On-Site Wastewater Management Assessment

For a
Planning Proposal
103 Yagers Lane, Skinners Shoot

For:	M. Schreiber
Report no:	21421_ww.docx
Date:	28 April 2022

Greg Alderson Associates

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Project name:	Dwelling entitlement
Reference:	21421_ww.docx
Revision summary:	

CONTENTS

1. INTRODUCTION

Greg Alderson and Associates have been commissioned by M. Schreiber to provide an On-Site Wastewater Management Report for approval of a proposed dual occupancy dwelling development at the site, and it is understood in the initial instance, a dwelling entitlement is being sought through a Planning Proposal for Lot 8 DP 8385, 103 Yagers Lane, Skinners Shoot. The following report provides information from the site investigation and the proposed On-site Sewage Management System (OSMS) that will treat wastewater from the proposed dual occupancy.

1.1 Proposed Development

The design of the on-site wastewater management system is based on a loading of 5 people, which consists of the two bedroom main dwelling and the one bedroom smaller dwelling. This is also a standard number in determining the feasibility of a site accommodating a dwelling.

The following will be used for the design of the proposed OSMS:

- The design is for 2 bedroom in main dwelling (3 people) and 1 bedroom in the smaller dwelling (2 people)).
- **Water Conserving Devices** to be installed, and the base rate of 145L/person/day equating to a design loading of **725 L/day** total.
- Secondary treatment system, consisting of a NSW Ministry of Health approved Taylex AWTS ABS.
- An **Evapotranspiration/ Absorption Bed (ETA)** Disposal Area, see attached plan.

There is an existing OSMS servicing the existing dwelling. It is proposed that this OSMS will be decommissioned.

2. Site Description

Staff of this office investigated the subject property and the existing OSMS. The site is accessed by driveway from Plantation Drive.

The property is shown within its immediate locality on **Exhibit No. 1**.

2.1 Land Area

The subject allotment has an area of approximately 9 hectares. There is sufficient area available for the treatment and disposal of wastewater within the subject allotment however prescribed setbacks to a drainage line cannot be met in close proximity to the dwelling and wastewater will need to be pumped up hill, to the south of the dwelling.

The disposal area is shown on **Exhibit No. 2**.

2.2 Vegetation

Generally, the property has maintained lawns and gardens in the vicinity of the dwelling, however the proposed disposal field will be located to the south of the dwelling in an area that is currently grass.

2.3 Slope

The topography of the property varies from gentle, to moderate to steeper slopes at the south of the site. The proposed wastewater disposal area will be in an area of moderate gradient of about 20 % with a northern aspect. It is considered

2.4 Soil

The top soil layer which extends for about 200mm depth was brown in colour, with a clay loam texture. Below this layer, the soil changed to yellow in colour and light clay in texture with a continual increase in clay through the profile. The soil was weakly structured to the depth of the borehole, which was 800mm.

SOIL ASSESSMENT

Horizon	Depth (mm)	Texture	Structure	Colour	Coarse Fragments	Soil pH	Dispersive Class
	0	Clay loam	High mod	Brown	Occasional	6 (Morand, 1994)	No dispersion (Morand, 1994)
	200	Light clay	Weak	Yellow			
	800	Test terminated					

The site of the proposed wastewater disposal area is located on the 'Bagotville' erosional soil landscape classes in accordance with the Soil Conservation Service 1:100,000 Soil Landscape Map. The following is a summary of the Morand (1994, p76).

Soil Landscape:	Erosional Bagotville Landscape
Soils:	Moderately deep (50–100 cm), moderately well-drained Yellow Podzolic Soils on slopes. Deep (>100 cm), moderately well-drained weakly podzolised Red/ Yellow Podzolic Soils and Red Earths may occur in association with claystone.
Geology:	Bundamba Group: sandstone, siltstone, claystone, conglomerate. McElroy (1962) has allocated the relevant areas of the Blackwall Range to the Tabulam Group, in which both lithic and quartz sandstones occur. The base of this group is marked over much of the area by the Corindi Conglomerate. An identical conglomerate occurs in the Broken Head–Suffolk Park area (McElroy 1962). This lithology is often littered with white quartz pebbles ("hailstone gravel") and in some instances is being podzolised.
Limitations:	acid, hardsetting soils of low fertility with localised stoniness. Steep slopes and localised rock outcrop and mass movement
Permeability:	moderate to high.

The following table (Table 1) is an assessment for the proposed disposal system in accordance with the *Environment and Health Protection Guideline On-site Sewage Management for Single Households* (EPA et al 1998).

Table 1: Soil Assessment for Wastewater Disposal in accordance to EHPG

SOIL FEATURE	COMMENT	LIMITATION RATING		
		Minor	Moderate	Major
DEPTH OF SOIL	Soil depth is estimated to be greater than 3000mm in depth	✓		
DEPTH TO HIGH EPISODIC/ SEASONAL WATERTABLE	The water table was not intersected during borehole tests and no springs or other water discharges were observed. An allowance of 3 m to the water table was used in order to size the disposal area based of phosphorous movements	✓		
SOIL PERMEABILITY	The sites soils were light clays which have an acceptable permeability.	✓		
COARSE FRAGMENTS	Non-observed in borehole	✓		
pH	Soil pH is generally acidic (6.0), and will require lime to be incorporated into the disposal area.	✓		
ELECTRICAL CONDUCTIVITY (dS/m)	Morand (1994) states that the Bagotville soil landscape has a very low electrical conductivity, there was no evidence of vegetation being affected by salt	✓		
PHOSPHOROUS SORPTION (kg/ha)	Morand (1994) states that the Bagotville soil landscape has a moderate to high phosphorous sorption rate of greater than 600mg/kg which is equivalent to greater than 10000kg/ha/year. 10 000kg/ha/year was used for the design of the disposal area	✓		
MODIFIED EMERSON AGGREGATE TEST	Morand (1994) states that the Bagotville soil landscape has a low dispersive percentage, there were no signs of dispersiveness when soil at site was examined	✓		

Overall the EHPG (1998) would class the soil as being a minor limitation for disposal of wastewater.

2.4.1 Improvements to Soil

Increased acidity affects cation exchange capacity and can lead to deficiencies in calcium and magnesium while mobilising aluminium, which is toxic to plant growth. Lime can be added to the soil profile when preparing the area for disposal to increase the pH to a range between 6.5 – 8.5, which will enable plants to take up nutrients, which will be within the wastewater. Gypsum will be added to the soil on an annual basis at the rate of 0.5 tonne/hectare to prevent the soil from degrading from sodium application, which is contained in the wastewater.

2.5 Environment and Health Risk Assessment

The following (Table 2) is an environment and health risk assessment in accordance with the policy for *Design Guidelines for On-Site Sewage Management Systems* Byron Shire Council (December, 2004).

Table 2: Environment and Health Risk Assessment for Proposed Disposal Area

SITE FEATURE	LIMITATION NONE	LIMITATION MAJOR	REASONING
FLOOD POTENTIAL	✓		The land of the proposed disposal areas is not subject to flooding.
SOIL TYPE	✓		Light clays which have adequate permeability.
EXPOSURE	✓		Adequate for on-site wastewater disposal.
SLOPE %	✓		20% which is suitable for ETA beds.
LANDFORM	✓		Gently sloping spur.
EROSION POTENTIAL	✓		No signs of erosion present in disposal areas.
SUBSOIL DRAINAGE	✓		No visible signs of subsoil dampness in the proposed disposal area.
SURFACE DRAINAGE	✓		Catch drains can be installed and stormwater runoff can be diverted from the disposal area.
LAND FILLING	✓		Non observed in proposed disposal area
LAND AVAILABLE FOR APPLICATION AREA	✓		There is area available for an OSMS.
ROCKS AND ROCK OUTCROPS	✓		Large floaters scattered occasionally throughout soil profile
TREATMENT SYSTEM	✓		Secondary treatment via a Taylex ABS NR AWTS
BUFFERS	✓		All buffers achieved, providing pumping to the south is undertaken

2.6 Site Constraints and Proposed Best Practice

Tables 1 & 2 presented site constraints that may occur following the BSC Design Guidelines for On-Site Sewage Management Policy (2004) and the Environment and Health Protection Guideline On-site Sewage Management for Single Households (1998). It can be seen that the proposed disposal field is generally not constrained and is suitable for an ETA bed disposal field, however the dwellings are positioned adjacent to a large dam and therefore the disposal field is required to be positioned 40 m to the south of the dam.

3. Proposed On-Site Wastewater Management System

Currently the wastewater is managed in a septic tank and absorption trench, with a pump well servicing the existing smaller building, transferring wastewater to the septic located towards the main house. The septic and absorption trench services both buildings. It is proposed that the septic tank and absorption trench will be decommissioned and an Aerated Wastewater Treatment System (AWTS) will be used to treat wastewater to a secondary level. The AWTS will receive wastewater under gravity from the main house and via the existing pump well servicing the smaller house.

It is proposed that a Taylex ABS NR will provide treatment for all wastewater generated from the proposed dual occupancy. All treated wastewater after AWTS will be pumped to evapotranspiration/absorption beds for disposal. The layout of the treatment and disposal system is shown on **Exhibit No. 2**.

3.1 Predicted Hydraulic Loading

The predicted hydraulic loads are based on the BSC Policy (December, 2004) using town water supply with standard water saving devices (145L/person/day) and the use of flush toilets in tall buildings. Below is the predicted hydraulic loading that the proposed OSMS is designed to manage:

- Main house - 2 bedrooms*1.5 people per bedroom*145 L/person = 435 L/day,
- Small house - 1 bedrooms*2 people *145 L/person = 290 L/day,

Therefore, the total hydraulic loading the OSMS is designed to manage is **725 L/day**.

3.2 Predicted Nutrient Loading

The base nutrient loadings are those from the BSC OSMS computer design model. It is proposed that an Taylex ABS NR AWTS system is used for providing secondary treatment for the proposed dwelling. The Taylex ABS NR is stated to provide a nutrient removal of up to 53.7 % for Total Nitrogen (TN) and 84% for Total Phosphorous (TP) on the NSW Ministry of Health Accreditation. The approved TN reduction of the AWTS is used for sizing the disposal area.

3.3 Disposal Area Required

This section investigates the disposal area required based on the predicted hydraulic and nutrient loadings from the proposed dual occupancy, and environmental factors which influence the area design. In order to ascertain the size of the disposal area, the model within the Byron Shire Council Design Guidelines for On-site Sewage Management for Single Households was used with the following parameters.

- 3 people in Group 1 (representing existing main dwelling) and 2 people in group 2 (representing smaller dwelling)
- Land area of 45000 m^2;
- 145L/person/day for water conserving devices and town water supply;
- Yellow podzolic soils
- Taylex ABS NR 54% TN reduction;
- ETA beds for disposal;
- Disposal area being mounded (representing natural fall in disposal area);
- No phosphorus reduction calculated;
- 5 m distance to groundwater.

The disposal area required for the hydraulic and nutrient loadings is as follows:

Area Required for	Hydraulics:	**117 m^2**
	Nitrogen:	0 m^2
	Phosphorus:	41 m^2

Therefore, the disposal area will be required to be 117 m^2, which requires three ETA beds each 14.45 m long x 2.0m wide to achieve this area.

4. Details of On-Site Wastewater Management System

4.1 Aerated Wastewater Treatment System

A Taylex ABS NR is proposed to be installed at the site to treat wastewater from the proposed dual occupancy. A Davey D42 submersible pump is to be fitted into the AWTS to dose the ETA disposal bed. Details are shown in **Exhibit No. 2.** The AWTS is to be fitted with a high-water alarm.

4.2 Pump Well

An existing Reln 600 L pump well is installed at the smaller house which is currently transferring wastewater to the septic tank. It is proposed to retain this system to pump wastewater to the new AWTS for treatment. The pump well has been fitted with a audible and visual alarm and a grinder pump.

4.3 Evapotranspiration/ Absorption Beds

The treated wastewater from the AWTS will be pumped to the ETA bed for disposal, via a 32 DN purple PE 80 with non-return valve. It is proposed to have **three** evapo-transpiration/absorption beds at **2.0 m** in width, **14.45 m** in length and **0.45 m** in depth.

It is proposed that the disposal field will be located in an area that will be retained as mown grass. Also, due to the slope in the area the ETA beds are to be finished off in line with the natural contour and a catch drain installed to assist in shedding of rainfall.

4.3.1 Construction of ETA Beds

The ETA beds are to be constructed in accordance with AS1547:2012 with the construction described as follows:

- Construction of the bed will involve the excavation of the natural soil to a depth of 450mm (on lower slope). Soil will be scarified and sand placed on this interface for a covering of about 50mm thick. Aggregate of 6-25mm diameter is placed on this to a depth of 200mm;
- Two slotted distribution pipes (PVC not ag pipe) 100 mm in diameter are placed on this layer, at 0.5m from the sides of the bed;
- Topsoil consisting of the natural soil is to cover the aggregate to a depth of 200mm, and the final finish is a mound appearance however at this site due to the slope the finish will match the natural land surface;
- Geotextile fabric is to be placed between the aggregate and the topsoil;
- An inspection point of (being slotted and capped PVC pipe) will be installed in the bed;
- A small catch drain shall be installed upslope of the disposal area to redirect overland flow away from the disposal area.

Exhibit No. 3 shows a typical cross section of the disposal bed. The proposed layout is presented in **Exhibit No. 2.**

5. Maintenance plans

The following is a maintenance check list to be undertaken by the client.

5.1 AWTS

Regular servicing and maintenance is required, commonly on a quarterly basis. The owner therefore must enter a service contract with a service agent. A copy of the service report is forwarded to Council within 14 days from the date of service. At each service, the treatment system and effluent disposal system should be checked, including:

- all pumps;
- the air blower, fan or air venturi:
- the alarm system:
- the operation of the sludge return system, where installed:
- pH from a sample taken from the irrigation chamber;
- check on sludge accumulation in the septic tank (primary treatment chamber) and the clarifier where appropriate;
- a thorough inspection & testing (if appropriate) of the effluent disposal field and all fixtures to ensure operation is in accordance with the approved design; and
- a sludge bulking test is required annually if activated sludge or contact aeration is used.

5.2 Evapotranspiration Absorption Field

The disposal system is designed in a manner that will allow the system to be maintained and repaired quickly if part of the system happens to fail.

- Bleach, bleach-based products, whiteners, nappy soakers and spot removers shall not be disposed of into the on-site system. They shall be disposed of on a disused area of a garden, well away from the disposal area.
- Hygiene products, condoms, tampons, sanitary napkins, disposable nappies and cotton buds shall not be disposed of via the on-site disposal system. They should be disposed of into garbage bins in sealed plastic bags.
- Only the recommended amounts of disinfectants should be used. Biodegradable products for septic systems are recommended. Runoff diversion banks to be inspected annually and maintenance as required undertaken to ensure that surface runoff is diverted around each of the disposal areas;
- No vehicular, stock or regular pedestrian access should be made across the disposal field.
- The disposal area is to be mown to maintain it as lawn, this will encourage regrowth and in turn will increase uptake of nutrients and water;
- Plant clippings shall be removed from the site to decrease amount of nutrients returning to the wastewater system;
- Effluent from disposal system should not be discharged to the stormwater system or over the ground;
- The effluent distribution pipes are to be inspected for blockage etc. when the aggregate is cleaned and flush cleaned or replaced as required.

Some signs of the disposal system failure are listed below, if any of these occur contact the plumber who installed the system and arrange for immediate pump out of the primary tank to relieve the need for effluent disposal to the disposal area.

- Surface ponding and run-off of treated wastewater;
- degradation of soil structure - eg. sheet and rill erosion, surface crusts, or hard surfaces are evident;
- poor vegetation growth;
- unusual odours.

6. CONCLUSION

A wastewater management system has been designed for an existing dwelling at Lot 8 DP 8385, 103 Yagers Lane, Skinners Shoot. It is concluded that on-site wastewater management can be achieved at the subject site conforming to the environmental and health objectives of BSC Policy (December, 2004) and it is recommended that the following is undertaken:

- Decommission the existing septic tank;
- Retain the pump well servicing the existing smaller dwelling;
- Install a Taylex AWTS ABS NR AWTS system to receive and treat all wastewater generated from the existing dwellings;
- Wastewater from main dwelling to flow under gravity to the new AWTS and pump from existing pump well at smaller cottage;
- Wastewater will be pumped from the AWTS to three ETA beds, each 14.45 m long x 2.0m wide x 0.45m deep which will achieve the requirement for the hydraulic and nutrient loads. See Exhibit No. 2 & 3 for details;
- A catch drain is to be installed upslope of the disposal area to direct stormwater around the disposal area;
- A maintenance program listed in Section 5.0 is to be undertaken by a suitably qualified service agent.

7. References

Australian Standard AS/NZ 1547 - 2012 *On-Site Domestic-Wastewater Management.*

Byron Shire Council (December, 2004). *Design Guidelines for On-site Sewage Management Systems.* Protecting the Environment and Health of Byron Shire. Technical Guidelines for System Designers.

Environment Protection Authority, Dept. of Local Government, Department of Land & Water Conservation and NSW Department of Health (Feb 1998). *Environment and Health Protection Guidelines - On-Site Sewage Management Systems for Single Households*.

Morand, D.T. (1994). *Soil Landscapes of the Lismore-Ballina 1:100,000 Sheet* Report, Soil Conservation Service of NSW, Sydney.

End of Report

8. OSMS Model spreadsheet

Byron OSMS Design Model *Version:* ww calcs.XLS

Set Defaults

bedrooms / persons — STEP 1

# persons (Grp 1)	3	STEP 3: Buffer to permanent water / Buffer to intermittant water	STEP 4: Block size (m2) 45000	Daily effluent flow accord. water supply type (STEP 5): Reticulated supply (bore,spring,creek) 180L/p.d; Reticulated + std. water saving devices 145L/p.d; Roof water harvesting 140L/p.d; Roof water harvesting + std. water sav. 115L/p.d	STEP 6: Grp1 / Grp 2 — Toilet, Bathroom, Laundry, Kitchen
# persons (Grp 2)	2	40			
Total Daily Flow (L/day) *	725	Daily Effluent Flow per person (L/day)	145	% black to tot WW in a full system	32%
TN production per year (kg/year)	21.00	N prod. per capita (kg/person/yr)	4.20	% black to tot WW in a full system: TN	70%
TN reduced by all N loss (kg/year) *	7.73	N loss in treatment system (% reduction)	54%	N loss in disposal bed (% reduction)	20%
N Plant Uptake rate (kg/ha/year)	200				
Phosphorus in effluent (Ip) (kg/yr) *	3.00	P prod. per person per yr (kg/person/yr)	0.60	wastewater in a full system: TP	40%

Wastewater stream

STEP 7 — **Treatment system**: Septic (primary teatment only); AWTS; Septic + single pass sandfilter (SPF); Septic + SPF, 25% septic return flow; Septic + recirculating sandfilter; Septic + reedbed

Current Inlet BOD conc. = 198 mg/L

STEP 8 — **P soil sorption accord. soil type**: "Alluvial"Soils 1 (dp,mu,my,te) 10,000 kg/ha/m; "Alluvial"Soils 2 (cr) 2,000 kg/ha/m; Red Basaltic Soils (bg,ca,co,el,ew,mb,ro,wo) 10,000 kg/ha/m; Duplex Soils (ba, bi,bu,mi, ni) 8,000 kg/ha/m; Podzol Soils (ab,bo,br,eb,fh,ki,ku,oq,po,ty,wy) 1,000 kg/ha/m

Nitrogen Report

P uptake by plants (Hp) (kg/ha/yr)	10	N plant uptake (kg/yr)	2.35	Total N-load 7.73kg/yr
P soil sorption (Ps) (kg/ha/m depth)	8000	N load exceedence	0.00	
Water Table/ Bedrock Depth (m) (STEP 10)	5.00	N load percolated (kg/yr)	5.38	
Buffer to Water Table (Bwt) (m)	0.5	N released (perc+exceed.) (kg/yr)	5.38	
Time for accumulation of P(years)	50	Enviro.N limit (kg/yr)	9.89	
Final area (m^2)	**117**	Nitrogen area (m^2)	0	
Phosphorus area (m^2)	41	Hydraulic area (m2)	117	
Water balance area (m^2)	117	total ETA trench area	86.72	
☑ Specific Crop Coeff.(grass=1.00)	1.00	ETA trench length (m)	14.45	
% Effective Rainfall	65%	number of ETA beds	3	
Percolation (mm/d)	8	beds total plus separating spaces:	X Y dimensions = 15.1m x 10.6m	Area =160 m2

STEP 9 — **Soil texture & structure beneath system**: Gravels,Sands Ksat >3.0m/d; Sandy loams - weakly structured Ksat >3.0m/d; Sandy loams - massive Ksat 1.4 - 3.0m/d; Loams - high/moderate structured Ksat 1.5 - 3.0m/d; Loams - weakly structured or massive Ksat 0.5 - 1.5m/d; Clay loams - high/mod structured Ksat 0.5 - 1.5m/d; Clay loams - weakly structured Ksat 0.12 - 0.5m/d; Clay loams - massive structured Ksat 0.06 - 0.12m/d; Light clays - strongly structured Ksat 0.12 - 0.5m/d; Light clays - moderately structured Ksat 0.06 - 0.12m/d; Light clays - weak. structured or massive Ksat <0.06m/d; Med. to heavy clays - strong. struct. Ksat 0.06-0.5m/d; Med. to heavy clays - mod. structured Ksat <0.06m/d; Med. to hvy clays - weak. struct. or massive Ksat<0.06m/d; DISPERSIVE soil (Modified Emerson Aggregate test)

Wetted depth(m) 0.50

TN% removal 50.0%

Reed bed area (m^2) 14.4

BOD target of 20mg/L is equiv. to ~64.6% TN — Current Outlet BOD conc. = 40 mg/L

% Effective Rainfall — STEP 11: Mounded bed; Level bed with grass

STEP 12 — **Soil texture in root zone**: Coarse Sand; Fine sand, Sandy loams; Loams,Clay loams,Silt; Clay (light,med,heavy)

Avg depth of root zone (m)	0.15	Effective porosity of root zone	0.34	Avail.Water Capacity (AWC) of root zone	0.13
Avg depth bluemetal (etc) in trench below root zone (m)	0.15	Effective porosity of bluemetal in trench below root zone	0.43	Default AWC of bluemetal in trench below root zone	0.00
Soil Moisture Holding Capacity: saturation & AWC (mm)	111.97	24.60			
Permissible percentile exceedence	5.00%	ETA trench width (m)	2.00	Lateral seepage width (m)	0.300
Minimum effluent application (mm/day/m^2)	6.17				

Trench under root zone <-

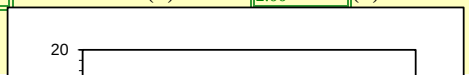
Land Application Type — STEP 13: SSI; ETA

STEP 14: Calculate (or Cntl- q)

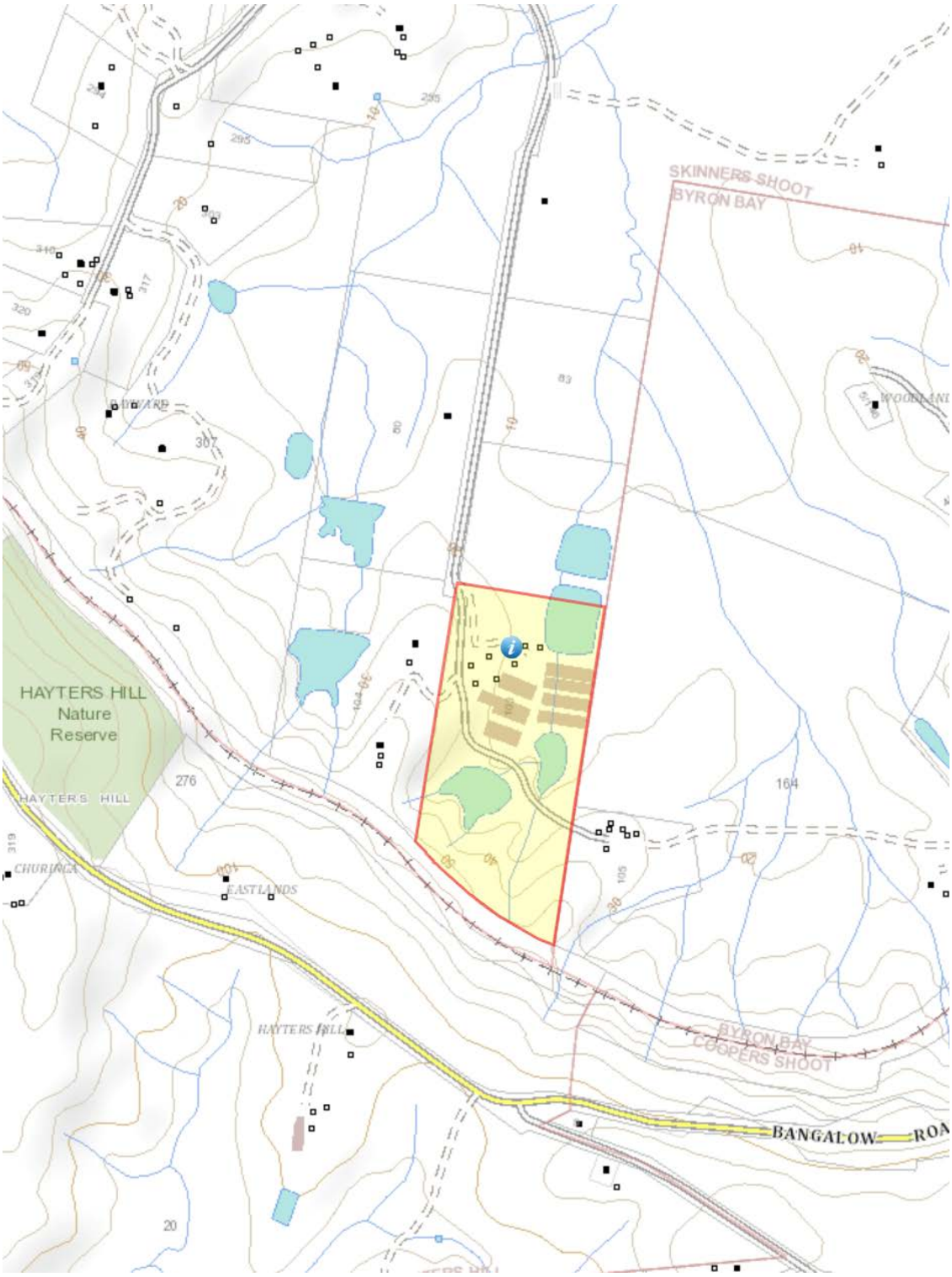
STEP 15: ETA trench separation 2.00

3

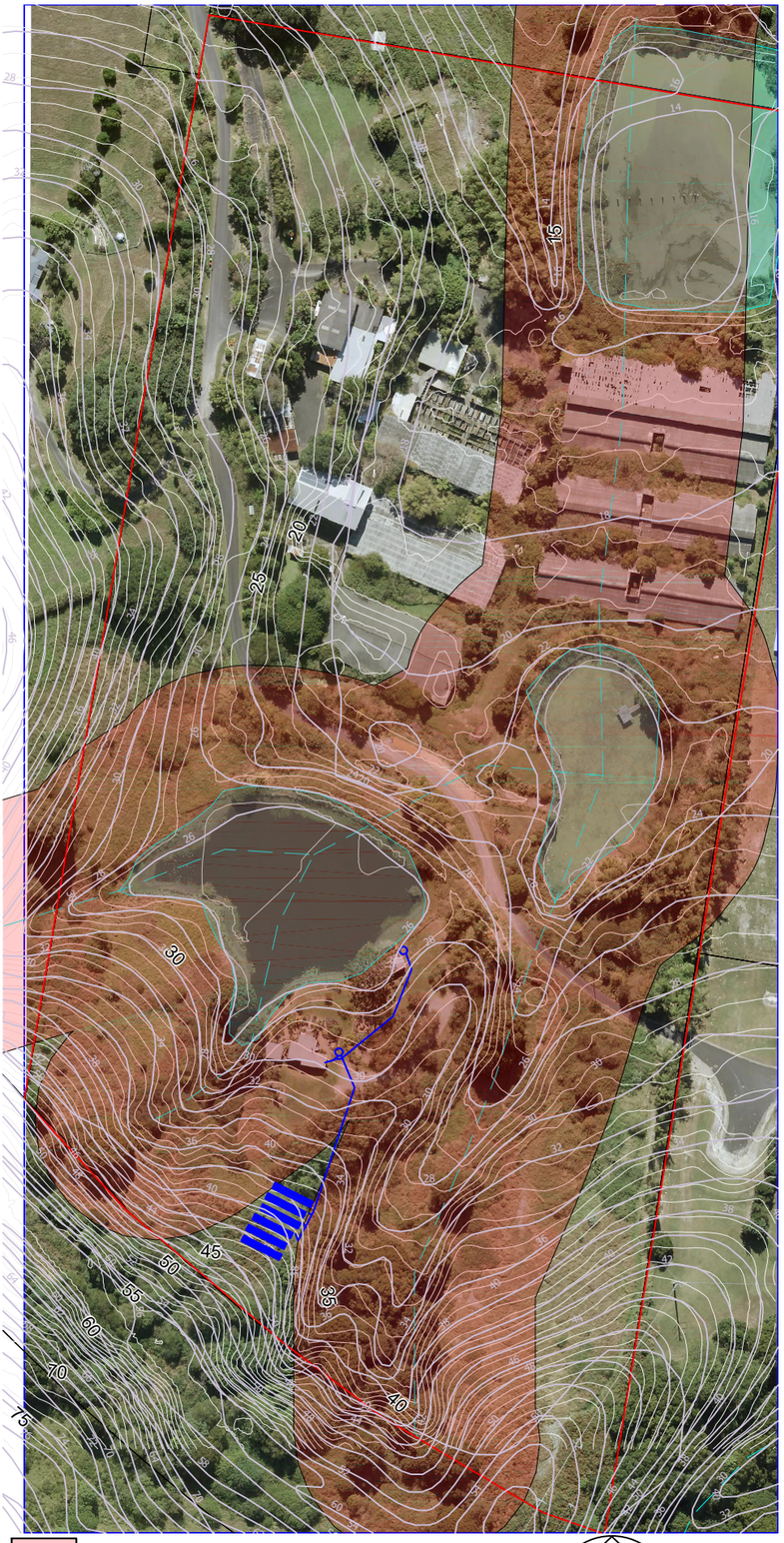
ETA bed separation 1.40

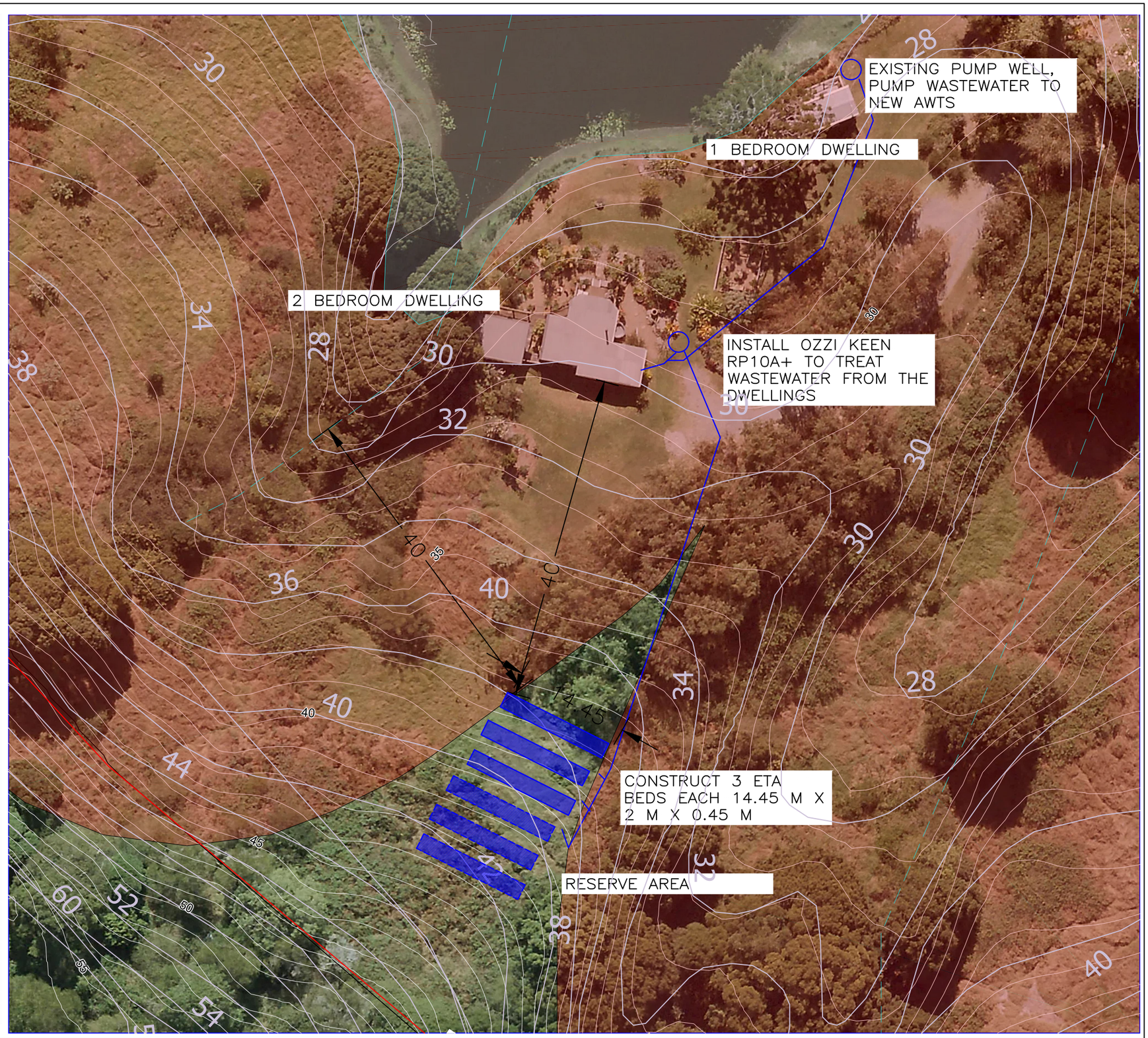


9. AWTS NSW Health Certificate of Accreditation



Source: NSW LPI Spatial Information Exchange (2020) Date May 5, 2022 Project No. 21421_ww.docx Scale: NTS	**GREG ALDERSON AND ASSOCIATES** **ABN 58 594 160 789** 43 Main Street, Clunes NSW 2480 Phone: (02) 6629 1552 Email: office@aldersonassociates.com.au	**Exhibit No. 1.** **SITE LOCATION** Lot 8 DP 8385, 103 Yagers Lane, Skinners Shoot





40 m Buffer to drainage lines

Wastewater Notes:
Design based on 5 people (3 people in main house and 2 people in smaller house)

1. Decommission existing septic tank
2. Install Taylex ABS AWTS to receive wastewater under gravity from main house and pumped from smaller house
3. Treated wastewater is disposed of within 3 ETA beds, each 14.45 m in length, 2.0m wide. See detail. Ensure 2.0m separation.
4. Catch drain to be maintained above disposal field.
5. Ensure all services are located in the field prior to excavation commences.
6. s68 application to be lodged before installing system

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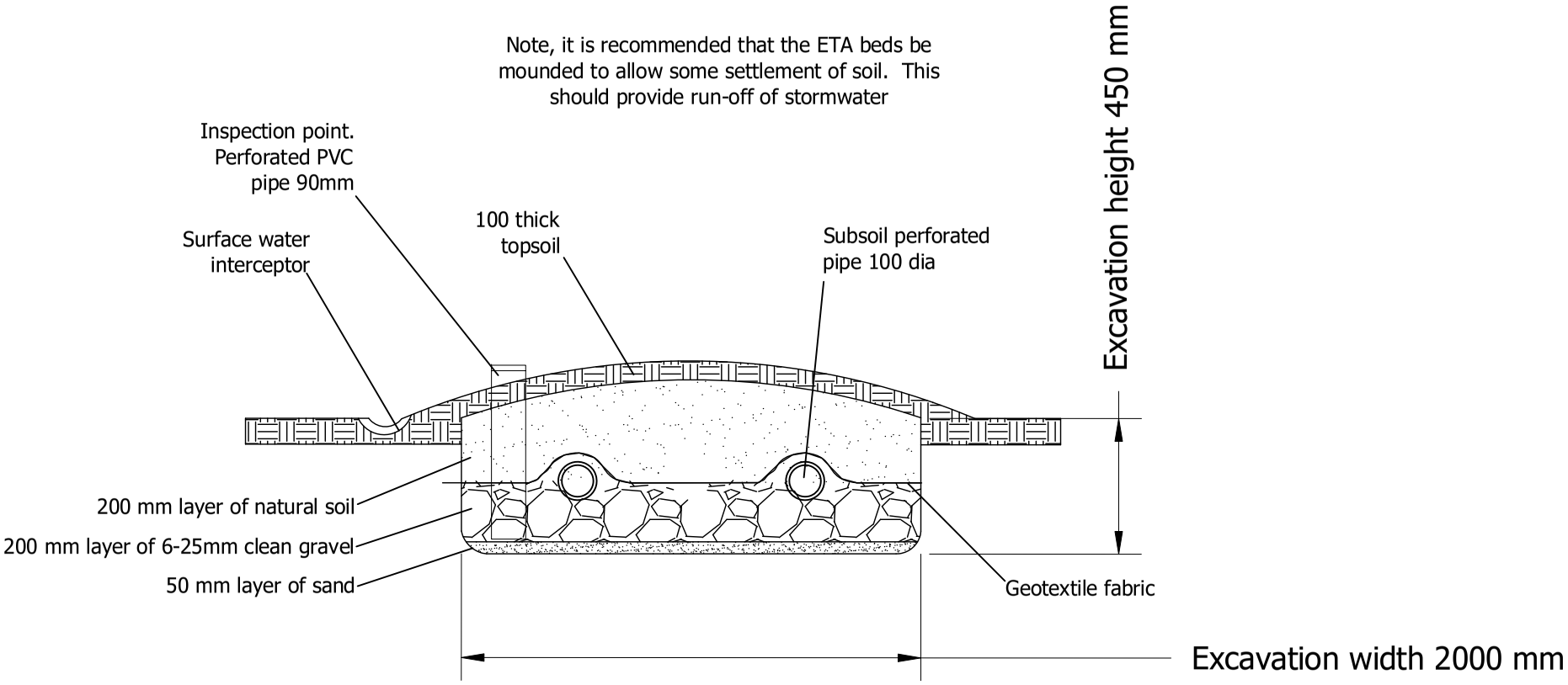
Client: M. Schrieber

Site address: Lot 8 DP 8385, 103 Yagers Lane, Skinners Shoot

PROPOSED ON-SITE WASTEWATER MANAGEMENT SYSTEM

Drawn: WA	Source: LIDAR, METROMAPS	EXHIBIT NO: 2	Date: 24-3-22
Scale: 1:500	Original Size: A3	Project: Rezoning Application	Revision: -
Job Number: 21421			

Note, it is recommended that the ETA beds be mounded to allow some settlement of soil. This should provide run-off of stormwater



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Client: M. Schrieber

Site address: Lot 8 DP 8385, 103 Yagers Lane, Skinners Shoot

EVAPOTRANSPIRATION/ABSORPTION BED DETAIL

Drawn: DB	Source: Greg Alderson & Associates, ASNZS 1547:2012	EXHIBIT NO: 3	Date: 29/1/20
Scale: 1:20	Original Size: A4	Project: Rezoning Application	Revision: -
Job Number: 21421			

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Wastewater
Acid Sulfate Soil
Water Quality
Ecology