On-Site Wastewater Management Report

Proposed dual occupancy dwelling at 945 Woodburn Coraki Rd, Bungawalbin (Lot 2 DP809736)

CLIENT	Suellen Thompson
REPORT	2310-16 Rev 2
DATE	17 February 2024

NORTH COAST WASTEWATER SOLUTIONS

EXECUTIVE SUMMARY

Address (Lot/DP)	Property size
945 Woodburn Coraki Rd, Bungawalbin (Lot 2 DP809736)	68.8ha
Proposed Development	
2-bedroom dual occupancy dwelling	
Design Effluent Volume	
360L/day	

Site Constraints	Description	Comment/Management Response
Exposure/Aspect	South east aspect with good sun and wind exposure	Minor limitation. Provide conservatively sized effluent land application area
Run-on/upslope seepage	Minor potential for upslope run-on	Minor limitation. Install catch drain/diversion bund upslope of LAA
Flooding Potential	Property is subject to flooding. 1 in 20 year (5% AEP) flood level is 5.0mRL. 1 in 100 year (1% AEP) flood level is 5.9mRL.	The proposed dwelling and OSSM system will be located on a small hill with ground elevation ranging from 5-6mRL. The lid of the septic tank is to be installed at 6.0mRL. This may require the tank to be installed underneath the dwelling. A concrete septic tank is recommended to resist overturning in major flood event. The disposal trenches will be installed in ground with natural surface above 5.0mRL.
Boulders/Floaters/Rock Outcrops	Sandstone shallow rock encountered on north side of dwelling at approximately 500mm depth below ground	Proposed effluent disposal area to be located on southern side of dwelling in area of deeper soil profile. No rock was encountered on southern side.
Acid Sulfate Soils	Mapped as class 3 acid sulfate soils. Excavation 1m below ground may require acid sulfate soils management plan.	Septic tank to be raised to achieve flood height which will also reduce excavation into ground. Excavated soil for septic tank may only be around 2 cubic meters. Due to low volume of soil to be excavated below ground an ASS management plan is not considered necessary. A 10kg bag of lime should be added to the excavated soil to limit possible acid generation.

Soil Type	DLR
Sandy loam - weak structure	20mm/day (primary treatment)
Soil Constraints	
Nil	

OSSM System Design		
Proposed treatment level	Primary	
Proposed treatment system	Septic tank	
Required Effluent Land Application Area		
Water Balance (Hydraulic) (m^2)	Nitrogen (m^2)	Phosphorus (m^2)
19.2 (minimum 45)	0	30
Proposed effluent disposal method	ETA beds	
Proposed effluent land application area	Two x 15m x 1.5m ETA beds (45m^2)	

OWNERS ACKNOWLEDGEMENT

I _____ , the owner of 945 Woodburn Coraki Rd, Bungawalbin,

have read and understood the requirements of this report, understand the general operating concepts and physical attributes of the proposed wastewater management system being nominated and agree to undertake the operation and maintenance schedule contained in this report.

Signed: _____ Date: _____

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Version Control

Revision	Description	Author	Issue Date
1	INITIAL ISSUE	Samuel Curran	9/11/2023
2	ADDED WETLAND DETAILS	Samuel Curran	17/02/2024

Contents

1. INTRODUCTION

North Coast Wastewater Solutions (NCWS) was commissioned by the property owner to investigate and design an on-site sewage management (OSSM) system to service a proposed 2-bedroom dual occupancy dwelling at 945 Woodburn Coraki Rd, Bungawalbin, Lot 2 DP809736.

The OSSM system has been designed to service the proposed development based on the expected wastewater load and site and soil constraints. Figure 1 below shows the location of the property.

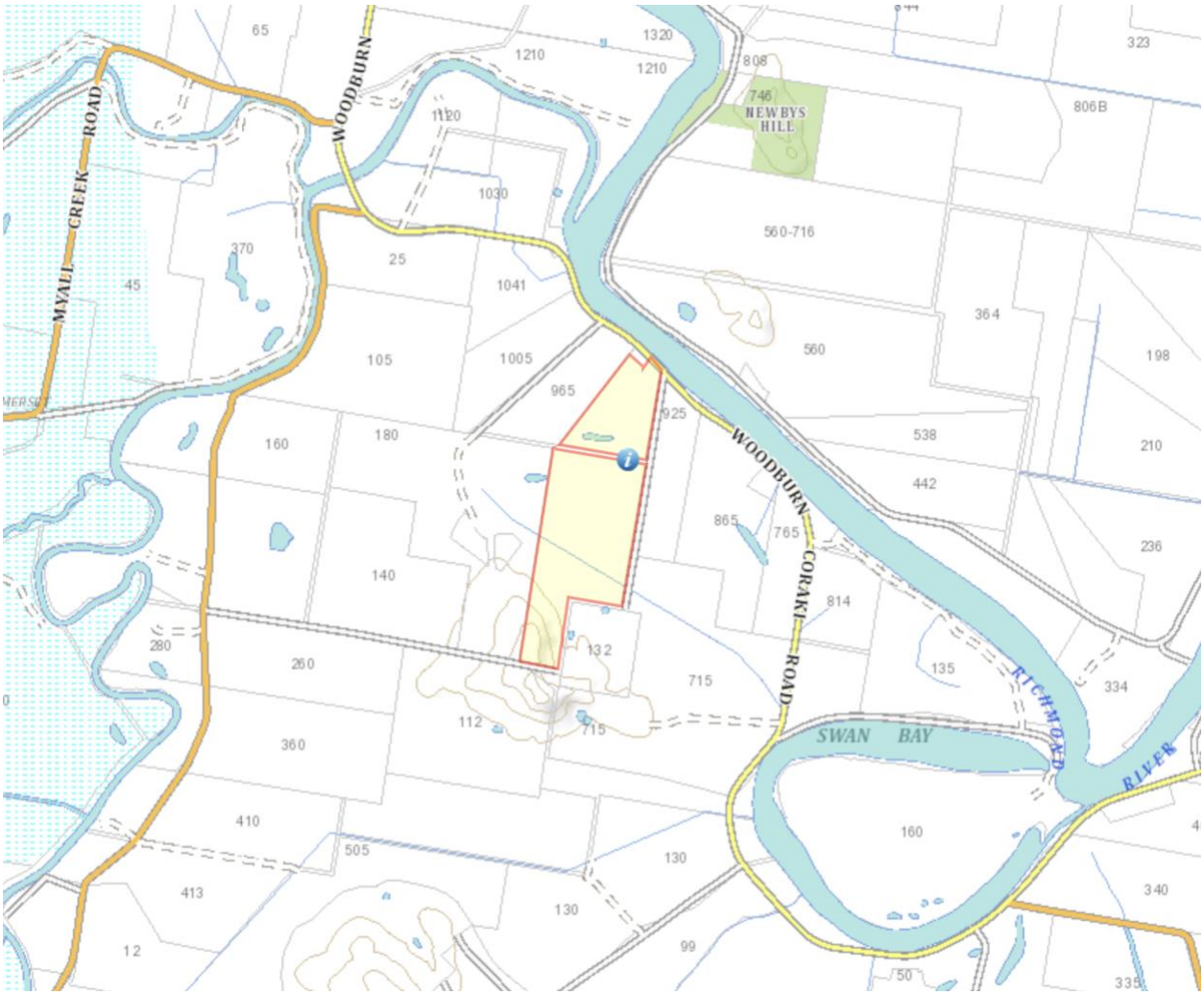


Figure 1 - Location map (source: SIX MAPS)

The on-site wastewater management system has been designed in accordance with the Richmond Valley Council On-Site Sewage Management Strategy 2018, Australian Standard AS1547-2012 On-Site Domestic Wastewater Management and the NSW Government guidelines On-Site Sewage Management for Single Households (1998) ("Silver Book").

The site plan of the proposed development is shown below in Figure 2.

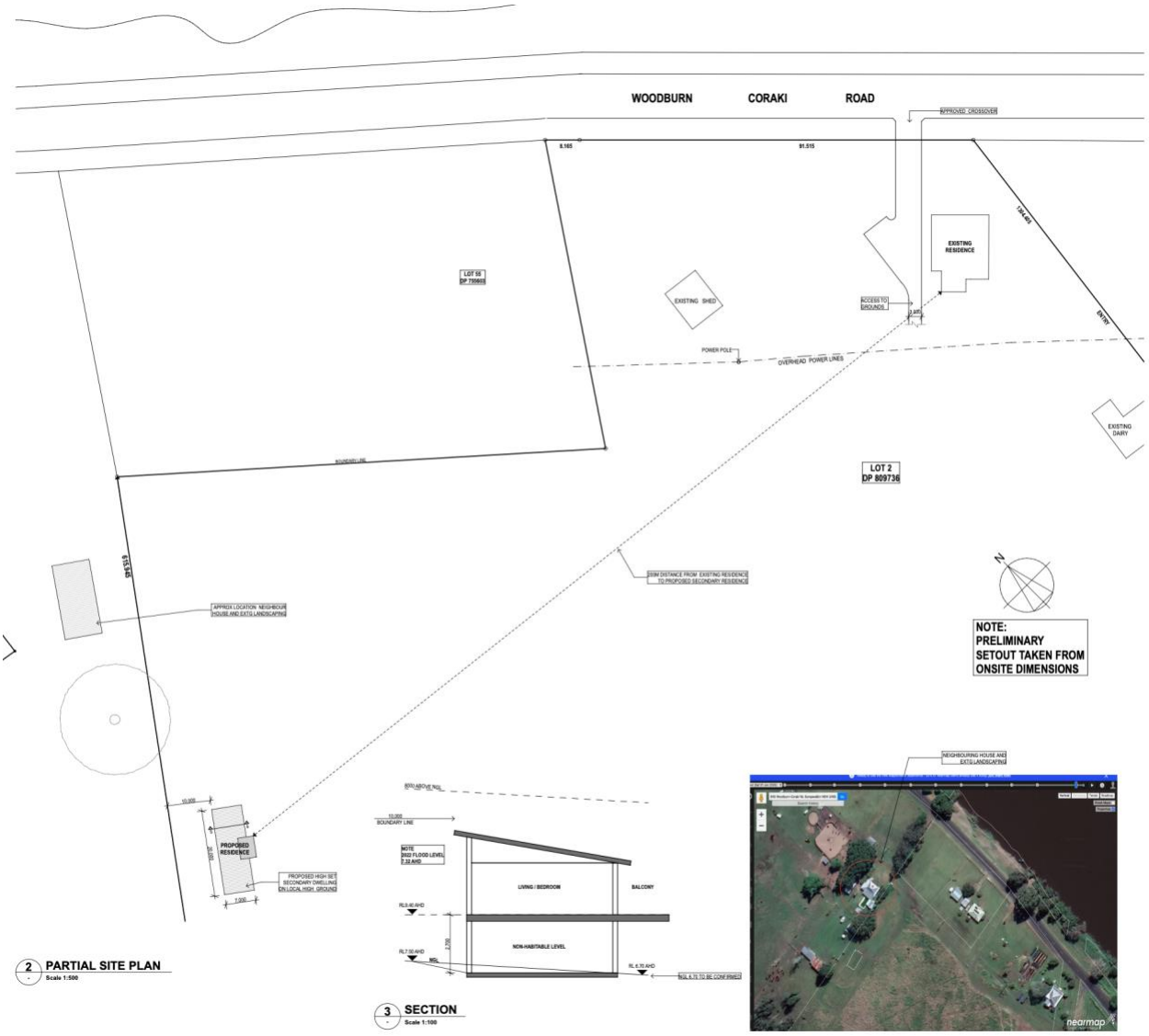


Figure 2 – Site plan of proposed dwelling (source: RSA Architects SK-0001-C)

The floor plan of the proposed development is shown below in Figure 3.

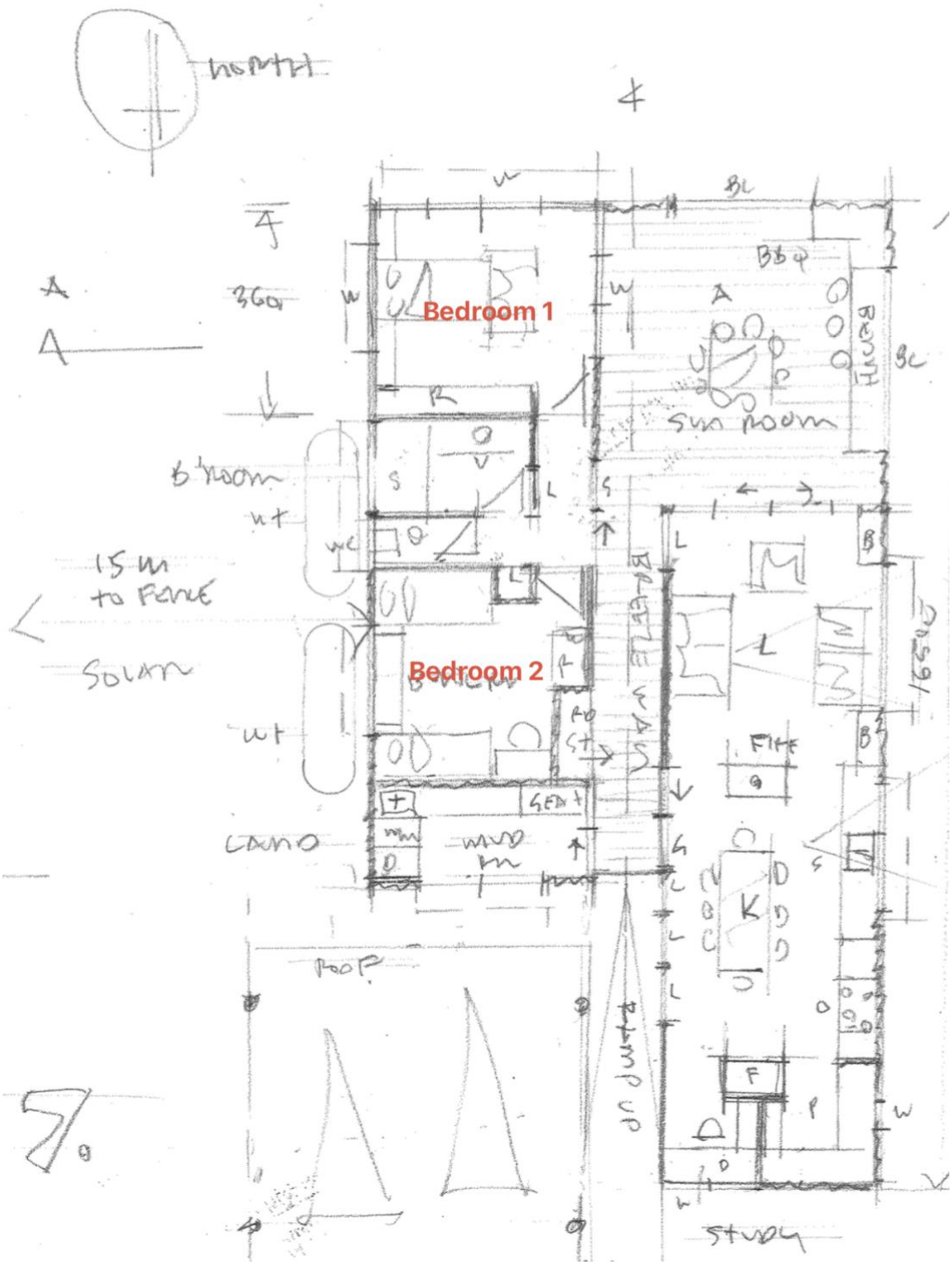


Figure 3 – Floor plan of proposed dwelling (source: RSA Architects SK-07)

2. SITE ASSESSMENT

2.1. Site Characteristics

A desktop study and site assessment of the property was undertaken to assess constraints and other environmental factors relating to on-site sewage treatment and disposal. Table 2 below provides a summary of the desktop study and site assessment and highlights specific limitations. Further discussion and review of specific limitations follows. Site photos are included in Appendix A.

Table 1 – Results of desktop study/site assessment

Property Details				
Address	945 Woodburn Coraki Rd, Bungawalbin			
Title	Lot 2 DP809736			
Date of site assessment	30/10/2023			
Recent weather conditions	Warm/sunny. 80mm rain in previous week			
Lot size	68.8ha (approx)			
Site Feature	**Limitation Guideline**		**Description**	**Comment/Management Response**
	No limitation	**Limitation**		
Slope	<15%	>15%	Slope in disposal area is 5%.	No limitation
Landform	Divergent (drainage-spreading) land shape e.g. hill crests	Convergent (drainage-concentrating) land shape	Divergent small hill	No limitation. Install catch drain/diversion bund upslope of LAA as standard
Exposure/Aspect	Facing within NW or NE quadrant, and high sunwind exposure	Facing within SW or SE quadrant, and sheltered from sun-wind	South east aspect with good sun and wind exposure	Minor limitation. Provide conservatively sized effluent land application area
Watercourses and Drainage Lines	> 100 metres to permanent surface waters (eg river, streams, lakes etc) > 40 metres to other waters (eg farm dams, intermittent waterways and drainage channels, etc)	< 100 metres to permanent surface waters (eg river, streams, lakes etc) < 40 metres to other waters (eg farm dams, intermittent waterways and drainage channels, etc)	No watercourses within 100m. Richmond River is approximately 150m north. No gullies or dams within 40m.	No limitation

Groundwater Bores/Wells	>250m to domestic groundwater bores/wells	<250m to domestic groundwater bores/wells	A search of NSW Real Time Water Database identified no bores/wells within 250m of the proposed effluent land application area.	No limitation
Setback Distances	In the case of SDI, spray or dripper under mulch >6m if up-gradient and >3m if down-gradient of property boundaries, swimming pools, driveways and buildings. (In the case of ETA beds: >12m if up-gradient and >6m if down-gradient of property boundaries, but 6m/3m as above for pools, dwellings etc)	In the case of SDI, spray or dripper under mulch <6m if up-gradient and <3m if down-gradient of property boundaries, swimming pools, driveways and buildings. (In the case of ETA beds: <12m if up-gradient and <6m if down-gradient of property boundaries, but 6m/3m as above for pools, dwellings etc)	All setback distances can be achieved	No limitation
Run-on/upslope seepage	Minor	Major, where diversion not practical	Minor potential for upslope run-on	Minor limitation. Install catch drain/diversion bund upslope of LAA
Flooding Potential	Disposal system above 1 in 20 year (5% AEP) flood contour Treatment system above 1 in 100 year (1% AEP) flood contour	Disposal system below 1 in 20 year (5% AEP) flood contour Treatment system below 1 in 100 year (1% AEP) flood contour	Property is subject to flooding. 1 in 20 year (5% AEP) flood level is 5.0mRL. 1 in 100 year (1% AEP) flood level is 5.9mRL.	The proposed dwelling and OSSM system will be located on a small hill with ground elevation ranging from 5-6mRL. The lid of the septic tank is to be installed at 6.0mRL. This may require the tank to be installed underneath the dwelling. A concrete septic tank is recommended to resist overturning in major flood event. The disposal trenches will be installed in ground with natural surface above 5.0mRL.
Site Drainage	No visible signs of surface dampness	Signs of surface dampness	No signs of dampness.	No limitation
Vegetation indicating waterlogging	Absence of sedges etc that indicate waterlogged soil	Presence of sedges etc that indicate waterlogged soil	No signs of vegetation indicating waterlogging	No limitation

Surface Condition	No bare ground or cracking	Bare ground or cracking	Well grassed.	No limitation
Fill	Disposal area not on fill	Disposal area contains fill	No fill in proposed land application area	No limitation
Erosion/mass movement	No sign of rills, slips	Rills, slips	No signs of rills or slips	No limitation
Boulders/floaters/rock outcrops	No exposed rock or rocks on ground	Areas of exposed or rock or rocks on ground	Sandstone shallow rock encountered on north side of dwelling at approximately 500mm depth below ground	Proposed effluent disposal area to be located on southern side of dwelling in area of deeper soil profile. No rock was encountered on southern side.
Drinking Water Catchment	Not within drinking water catchment	Within drinking water catchment	Not within drinking water catchment	No limitation
Coastal Wetland	Not within Coastal Management SEPP area or proximity area	Within Coastal Management SEPP area or proximity area	Not within Coastal Management SEPP area or proximity area. LAA is Greater than 50m from wetland.	No limitation
Oyster Aquaculture	Not within zone of influence	Zone of influence - within 100m of the riverbank or tributary and within 10km upstream or downstream to the nearest Oyster Aquaculture	Not within zone of influence	No limitation
Acid Sulfate Soils	No acid sulfate soils present	Acid sulfate soils present (class 1-5)	Mapped as class 3 acid sulfate soils. Excavation 1m below ground may require acid sulfate soils management plan.	Septic tank to be raised to achieve flood height which will also reduce excavation into ground. Excavated soil for septic tank may only be around 2 cubic meters. Due to low volume of soil to be excavated below ground an ASS management plan is not considered necessary. A 10kg bag of lime should be added to the excavated soil to limit possible acid generation.

2.2. Further review of site constraints

Flood Potential

Richmond Valley Council provided flood height information and lidar information for the subject property as shown below in Figure 4. The proposed septic tank lid will be installed at 6.0m above the 1 in 100 year flood level. The tank will likely need to be installed underneath the dwelling to achieve this.

The proposed effluent disposal trenches will be installed in natural ground above the 1 in 20 year flood level of 5.0mRL to achieve compliance with the RVC OSSM Strategy 2018. If required the area of the ETA beds should be raised with site won soil of same texture to achieve the design flood height.

Property Details Address ***945 Woodburn Coraki Road***
Town ***Bungawalbin***
Lot / DP ***2 / 809736***

Development Requirements **Mid Richmond Floodplain Risk Management Plan 2004**

NOTE levels include CC3 modelling (2010/2014 studies)

Minimum Habitable Floor Level Region: RL *6.4 (2023)* m AHD (Flood Planning Level)

Higher levels are encouraged if financially and physically practical (subject to building height standards/considerations)
(for future development [1% AEP (100yrARI) design flood + 0.5m freeboard = Flood Planning Level = Min Hab Floor Level])
Variations for industrial, community, and emergency service developments may be applicable – refer planning matrix.

Flood Information ***(please note that there will be higher floods rarer than the 1%AEP)***

Annual Exceedance Probability	Design Flood Levels m AHD	Average Recurrence Interval
0.2% AEP	RL 6.5 m AHD (2010 study)	1 in 500 year ARI
1% AEP	RL *5.7* m AHD (2010 study) RL *5.9* m AHD (2023 study)	1 in 100 year ARI
2% AEP	RL 5.4 m AHD (2010 study)	1 in 50 year ARI
5% AEP	RL 5.0 m AHD (2010 study)	1 in 20 year ARI

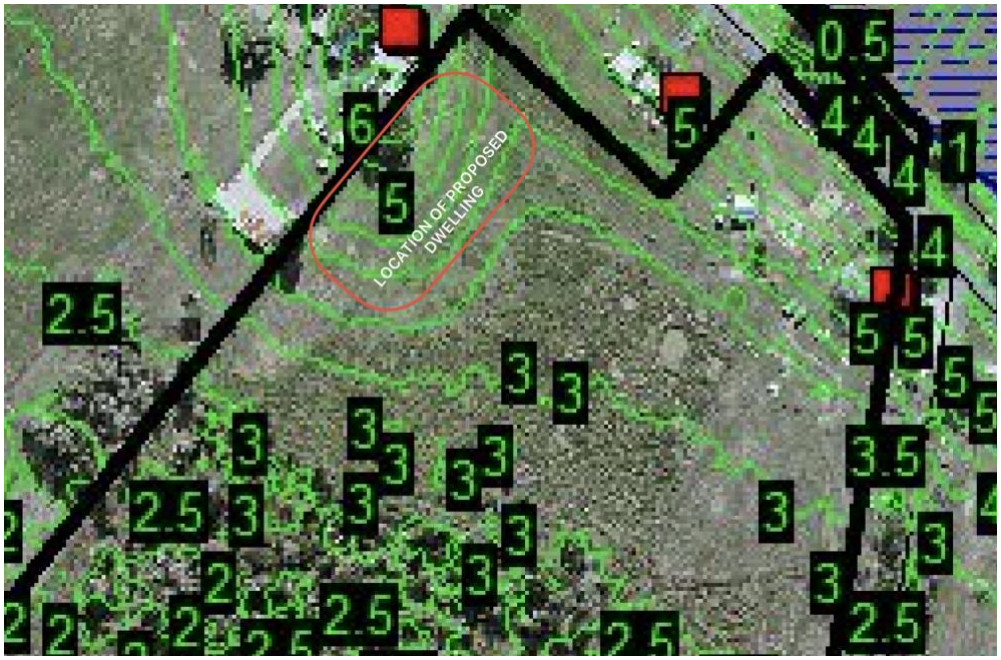


Figure 4 – Flood information and lidar mapping (source: Richmond Valley Council)

Rock Outcrops

Three boreholes were drilled in the area to the north of the proposed dwelling as shown marked red in Figure 5 below. All boreholes encountered sandstone rock at approximately 500mm depth suggesting a sandstone shelf in this area.

Soil test boreholes drilled on the southern side found sandy loam soil to a depth of at least 1000mm. The southern side of the dwelling is proposed for effluent land application.

Figure 5 – Area of shallow sandstone and area of good soil depth (aerial image: NCWS 30.10.23)

Wetland

The proposed effluent land application area has been located outside the 50m setback requirement to the mapped wetland further south on the property as shown in Figure 6 below.

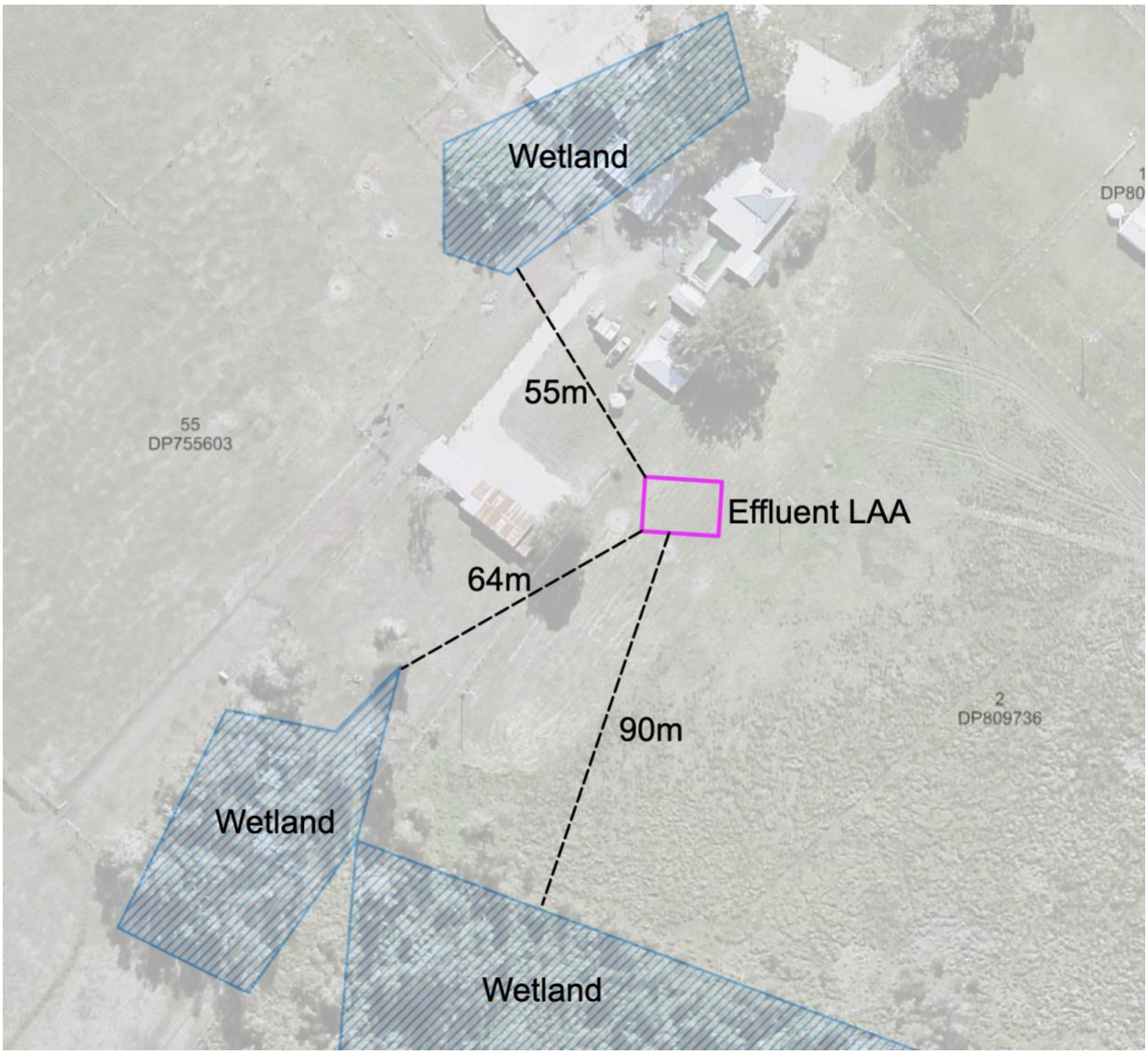


Figure 6 – Setbacks to mapped wetlands – source: RVC Intramaps

3. SOIL ASSESSMENT

3.1. Soil Tests

Soil tests were conducted in the area identified for potential land application. Soil test photos are included in Appendix A. Two 1000mm deep boreholes were constructed and sampled on 30 October 2023 within or adjacent to the proposed land application area.

There was no evidence of springs or groundwater. Bedrock is assumed to be 3m deep. Groundwater is assumed to be at least 5m below surface. Boreholes results are presented in Tables 2 and 3 below with their locations marked on the site plan. Soil limitations are assessed in Table 4.

Table 2 – Soil Borehole 1

SOIL ASSESSMENT								
		SOIL UNIT (Morand, 1994):					Coraki	
Horizon	Depth (mm)	Texture	Structure	Colour	Soil Category	Coarse Fragments	Soil pH	Dispersive Class
A	0-800	Sandy loam (20mm ribbon)	Weak	Brown	2	Nil	6.0	Class 2 (slake only)
B	800-1000	Clayey Sandy loam (20mm ribbon)	Weak	Grey brown	2	5% up to 20mm	5.5	Class 2 (slake only)

Table 3 – Soil Borehole 2

SOIL ASSESSMENT								
		SOIL UNIT (Morand, 1994):					Coraki	
Horizon	Depth (mm)	Texture	Structure	Colour	Soil Category	Coarse Fragments	Soil pH	Dispersive Class
A	0-800	Sandy loam (20mm ribbon)	Weak	Brown	2	Nil	6.0	Class 2 (slake only)
B	800-1000	Clayey Sandy loam (20mm ribbon)	Weak	Grey brown	2	5% up to 20mm	5.5	Class 2 (slake only)

Table 4 - Soil Limitations

Soil Feature	Limitation Guideline		Description	Comment / Management Response
	No limitation	Limitation		
Soil Category	Receiving soils for primary treated effluent: Soil Categories 1-5 excluding mod. or weakly structured light clays. Receiving soils for secondary treated effluent: Soil Categories 1-5	Receiving soils for primary treated effluent: Soil Categories 5,6 excluding strongly structured light clays Receiving soils for secondary treated effluent: Soil Category 6 (as noted: dispersive or shrink-swell soils are to be considered as Soil Category 6 soils)	Category 2 – weakly structured sandy loam	No limitation
Limiting soil texture	Sands to strong/mod structured light clays	Weakly structured light clays, medium/heavy clays, shrink-swell & dispersive soils	weakly structured sandy loam	No limitation
Coarse fragments	Occupies <20% of soil volume	Occupies >20% of soil Volume (Need to increase Soil Category by one class)	Coarse fragments occupy <20% of soil volume	No limitation.
Field pH	>5.5	<5.5	pH 5.5-6.0	No limitation
Dispersiveness	Class 1 or 2	Class 3 or 4	Class 2 (slake only)	No limitation
Depth to groundwater	Soil depth of >1m before groundwater is encountered	Soil depth of <1m before groundwater is encountered	Assumed >5m	No limitation
Depth to bedrock	Soil depth of >1m before bedrock is encountered	Soil depth of <1m before bedrock is encountered	Assumed >3m	No limitation

3.2. Soil Assessment Summary

The most limiting soil layer in the boreholes for wastewater disposal is a **sandy loam weak structure (Category 2)** which occurs from 800mm below surface in the proposed land application area. The Design Loading Rate (DLR) for primary treated effluent into ETA beds is **20mm/day** in accordance with Table L1 AS1547:2012.

There were some coarse fragments present but not in sufficient quantity or size to impede the flow of water into the soil. The pH in in the subsoil is within the suitable range for effluent disposal, and it is recommended that lime to be added to the soil at the base of the land application area at a rate of 1kg/m2 to maintain the pH above 5.5. The soil is not dispersive.

There was no evidence of springs or groundwater. Bedrock is assumed to be 3m deep. Groundwater is assumed to be at least 5m below surface.

4. OSSM AND LAND APPLICATION AREA MODELLING

4.1. Introduction

This section of the report models the required OSSM system including land application area requirements to service the proposed dwelling.

The guiding principles of the proposed OSSM system design are:

- Protection of public health and the environment
- Maximise opportunity for nutrient and water re-use by vegetation uptake
- Efficient utilisation of resources

4.2. Design Considerations

The following constraints, opportunities, and issues were considered in the design and selection of appropriate OSSM systems for this site.

- The subject property has some constraints including flooding and shallow rock however careful siting of the proposed OSSM system outside of these areas can ensure a primary treatment septic system is suitable for the development.
- The proposed conventional septic system will provide a low cost, low maintenance and reliable long term solution for wastewater management for the dwelling.
- Richmond Valley Council generally requires OSSM systems to be designed for 5 persons however as per Section 3.1 of the Strategy, secondary dwelling OSSM systems are to be based on the number of bedrooms + 1.

4.3. Volume of Effluent

The proposed dwelling will have 2 bedrooms, supplied with rainwater and all fixtures will be water efficient to meet BASIX requirements. A wastewater allowance of 120L/person/day has been adopted in accordance with Table H1 AS1547:2012.

The number of equivalent persons (EP) in the dwelling for the purposes of peak occupancy wastewater loading, is taken to be the number of bedrooms + 1. Therefore, the design effluent volume is as follows:

Development	Bedrooms	EP	Effluent Volume (L/day)
2-Bedroom Dwelling	2	3	360

4.4. Septic Tank Sizing

In accordance with Appendix J AS1547:2012 the minimum size septic tank for the dwelling will be 3000L. This tank can cater for up to 5 persons or 1000L/day.

4.5. Land Application Area

To ascertain the size of the land application area required, the On-Site Wastewater Model (single rural households) was used. This model determines the required land application area (LAA) in accordance with the most limiting factor, being nitrogen, phosphorous or hydraulic loadings. The model performs an iterative water balance to determine the LAA required to adequately dispose of the hydraulic load. The water balance considers the allowable infiltration rate of the soil and local rainfall and evapotranspiration rates.

4.5.1. Model Parameters

Other OSSM model parameters adopted for this assessment are as follows:

- Lot size – the property lot size 68.8ha (from RVC Intramaps)
- Distance to river >100m (from RVC Intramaps)
- Soil type is Duplex (from soil tests)
- Depth to bedrock has been assumed at 3m (assumed based on soil type and soil classification tests)
- Limiting soil layer is sandy loam with weak structure (20mm/day DLR)
- Primary treatment via septic tank
- Land application via ETA beds

4.5.2. Nutrient Loadings

The Environment and Health Protection Guidelines (1998) state that wastewater disposal systems are to be designed based on the most limiting factor of either hydraulic, BOD or nutrient loadings. The nutrients of concern include phosphorus and nitrogen.

Nitrogen

The expected chemical forms of nitrogen include ammonia, nitrite and nitrate. Nitrate is readily taken up by plants although it is very mobile and will move through the soil profile and has the potential to leach to groundwater.

TN Generated/person per year= 4.2kg
Household TN Generated = 4.2kg/person/year x 3 people = 12.6kg/year
Allowing for losses of 20% to atmosphere.
Land Application Area for N = 0.0m^2

Phosphorous

Phosphorous is removed from effluent through biological, chemical and physical processes in soil, with minor uptake by vegetation.

TP Generated/person per year= 0.52kg

P_{sorp} = Phosphorus Sorption Capacity of Duplex Soils is 8000kg/ha.m.yr
Depth to bedrock is assumed at 3m for this site.
The land application area required for the soil to be saturated with Phosphorus over a 50-year time period.
Household TP Generated = 0.52kg/person/year x 3 people = 1.56kg/year
Land Application Area for P = 37.1m^2

4.6. Land Application Area Required

A summary of the LAA required for each of the loadings is as follows:

Development	Water Balance (Hydraulic) (m^2)	Nitrogen (m^2)	Phosphorus (m^2)
2-Bedroom Dwelling	19.2 (45 minimum)	0	37.1

The minimum size of effluent land application for primary treated effluent is 15m^2 per person. The adopted size of the ETA beds will be 45m^2 to provide a conservative factor of safety in the design.

The proposed wastewater management system required to treat and dispose of the hydraulic and nutrient wastewater load from the site is as follows:

- 3000L Septic Tank
- Two x ETA beds measuring 15m x 1.5m each (45m^2)

Wastewater model results are included in Appendix B. Refer to design plans included in Appendix C.

5. ON SITE SEWAGE MANAGEMENT SYSTEM

5.1. Septic Tank and Effluent Filter

It is proposed to install a minimum 3000L septic tank to accept the wastewater load. The septic tanks must be NSW Health accredited and manufactured and installed in accordance with AS1546 and manufacturer requirements.

As a minimum the tank shall be installed on a compacted metal dust base and backfilled with metal dust. The tank should be sited to allow ease of maintenance and pump outs. An effluent filter (Taylex or similar) must be installed in the outlet of the septic tank in a location that is easy to access for maintenance.

5.2. Distribution Box

A distribution box will be required to be installed following the septic tank. The distribution box is to be installed level on a compacted base of metal dust. Water should be run through the box after installation to ensure even flow of water to the ETA beds and adjusted if required.

5.3. Evapotranspiration/absorption (ETA) beds

The construction of the ETA beds is briefly described below, and design plans are included in Appendix D.

ETA beds shall be installed along a contour to achieve a flat base. Incorporate lime (1.0kg/m2) into the soil at base of ETA bed. Install 20mm gravel and 100mm slotted pipes for effluent distribution. Install geotextile over gravel and backfill with soil from site. The beds will be installed on sloping ground and will be required to be terraced into the slope. The maximum batter slope between beds shall be 20 degrees (1 in 3). The surface of the bed shall have fall towards the downslope side to avoid water ponding on the bed surface.

A minor catch drain and berm is required to be maintained upslope of the ETA beds to redirect overland flow away from the disposal area.

5.4. Pipework

All gravity pipework shall be 100mm PVC buried at a minimum depth of 300mm (500mm minimum for trafficable areas) at minimum grade of 1 in 60. All plumbing works to be in accordance with AS3500.

5.5. Reserve Area

A 100% land application reserve area has been nominated on the design plans for future upgrade or replacement.

6. OPERATION AND MAINTENANCE

6.1. Roles and Responsibilities

On site wastewater management systems undertake treatment and disposal of wastewater to ensure the risks to public health and the environment are minimised. It is important the installed system is operated and maintained in accordance with these guidelines and any other operation and maintenance manuals provided for components of the system to ensure the system is working as intended. Correct operation and maintenance will help achieve a long lifetime of service.

Table 5 below outlines the roles and responsibilities of the persons involved in the ongoing management of the wastewater management system to ensure its effective and sustainable performance.

Table 5 - Roles and Responsibilities for Operation and Maintenance

Role	Responsibilities
Property Owner	• Ensure they are fully aware of the function, operation and maintenance of the wastewater management system installed on their property • Ensure dwelling occupants and other persons and visitors at the property are aware of good kitchen and laundry practices and what can and can't enter the wastewater system • Ensure they keep a copy of this report, designs plans and the operation and maintenance manuals available on the property for the life of the system • Ensure the operation and maintenance activities are carried out in accordance with this report, other operation and maintenance manuals provided with the system and Council requirements • Ensure records of system maintenance are maintained for at least 10 years
Service Agent/ Plumber	• Ensure all field staff have undertaken appropriate training, including training specific to the wastewater management system being installed (where applicable) • Ensure operation and maintenance activities are undertaken in accordance with the recommendations in this report and operation and maintenance manuals provided with the system and Council requirements • Ensure the Property Owner and Council are advised of unusual circumstances or wastewater management system defects found during servicing • Ensure a service report is provided to the Property Owner and Council covering all maintenance carried out • Ensure service reports are kept for at least 10 years • Ensure alarms and emergency call outs are attended to and the system returned to normal operation in a timely manner
Equipment	• Ensure they maintain an appropriate on call or support operation

Suppliers	and available spares for the life of the system
Council	• Ensure the system is managed and monitored in accordance with Council's On-site Wastewater Management Strategy

6.2. System Function

All persons involved in the ongoing management of the wastewater management system should have basic knowledge of the function of the system and a general understanding of how each stage of the treatment and disposal works. This will assist in understanding the importance and reasoning for maintenance activities and may assist in early identification of issues.

The proposed wastewater management system for this site is as follows:

- Primary Treatment: Septic Tank
- Land Application: Evapotranspiration (ETA) Beds

Details on each stage of the wastewater management system are provided below in Table 6.

Table 6 - Wastewater Management System Function

Stage	Function
Primary Treatment	All wastewater from the dwelling flows by gravity into the Septic Tank. Household wastewater first flows into a primary chamber where solids settle to the bottom of the tank to form a sludge layer, and greases and fats float to the surface to form a scum layer. Bacteria in the tank digest the solids and nutrients in the wastewater. Therefore, it is important to minimise the amount of detergents, bleaches and disinfectants use in the home to help maintain the biological activity in the tank. Clarified effluent passes through baffles into the second chamber of the Septic Tank. As additional wastewater flows into the Septic Tank this raises the water level in the tank and clarified effluent is passed through the outlet and outlet filter of the Septic Tank to the next treatment stage.
Land Application	The treated effluent is discharged by gravity to the land application area. The land application area for this site is Evapotranspiration Absorption (ETA) Beds. The beds are divided into separate dosing zones and are supplied through a distribution box. The distribution box ensures an even distribution of effluent to each ETA bed. The beds are required to be installed level and across contours to ensure even distribution of effluent throughout the bed to avoid overloading one area. The ETA beds are designed to dispose of the wastewater through evapotranspiration through the top of the beds and absorption through the soil in the base. The effluent is discharged underground to protect public health. This filtering process allows the removal of pathogens, toxins and other

	pollutants. Nutrients left in the wastewater are then taken up by vegetation (normally grass) planted across the surface of the trench. The ETA Beds have been designed to effectively dispose of the peak hydraulic loading and are specifically sized to suit the constraints of this site. This transfer of the wastewater load to the environment is achieved primarily through the vegetation (grass, shrubs, etc) and the sorption capacity of the soil.

6.3. System Limitations

The proposed system has been designed to adequately treat and dispose the wastewater volume and quality outlined in this report. Short term spikes or long-term variances from these design parameters may impact the ability of the wastewater system to treat the effluent to the required standard. Should there be a change in operation of the property that may alter the wastewater volume (i.e. additional bedrooms/persons) or quality (i.e. non domestic wastewater sources) being discharged to the wastewater system, the property owner should consult a suitably qualified plumber or wastewater consultant prior to making the change.

6.4. System Operation and Management

The wastewater management system for this site is designed to run automatically with minimal operator input. The key operational requirements of the system include performing routine inspections and regular maintenance.

The general requirements for operation include regular visual inspections to be undertaken by the property owner for early identification of issues, regular cleaning of the effluent filter and regular pump outs by a licensed effluent pumping contractor. Further details on specific maintenance activities are included in the following section.

All persons undertaking maintenance and operation activities shall always ensure that precautions are taken to protect their own health and the health of other persons at risk from the activity.

To help ensure trouble free operation of the system the property owner should adhere to the following kitchen, laundry and general water use practices, provided below in Table 7, and ensure this information is provided to all occupants at the property.

Table 7 - Good water use practices

Good Water Use Practices for On-Site Wastewater Management Systems
Minimize the amount of fats, oils and grease disposed of into the on-site disposal system (e.g. scrape food and excess oils from dishes into the bin prior to washing)
Bleach, bleach-based products, whiteners, nappy soakers and spot removers shall not be disposed of into the on-site system

Hygiene products, condoms, tampons, sanitary napkins, disposable nappies and cotton buds shall not be disposed of via the on-site disposal system.
Only the recommended amounts of disinfectants and detergents should be used. Biodegradable, low sodium and phosphate-free and products specifically designed for on-site disposal systems are recommended

6.5. Maintenance Schedule

Table 8 below contains the maintenance checklist to be undertaken on the wastewater treatment and disposal system by the property owner and/or service agent.

Maintenance records and log sheets must be completed by any person performing maintenance or inspection on the system. Maintenance records shall be readily available to any person involved in the management, operation or maintenance of the system and to any person auditing or certifying that the system is being operated and maintenance properly and, if required, to the regulatory authority.

Table 8 - Maintenance Checklist

Component	Activity	Maintenance Description	Responsibility	Frequency
General	Plant shutdown	If the dwelling will be vacated for more than 6 months contact your plumber to discuss the appropriate measures to take before vacating the premises and on return to the premises.	Property Owner	Ongoing
	Reserve Area	The reserve area, where allocated, must be reserved for future wastewater upgrades and should not be developed or built on	Property Owner	Ongoing
	Housekeeping	Keep the area around the septic tank and land application area in a clean state, to avoid damage from vehicles, debris and fire.	Property Owner	Ongoing
	Landscaping	Do not plant trees or shrubs on top of the septic tank or land application area.	Property Owner	Ongoing
	Drain cleanout	Empty kitchen sink and bathroom drain strainers into bin regularly	Property Owner	As required
Septic Tank	Clean filter	Remove from septic tank and clean effluent filter with hose	Property Owner	Monthly
	Pump out	Ensure that your septic tank is regularly de-sludged by a licensed septic pump out contractor	Property Owner	Every 4 years
Whole system	Visual Inspection	Inspect the septic tank and land application area to provide early identification of issues including leaks, discharges and overflows Signs of failure include: • surface ponding and run-off of treated wastewater; • degradation of soil structure - e.g. sheet and rill erosion, surface crusts, or hard surfaces are evident; • poor vegetation growth; • unusual odours; • slow running drains and toilets Any issues identified should be immediately reported to a plumber	Property Owner	Weekly
ETA Beds	Routine Maintenance	• Runoff diversion banks to be inspected and maintenance as required undertaken to ensure that surface runoff is diverted around each of the disposal areas • No vehicular or stock access should be made across the disposal field • Plant lawn 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 storm water system or over the ground • Maintain grass cover on the surface of the trench to allow uptake of nutrients.	Property Owner	Ongoing

7. CONCLUSION

This report details the investigations, undertaken in accordance with the Richmond Valley Council OSSM Strategy 2018, to design a new OSSM system to service the proposed 2-bedroom dual occupancy dwelling at 945 Woodburn Coraki Rd, Bungawalbin. The investigations included desktop studies, site and soil evaluation and modelling and design of a suitable OSSM system based on the potential effluent loading.

The key limitations on this site that were addressed in the design were southern aspect, flood potential, shallow rock and acid sulfate soils. The on-site wastewater system has been designed with priority given to protecting public health, the environment, community amenity and efficient utilisation of resources.

The system and owner requirements are summarized below:

- Effluent volume of 360L/day based on up to 3 persons with rainwater supply
- Install minimum 3000L septic tank
- Install two x ETA beds measuring 15m x 1.5m each (45m^2)

A shallow catch drain is to be maintained to direct overland run-off around the disposal area. The maintenance program listed in this report will be undertaken by the householder or servicing agent as detailed. Disposal area to be grassed and fenced or otherwise to prevent vehicle and livestock damage.

The proposed OSSM system constructed in accordance with the design plans and detail provided in this report and maintained in accordance with the operation and maintenance guidelines will provide a suitable wastewater management system for the proposed dwelling at 945 Woodburn Coraki Rd, Bungawalbin, Lot 2 DP809736, that is consistent with the performance objectives of the Richmond Valley Council OSSM Strategy 2018 and AS1547:2012.

Prior to installation, the proposed on-site sewage management system must be approved by the local Council. The property owner is to lodge a *Section 68 Application for Approval to Install* the on-site sewage management system to their local Council to seek this approval.

8. REFERENCES

Australian Standard AS 1546.1 - 2008 *On-site domestic wastewater treatment units – Part 1: Septic Tanks*

Australian Standard AS 1546.3 - 2008 *On-site domestic wastewater treatment units – Part 3: Aerated wastewater treatment systems*

Australian Standard AS 1547 - 2012 *Disposal Systems for Effluent from Domestic Premises*

Bureau of Meteorology, *Australian Groundwater Explorer,* www.bom.gov.au/water/groundwater/explorer/map.shtml

Crites, R., & Tchobanoglous, G. (1998). *Small and decentralized wastewater management systems*. Boston: WCB/McGraw-Hill.

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

Metcalf & Eddy, Inc. (2003). *Wastewater engineering: treatment and reuse*. Boston. McGraw-Hill

NSW Office of Environment and Heritage, eSPADE v2.0, *Soil Landscapes,* http://www.environment.nsw.gov.au/eSpade2Webapp

Richmond Valley Council (2018). *On-Site Wastewater Management Strategy*

9. APPENDICES

9.1. Appendix A – Site and Soil Photos

Proposed land application area – looking east

Proposed land application area – looking south

Proposed land application area – looking west

Proposed land application area – looking north

Soil test borehole

Ribbon test

9.2. Appendix B – Wastewater Model Results

	RVC On-site Wastewater Model (Single Rural Households) OSmodel170115.xls *Printed 9-11-2023*	Default	User-defined
Client	SuellenThompson		
Address	945 Woodburn Coraki Rd		
Site	Block size (m2) [effective block size/sys for N calcs = 688000m2]		688000
	Buffer (m) from land application area t stream	>100	100
	Water (L/p.d) from Roof water harvesting	120	
	Persons		3
	☐ Internal wastewater sources split? ☐ Multiple households? How many?		
Wastewater components/system	Toilet ☑		
	Bathroom ☑		
	Laundry ☑		
	Kitchen ☑		
	Total wastewater flow (L/d) [needs caution if user-defined]	360	
Treatment system	Primary only (e.g. septic)		
	Nitrogen removal %	0%	
	Maximum N allowed to go down from system (kg/yr)	15.00	
Land application	Land application type ETA beds		
	Depth of soil above gravel layer (= root zone) (mm)	200	
	Depth of gravel layer (mm)	200	
Soil information	Morand code (examples) Duplex Soils= ck		
	Phosphorus sorption (kg/ha.m)	8000	
	Depth to water table or bedrock (for P calcs) (m)		3
	Texture/structure Sandy loams - weakly structured		
	DLR (mm/d)	20	
Area calculations	Hydraulic area (m2)	19.2	
	Nitrogen area (m2) [allowing export of 15.00 kg/yr]	0.0	
	Phosphorus area (m2)	37.1	
	Required land application area (m2) (capped)	**45.0**	
			0.0%

9.3. Appendix C – OSSM System Design Plans

LEGEND

- S — SEPTIC TANK - 3000L
- □ — DISTRIBUTION BOX
- ——— 100mm PVC
- ~~~~ CATCH DRAIN/DIVERSION BUND
- ⊕ — SOIL TEST BOREHOLE LOCATION (APPROXIMATE)

NOTES

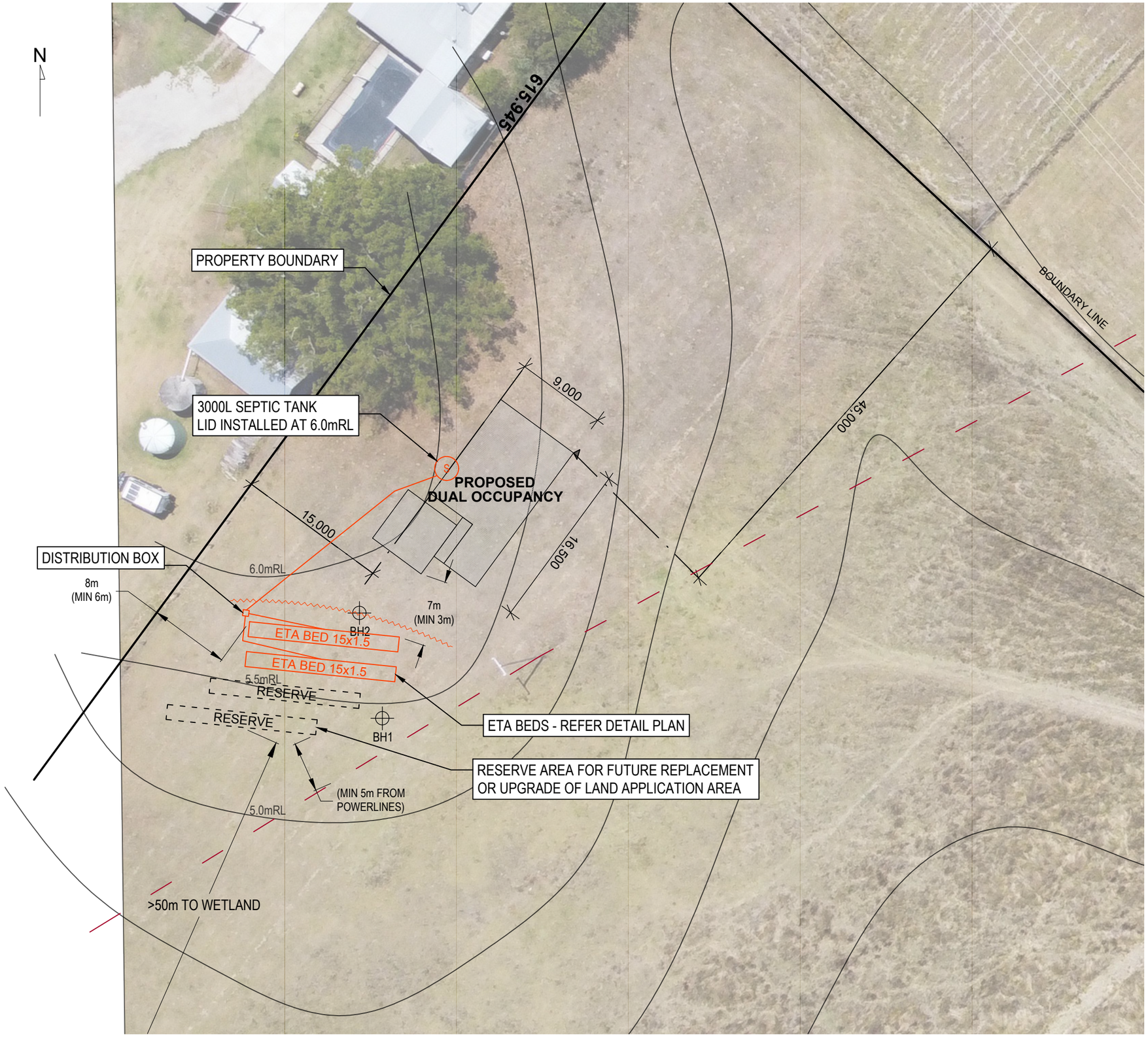
1. OSSM SYSTEM HAS BEEN DESIGNED FOR 360L/DAY BASED ON UP TO 3 PERSONS AND SOIL DESIGN LOADING RATE OF 20mm/DAY
2. ALL PLUMBING WORK TO BE IN ACCORDANCE WITH AS3500

SEPTIC TANK

3. **INSTALL 3000L SEPTIC TANK**
4. ALL WASTEWATER (INCLUDING GREYWATER) TO FLOW INTO SEPTIC TANK
5. **TANK LID TO BE INSTALLED A MINIMUM OF 100mm ABOVE GROUND LEVEL AND ABOVE 6.0mRL (5.9mRL 1 in 100 year flood level)**
6. TANK TO BE INSTALLED ON A BASE OF COMPACTED METAL DUST
7. OUTLET FILTER TO BE INSTALLED IN OUTLET OF TANK IN AN ACCESSIBLE LOCATION FOR REGULAR INSPECTION AND CLEANING
8. ALL PIPEWORK TO BE BURIED AT 300mm DEPTH OR 500mm IN TRAFFICABLE AREAS
9. ALL PENETRATIONS AND GAPS IN TANK TO BE APPROPRIATELY SEALED FROM WATER INGRESS
10. PROPERTY OWNER TO PROVIDE AND MAINTAIN CLEAR TRUCK ACCESS TO TANK FOR FUTURE PUMPOUTS

LAND APPLICATION AREA

11. **INSTALL TWO x ETA BEDS MEASURING 15m x 1.5m EACH ABOVE 5.0mRL (5.0mRL 1 in 20 year flood level)**
12. DISTRIBUTION BOX REQUIRED
13. REFER ETA BED DETAIL PLAN FOR FURTHER NOTES ON ETA BED CONSTRUCTION



0m 5m 10m 20m

1:400 SCALE - MAIN LAYOUT

SITE PLAN: RSA ARCHITECTS
BUILDING LAYOUT, AERIAL IMAGE: NCWS 30.10.23

No.	Revision	Date	Drawn	Checked
A	ISSUED FOR COUNCIL APPROVAL	9.11.23	S.C	

NORTH COAST WASTEWATER SOLUTIONS

DESIGNED: SC | DRAWN: SC | REF. NO.: 2310-16

info@ncws.com.au
www.ncws.com.au

CLIENT:
Suellen Thompson
945 Woodburn Coraki Rd, Bungawalbin

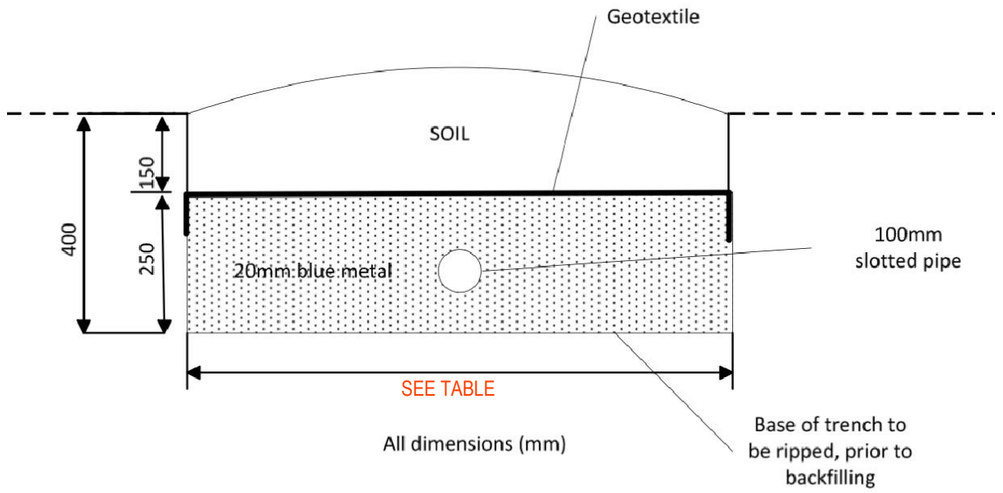
Wastewater Management System
945 Woodburn Coraki Rd, Bungawalbin

SITE PLAN

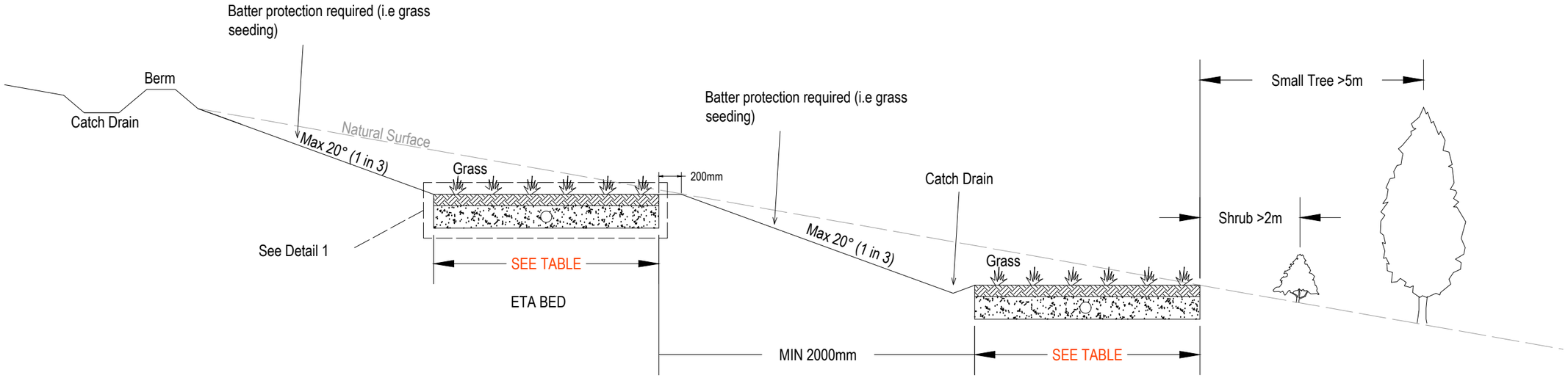
PLAN NUMBER: 2310-16.1
PLAN IN SET: 1 of 2
SCALES: 1:400 @ A3
DATE: 9.11.23

NOTES

1. LAND APPLICATION AREA AND RESERVE AREA MUST BE MINIMUM 6m FROM PROPERTY BOUNDARIES (12m FROM DOWNSLOPE PROPERTY BOUNDARIES), 10m FROM POWERLINES, 3m FROM DRIVEWAYS, BUILDINGS AND SWIMMING POOLS (6m FROM DOWNSLOPE DRIVEWAYS, BUILDINGS AND SWIMMING POOLS)
2. GAP BETWEEN ETA BEDS TO BE MINIMUM 2m
3. WHERE MORE THAN ONE ETA BED INSTALLED, EFFLUENT IS TO BE EVENLY DISTRIBUTED ACROSS ALL BEDS THROUGH DISTRIBUTION BOX OR INDEXING VALVE AS SHOWN ON SITE PLAN
4. EFFLUENT FROM TREATMENT SYSTEM TO BE DIRECTED INTO THE CENTER OF EACH BED OR INTO END OF EACH BED FOR PUMPED SYSTEMS ONLY
5. ETA BEDS TO BE CONSTRUCTED ALONG CONTOURS AND HAVE LEVEL BASE
6. INCORPORATE LIME (1.0kg/m2) INTO BASE OF TRENCHES
7. INSTALL 20mm GRAVEL WITH 100mm SLOTTED OR DRILLED PVC IN EACH ETA BED. SLOTS AT 90 AND 180 DEGREES.
8. INSTALL INSPECTION PORT IN EACH ETA BED
9. INSTALL GEOTEXTILE LAYER BETWEEN GRAVEL AND BACKFILL SOIL TO PREVENT MOVEMENTS OF FINES INTO FILTER MEDIA
10. SOIL TO BE ADEQUATELY DISTRIBUTED/BROKEN UP PRIOR TO BACKFILLING TRENCH
11. SURFACE TO BE GRASSED AND SUITABLE FOR MOWING
12. SURFACE OF ETA BEDS TO BE SLIGHTLY MOUNDED TO SHED RAINWATER
13. MINOR VEGETATION CAN BE PLANTED A DISTANCE AWAY FROM EDGE OF ETA BEDS EQUAL TO THE MATURE HEIGHT OF THE VEGETATION
14. INSTALL A SHALLOW CATCH DRAIN UPSTREAM OF THE ETA BEDS TO DIVERT RUN-ON FLOWS
15. MAXIMUM BED LENGTH IS 20m. FOR LONGER LENGTHS REFER TO WASTEWATER CONSULTANT
16. HOMEOWNER TO INSTALL FENCING AROUND LAA TO PREVENT LIVESTOCK ACCESS IF REQUIRED
17. HOMEOWNER TO BROADCAST GRASS SEED OR INSTALL TURF ON ETA BEDS AS SOON AS POSSIBLE FOLLOWING INSTALLATION



ETA BED DETAIL



TYPICAL SLOPE DETAIL (1:40 @ A3)

ETA BED DIMENSIONS				
OSSM SYSTEM	**ETA BED AREA REQUIRED**	**NUMBER OF ETA BEDS**	**BED LENGTH**	**BED WIDTH**
2 BEDROOM DWELLING	45m²	2	15m	1.5m

NOTES

No.	Revision	Date	Drawn	Checked
A	ISSUED FOR COUNCIL APPROVAL	9.11.23	S.C	Checked

NORTH COAST WASTEWATER SOLUTIONS
DESIGNED: SC | DRAWN: SC | REF. NO: 2310-16
info@ncws.com.au
www.ncws.com.au

CLIENT:
Suellen Thompson
945 Woodburn Coraki Rd, Bungawalbin

Wastewater Management System
945 Woodburn Coraki Rd, Bungawalbin
ETA BED DETAIL

PLAN NUMBER 2310-16.2
PLAN IN SET 2 of 2
SCALES AS SHOWN @ A3
DATE: 9.11.23