LEVEL AND IT SHOULD BE NO DEEPER THAN 400 MM. MINIMUM TOTAL BASAL AREA REQUIRED = 192 M². FURTHER DETAILS ARE PROVIDED IN SECTION 8 OF THE REPORT, AND A STANDARD DRAWING IS PROVIDED IN APPENDIX 5. IF GRAVITY-FED, THE PLUMBER SHOULD INSTALL DISTRIBUTION BOXES TO SPLIT WASTEWATER BETWEEN THE BEDS.

10. ABSORPTION BED TO BE LOCATED > 4 M DOWNGRADIENT OF ANY IN-GROUND DRINKING WATER STORAGE TANK.

11. DECOMMISSION OLD SEPTIC TANK (AS REQUIRED) IN ACCORDANCE WITH NSW HEALTH ADVISORY NOTE 3; DESTRUCTION, REMOVAL OR REUSE OF SEPTIC TANKS, COLLECTION WELLS, AERATED WASTEWATER TREATMENT SYSTEMS (AWTS) AND OTHER SEWAGE MANAGEMENT FACILITIES (SMF).

12. ALL CONTRACTORS MUST LODGE A DIAL BEFORE YOU DIG NOTICE (WWW.1100.COM.AU) OR ENGAGE A SERVICE LOCATOR TO FIND BURIED SERVICES BEFORE COMMENCING ANY EXCAVATIONS.



2 DETAILED VIEW
1 : 250

REVISIONS	No	REVISION	DATE
	0	ISSUE TO CLIENT	121/08/24
	1		
	2		
	3		
	4		

N

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Surveyed	Drafted	Checked	Title	ON-SITE WASTEWATER MANAGEMENT SITE LAYOUT PLAN	Sheet No. 1/1
FINAL VERSION			Client	METRICON HOMES - R. MILKELLIDES	
			Lot/ DP	LOT 30 IN DP 815308	Revision 0
		Original Size	Address	8440 NEW ENGLAND HIGHWAY MUSWELLBROOK, NSW	
DO NOT SCALE		A3	QCAD File:	Ref No: EW-R-305	Date: 12/08/24

Appendix 2
Floor plans

Appendix 3
Soil profile descriptions

Earthwise Environmental

SOIL PROFILE DESCRIPTION OF BH1

PROJECT NUMBER/NAME 305 - WWR
CLIENT Metricon
LOT & D.P. 30/815308
ADDRESS 8440 New England Highway Muswellbrook

CORING DATE 11/06/24
MAX DEPTH 1.1m
CORING METHOD Post Driver
VEGETATION Managed Lawn
GROUND COVER 100%

LAT/LONG -32.323, 150.946
GROUNDWATER DEPTH >1.1m
TOPOGRAPHY
SURFACE ELEVATION see Appendix 1
LOGGED BY BE & TB

COMMENTS Taken south east of dwelling, adjacent to the northern side of the existing absorption bed. Excellent solar and wind exposure. Disturbed topsoil.

Photograph	Depth (m)	Horizon	Colour	Soil Texture	Soil Category	Structure	Mottles	Moisture	Soil profile features	Depth Sampled (m)
	0.1	F	Dark brown	Sandy clay	5	Strong	Nil	Moist	Roots Common (10-20%) medium gravel. Disturbed layer	0-20
	0.2	B1	Brown	Medium clay	6	Strong	Slight	Moist	Gradual colour and texture change Common (10-20%) medium gravel - quartz and sandstone Roots to depth Rocky layer between 0.5 - 0.6m Rocky layer between 0.8 - 0.85m	60-75
	1								Abrupt change to loose fine gravel.	
	1.1								BH terminated due to refusal	

Disclaimer Actual soil conditions may differ across the site.

Earthwise Environmental

SOIL PROFILE DESCRIPTION OF BH2

PROJECT NUMBER/NAME 305 - WWR
CLIENT Metricon
LOT & D.P. 30/815308
ADDRESS 8440 New England Highway Muswellbrook

CORING DATE 11/06/24
MAX DEPTH 1.5m
CORING METHOD Post Driver
VEGETATION
GROUND COVER

LAT/LONG -32.323, 150.946
GROUNDWATER DEPTH >1.5m
TOPOGRAPHY
SURFACE ELEVATION see Appendix 1
LOGGED BY BE & TB

COMMENTS Taken on the southern side of the existing absorption bed, ~20m south of BH1

Photograph	Depth (m)	Horizon	Colour	Soil Texture	Soil Category	Structure	Mottles	Moisture	Soil profile features	Depth Sampled (m)
	0.1	F	Grey brown	Sandy clay loam	4	Strong	Nil	Moist	Roots	0-20
	0.2		Light brown	Sandy clay loam	4	Strong	Few	Moist	Abrupt colour change Many fine gravel Orange and grey mottles	
	0.3		Brown	Sandy clay	5	Strong	Slight	Moist	Abrupt colour and texture change. Many fine and coarse gravel. Clay content slightly decreases with depth	60-75
	0.4									
	0.5									
	0.6									
	0.7									
	0.8									
	0.9									
	1									
	1.1									
	1.2									
	1.3									
	1.4									
	1.5								BH terminated due to refusal	

Disclaimer Actual soil conditions may differ across the site.

Appendix 4
Hydraulic balance calculations

Water balance with nominated area to determine wet weather storage

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Client: Metricon Homes

Address: 8440 New England Highway Muswellbrook

Parameter	Symbol	Units	Total
Daily wastewater flow	Q	L/day	960
Percolation Rate	R	mm/week	35
DIR or DLR	DIR	mm/day	5
Runoff Coeffient	Rc	unitless	0.9
Nominated EDA	L	m^2	192

Proportion of rainfall that remains onsite and infiltrates.

Rainfall Data Loc:	Scone Airport AWS
Evaporation Data	Cessnock (Nulkaba)

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in Month	D		days	31	28	31	30	31	30	31	31	30	31	30	31	365
Median Precipitation	P		mm/mth	53	45	58	24	27	32	37	28	27	48	60	77	**636**
Mean Evaporation	E		mm/mth	177	137	121	84	59	45	53	78	105	133	150	177	**1,141**
Crop Factor	C			0.8	0.8	0.7	0.6	0.5	0.4	0.4	0.5	0.6	0.7	0.7	0.8	
INPUTS	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
Retained rainfall	RR	R x Rc	mm/mth	47	41	52	22	25	29	33	26	25	43	54	69	**572**
Effluent Irrigation	W	Q x D / L	mm/mth	155	140	155	150	155	150	155	155	150	155	150	155	**1,825**
Total Inputs	I	P+W	mm/mth	**202**	**181**	**207**	**172**	**180**	**179**	**188**	**181**	**175**	**198**	**204**	**224**	2,290
OUTPUTS	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
Evapotranspiration	ET	E x C	mm/mth	141	110	85	50	29	18	21	39	63	93	105	141	**896**
Percolation	B	(R/7) X D	mm/mth	155	140	155	150	155	150	155	155	150	155	150	155	**1,825**
Total Outputs	O	ET + B	mm/mth	**296**	**250**	**240**	**200**	**184**	**168**	**176**	**194**	**213**	**248**	**255**	**296**	2,721
STORAGE	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
Carry over			mm/mth	0	0	0	0	0	0	11	23	10	0	0	0	
Monthly Storage	S	I-O	mm/mth	-94	-69	-33	-28	-5	11	12	-13	-38	-50	-51	-72	**-432**
Cumulative Storage	M		mm	0	0	0	0	0	11	23	10	0	0	0	0	**43**

Storage	V	largest M	mm	22.8
	V	V X L/1000	KL	4.4
Storage (1 m in EDA) Pore space of 30%[1]			KL	57.6

Porosity Sands 30 to 35%

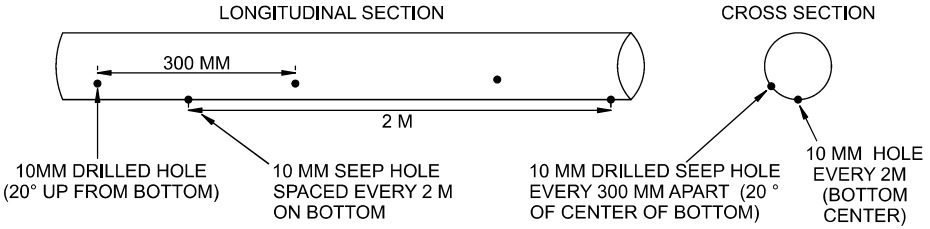
Clay 40 to 60%

1. NB: Average soil pore space typically ranges from 30% to 70%, with variations depending on soil type and composition (Source: Nimmo (2004).

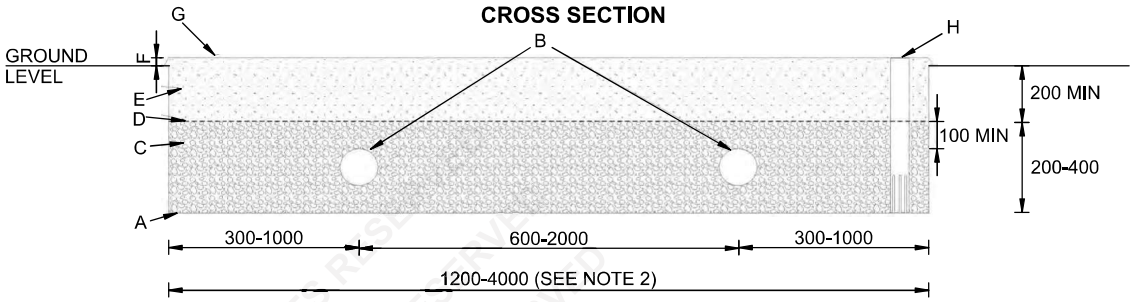
Appendix 5
Standard drawing an absorption bed

GRAVITY FED ABSORPTION BED STANDARD DRAWING

INSET 1. TYPICAL PLAN SHOWING DRILL HOLE DISTRIBUTION FOR 90/100 MM PVC PIPE



CROSS SECTION



GENERAL NOTES ABSORPTION BED CONSTRUCTION

A. EXCAVATE SOIL TO A DEPTH OF BETWEEN 400 TO 600 MM (SEE POINT G BELOW). BE SURE TO SEPARATE TOPSOIL AND SUBSOIL INTO TWO PILES AND SIEVE OUT ROCKS/BOULDERS. IT'S A GOOD IDEA TO CHECK BOREHOLE LOGS IN THE REPORT TO HAVE AN INDICATION OF SOIL LAYER DEPTHS. IT SHOULD BE AT LEAST 600 MM (OR GREATER) ABOVE THE UNDERLYING BEDROCK OR HARDPAN. ENSURE THE BASE OF THE BED IS COMPLETELY LEVEL TO ENSURE EVEN DISTRIBUTION OF EFFLUENT. BASE LEVELS SHOULD BE CHECKED WITH A DUMPY / LASER LEVEL. APPLY LIME OR GYPSUM TO THE BASE OF THE BED ACCORDING TO RECOMMENDATIONS IN THE REPORT.

B. 90/100 MM PRE-DRILLED OR PRE-SLOTTED PVC PIPE. INSTALLER MAY DRILL OR SLOT HOLES IN PVC PIPE (SEE NOTE 3). SEE INSET 1 FOR AN EXAMPLE OF DRILLED PVC PIPE CONFIGURATION.

C. TYPICALLY, 20 TO 40MM DISTRIBUTION AGGREGATE IS USED FOR THE BASE OF THE BED AND TO COVER PIPES. ALTERNATIVELY, 40 TO 70 MM RAILWAY BALLAST MAY ALSO BE USED AS IT WILL PROVIDE MORE AIR SPACE.

D. LAYER OF GEOTEXTILE FILTER CLOTH COVERING PIPES AND AGGREGATE. THIS IS TO PREVENT SILTATION AND CLOGGING OF AIR SPACES BETWEEN ROCKS/AGGREGATES.

E. COVER PIPEWORK AND FABRIC WITH CLEAN LOCAL SOIL (SANDY LOAM TO CLAY LOAM TEXTURE). DO NOT USE LIGHT/MEDIUM OR HEAVY CLAYS FOR BED CONSTRUCTION. IMPORTED SOIL SHOULD BE ACCOMPANIED BY A VIRGIN EXCAVATED NATURAL MATERIAL (VENM) CERTIFICATE OR SHOULD SHOW CONFORMITY WITH THE EXCAVATED NATURAL MATERIAL ORDER (2014).

F. ALLOW 100 TO 150 MM FOR SETTLING AFTER BACKFILLING.

G. AS SOON AS POSSIBLE, QUICKLY RE-ESTABLISH GRASS COVER ACROSS THE SURFACE OF THE BED AND ANY SURROUNDING DISTURBED AREA. BEFORE EXCAVATIONS, PREPARE THE SITE OF THE EDA BY CLEARING ALL SHRUBS, TREES, AND BOULDERS. CUT TREES TO GROUND LEVEL AND THEN GRIND THE STUMP OUT TO A DEPTH OF 600MM. SCARIFY THE NATURAL SOILS ACROSS THE ENTIRE BASAL AREA TO A MINIMUM DEPTH OF 200 MM, TAKING CARE NOT TO COMPACT THE BASAL AREA IN THE PROCESS.

H. INSPECTION PORT ON THE DOWNHILL SIDE OF THE BED. MADE FROM 50MM PVC PIPE WITH PERFORATIONS IN THE AGGREGATE LEVEL OF THE BED.

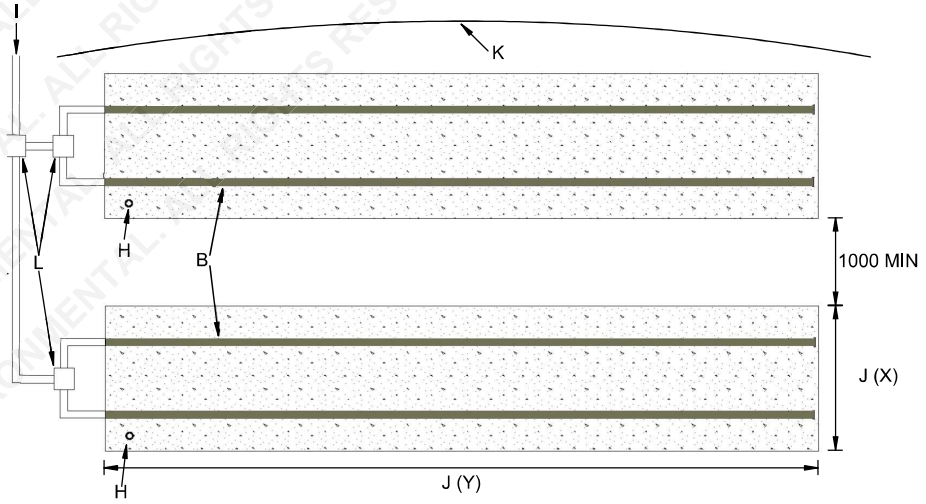
I. 100 MM PVC GRAVITY-FED EFFLUENT PIPE (INFLOW) FROM SEPTIC TREATMENT SYSTEM.

J. BED DIMENSIONS (X AND Y) ARE AN EXAMPLE ONLY. THE BASAL AREA OF X AND Y MUST BE DETERMINED ACCORDING TO THE PROCEDURES SET OUT IN AS/NZS1547:2012, WATER NSW (2019), AND THIS DOCUMENT. THE LOCATION AND ORIENTATION OF THE BED SHOULD BE BASED ON A SITE AND SOIL ASSESSMENT BY A SUITABLY QUALIFIED PERSON. A MINIMUM BED LENGTH-TO-WIDTH RATIO OF 3:1 MUST BE ADOPTED WHEN DEVELOPING INDIVIDUAL DESIGNS, AND BEDS MUST BE INSTALLED PARALLEL TO THE SITE CONTOURS. FOR BEDS 4,000 MM WIDE, TWO DISTRIBUTION PIPES SPACED 1000 MM FROM ONE ANOTHER AND THE SIDE WALLS MAY BE USED. THE SYSTEM MAY COMPRISE A SINGLE BED OR MULTIPLE SMALLER BEDS. IT IS ESSENTIAL THAT EFFLUENT IS DISTRIBUTED EVENLY TO SPLITTER BOXES AND TO PIPES WITHIN BEDS ON A DAILY BASIS.

K. INSTALL AN UPSLOPE STORMWATER DIVERSION DRAIN AS REQUIRED. IT IS IMPORTANT THAT NO STORMWATER PIPES OR SURFACE WATER FLOWS LEAD ONTO THE EDA (SEE STANDARD DRAWING NO.9A IN WATER NEW 2019 FOR DESIGN DETAIL). SUBSOIL DRAINAGE MAY BE NECESSARY ON PARTICULAR SITES.

L. INSTALL SPLITTER BOXES TO DISTRIBUTE EFFLUENT EVENLY BETWEEN TWO OR MORE BEDS. SPLITTER BOXES SHOULD ALSO BE USED TO EVENLY DOSE MULTIPLE PIPES WITHIN A SINGLE BED. ENSURE THAT THE SPLITTER BOXES ARE POSITIONED HIGHER THAN THE ABSORPTION BEDS TO ENABLE EFFECTIVE GRAVITY-FLOW DISTRIBUTION AND PREVENT BACKFLOW.

PLAN VIEW: TYPICAL BED LAYOUT



OTHER GENERAL NOTES

1 THE LAYOUT AND DIMENSIONS USED IN THESE DRAWINGS ARE FOR GENERAL GUIDANCE ONLY. THE LOCATION, CONFIGURATION AND LAYOUT OF INDIVIDUAL BEDS WILL NEED TO BE DETERMINED ON A SITE-SPECIFIC BASIS. THE PURPOSE OF THIS DRAWING IS TO ILLUSTRATE A TYPICAL CONFIGURATION AND SPECIFY MINIMUM SYSTEM COMPONENTS.

2 CONSIDERATION SHOULD BE GIVEN TO ENSURING ALL BEDS HAVE A LEVEL BASE WHEN DETERMINING AN APPROPRIATE WIDTH. THE DISTRIBUTION MANIFOLD MUST ALSO BE LEVEL. BEDS LONGER THAN 30M WILL REQUIRE SPECIALIST HYDRAULIC DESIGN.

3 EE AND WATER NSW (2019) NOTES THAT DRILLING HOLES WITHIN PVC PIPE MAKES THEM NON-COMPLIANT WITH THE AS/NZS 3500, AS IT IMPACTS THE STRUCTURAL INTEGRITY OF THE PIPE.

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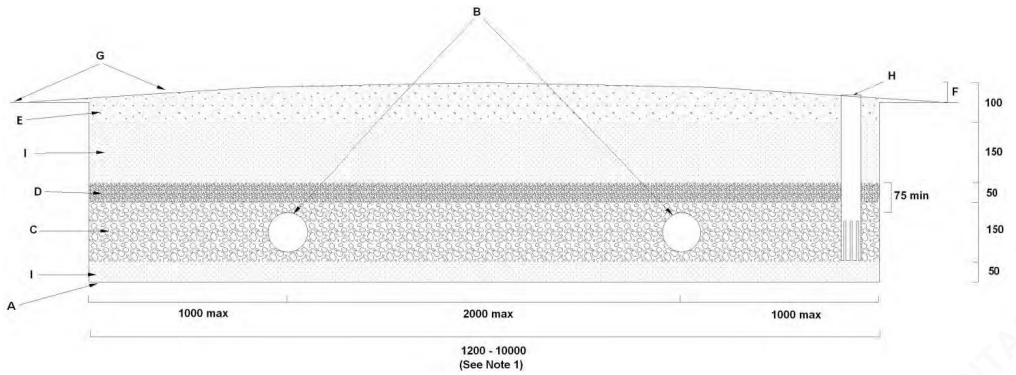
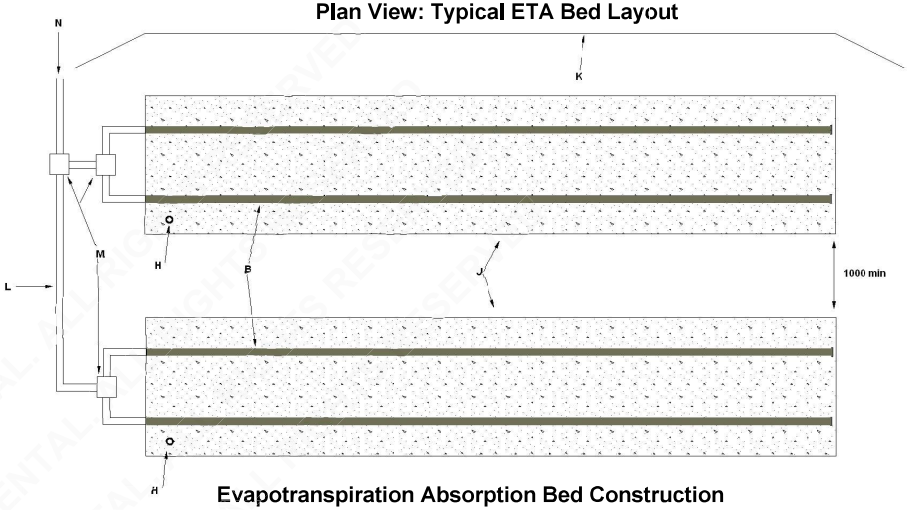
Surveyed	Drafted	Checked	Title	GRAVITY FED ABSORPTION BED STANDARD DRAWING	Sheet No.
FINAL VERSION					1/1
UNITS = MM		Original Size			
NOT TO SCALE		A3		Date: 12/01/2024	

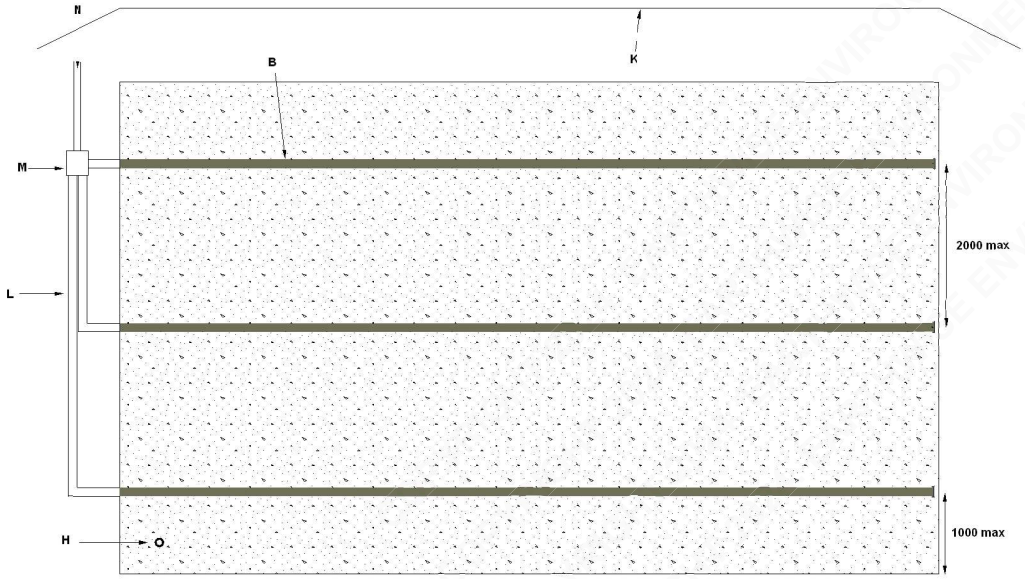
Cross Section: Evapotranspiration Absorption (ETA) Bed



Plan View: Typical ETA Bed Layout



Plan View: Typical Large ETA Bed Layout (applicable only if pressure-dosed and a flat site <5% slope)



Evapotranspiration Absorption Bed Construction

A The base of the bed must be level to ensure even distribution of effluent. It must also be scarified to overcome any smearing during excavation. Base levels should be checked with a dumpy / laser level.

B 100mm slotted PVC pipe or ag pipe (if council permits) with drilled 25/32 mm PVC pipe inside. Only 1 pipe if 1.5 m wide.

C 20-40mm distribution aggregate.

D 5-10mm aggregate.

E Clean local or imported topsoil (sandy loam to loam).

F Allowance for settling after backfilling.

G Grass must be established across the construction area as soon as possible. Trench / bed surface should be level or slightly mounded.

H Inspection port on downhill side of the bed. Made from 50mm PVC pipe with perforations in the aggregate level of the bed.

I Fine sand (0.1mm).

J Bed dimensions are an example only. The basal area of the land application area must be determined according to the procedures set out in AS/NZS 1547:2012 and this Manual. The location and orientation of the area should be based on a site and soil assessment by a suitably qualified person. The system may comprise a single trench / bed or multiple smaller trenches / beds. It is essential that effluent is distributed evenly to all units on a daily basis.

K Upslope stormwater diversion drain (see Standard Drawing No.11A for design detail). Subsoil drainage may be necessary on particular sites.

L 100 mm PVC gravity dosing pipe.

M Gravity splitter box to distribute effluent evenly between two to four separate trenches / beds. Should also be used to evenly dose multiple pipework within a single trench / bed.

N Gravity, siphon or pump fed effluent from treatment system.

Note

1 More than two distribution pipes will be required in beds wider than 4,000mm. Care should be taken with beds wider than 4,000mm to ensure a level base.

2 WaterNSW notes that drilling holes within PVC pipe makes them non-compliant with the AS/NZS 3500, as it impacts the structural integrity of the pipe.

Standard Drawing 11B – Evapotranspiration Absorption Bed

(not to scale)

Source: Water NSW 2019.

Appendix 6
Groundwater search results

NSW GROUNDWATER BORE SEARCH

Source: Water NSW

REVISIONS	No	REVISION	DATE
	0		
	1		
	2		

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SOIL | WATER | GEOTECHNICAL

Surveyed	Drafted	Checked	Title	GROUNDWATER BOREHOLE SEARCH RESULTS	Sheet No.
			Client		
FINAL VERSION			Lot/ DP		
		Original Size	Address		Revision
DO NOT SCALE		A3	QCAD File:	Ref No: J305 Date:	

Appendix 7
Plants suitable for wastewater

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Vegetation suitable for planting with effluent application areas

Below is a list of grasses, groundcover/climbers and other native trees and scrubs that are recommended for planting in the effluent disposal areas. You may take this list to your local nursery or to your landscaper. Note: Other plants may also be suitable to grow with effluent disposal areas, please seek expert advice for further information.

Botanical Name	Approximate Height	Common Name or Variety
Grasses		
Carex spp.		
Lomandra longifolia		
Microlaena stipoides		
Oplismenus imbecillis		
Pennisetum alopecuroides	40 - 80 cm	Available as lawn turf
Poa lab		
Stipa spp.		
Ground cover/climbers		
Hibbertia scandens		Snake vine
Hibbertia stellaris		
Isotoma fluviatalis	Prostrate	
Kennedia rubicunda	Climber	Dusky coral pea
Scaevola albida		
Scaevola ramosissima		
Veronica plebeia		
Viola hederacea		Native violet
Sedges/grasses/small plants		
Anigozanthus flavidus	2m	Kangaroo Paw
Baumea acuta		
Baumea articulata	Sedge	
Baumea juncea	Sedge	
Baumea nuda	Sedge	
Baumea rubiginosa	Sedge	
Baumea teretifolia	Sedge	
Blandfordia grandiflora	30-90cm	Christmas Bell
Blandfordia nobilis	30-90cm	Christmas Bell
Brachyscome diversifolia	Clump	Native Daisy
Carex appressa	Sedge	
Cotula coronopifolia	10-20cm	Waterbutton
Crinum pedunculatum	<2m	Swamp Lily
Cyperus polystachyos	Sedge	
Dianella caerulea	Low plant	Blue Flax Lily
Epacris microphylla	50cm -1m	
Ferns		
Gahnia spp.	Tall Grass	
Juncus spp.	0.5 m Rush	
Lobelia trigonocaulis	5-10cm	
Lomandra spp.	Grass	
Patersonia fragilis		Native Iris
Patersonia glabrata		Native Iris
Patersonia occidentalis		Native Iris
Ranunculus graniticola	5cm	
Restio australis	Reed	
Restio tetraphyllus	1m	
Sowerbaea juncea	Sedge	Rush Lily
Tetratheca juncea	<30cm	
Xyris operculata	<1m	Tall Yellow Eye

Botanical Name	Approximate Height	Common Name or Variety
Shrubs		
Agonis flexuosa nana		
Baekea linifolia	1 - 2.5 m	
Baekea utilis	1-2.5 m	
Baekea virgata	< 4 m	
Banksia aemula	1 - 7 m	
Banksia robur	0.5 - 2 m	
Bauera ruboides	0.5 - 1.5 m	
Callistemon	2 - 3 m	Burgundy
Callistemon	2 - 4 m	Eureka
Callistemon	3 - 4 m	Harkness
Callistemon	3 - 4.5 m	Kings Park Special
Callistemon	2 - 3 m	Mauve Mist
Callistemon	1 - 2.5 m	Red Clusters
Callistemon	2 - 3 m	Reeves Pink
Callistemon citrinus	50 - 80 cm	Austraflora Firebrand
Callistemon citrinus	2 - 4 m	Splendens
Callistemon citrinus	60cm – 1m	White Ice
Callistemon linearis	1 - 3 m	
Callistemon macropunctatus	2 - 4 m	
Callistemon pachyphyllus	2 - 3 m	
Callistemon pallidus	1.5 - 4 m	
Callistemon paludosus	3 - 7 m	
Callistemon pinifolius	1 - 3 m	
Callistemon rigidus	1.5 - 2.5 m	
Callistemon salignus	3 – 10m	
Callistemon shiresii	4 - 8 m	
Callistemon sieberi	1.5 - 2 m	
Callistemon sieberi	50 - 80 cm	Austraflora Little Cobber
Callistemon subulatus	1 - 2 m	
Callistemon viminalis	1 - 2 m	Captain Cook
Callistemon viminalis	5 - 10 m	Dawson River
Callistemon viminalis	3 - 5 m	Hannah Ray
Callistemon viminalis	50 cm - 1 m	Little John
Callistemon viminalis	1.5 - 2 m	Rose Opal
Callistemon viminalis	2 - 3 m	Western Glory
Goodenia ovata	1 - 1.5 m	
Hibiscus diversifolius	1 - 2 m	Swamp hibiscus
Kunzea capitata	1 - 2 m	
Leptospermum flavescens	< 2 m	Tea-tree
Leptospermum juniperinum	1 m	Tea-tree
Leptospermum lanigerum	1 - 2 m	Woolly tea-tree
Leptospermum squarrosum	< 2 m	Tea-tree
Melaleuca alternifolia	4 - 7 m	
Melaleuca decussata	1 - 2 m	Cross-leaved honey myrtle
Melaleuca lanceolata	4 - 6 m	
Melaleuca squamea	1 - 2 m	
Melaleuca thymifolia		

Botanical Name	Approx Height	Common Name or Variety
Trees		
Acacia elongata	> 2 m	
Acacia floribunda	2 - 4 m	Gossamer wattle
Agonis flexuosa	5 - 6 m	Willow myrtle
Allocasuarina diminuta	1.5 m	
Allocasuarina paludosa	0.5 - 2 m	
Angophora floribunda	Large tree	
Angophora subvelutina	Large tree	
Callicoma serratifolia	< 4m	
Casuarina cunninghamiana	10 - 30 m	River she-oak
Casuarina glauca	6 - 12 m	Swamp oak
Elaeocarpus reticulatis	Large tree	Blueberry ash
Eucalyptus amplifolia	Large tree	
Eucalyptus botryoides (coastal areas)	10 - 30 m	
Eucalyptus camaldulensis (west of ranges)	15 - 20 m	River red gum
Eucalyptus deanei	Large tree	Blue Mountains blue gum
Eucalyptus elata	Large tree	River Peppermint
Eucalyptus grandis	10 - 20 m	Flooded gum
Eucalyptus longifolia	20 m	Woollybutt
Eucalyptus pilularis	30 - 40 m	Blackbutt
Eucalyptus punctata	< 35 m	Greygum
Eucalyptus robusta	20 - 30 m	Swamp mahogany
Eucalyptus saligna (coastal)	30 - 50 m	Sydney blue gum
Eucalyptus tereticornis	30 - 40 m	Forest red gum
Eucalyptus viminalis (ranges)	20 - 40 m	Ribbon gum
Acmena smithii	10 - 20 m	Lilli pilli
Flindersia australis	< 40 m	Native teak
Hymenosporum flavuum	3 - 6 m	Native frangipani
Melaleuca armillaris	3 - 4 m	Bracelet honey myrtle
Melaleuca decora	4 - 7 m	
Melaleuca ericifolia	6 m	
Melaleuca halmaturorum	4 - 6 m	
Melaleuca hypericifolia	2 - 3 m	
Melaleuca linariifolia	4 - 8 m	Snow in summer
Melaleuca quinquenervia	5 - 7 m	Broad paperbark
Melaleuca squarrosa	6 m	
Melaleuca stypheloides	6 - 15 m	
Melia azedarach	15 - 20 m	
Pittosporum spp.		
Syzgium paniculatum	8 - 10 m	Bush cherry
Tristania laurina	5 - 15 m	Kanuka
Viminaria juncea	2 - 3 m	Golden spray

Source: Australian Plants Society