

Trine Solutions Pty Ltd

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On-site Wastewater Management Systems

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THE GENERAL MANAGER

BYRON SHIRE COUNCIL

ON-SITE WASTEWATER MANAGEMENT LAND CAPABILITY ASSESSMENT

FOR

PROPOSED DWELLING ENTITLEMENT

AT

**LOT 10 DP: 586360
114 STEWARTS ROAD
CLUNES**

OWNER

John Stewart

SITE INVESTIGATION

TRINE SOLUTIONS

DATE

10th November 2020

Report No: TS21430

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List of Attachments

1. Illustration 1: Subject Site – Balanced Systems Planning Consultants
2. Byron OSMS Design Model spread sheets

1.0 INTRODUCTION

Trine Solutions Pty Ltd has been commissioned by the applicant to prepare an On-site Wastewater Management Land Capability Assessment Report for a proposed Dwelling Entitlement at Lot 10 DP: 586360 / 114 Stewarts Road Clunes.

The site is not connected to a centralised sewerage treatment system and will require approval for an on-site wastewater treatment system to service the proposed Dwelling Entitlement. The site contains an existing dwelling building that then will be subject to a future Development Application and Building Certificate.

The assessment will be based on calculations required for an assumed three (3) bedroom dwelling.

The report describes the site conditions as they effect the land application of effluent, presents the results of field testing, provides advice and recommendations on the available options for on-site wastewater management. Calculations for sizing of land area requirements are based on the methods set out in AS/NZ 1547:2012 – Appendix L - Land Application Methods and Byron Shire Council – Design Guidelines for On-site Sewage Management for Single Households – 1 December 2004.

2.0 THE SITE AND SURROUNDING ENVIRONMENT

The site and the surrounding environment are as depicted within Photo Plates 1, 2 and 3.

The physical attributes of the lot with an area of approximately 2.9ha are more closely associated with the Rosebank landscape, rolling low hills and hills on Lismore Basalts. Relief 70-100m, slopes 20-40%.

Ridges and crests are convex and moderately broad (100-300m). Ridge slopes, side slopes and isolated hills are common. Extensively cleared closed native forest, now predominately sod grassland with large areas of closed camphor laurel forest.

The lot sits on a broad ridgeline with ample area for wastewater application with slopes varying from 0-10% all with good wind and sun exposure. The lot has been extensively landscaped with varied plantings and grassed areas.

There are no major site constraints for wastewater application, a creek line traverses the valley floor approximately 40m off the centre of the western boundary, then just crosses the north-western corner of the lot. There is ample area on the lot that achieves a $\geq 100\text{m}$ buffer to the creek.

3.0 DESIGN PRINCIPLES OF WASTEWATER MANAGEMENT

The design principles adopted for effective wastewater management for the proposed development are:

- Cost effective
- Sustainable for the life of the development
- Reuse of resources where possible

4.0 SITE ASSESSMENT

The Site

Plate 1



Plate 2



Plate 3



5.0 SOIL ASSESSMENT

The soil classification and profile description is consistent with published works by Morand titled 'Soil Landscapes of the Lismore - Ballina 1:100 000 Sheet'

Soil description

Soil Landscape	Erosional – rolling low hills and hills on Lismore Basalts
Grouping	ro – Rosebank
Description	Moderately deep to deep (>100cm) Krasnozems and brownish red well drained Krasnozems
Limitations	High aluminium toxicity potential with localised rock outcrops

Morand states that the soils are not limited for the application of effluent and a percolation rate in the order of 0.3m-1m/day can be achieved.

The complete results of the site assessment have been summarized in the table below.

TABLE OF SITE CHARACTERISTICS:	
Soil:	Clay Loam
Land area:	Not limited - 2.9ha
Flood Potential:	Nil
Exposure	Good wind & sun exposure
Slope %	5-10%
Landform	The sub-soils are moderately well drained
Run-on and up-slope seepage	Nil
Erosion potential	Nil
Site drainage	Good
Buffer distance	All buffers met
Depth to bedrock	>3m
Geology/regolith	The underlying stratum provides good internal drainage
Exchangeable Sodium Percentage	Not limiting
Permeability (Ksat)	0.3m/day
Emerson Aggregate Test	Dispersive class - 5 or 6

6.0 WASTEWATER MANAGEMENT OPTIONS

Treatment standard

The minimum treatment standard considered appropriate for the site is Secondary Treatment. This will ensure the bacterial and nutrient quality will not compromise the soil structure. To achieve this standard, it is recommended a passive system be installed such as a septic tank with minimum capacity as per the current Standard AS/NZS 1547:2012. The most appropriate method for achieving a passive secondary treatment is sand filters or constructed wetlands.

Land Application Method

No limitation exists for applying effluent to the land as ample land areas suitable are available as evident in the photo plates

The recommendation considered appropriate to comply with design principles is constructed wetlands discharging to ETA beds

The typical land area requirements are detailed below. It should be noted that the hydraulic load generated from the proposed dwelling entitlement will be based on an assumed (say) 3-bedroom dwelling (roof harvest water supply – 517.5L/day / 4.5 persons @ 115L/per person/day).

7.0 SIZING OF CONSTRUCTED WETLANDS

It is proposed to incorporate sub-surface flow constructed wetlands to achieve secondary treatment of all effluent generated from the proposed development.

The above parameters have been factored into the **Byron OSMS Design Model** with a constructed wetland as the nominated method for achieving Secondary Treatment at this site.

Constructed Wetland Area required = 10.2m²

8.0 SIZING OF APPLICATION BEDS

The above parameters have been factored into the **Byron OSMS Design Model** with a constructed wetland as the nominated method for achieving Secondary Treatment at this site.

ETA Bed Area required = 68m² or 2 x 18.15 x 1.2m ETA beds.

***Byron OSMS spread sheets attached**

9.0 SUMMARY AND CONCLUSIONS

The site and soil assessment demonstrates that appropriate sustainable arrangements can be made for on-site sewage management for all wastewater generated from the proposed dwelling entitlement at this site. This is based on the following observations and recommendations:

- ✓ Site is not constrained by land area available
- ✓ Suitable soils for wastewater application
- ✓ Secondary Treatment via Constructed Wetlands recommended
- ✓ Passive energy efficient treatment system
- ✓ Sustainable for the life of the development

10.0 REFERENCES

Australian Standard AS/NZS 1547:2012 - On-Site Domestic-Wastewater Management.

Plumbing Code of Australia – NCC 2019 – Volume Three

Byron Shire Council - Design Guidelines for On-Site Sewage Management Systems for Single Households. (1 December, 2004)

Crites – Tchobanoglous (1998) - Small and Decentralized Wastewater Management Systems

Metcalf & Eddy – Wastewater Engineering - Third Edition

G. Swarbrick – Short Course in Waste Management – University N.S.W. 1996

Department of Land and Water Conservation NSW - The Constructed Wetlands Manual Volume 2

Ratcliff (1983) Published Paper

W Cromer, E Gardner & P Beavers - Published Paper - On-site '01 Armidale, 2001

Metcalf & Eddy (1991) Wastewater Engineering 3rd Edition

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

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

End of Report

Bradford Nicholson
Trine Solutions P/L

Head count by (1) bedrooms / (2) persons	1
Bedrooms (gp1)	3
Bedrooms (gp2)	0
Persons (grp 1)	5
Persons (grp 2)	0
Block size (ha)	29000
Setback type listbox	1
Setback distance (m)	100
Daily Effluent Flow per person (L/day)	115
Daily effluent water supply type listbox	4
toilet g1 tickbox	TRUE
bath g1 tickbox	TRUE
laundry g1 tickbox	TRUE
kitchen g1 tickbox	TRUE
toilet g2 tickbox	FALSE
bath g2 tickbox	FALSE
laundry g2 tickbox	FALSE
kitchen g2 tickbox	FALSE
Treatment system listbox	6
% black to total wastewater in a full system: Water	32%
N production per person per year (kg/person/yr)	4.2
% black to total wastewater in a full system: TN	70%
N loss in treatment system (% reduction)	50%
N loss in disposal bed (% reduction)	40%
N Plant Uptake rate (kg/ha/year)	200
P production per person per year (kg/person/yr)	0.6
% black to total wastewater in a full system: TP	40%
P uptake by plants (Hp) (kg/ha/yr)	10
P soil sorption (Ps) (kg/ha/m depth)	10000
P soil sorption according to soil type listbox	3
Water Table Depth (Wtd) (m)	3
Buffer to Water Table (Bwt) (m)	0.5
Time for accumulation of P(years)	50
Crop factor(grass = 0.74)	1
Crop coefficient (TRUE) / crop factor (FALSE) tickbox	TRUE
% Effective Rainfall	65%
Effective Rainfall listbox	1
Percolation (mm/day)	27.36632336
Soil texture and structure beneath system listbox	6
Depth of root zone (m)	0.15
Effective porosity of root zone	0.37
Avail.Water of root zone	0.15
Soil texture in rootzone listbox	3
Depth of trench below root zone (m)	0.15
Effective porosity of trench below root zone	0.43
Avail.Water of trench below root zone	0
Permissible percentile exceedence	5.0000%
Trench width (m)	1.2
Lateral seepage width (m)	0.3
Disposal Type SSI (1) / ETA (2) listbox	2
Number of trenches (spinner button)	2
Hydraulic area (m2)	22.68
Nitrogen area (m2)	0.00
Phosphorus area (m2)	52.94
Water balance area (m2) - Cntl-q (see text)	67.50
Final area (m2)	67.50

Proposed Dwelling Entitlement
114 Stewarts Road Clunes

Byron OSMS Design Model

Version: Copy of OSMS Design Model 70 (Autosaved).xls

Set Defaults

bedrooms

persons

STEP 1

bedrooms (Grp 1)

bedrooms (Grp 2)

STEP 2

3

STEP 3

Buffer to permanent water

Buffer to intermittent water

STEP 4

Block size (m²)

29000

100

STEP 5

Daily effluent flow accord. water supply type

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

Grp1

Grp2

STEP 6

Toilet

Bathroom

Laundry

Toilet

Bathroom

Laundry

STEP 7

Wastewater stream

Septic (primary treatment only)

AWTS

Septic + single pass sandfilter (SPF)

Septic + SPF, 25% septic return flow

Septic + recirculating sandfilter

Septic + reedbed

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, og, po, ty, wy) 1,000 kg/ha/m

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)

STEP 10

Water Table/ Bedrock Depth (m)

3.00

STEP 11

% Effective Rainfall

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)

STEP 13

Land Application Type

SSI

ETA

STEP 14

Calculate (or Cntl- q)

STEP 15

ETA bed separation

0.90

STEP 16

ETA trench width (m)

1.20

STEP 17

ETA trench length (m)

18.15

STEP 18

ETA trench area (m²)

43.56

STEP 19

ETA trench depth (m)

0.15

STEP 20

ETA trench volume (m³)

0.00000

STEP 21

ETA trench separation

1.50

STEP 22

ETA trench width (m)

1.20

STEP 23

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18.15

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1.20

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ETA trench length (m)

18.15

STEP 240

ETA trench area (m²)

43.56

STEP 241

ETA trench depth (m)

0.15

STEP 242

ETA trench volume (m³)

0.00000

STEP 243

ETA trench separation

1.50

STEP 244

ETA trench width (m)

1.20

STEP 245

ETA trench length (m)

18.15

STEP 246

ETA trench area (m²)

43.56

STEP 247

ETA trench depth (m)

0.15

STEP 248

ETA trench volume (m³)

0.00000

STEP 249

ETA trench separation

1.50

STEP 250

ETA trench width (m)

1.20

STEP 251

ETA trench length (m)

18.15

STEP 252

ETA trench area (m²)

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STEP 253

ETA trench depth (m)

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ETA trench volume (m³)

0.00000

STEP 255

ETA trench separation

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STEP 256

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ETA trench volume (m³)

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ETA trench separation

1.50

STEP 310

ETA trench width (m)

1.20

STEP 311

ETA trench length (m)

18.15

STEP 312

ETA trench area (m²)

43.56

STEP 313

ETA trench depth (m)

0.15

STEP 314

ETA trench volume (m³)

0.00000

STEP 315

ETA trench separation

1.50

STEP 316

ETA trench width (m)

1.20

STEP 317

ETA trench length (m)

18.15

STEP 318

ETA trench area (m²)

43.56

STEP 319

ETA trench depth (m)

0.15

STEP 320

ETA trench volume (m³)

0.00000

STEP 321

ETA trench separation

1.50

STEP 322

ETA trench width (m)

1.20

STEP 323

ETA trench length (m)

18.15



Lot 10 DP 586360
114 Stewarts Road
Clunes

Planning Proposal:
Dwelling Entitlement

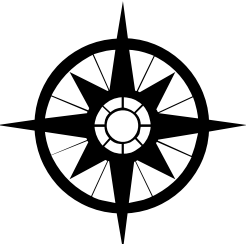
Illustration 1:
Subject Site

Legend

-  Subject Site
-  Lot
-  Contour (10m)
-  Watercourse

Scale: A3
Datum: GDA94
Projection: MGA Zone 56
Date: 01/11/2020
Version 1.0
LGA: Byron
Parish: Bexhill

Data Source:
Cadastral, Topographic Data: LPI NSW 2020
LiDAR Data: NSW Spatial Services
Imagery: Nearmap 2020



1:1,000



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