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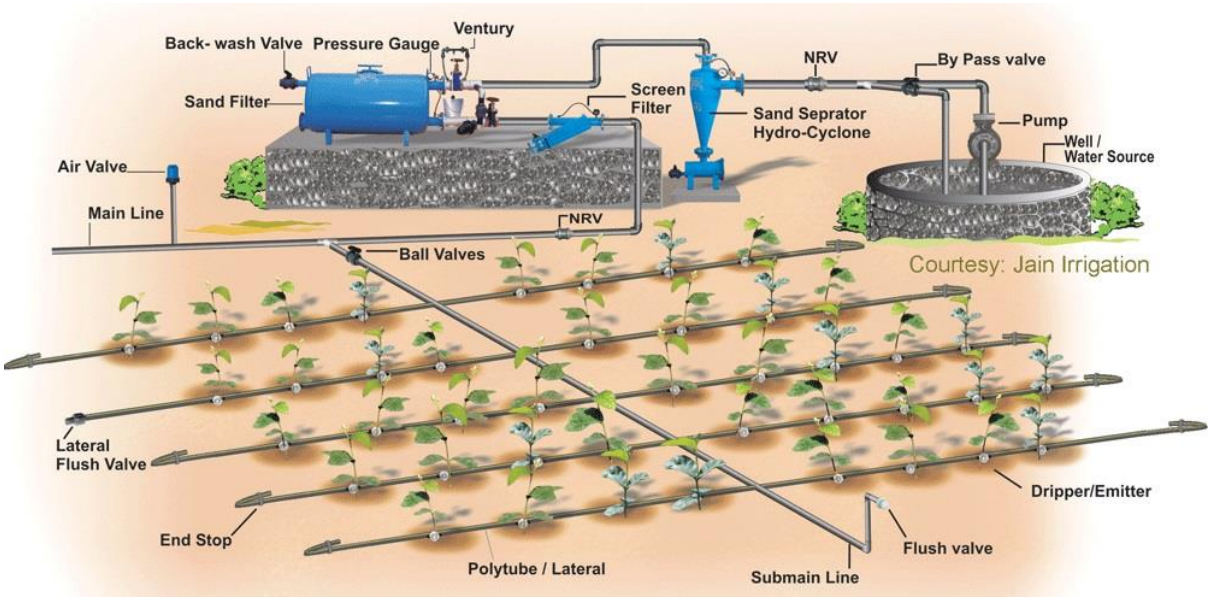
PRELIMINARY ON-SITE WASTEWATER MANAGEMENT SITE EVALUATION REPORT



Client:	Development Nous Limited Hastings
Project:	Springhill Subdivision
Location:	Corner of State Highway 50 and 612 Wakarara Road, Ongaonga
Prepared by:	Professor Freeman J Cook, Environmental Physicist, Freeman Cook and Associates Pty LTD
Date	16 April 2021

Table of Contents

Introduction

This report has been prepared by Professor Freeman J Cook for Development Nous Limited. It is a preliminary report only, based on a desk top study of relevant information from various sources and scheme plan supplied by Development Nous Limited.

The intent of this report is to provide expert advice on Effluent Management options for the proposed subdivision. This report has only assessed in a general sense the wastewater management options and when the project goes forward the individual lots within the development will need specific On-Site design.

The report is “preliminary” and all comments and recommendations are solely with reference to the Overall Scheme Layout Plan drawing number H20210003-CO10.

Sources of Information

The Sources of information used in this assessment are listed below:

- Development Nous Limited
- Geotechnical Report (Initia Geotechnical Specialists, 2021)
- Hawkes’s Bay Regional Resource Management Plan (HBRRMP, 2015)
- Landcare Research S-Maps (https://soils.landcareresearch.co.nz/soil-data/s-map-and-s-map-online/)
- NIWA Cliflo (https://cliflo.niwa.co.nz/)
- Central Hawke’s Bay District Council GIS
- Google Earth Pro
- Scientific literature (see references)

Site Information

The location is shown in in figure 1 and the lot layout of the proposed scheme plan in figure 3.

Figure 1. Site location outline with black line, sited on the corner of Wakarara Road and State Highway 2.

The site is generally rectangular in shape with a length of approximately 2000 m and width of 1000 m. The subdivision proposes the creation of 312 rural sized lots with a median lot size of 5895 m^2, maximum of 1.5 ha and minimum of 4010 m^2. The majority (287) of the lots are less than 1 ha in area.

All lots are larger than the 2500 m^2 minimum land area for wastewater discharge with no more than advanced primary treatment as a permitted activity pursuant to Rule 37 Condition a of the Hawke's Bay Regional Resource Management Plan (HBRRMP).

Topography

The proposed development is located on land with a slope of less than 5% and generally less than 1%. An ephemeral stream channel passes across the southern end of the site before continuing under State Highway 50 at Chestermans Bridge (figure 1, figure 2). Wastewater systems installed in proximity of **this ephemeral waterway will need to provide a minimum of 20m separation between the dispersal field and the water channel to accord with Rule 37 Condition e of the HBRRMP.**

The Waipawa River runs to the north of the site but is over 1.2 km away from the northern boundary of the proposed development, so does not need to be considered.

Figure 2. Photograph showing Chestermans bridge (left hand panel) and of the ephemeral creek (right hand panel).

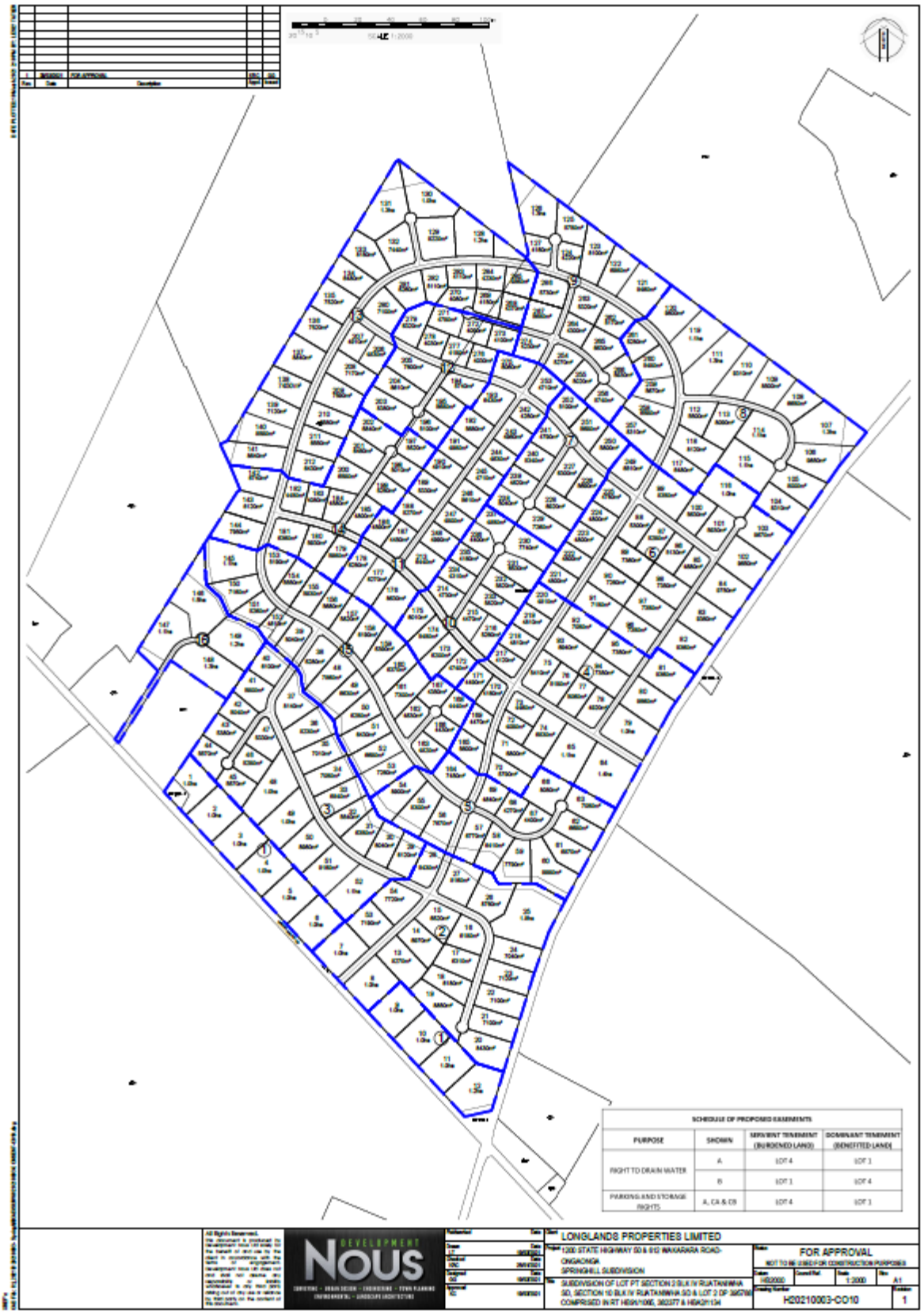


Figure 3. Proposed Scheme Plan.

Soil

The site has three soil types according to the Manaaki Whenua S-Map soil mapping resource; Bushgate_14a.1, Mangatewai_3a.1 and Tararu_6a.1. The proposed development area is shown on the soil map in figure 4.

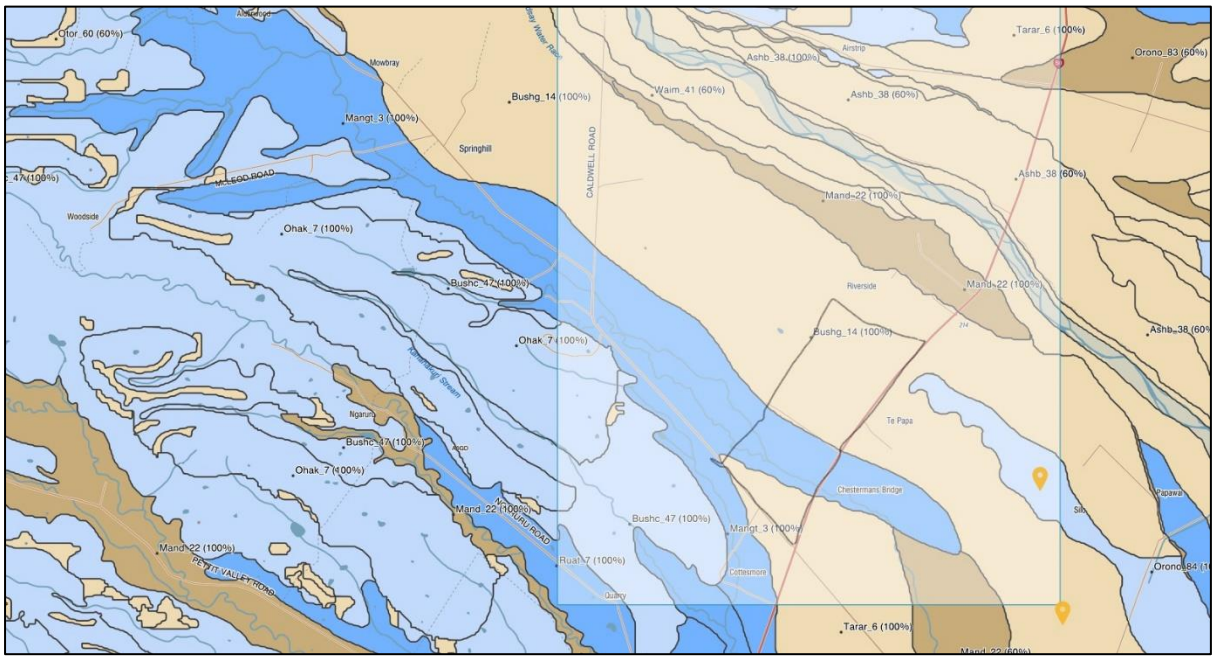


Figure 4. Soil map from S_MAPS with black rectangle identifying general area of the proposed development.

The soils on this site consist of the Bushgate over the northern two thirds of the area. The Tararu soil covers a triangular area to the south east and the rest is the Mangatewai soil (in blue on map).

Bushgate soil

The Bushgate soil has a loamy topsoil for the top 30 cm with rapid to moderate permeability and rapid permeability in the gravel below this (Appendix 1). Lots on this soil could use any of the primary disposal methods of trenches, beds or subsoil irrigation.

Mangatewai soil

The Mangatewai soil has a loamy topsoil with rapid to moderate permeability but the preponderance of gravel below a depth of 0.4 m is considered a restriction and the permeability is only described as moderate to slow (Appendix 1). Lots on this soil could use subsurface drip irrigation.

Tararu soil

The Tararu soil has a loamy topsoil with rapid to moderate permeability and a good depth of loamy soil to 0.55 m. The gravel below 0.55 m is considered to have a moderate permeability (Appendix1). Lots on this soil could use any three of the disposal methods but given the depth of loamy soil subsoil, irrigation would be a better in this semi-arid climate.

Geotechnical Survey

The geotechnical survey of the development site (Initia Geotechnical Specialists, 2021) is consistent with the S_MAPS descriptions of the soils. The bore logs show a varying depth of fine material on top of gravels with a hard silt capping in some bores.

Climate

This region is semi-arid. Climate data applicable to the wider area is available from Waipukurau airport for the period from 29/3/1972 to 1/1/1988, a period of 5761 days. The total rainfall in this period was 13012 mm and the reference evapotranspiration (ET0) was 16841 mm (calculated using FAO-56

(Allen et al., 1998)) giving a potential moisture deficit of 3829 mm. The potential daily water balance (DWB = rainfall – ET0) was calculated and median value was -2 mm/day. The minimum DWB was -11 mm and the maximum 94 mm. This indicates that a large proportion of the wastewater will be taken up by plants over a dispersal field.

ON-SITE EFFLUENT MANAGEMENT

There are three significant controlling factors that will influence where and how effluent from proposed homes will be applied to land:

- Degree of slope
- Variation of contour and,
- Subsoil category.

The first two controlling factors are not an issue for this development.

Firstly, we need to consider if the net site area to wastewater discharge meets the permitted activity status discharge rate of Rule 37 Condition aAii of the HBRRMP. The minimum lot size is 4010 m^2. For a four bedroom home with an occupancy of 6 people and water supply from rainwater tanks the daily wastewater discharge is 6x180 = 1080 litres/day. The ratio of area to daily discharge is 4010/1080= 3.71, which exceeds the minimum requirement of 1.5m^2 per litre per day.

The soils data suggest that different methods of disposal could be used on different Lots dependent on soil type. The disposal methods and area required for each soil type based on daily discharge of 1080 litres/day are given in Table 1. The area required for the trenches is based on the design specifications of a width of 0.3 m and spacing of 1 m between trenches provided at 6.3.2 of the HBRRMP. The area required for the beds is based on the design specifications of 1 m width and 1 m spacing between adjacent beds again provided at 6.3.2 of the HBRRMP. Both trenches and beds are calculated as 25 m length, which is the maximum length again provided in 6.3.2b of the HBRRMP.

Table 1. Calculated disposal area dependent on method of disposal. Rates are from HBRRMP (2015, Tables 6.2.1 and 6.3.1) and areas are calculated using design specifications HBRRMP (2015, 6.2.2 and 6.3.2). Dripper spacing based on estimation with WetUp (Cook et al., 2003).

Soil	Disposal method	Design irrigation rate (mm/day)	No. of trenches /beds	Area required (m^2)	Dripper spacing (m)	Volume per dripper (l)	No. of drippers	Area (m^2)
Bushgate Tararu	Trench	20	8	235				
Bushgate Tararu	Beds	20	3	125				
Bushgate Tararu,	Subsoil drip	4			0.3	0.36	3000	270
Mangatewai	Subsoil drip	4			0.5	1	1080	270

The WetUp software (Cook et al., 2003) was used to estimate wetting depths, rise above the dripper and radius of wetting. From this the dripper spacing was estimated (Table 1) and the results indicated that the depth of installation should be approximately 0.15 m below the soil and depth of wetting will be between 0.3 and 0.4 m below the soil surface. The suggested spacings are less than 0.6 m which is the maximum spacing provided in 6.2.2c of the HBRRMP.

Impact on Surface Water

There is an ephemeral stream that runs through this site, so no disposal areas can be within 20 m of this on Lots that abut this creek.

The Waipawa river is over 1 km from the northern edge of the development, so no impact is expected.

Impact on Ground Water

The ground water at this site is at greater than 2 m below the soil surface (Initia Geotechnical Specialists, 2021) which is greater than the required depth below the discharge depth 0.6 m (HBRRMP Rule 37 Condition J). No impact on groundwater would seem likely from this development. The pathogens, nitrogen and phosphorus can be expected to be reduced due to uptake by plants, soil and consumption by soil microorganisms.

Impact on Soils

The nitrogen and phosphorus will be taken up by the plants and to avoid accumulation the herbage should be removed following cutting and the disposal area should not be fertilised with fertilisers containing nitrogen and phosphorus. Some application of potassium and micro-nutrients may be required from time to time.

Land Stability

Effluent application will be applied on an area with low slopes and gravel subsoils, so no stability issues are envisaged,

STATUTORY

Provide recognised design and installation methods as set out in on-site design manuals such as TP58 and AS/NZ1547:2012 and local regulatory requirements are met sustainable on-site effluent management should be achievable for this development.

SUMMARY/CONCLUSIONS

This scheme presents a low-density subdivision providing rural lots within a rural area that are likely to be developed for rural residential purposes. Based on the scheme plan information provided by Development Nous Limited my conclusion is that the wastewater from this development will have minor environment effect. The soils vary across the development area and individual assessment should be carried out at each site before the on-site wastewater systems is installed. In combination the subdivision form, site soils and wider environmental conditions of the site do not present any obstacle to the achievement of on-site domestic wastewater dispersal required for reasonably envisaged residential development of the lots.

Professor Freeman J Cook

Principal Scientist/Director

B.Sc, Dip. Agric. Sci., M.Phil (Massey University); PhD (University of Technology Sydney)

Fellow MSSANZ

American Geophysical Union, member

References

Allen RG Pereira LS, Rae D and Smith M (1998). Crop evapotranspiration: Guidelines for computing crop requirements. Irrigation and Drainage Paper No. 56, FAO, Rome, Itay, 300p.

AS/NZS1547:2012. On-site Domestic Wastewater Management. Wellington New Zealand.

Cook FJ, Thorburn PJ, Fitch P and Bristow KL (2003). WetUp: a software tool to display approximate wetting patterns from drippers. *Irr. Sci.*, **22**:129-134.

HBRRMP (2015). Chapter 6 Regional Rules. Hawkes Bay Regional Resource Management Plan. 86p.

Initia Geotechnical Specialists (2021). Springhill farm lifestyle development. Preliminary geotechnical assessment. Initia Ref P-001061 Rev 1, 60p.

TP58 (2004) On-Site Wastewater Systems Design and Management Manual. Auckland Regional Council Technical Publication 58.

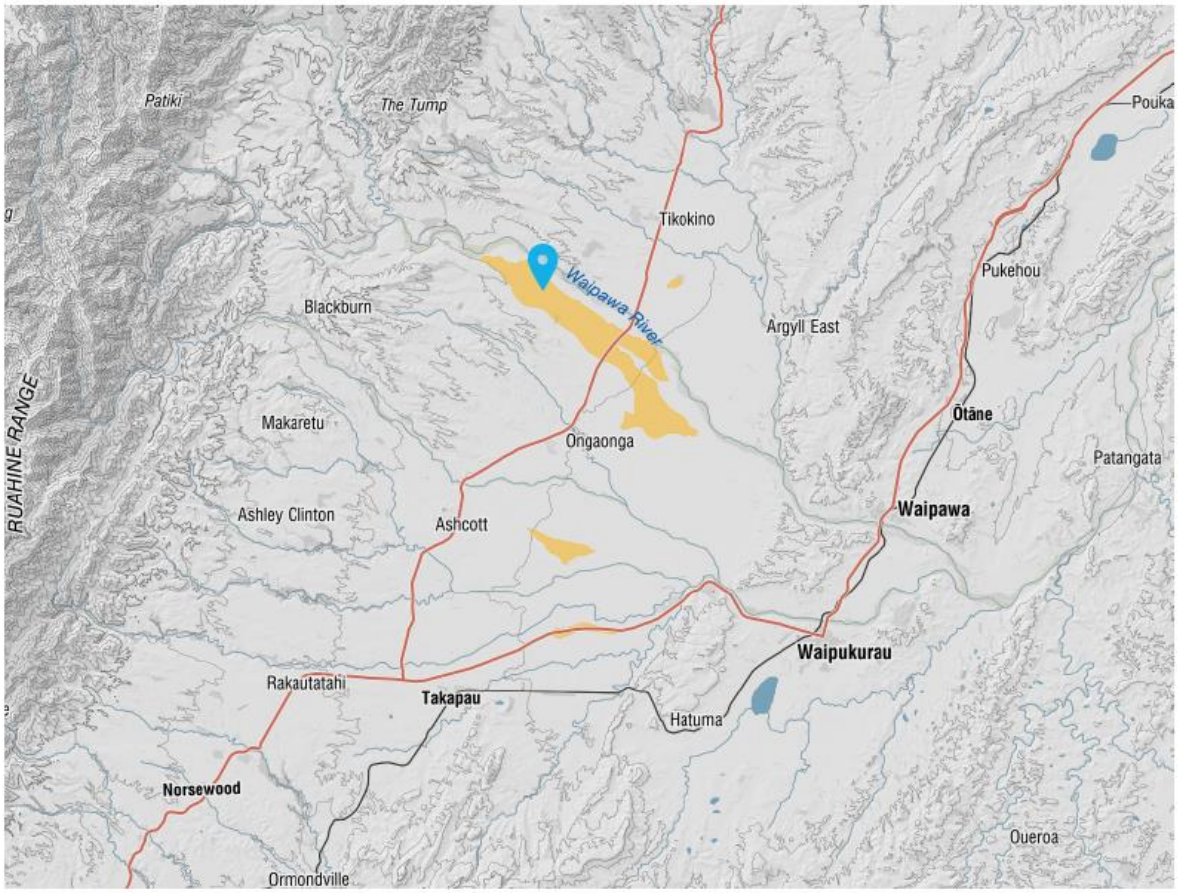
Appendix 1. Soil data

Bushgate Soil

Soil map unit factsheet

Report generated: 10/04/2021 from https://smap.landcareresearch.co.nz/maps-and-tools/app/?url=/print-soil-map-unit-factsheet/&gislayer=HawkesBay&soilmapuc=rt_SHB_1000008&pinCoordinate=1890314.3911806059%2C5583138.852209832

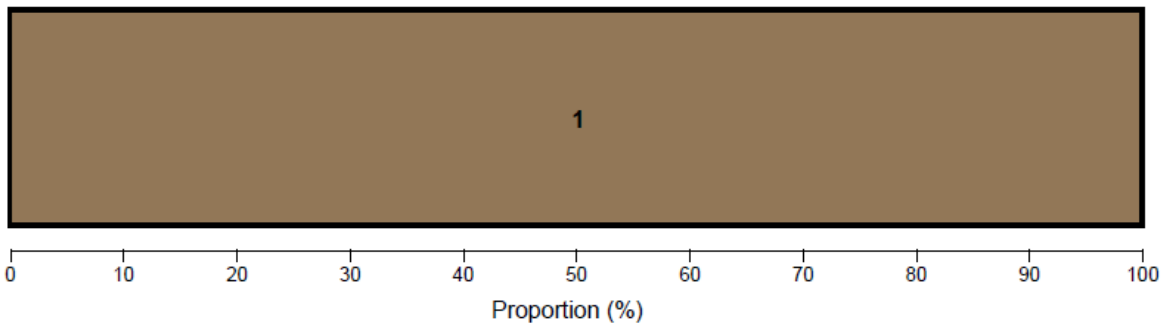
Areas with HawkesBay\rt_SHB_1000008 map unit code are shown on the map below. A soil map unit is a collection of areas that have the same soils (i.e. siblings) in the same proportion.



Map contains data sourced from LINZ. Crown Copyright Reserved

Proportion of siblings in this map unit

Graph is coloured according to the NZSC soil order of each sibling within this map unit.



Sibling	Soil Order
1: Bushgate_14a.1 (100%)	Brown

Soil properties of the siblings within the soil map unit

This table shows the details of the soil siblings within the map unit. The profile available water (Paw) is a measure of the capacity of the soil sibling to store water to a depth of 1 metre. Click the links below to find out more about each item:

Soil Order, Drainage Class, Depth Class

No.	Smap name	Proportion (%)	Depth	Texture	Drainage class	PAW (mm)	Order
1	Bushgate_14a.1	100	Shallow	silt	Well drained	111.8	Brown

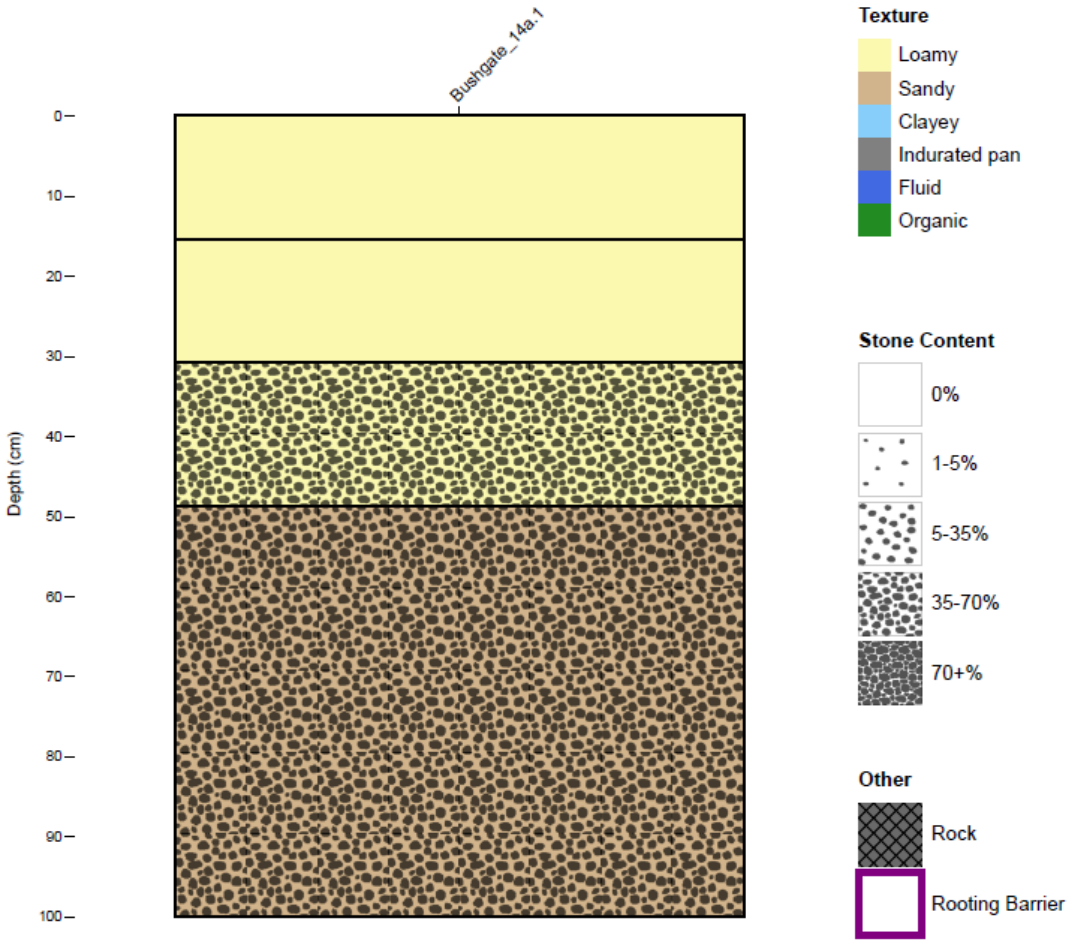
Soil Survey

This soil mapunit was mapped within the following soil survey:

Survey Title: Survey of the Ruataniwha Plains (Elwyn Griffiths, Malcolm Reeves, Sharn Hainsworth)
Survey Scale: 50000
Survey Date: 2004
Origin: legacy update major
Map Unit Delineation Method: Hand-drawn
Map Unit Labelling Method: Observations
Sibling Base Property Classification Method: Observations
Description: Mapping based on adequate to good supporting layers and observations in a mod to highly predictable landscape. Or mapping that could be Excellent but has not been statistically verified or reviewed.
Map Unit Description:

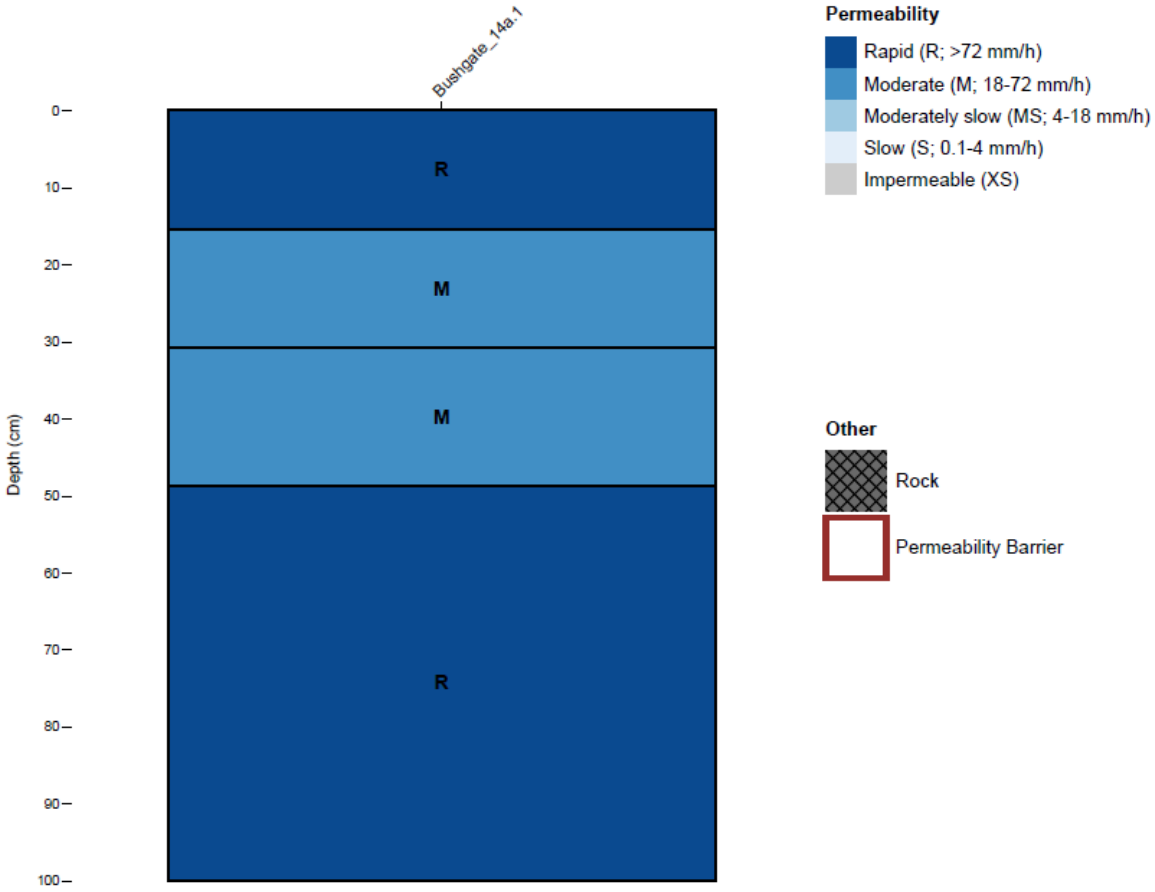
Texture graph

This graph shows the texture profile of the siblings found in the map unit. Each horizon is coloured according to its texture.



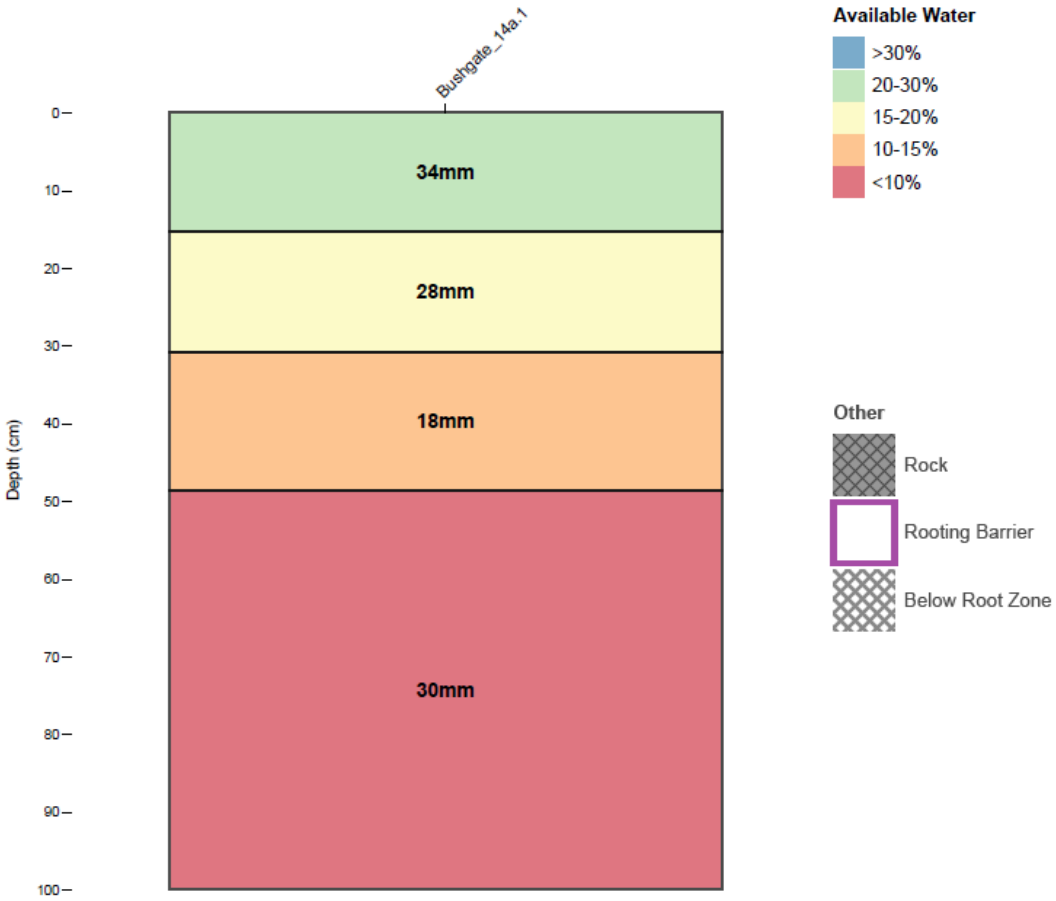
Permeability graph

This graph shows the permeability profile of the siblings found in the map unit. Each horizon is coloured according to its permeability. Click here for more information on permeability.



Available Water Graph

This graph shows the available water profile of the siblings found in the map unit. This is capacity of the soil to hold water that is available to plants. Each horizon is coloured according to its percent available water content. Click here for more information on available water.



About this publication

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Mangatewa soil

Soil map unit factsheet

Report generated: 10/04/2021 from https://smap.landcareresearch.co.nz/maps-and-tools/app/?url=/print-soil-map-unit-factsheet/&gislayer=HawkesBay&soilmapuc=rt_SHB_1000032&pinCoordinate=1890335.3911806059%2C5582018.852209832

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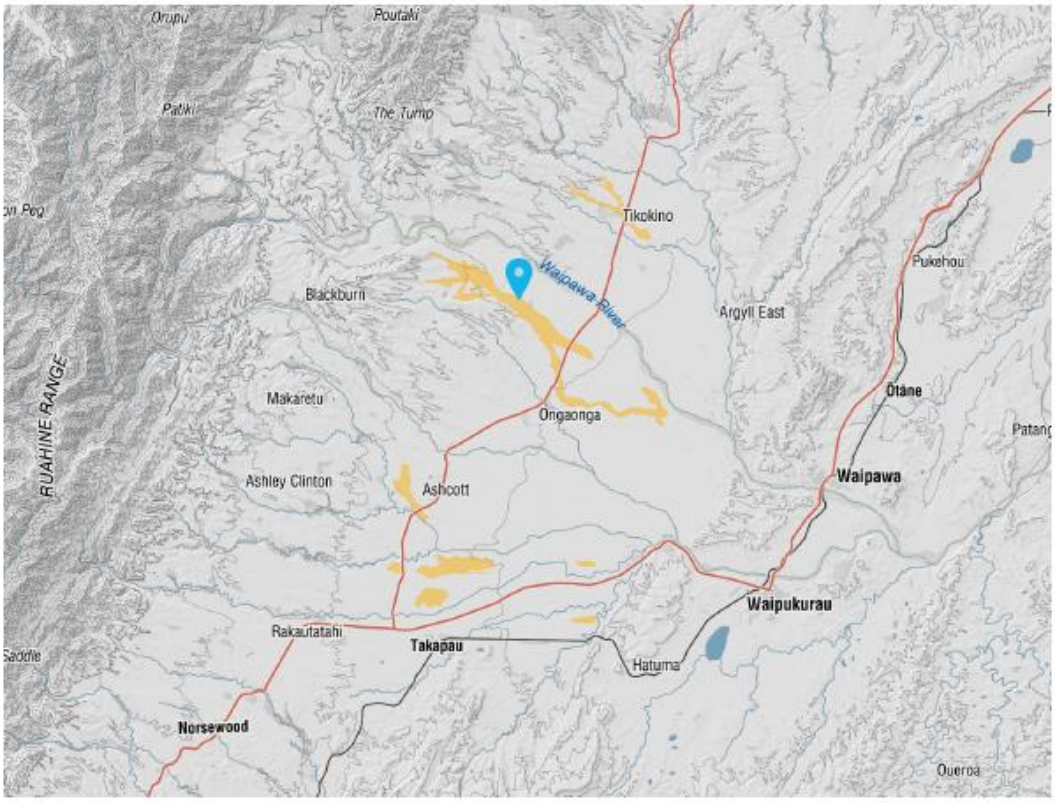
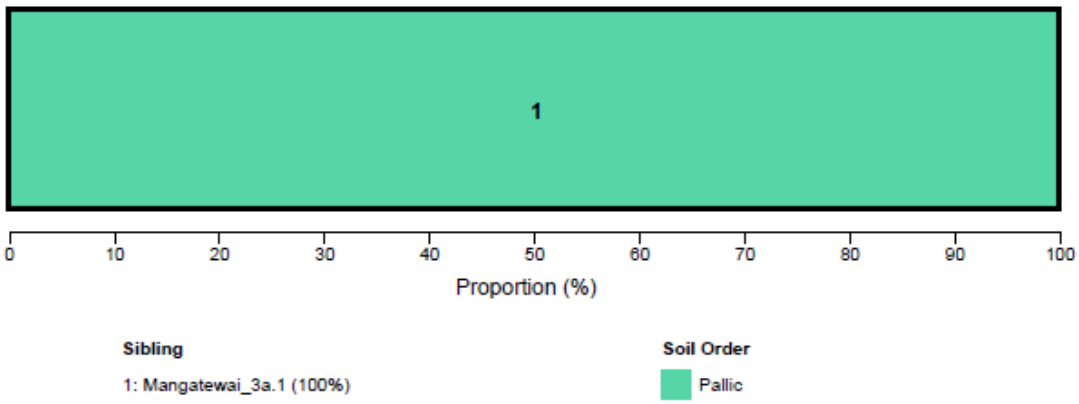


Map contains data sourced from LINZ. Crown Copyright Reserved

Proportion of siblings in this map unit

Graph is coloured according to the NZSC soil order of each sibling within this map unit.



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Soil Order, Drainage Class, Depth Class

No.	Smap name	Proportion (%)	Depth	Texture	Drainage class	PAW (mm)	Order
1	Mangatewai_3a.1	100	Shallow	silt	Poorly drained	63	Pallic

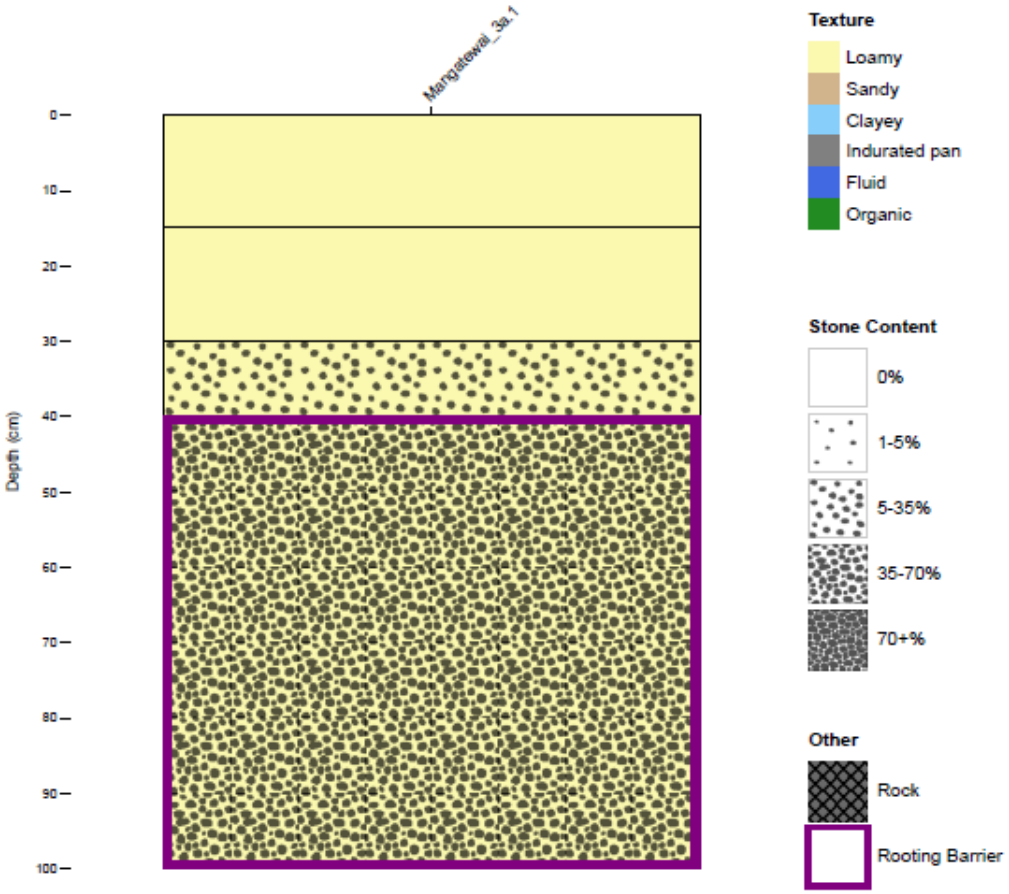
Soil Survey

This soil mapunit was mapped within the following soil survey:

Survey Title: Survey of the Ruataniwha Plains (Elwyn Griffiths, Malcolm Reeves, Sharn Hainsworth)
Survey Scale: 50000
Survey Date: 2004
Origin: legacy update major
Map Unit Delineation Method: Hand-drawn
Map Unit Labelling Method: Observations
Sibling Base Property Classification Method: Observations
Description: Mapping based on adequate to good supporting layers and observations in a mod to highly predictable landscape. Or mapping that could be Excellent but has not been statistically verified or reviewed.
Map Unit Description:

Texture graph

This graph shows the texture profile of the siblings found in the map unit. Each horizon is coloured according to its texture.



Available Water Graph

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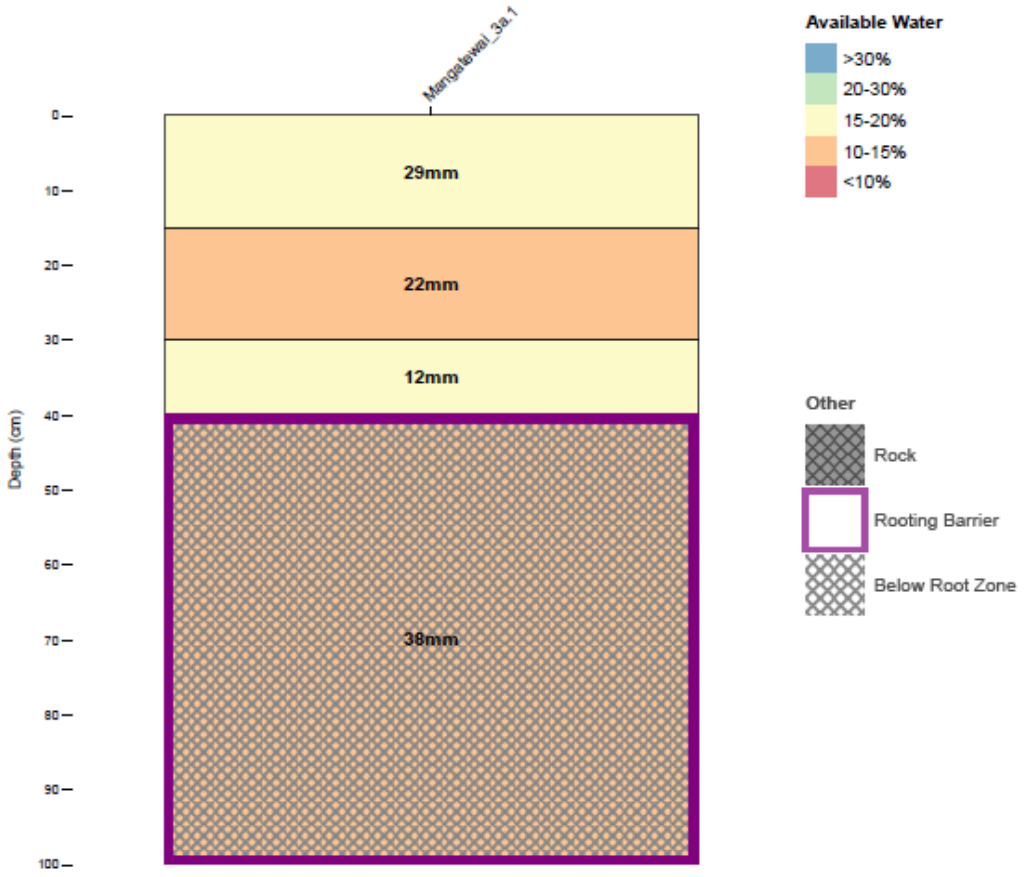
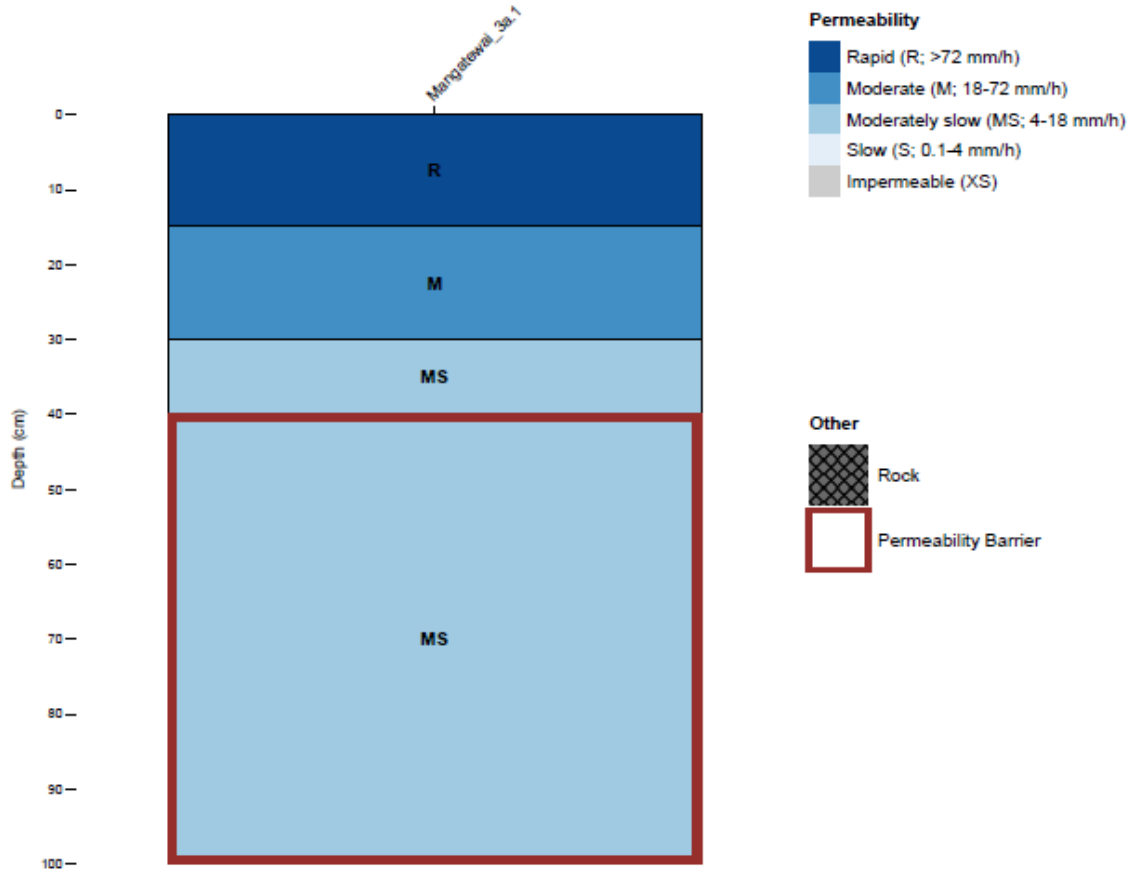


Permeability graph

This graph shows the permeability profile of the siblings found in the map unit. Each horizon is coloured according to its permeability. Click here for more information on permeability.



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Tararu soil

Soil map unit factsheet

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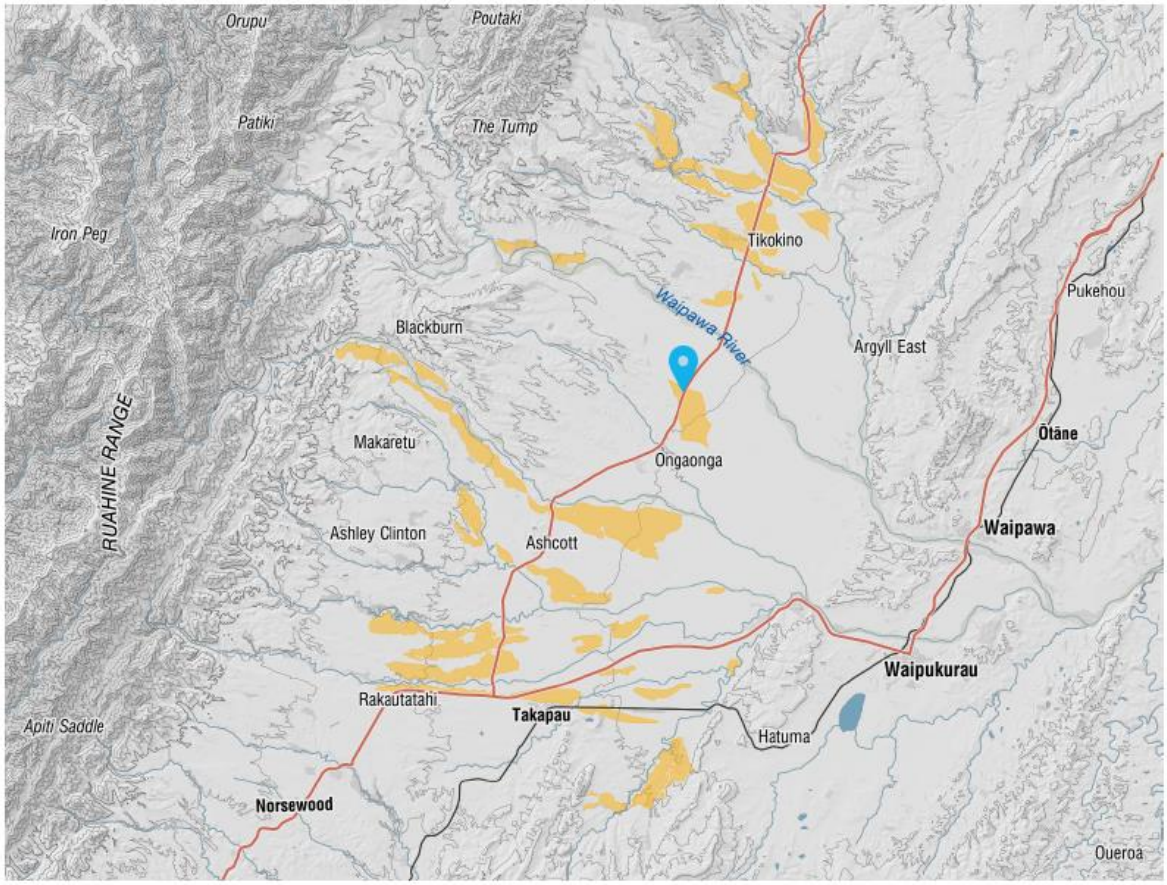

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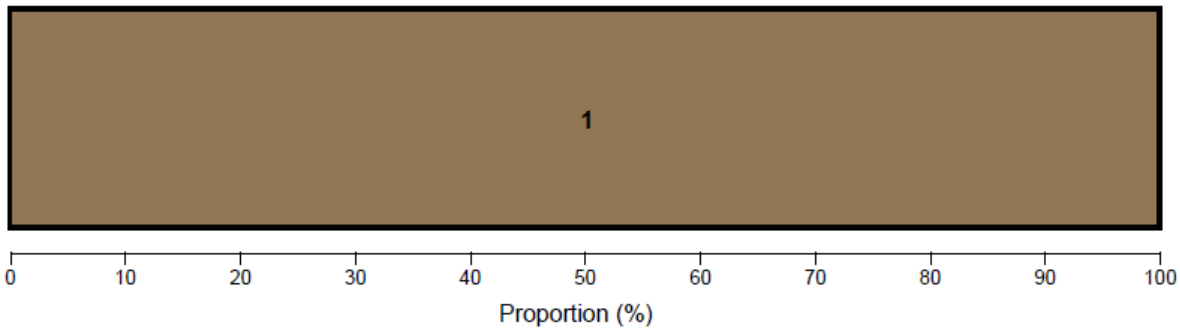

Sibling	Soil Order
1: Tararu_6a.1 (100%)	Brown

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Soil Order, Drainage Class, Depth Class

No.	Smap name	Proportion (%)	Depth	Texture	Drainage class	PAW (mm)	Order
1	Tararu_6a.1	100	Moderately Deep	silt	Well drained	144	Brown

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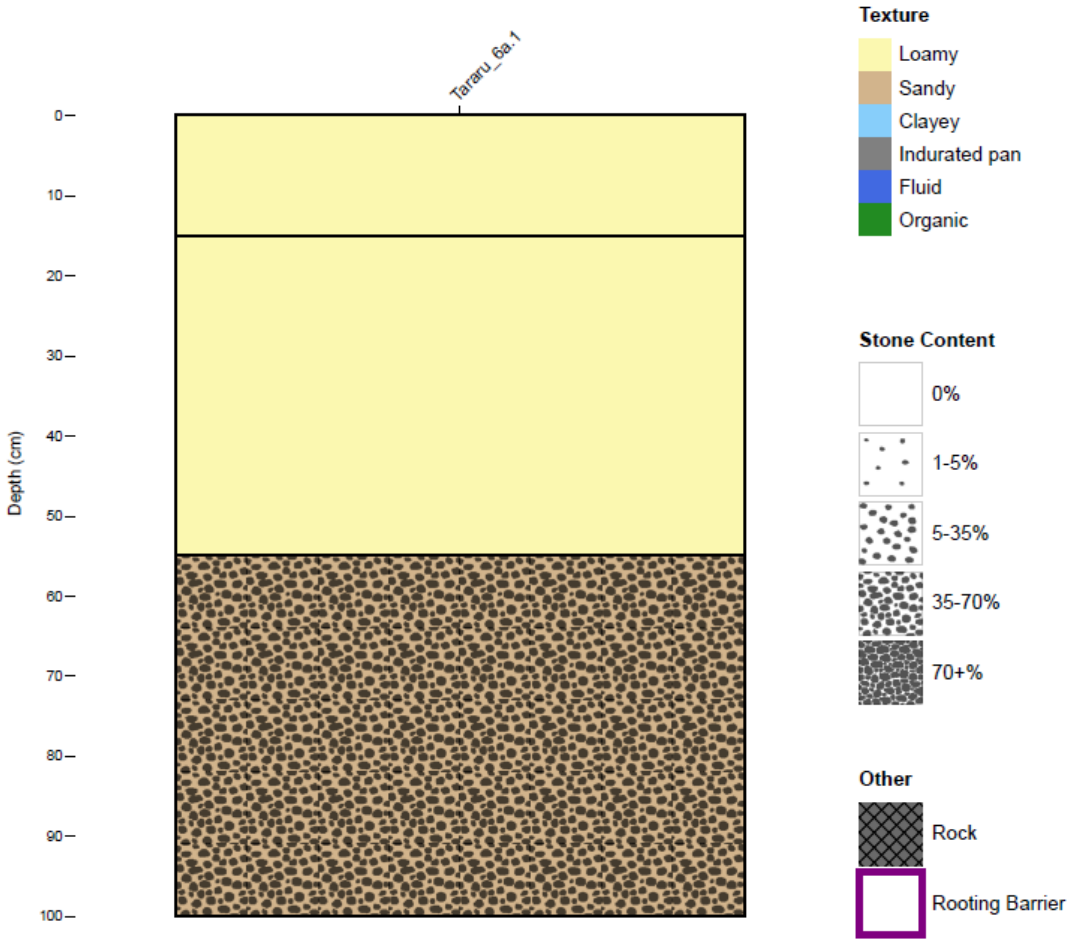

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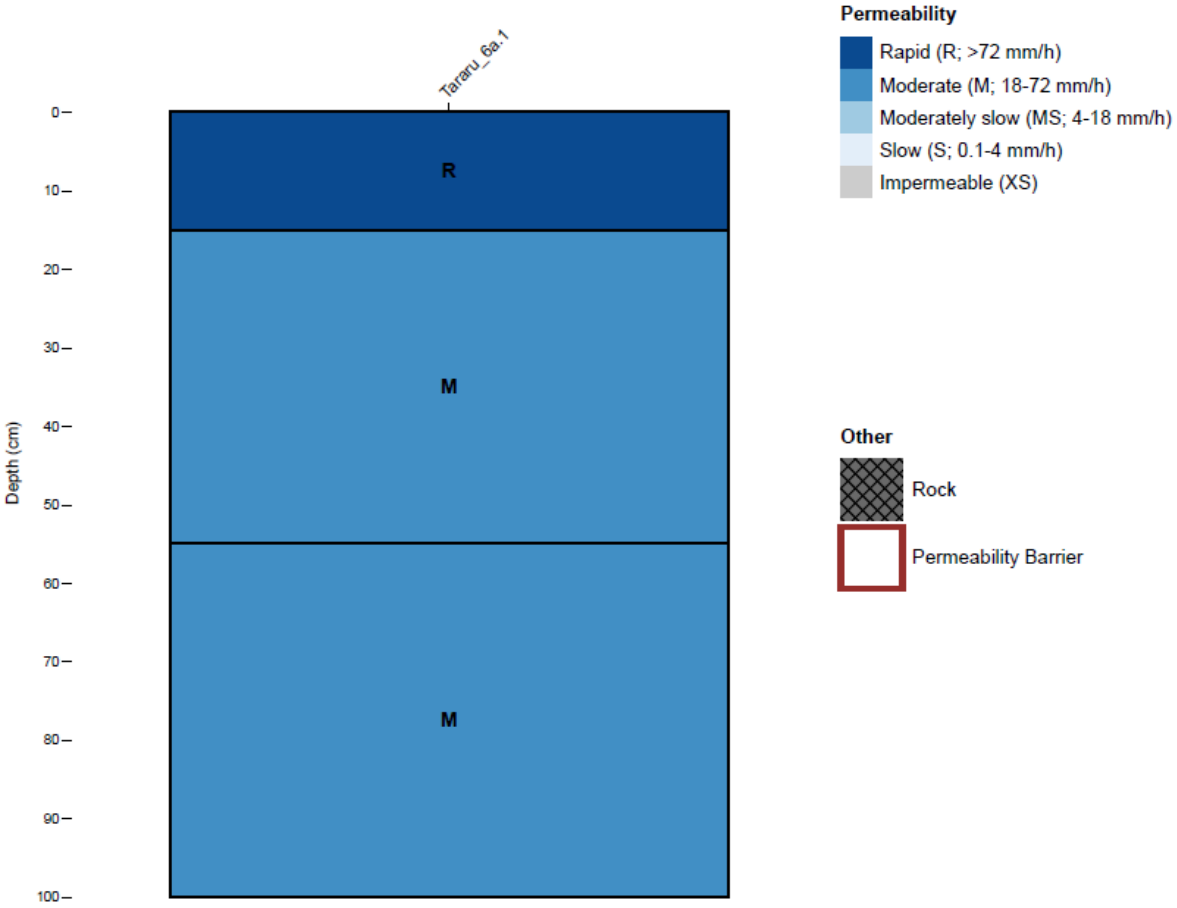

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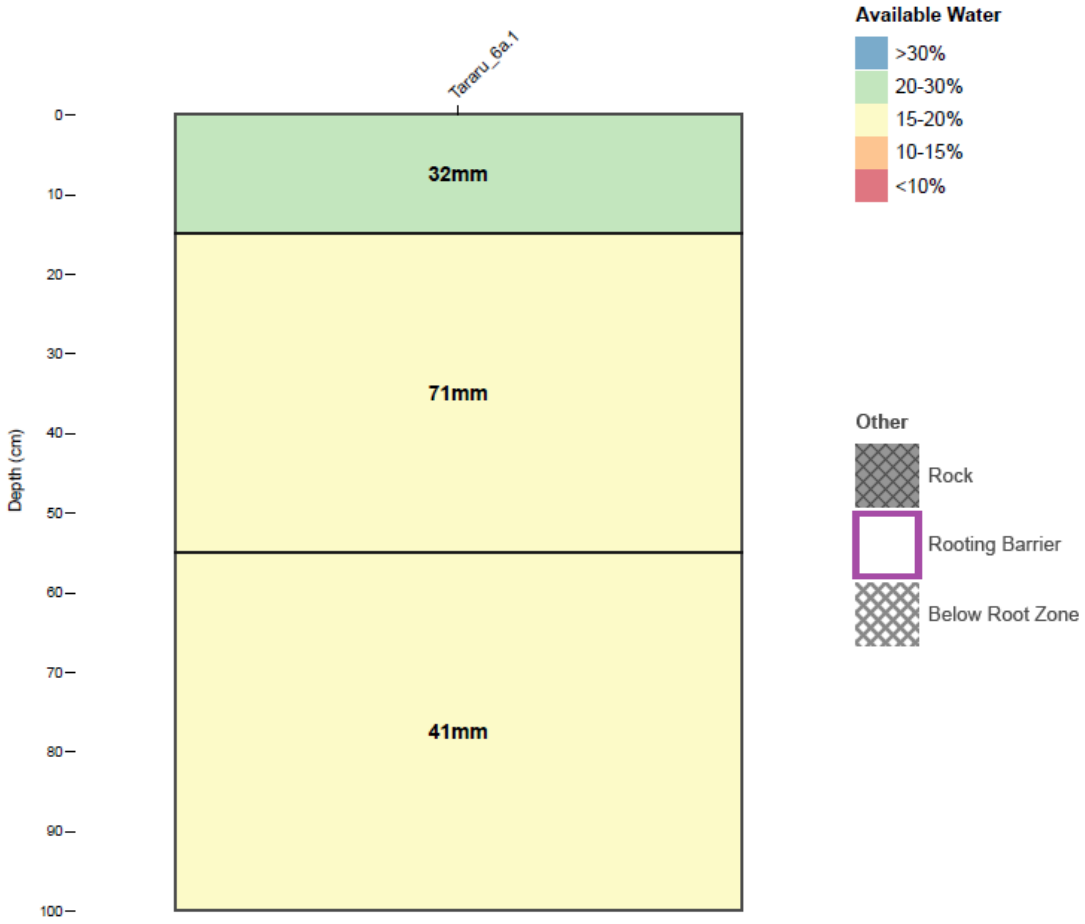

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