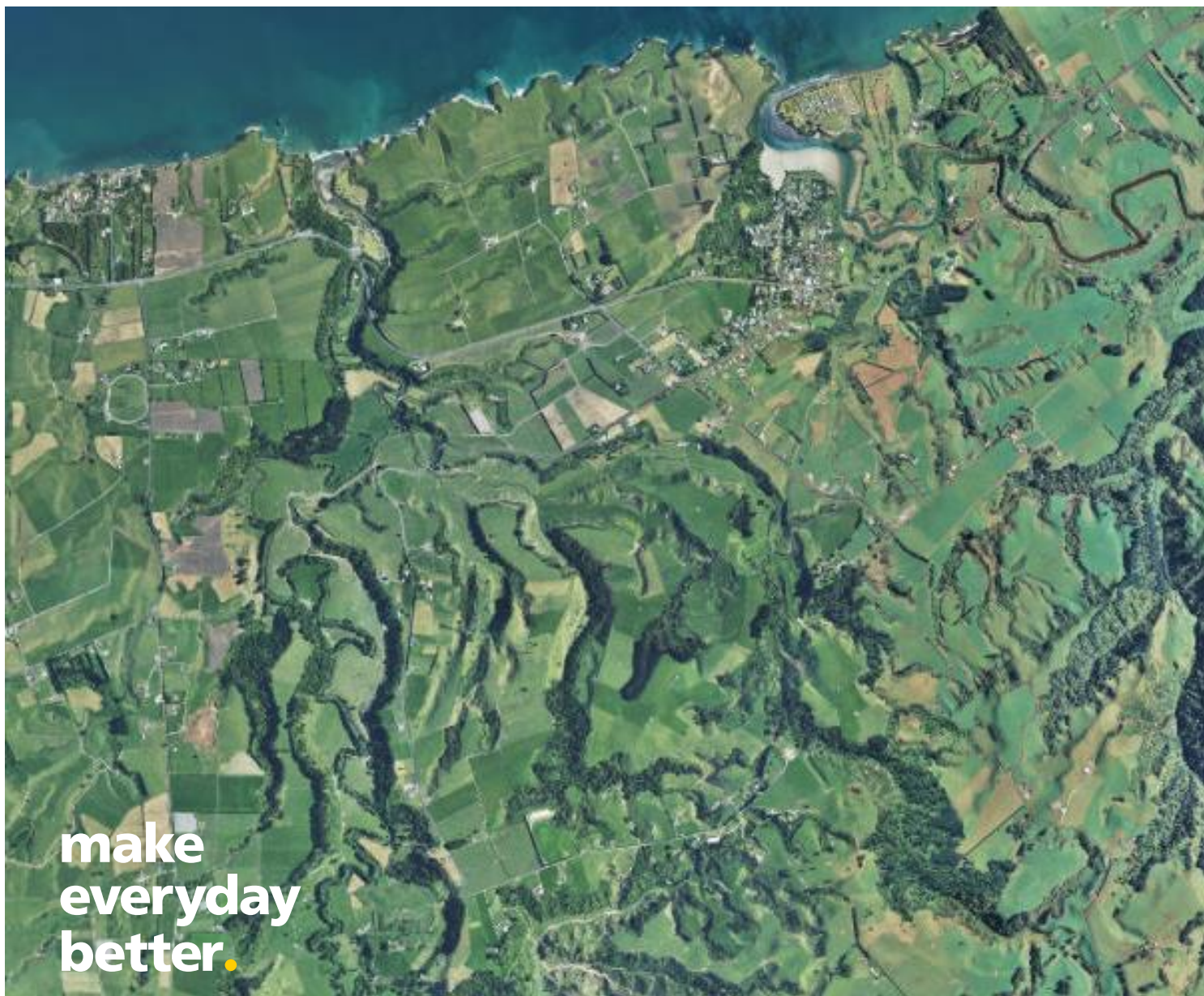




Urenui and Onaero Wastewater Treatment Plant - Assessment of Alternative Sites

Prepared for New Plymouth District Council
Prepared by Beca Limited

19 January 2024



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Revision History

Revision N°	Prepared By	Description	Date
1	Sarah Blair	Draft for Client Review	14 May 2023
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Action	Name	Signed	Date
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Reviewed by	Garrett Hall		19 Jan 2024
Approved by	Roddy Copeland		19 Jan 2024
on behalf of	Beca Limited		

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Executive Summary

This assessment of alternative sites report has been prepared on behalf of New Plymouth District Council (NPDC) as the requiring authority for a new Wastewater Treatment Plant (WWTP) to service the townships of Urenui and Onaero. This report supports the Notice of Requirement (NoR) for designation and has been prepared in accordance with Section 171(1)(b) of the Resource Management Act 1991 (RMA).

An assessment of alternatives methodology was developed to assess alternative WWTP sites and ultimately determine a preferred option. The key steps adopted in the assessment of alternative sites were as follows:

- 1. Develop initial screening criteria:** Initial screening criteria were developed for the project based on site size, land discharge requirements and proximity to the existing townships. Following this initial process a property came onto the market slightly outside the initial area of consideration, and after investigating this property, a site purchase was made.
- 2. Undertake additional screen of land parcels:** At this stage NPDC were committed to undertaking a best practice assessment of alternative sites and proceeded with the assessment methodology. The area of investigation was extended slightly and 23 sites were identified for consideration. After further refinement this list was reduced to 12 sites for the long list assessment.
- 3. Long list assessment of sites:** The long list sites were subject to a traffic light assessment against the project assessment criteria and were scored either green, amber or red depending on how well that site met the criteria. At the long list assessment workshop, the Multi-Criteria Analysis (MCA) framework and any scoring was collectively reviewed. Upon completion of the workshop, the Project Team met to review and test the results to determine which sites would progress to the short list. Six sites made it through to the short-list.
- 4. Short list assessment of sites:** The short list sites were rated on a scale from 0 (the worst) to 10 (the best) by technical experts and the Project Team. These scores were then presented and challenged in an interdisciplinary MCA workshop, where some scores were consequently changed. Landowner discussions also took place during this stage. As a result of this process, two sites were considered as the 'emerging preferred sites'.
- 5. Confirmed preferred site:** The preferred site was identified once the Project Team assessed the advantages and disadvantages of the two emerging preferred sites and NPDC confirmed the final preferred site.

NPDC undertook a partnership approach with Ngāti Mutunga to steps 1-5 above and factored this into its options assessment.

Based on the long list assessment options (step 3), sites 6, 16, 19, 20, 22 and 23 proceeded to the short list stage. The Project team carried out onsite assessments for sites 16 and 20 (the remaining sites were unable to be accessed).

Following the short list assessment, sites 16 and 20 were selected as the emerging preferred site. Site 16 scored highest through the MCA process, although was held in private ownership. It is a large site, can easily accommodate all treated wastewater to land, and provides for sufficient buffer to sensitive activities.

Whilst site 20 was already owned by NPDC, it was a smaller site and had a lesser land area than site 16. Concern was also expressed by Ngāti Mutunga on potential adverse environmental effects of treated wastewater spray drift on waterways that run through the site.

As part of the short-list assessment process NPDC commenced property acquisition conversations with all short list sites and the property owners of Sites 6, 19, 22 and 23 ruled out selling their land. The property owner at Site 16 indicated that they would be open to selling their land and Site 20 was already owned by

NPDC. Due to project timeframes and the opportunity to acquire Site 16 outside of the Public Works Act process, Sites 6, 19, 22 and 23 were eliminated from the preferred site selection process.

Based on the short list assessment and input from Ngāti Mutunga, Site 16 was identified as the preferred site over Site 20. This was mainly due to the larger size of Site 16 and the lack of waterways present on the site (Site 20 was constrained by several waterways crossing the site, constraining the available area for the discharge field and concerning Ngāti Mutunga from an environmental perspective). Although dwellings were located around the site, the large site area meant that both the WWTP and land discharge infrastructure could be placed within the site to allow for appropriate buffers between the activities and these sensitive receptors. Based on these findings, property acquisition conversations continued with the owners of Site 16 and NPDC were able to successfully purchase the site.

1 Introduction

1.1 Background and Context

The settlements of Urenui and Onaero are located on the coast approximately 25 km north-east of New Plymouth, New Zealand (Figure 1). These settlements currently do not have a centralised wastewater system and dwellings rely on on-site septic tank systems. New Plymouth District Council (NPDC) are planning on constructing a new Wastewater Treatment Plant (WWTP) to provide a centralised wastewater collection and discharge to land system for these settlements. It is proposed that the discharge to land occur on the WWTP site. Beca Limited (Beca) have been commissioned to undertake an option assessment process to guide site selection for the new WWTP.

This report does not cover any optioneering associated with the conveyance network that may be required – both within the reticulated areas within Urenui and Onaero, and from those areas to the WWTP. This report also excludes optioneering around wastewater treatment processes and discharge methods (e.g. surface spray, sub-surface irrigation). These matters will be considered at subsequent design stages.



Figure 1. Location of Onaero and Urenui in relation to New Plymouth.

2 Purpose of this Report

This assessment of alternatives report has been prepared on behalf of NPDC as the requiring authority for the Urenui and Onaero WWTP. This report will support the Notice of Requirement (NoR) for designation and has been prepared in accordance with Section 171(1)(b) of the Resource Management Act 1991 (RMA).

Section 171(1)(b) of the RMA requires that when making a recommendation on a NoR, a territorial authority shall consider whether adequate regard has been given to alternative sites, routes or methods of undertaking the work in circumstances where:

- a. The requiring authority does not have an interest in the land sufficient for undertaking the work; or
- b. It is likely that the work will have significant adverse effects on the environment.

At the time of writing this report NPDC owned the land for which a designation will be sought and therefore has 'an interest in the land sufficient for undertaking the work'. Further site specific work is required to determine the magnitude of effects and until that work is concluded confirmation of the magnitude of effects cannot be made. Notwithstanding this, measures have been incorporated into the alternative assessment methodology to avoid significant adverse effects (e.g. by applying buffers to sensitive receptors). It is therefore considered best practice to undertake an assessment of alternative sites to inform the site selection process.

There are several principles and key considerations for a requiring authority to apply and adhere to when undertaking an assessment of alternatives and identifying a preferred option. Of note are the following:

- The process should be adequately transparent and robust, and clearly recorded so that it can be understood by others;
- An appropriate range of alternatives should be considered;
- The extent of options considered, and the assessment of these options, should be proportional to the potential effects of the options being considered;
- The requiring authority must show that it has not acted arbitrarily or given only cursory consideration of alternatives; and
- The focus under section 171 is on the process that was followed. There is no requirement to show that the best alternative has been chosen.

3 Treatment and Discharge Characteristics

General assumptions and characteristics of the proposed discharge to land were agreed upon before the analysis and subsequently embedded in the assessment of alternatives methodology. The key assumptions and characteristics are summarised below.

3.1 Land Discharge

Whilst discharge of treated wastewater to surface water is an option (the Proposed Coastal Plan for Taranaki prohibits new discharges of treated wastewater containing human sewage), there was a strong drive by Ngāti Mutunga and NPDC for the discharge of treated wastewater to be to land. Given this, Beca, on behalf of NPDC, engaged Lowe Environmental Impact (LEI), a consultancy specialising in the land discharge of treated wastewater, to undertake an assessment of land suitable for the discharge of treated wastewater within 10km of the townships (the Investigation Area).

Within the Investigation Area the following characteristics were assessed:

- Rainfall and Potential Evapotranspiration (PET)
- Future flows from the townships of Urenui and Onaero, and the Urenui and Onaero Domains

Based on these initial factors a minimum land area requirement of 20ha was identified for the future discharge of treated wastewater to land. Land meeting this minimum area requirement within 10km of the townships was then further assessed according to the following characteristics:

- Land use
 - Nutrient uptake potential
 - Climate
- Soil attributes
 - Slope and stability
 - Soil drainage and permeability
 - Depth to restrictive layer
- Hydrological and hydrogeological attributes
 - Flood return interval and flood risks
 - Riparian buffers
 - Coastal hazards.

Based on this analysis, and number of groupings were developed categorising the various land characteristics into groupings. These groupings are referred to as Land Application Suitability Zones. Five Zones were used and described In Table 1, which summarises the implications of the Zones for the discharge of treated wastewater to land. This initial assessment is presented in Appendix A¹.

¹ Appendix A was an early report that assessed both the suitability of land for septic tanks and the suitability of land for discharge from a municipal treatment and discharge scheme.

Table 1: Land Application Suitability Zones (Appendix A)

Zone	Suitable for
A	Well Suited Requires smaller land area High value and/or short rotation crops Non-deficit irrigation – nil or limited storage required Greater number of irrigable days High rate of nutrient removal Routine cultivation and harvest, with short withholding periods.
B	Moderately Well Suited High value and/or short rotation crops Non-deficit irrigation or partial deficit irrigation Can irrigate in shoulder seasons (April, May, September, October) for drier than average years – some storage likely to be required Moderately high rate of nutrient removal Short withholding period for grazing or cultivation and harvest
C	Minor Limitations Pasture or restricted range of annual crops Predominantly deficit irrigation, requiring large storage or combined water discharge Larger land area requirement Withholding period prior to grazing or cultivation and harvest is extended
D	Significant Limitations Plantation forestry, pasture, shallow rooting crops Deficit irrigation over summer months, requiring larger storage/combined water discharge Low nutrient loading Limitation to cultivation and harvest Extended withholding period for stock trafficking
E	Severe Limitations Requires largest land area Conservation plantings Low deficit irrigation for short season, requiring larger storage/combined water discharge No cultivation, infrequent harvest.

Table 2 summarises the area of the Zones within 10km of the townships and the percentage of the total land area whilst Figure 2 maps these same Zones within the Investigation Area.

Table 2: Irrigation Suitability – Within 10km of Urenui and Onaero Townships (Appendix A)

Zone	Land Suitability	Land Area (ha)	Land Area (% of Total)
Zone A	Suitable – Negligible limitations	4,521	18.8 %
Zone B	Moderately Suitable – Minor limitations	2,978	12.4 %
Zone C	Marginally Suitable – Moderate limitations	4,542	18.9 %
Zone D	Not Suitable – Significant limitations	8,395	34.9 %
Zone E	Not Suitable – Severe limitations	261	1.0 %
Riparian Buffers	Excluded	3,387	14 %*
Total (Excluding Riparian Buffers)		20,697	

* Riparian buffers are excluded from all total areas and percentages within the above table. This total value and percentage of the Investigation Area is addition to the values represented within the table. Area associated with riparian buffers can be added to the total land area excluding riparian buffers (20,697 ha) which is 24,084 ha (the total land area within 10 km surrounding communities).

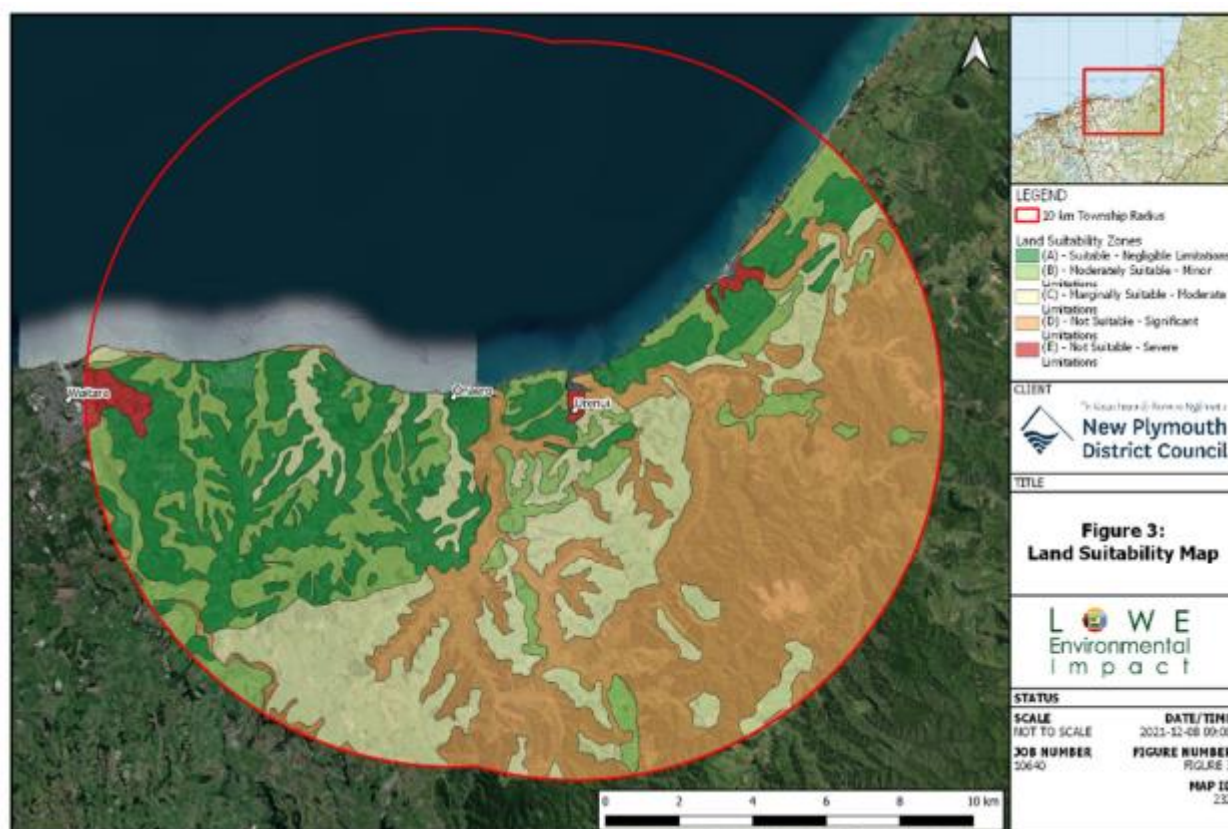


Figure 2: Land Suitability (Appendix A)

Given that sufficient Zone A (suitable) land was present within the Investigation Area, and was considered to be the most suitable for discharge to land with negligible limitations, further investigations focussed within areas of Zone A land.

3.2 Wastewater Treatment Plant

A new WWTP will be required to be constructed and it was assumed that this would be co-located at the land discharge site. Whilst a specific technology has not been chosen at this stage and would be dependent upon the limitations of the chosen land discharge site, the WWTP itself would be expected to be approximately one ha in area.

3.3 Wastewater Conveyance

A conveyance system including pipelines and pumping station(s) will be required to convey the wastewater from Urenui and Onaero to a new WWTP for treatment. A decision has not been made yet by NPDC on the sewerage system within the townships.

4 Assessment of Alternatives Methodology

This section provides an overview of the assessment of alternatives methodology developed to assess alternative WWTP locations and ultimately determine a preferred site. The key steps are outlined in Figure 3 and described below. Each step is explained in detail in the sections that follow.

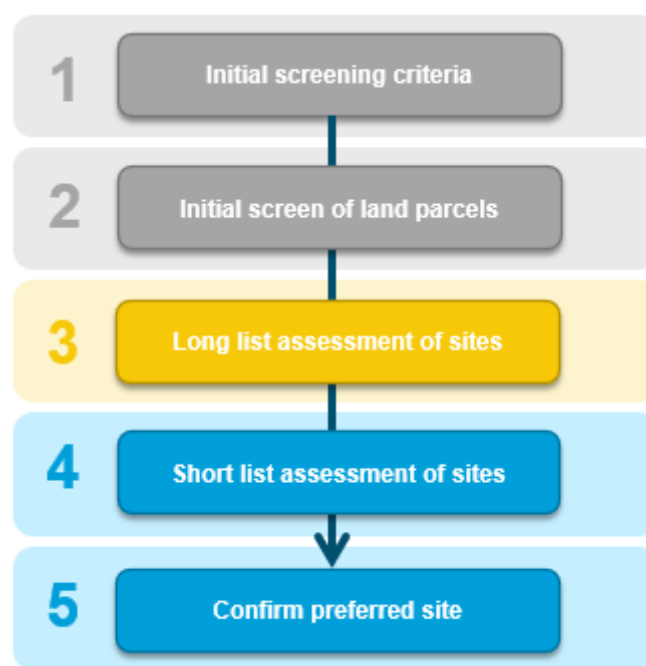


Figure 3: Methodology

The process for the assessment of alternatives was as follows:

4.1 Step 1 – Initial Screening Criteria

An initial screening exercise was completed and reported by LEI which identified Land Application Suitability Zones (Appendix A) within 10km of the townships. The initial screening of Zones is described earlier in section 3.1 of this Report.

A further screening exercise was then undertaken by LEI, considering potential pump station locations and conveyance distances from the townships to the WWTP site. An irregular shape was then adopted to enable the consideration of as broad a range of suitable land parcels as possible while accounting for elevation changes. To these polygons, a 150m buffer was added to even out the area and pick up any extra sections of the properties not previously included. This subset of Zone A was then referred to as Zone Aa. This further screening of Zone A land is described in Appendix B.

4.2 Step 2 – Undertake Additional Screen of Land Parcels

Following the application of the initial screening criteria, 19 potential sites were identified. At this stage of the process, NPDC were made aware of a property that had come onto the market in the Onaero area. This property, located at 319 Waiau Road, comprised of 36.51 ha of land and an adjoining 4.56 hectares. This land was slightly outside of the area initially identified as Zone Aa, but was identified as likely to be suitable for discharge to land (this land was identified as Zone A land). A report to Council dated 16 May 2022 identified the following in relation to 319 Waiau Road:

“While investigations have been limited they have demonstrated that this land is highly likely to be suitable for a WWTP and land based disposal. It is noted however that there may be unknown factors which could be discovered meaning that Council cannot effectively mitigate the effects of the WWTP or treated water disposal on the neighbours or the environment. Consequently resource consent maybe unable to be obtained if the site proves to be not large enough for predicted flows or anticipated growth.

The land is also located just beyond the preferred optimal distance from the townships.

The report to Council, seeking approval to purchase the property, was approved on 18 May 2022. NPDC then purchased the property a short time after.

At this stage, given that the assessment of alternative process had not been completed, NPDC proceeded with the assessment methodology, taking into account 319 Waiau Road was now purchased.

The definition of Zone Aa land was revisited by LEI, Beca and NPDC which considered potential pumpstation locations and reticulation distance and the investigation area was reduced to a 5km radius around the townships. Following this, discussions were held with NPDC and Ngāti Mutunga where Ngāti Mutunga indicated that waste from Onaero and Urenui should not be discharged to another iwi's rohe. The result was to incorporate the rohe boundary as the western extent of the Investigation Area. A shortlist of properties were identified within the Zone Aa area which met the following criteria:

- Within the revised Zone Aa investigation area (Appendix B)
- At least 20 ha in area;
- Contain at least 10ha of Zone A land.

This resulted in the confirmation of 23 sites that were then taken forward to the long list assessment (including 319 Waiau Rd).

These sites are described in Section 6.1 of this Report.

4.3 Step 3 – Long List Assessment of Sites

Step 3.1 - GIS Platform

To assist the consideration of alternative WWTP sites, a project geographic information system (GIS) platform was established. This was an online, interactive tool created specifically to allow technical experts to view all known constraints within the vicinity of the Urenui and Onaero townships and surrounding area.

As a result of this analysis of the 23 sites, a further 10 sites were excluded based on LiDAR slope analysis (flatter land was preferred) or layouts that were constrained by non-contiguous areas. These left 13 sites on the long list assessment of sites. One further site was then excluded due to multiple property owners. This left 12 long list sites.

Step 3.2 – Multi Criteria Analysis (MCA) Framework

The 12 revised long list sites were then subject to a traffic light assessment against the project assessment criteria (see Table 3 below). These criteria were jointly developed by Beca, LEI and NPDC. At the long list stage, technical experts (in discipline fields of ecology, archaeology, etc.) and the Project Team ranked each site green, amber, or red depending on how well that site met the criteria using their best professional judgement as set out below:

	Meets criteria well
	Marginally meets the criteria
	Does not meet the criteria

Table 3: Assessment criteria for the long list MCA.

Topic	Number	Criteria	Measure(s) / Potential Adverse Effects on:	Source	Project Team Responsible for Scoring
Cultural	1a	Wāhi tapu sites and areas of significance to Ngāti Mutunga	Potential effects on the relationship of Māori and their culture and traditions with wāhi tapu sites.	Mana whenua engagement	Ngāti Mutunga
	1b	Mauri and mahinga kai values of waterbodies within and immediately adjacent to the site	Potential effects on the relationship of Māori and their culture and traditions with their ancestral waterways.	Mana whenua engagement	Ngāti Mutunga
Heritage	2a	Heritage	Sites and places of known value: - Sites and places of European cultural heritage value - - Heritage sites scheduled in the NPDC district plan maps - Notable trees scheduled in the NPDC district plan maps	Project team – desktop review	Beca
	2b	Archaeology	Sites and places of archaeological value.	Archaeologist – desktop study	Archaeologist
Social	3a	Number of adjoining landowners	Number of directly adjoining landowners to the site	NPDC – desktop review	NPDC
	3b	Proximity of dwellings	Odour, amenity, construction disturbance	Project team – desktop review	Beca
Natural Environment	4a	Ecology	Significant indigenous flora, SNAs Significant habitats of indigenous flora Indigenous biodiversity Sensitive Coastal environment – regional plan requirements	Ecologist – desk-top review	Riverwise Consulting
Engineering	5b	Access	Proximity to roads and ability to get to useful parts of the site via internal tracks and associated maintenance requirements	LEI/Project team – desktop review	LEI
Resilience	6a	Vulnerability to natural processes	Vulnerability of the site (including access) to natural processes including coastal erosion, flooding and earthquakes (liquefaction risk)	NPDC – desktop review	NPDC

Topic	Number	Criteria	Measure(s) / Potential Adverse Effects on:	Source	Project Team Responsible for Scoring
Useable Land	7a	Amount of suitable land available for the WWTP site	Operational ease, ability to accommodate growth, etc Able to accommodate ~50m x 50m WWTP site and associated operational area (allow one hectare)	Project team - desktop review	Beca

Step 3.3 - Briefing Packs

Briefing packs were provided to technical experts ahead of the long list and assessment workshop with an outline of the options to be assessed (Appendix C), the criteria to be used in undertaking this assessment including the MCA framework, and a pre-scoring spreadsheet.

Buffer exclusion zones were applied to identified Māori sites of significance, waterways, bores, dwellings, coastal areas and significant ecological areas. A 150m buffer zone was also applied inside the property boundaries to provide an odour buffer zone to inform siting the WWTP (criteria 7a).

Step 3.4 - Pre-Scoring

In advance of the long list workshop, technical experts and the project team were asked to pre-score options using the MCA spreadsheet so that these could be compiled, discussed and challenged during the workshop. Supporting each score was an explanation (reason) for the score.

Step 3.5 - Interdisciplinary Workshop

At the long-list assessment workshop, the MCA framework and any pre-scoring outcomes were collectively reviewed. Initial scoring by technical experts was presented and discussed at the workshops. As part of this process, the workshop facilitator encouraged a group discussion to challenge scores and assumptions. Once complete, experts were given the opportunity to amend their scores in light of the discussion at the workshop, if they felt it was appropriate.

Step 3.6 - Mana Whenua Engagement

Engagement was undertaken by NPDC with Ngāti Mutunga so that they could provide scoring for the 'cultural values' criteria of the MCA. This was an opportunity for mana whenua to provide feedback on the options and input into the decision-making process.

Step 3.7 – Results of the Long List Assessment

Based on the long list assessment, six sites were identified for an emerging short-list.

4.4 Step 4 – Short List Assessment of Sites

Step 4.1 - Recommendation of Short List Options

Following the completion of Steps 3.2 - 3.7 above, the Project Team identified six sites to further consider through the short list assessment.

Step 4.2 - Assessment of Short List Options

At the short list stage, the criteria against which options were assessed at the long list was revisited by the Project Team. The purpose of this was to refine the criteria and add additional factors for consideration

(where required) to undertake a more detailed assessment of the short list sites. The refined set of assessment criteria are listed in Table 4.

For the short list assessment, a rating scale was implemented to determine compliance with the criteria on a gradual scale ranging from 10 being the 'best' to 1 being 'worst'. A scoring rationale was prepared for the short list MCA assessment to guide consistent decision making from the technical experts (Table 5).

Again, in advance of the short list workshop, technical experts and the project team were asked to pre-score options using the MCA spreadsheet so that these could be compiled, discussed and challenged during the workshop.

Table 4: Assessment criteria for the short list MCA.

Topic	#	Criteria	Measure(s) / Potential Adverse Effects on:	Source	Project Team Responsible for Scoring
Cultural	1a	Wāhi tapu sites and areas of significance to Ngāti Mutunga	Potential effects on the relationship of Māori and their culture and traditions with wāhi tapu sites.	Mana whenua engagement	Ngāti Mutunga
	1b	Mauri and mahinga kai values of waterbodies within and immediately adjacent to the site	Potential effects on the relationship of Māori and their culture and traditions with their ancestral waterways.	Mana whenua engagement	Ngāti Mutunga
Heritage	2a	Heritage	Sites and places of known value: - Sites and places of European cultural heritage value - - Heritage sites scheduled in the NPDC district plan maps - Notable trees scheduled in the NPDC district plan maps	Project team – desktop review	Beca
	2b	Archaeology	Sites and places of archaeological value.	Archaeologist – desktop study	Archaeologist
Social	3a	Ability to acquire land	Landowner's willingness to sell	NPDC – landowner discussions	NPDC
	3b	Odour amenity	Ability to provide for a minimum 150m odour buffer within the site and number of sensitive receptors beyond 150m to 300m of the proposed site	Odour specialist – desktop review	Beca
	3c	Traffic	Traffic movements (both construction and operational)	Traffic engineer – desktop review	Beca
	3d	Groundwater Bores	Proximity to water bores	Hydrogeologist – desktop review	Beca
Natural Environment	4a	Terrestrial ecology	Significant indigenous flora, Significant Natural Areas (SNAs) Significant habitats of indigenous flora Indigenous biodiversity Sensitive Coastal environment – regional plan requirements	Ecologist – site walkover	Riverwise Consulting

Topic	#	Criteria	Measure(s) / Potential Adverse Effects on:	Source	Project Team Responsible for Scoring
	4b	Aquatic ecology	Stream/waterway/wetland ecology	Ecologist – site walkover	Riverwise Consulting
Engineering	5a	Wastewater conveyance	Length of pipe and pumping head required Size and number of pump station(s) Construction difficulty	Beca/NPDC – desktop review	Beca
	5b	Access	Proximity to roads and ability to get to useful parts of the site via internal tracks and associated maintenance requirements	LEI/Project team – desktop review	LEI
	5c	Services	Power requirements (proximity to HV power supply) Existing services on site including water supply	Beca – desktop review	Beca
Resilience	6a	Vulnerability to natural processes	Vulnerability of the site (including access) to natural processes including coastal erosion, flooding and earthquakes (liquefaction risk)	NPDC – desktop review	NPDC
Useable Land	7a	Amount of suitable land available for disposal	Operational ease, ability to accommodate growth Contiguous parcels, practical irrigation layout Potential for stranded land that needs to be managed/potential for disposal	LEI – site walkover	LEI
Carbon	8a	Greenhouse gas emissions	Qualitative assessment of differences in whole of life greenhouse gas emissions generated from the construction of the conveyance infrastructure	Beca – desktop review	Beca

Table 5: Scoring rationale for the short list MCA.

Topic	#	Criteria	MCA Scores – Rationale for Assigning Scores (1= worst / 10 = best) (Note – the following comments are for guidance only)			
			1	2 – 4	5 – 7	8 – 10
Cultural	1a	Wāhi tapu sites and areas of significance to Ngāti Mutunga	Use of this property for the project would cause unacceptable effects on a site or area of significance to Ngāti Mutunga.	Use of this property for the project would cause negative effects on a site or area of significance to Ngāti Mutunga and there is no clear way to avoid this.	Use of this property for the project could cause negative effects to a site or an area of significance to Ngāti Mutunga but there are identified ways	There are no identified wāhi tapu sites or areas of significance within or immediately adjacent to this property.

Topic	#	Criteria	MCA Scores – Rationale for Assigning Scores (1= worst / 10 = best) (Note – the following comments are for guidance only)			
			1	2 – 4	5 – 7	8 – 10
					these effects could be avoided.	
	1b	Mauri and mahinga kai values of waterbodies within and immediately adjacent to the site	Use of this property for the project would cause unacceptable effects on the mauri or mahinga kai values of a waterbody within or immediately adjacent to the property.	Use of this property for the project (as described at present) would cause negative effects on the mauri or mahinga kai values of the waterbodies within or immediately adjacent to this property and there is no clear way to avoid this.	Use of this property for the project could cause negative effects on the mauri or mahinga kai values of the waterbodies within or immediately adjacent to this property but there are identified ways these effects could be avoided.	Use of this property for the project would not have any known negative effect on the mauri or mahinga kai values of the waterbodies within or immediately adjacent to this property.
Heritage	2a	Heritage	Some heritage sites within proximity of the site and effects on heritage values are likely to be more than minor.	Some heritage sites within proximity of the site and effects on heritage values will take considerable effort to mitigate.	Some heritage sites within proximity of the site. Effects on heritage values are relatively simple to mitigate.	Some heritage sites within proximity of the site but effects on heritage values can be avoided; or no heritage sites within proximity of the site.
	2b	Archaeology	Significant archaeological site(s) expected to be impacted, with significant impacts expected, unlikely to be able to mitigate effects beyond an authority to modify/destroy.	Archaeological site(s) within proximity of the site and effects on archaeological values will take considerable effort to mitigate.	Archaeological site(s) expected to be impacted but effects are relatively simple to mitigate.	Archaeological site(s) present but effects on archaeological values can be easily avoided, or no archaeological site(s).
Social	3a	Ability to acquire land	Scoring to be based on potential complexity of property acquisition process.			
	3b	Odour amenity	Minimum 150m odour buffer cannot be provided within the site.	Minimum odour buffer of 150m can be provided in site, but two or more dwellings are located within 200m of the buffer area	Minimum odour buffer of 150m can be provided within the site, but two or more dwellings are located within 250m of the buffer area	Minimum odour buffer of 150m can be provided within the site, but two or more dwellings are located within 350m of the buffer area
	3c	Traffic	Traffic effects on the transport network and local community during	Traffic effects on the transport network and local community during	Minor traffic effects on the transport network and	Very minor traffic effects (if any) on the transport network and local community

Topic	#	Criteria	MCA Scores – Rationale for Assigning Scores (1= worst / 10 = best) (Note – the following comments are for guidance only)			
			1	2 – 4	5 – 7	8 – 10
			construction and operation are likely to be more than minor.	construction and operation will take considerable effort to mitigate.	local community during construction and operation that are relatively simple to mitigate.	during construction and operation can be avoided.
	3d	Groundwater Bores	Adverse effects on existing water bores are likely to be more than minor.	Adverse effects on existing water bores will take considerable effort to mitigate.	Minor adverse effects on existing water bores that are relatively simple to mitigate.	Very minor effects (if any) on existing water bores can be avoided.
Natural Environment	4a	Terrestrial ecology	Adverse effects on terrestrial ecology are likely to be more than minor.	Adverse effects on terrestrial ecology will take considerable effort to mitigate.	Minor adverse effects on terrestrial ecology that are relatively simple to mitigate.	Very minor effects on terrestrial ecology (if any) can be avoided.
	4b	Aquatic ecology	Adverse effects on aquatic ecology are likely to be more than minor.	Adverse effects on aquatic ecology will take considerable effort to mitigate.	Minor adverse effects on aquatic ecology that are relatively simple to mitigate.	Very minor effects on aquatic ecology (if any) can be avoided.
Engineering	5a	Wastewater conveyance	Very long pipelines and greater pump station requirements Very high construction difficulty when compared to other sites	Longer pipelines and greater pump station requirements Relatively high construction difficulty when compared to other sites	Moderate length pipelines and moderate pump station requirements Relatively moderate construction difficulty when compared to other sites	Shorter pipelines and lesser pump station requirements Relatively low construction difficulty when compared to other sites
	5b	Access	Very poor proximity to roads and/or very poor internal access (when compared to other sites)	Relatively low proximity to roads and/or poor internal access (when compared to other sites)	Moderate proximity to roads and average internal access (when compared to other sites)	Relatively high proximity to roads and good internal access (when compared to other sites)
	5c	Services	Very poor proximity to power supply and/or very poor level of existing services (when compared to other sites)	Relatively low proximity power supply and/or poor level of existing services (when compared to other sites)	Moderate proximity to power supply and average level of existing services (when	Relatively high proximity to power supply and high level of existing services (when compared to other sites)

Topic	#	Criteria	MCA Scores – Rationale for Assigning Scores (1= worst / 10 = best)			
			(Note – the following comments are for guidance only)			
			1	2 – 4	5 – 7	8 – 10
					compared to other sites)	
Resilience	6a	Vulnerability to natural processes	Very high vulnerability to natural processes (when compared to other sites)	High vulnerability to natural processes (when compared to other sites)	Moderate vulnerability to natural processes (when compared to other sites)	Low vulnerability to natural processes (when compared to other sites)
Useable Land	7a	Amount of suitable land available for disposal	Very limited amount of suitable land for disposal (i.e. due to steep slopes or waterway buffer exclusions) and/or very impractical layout with non-contiguous parcels	Limited amount of suitable land for disposal (i.e. due to steep slopes or waterway buffer exclusions) and/or impractical layout with non-contiguous parcels	Moderate amount of suitable land for disposal that can accommodate some growth and the layout is operationally practical	High amount of suitable land for disposal that can accommodate growth and the layout is operationally practical
Carbon	8a	Greenhouse gas emissions	Very high level of greenhouse gas emissions (when compared to other sites)	High level of greenhouse gas emissions (when compared to other sites)	Moderate level of greenhouse gas emissions (when compared to other sites)	Low level of greenhouse gas emissions (when compared to other sites)

Step 4.3 – Short List Workshop

Scoring was completed by technical experts and the Project Team. Experts were asked to score the criteria in their field of expertise using professional judgement and provide justification for the scoring, including any assumptions. Experts were also asked to comment on the level of certainty of their assessment and note where further information may be required and what additional assessments may be necessary to determine a preferred option. These scores were then be presented and challenged in an interdisciplinary MCA workshop. Subsequently, some initial scores were changed.

The MCA assessment at the short-list stage identified two emerging preferred options. These two emerging compared options were compared against each other on a qualitative basis in terms of advantages / disadvantages and the results of landowner discuss to date to determine whether the site landowners would be open to selling.

4.5 Step 5 – Confirmation of Preferred Site

A preferred site was identified based on the short list assessment and input from Ngāti Mutunga. Positive landowner discussions also meant that NPDC were able to purchase a new site and confirm it as the preferred project site.

5 Mana Whenua Partnership

Throughout the short and long list assessments, Ngāti Mutunga were included as part of the assessment process. Ngāti Mutunga's involvement included the following:

- Reviewing the spatial extent of the Investigation Area with NPDC and revising the boundaries of that area to take into consideration the rohe boundary of Ngāti Mutunga;
- Inputting into the MCA cultural criteria development;
- Preparing for, attending and scoring the longlist sites at the long-list workshop held on 29 July 2022 (on-line);
- Preparing for, attending and scoring the short-list sites at the short-list workshop held on 20 October 2022 (on-line);
- Attending site walkovers with NPDC staff for short-listed sites 16 and 20.

Based on the above partnership process cultural values and consideration of effects have been integrated into the assessment of alternative process as much as practicable.

6 Consideration of Alternative Sites

6.1 Long List Options

The following section outlines the long list sites considered for this project. As described in Section 4.2, an initial long list of 23 possible sites was developed at a property level as shown in Figure 4.

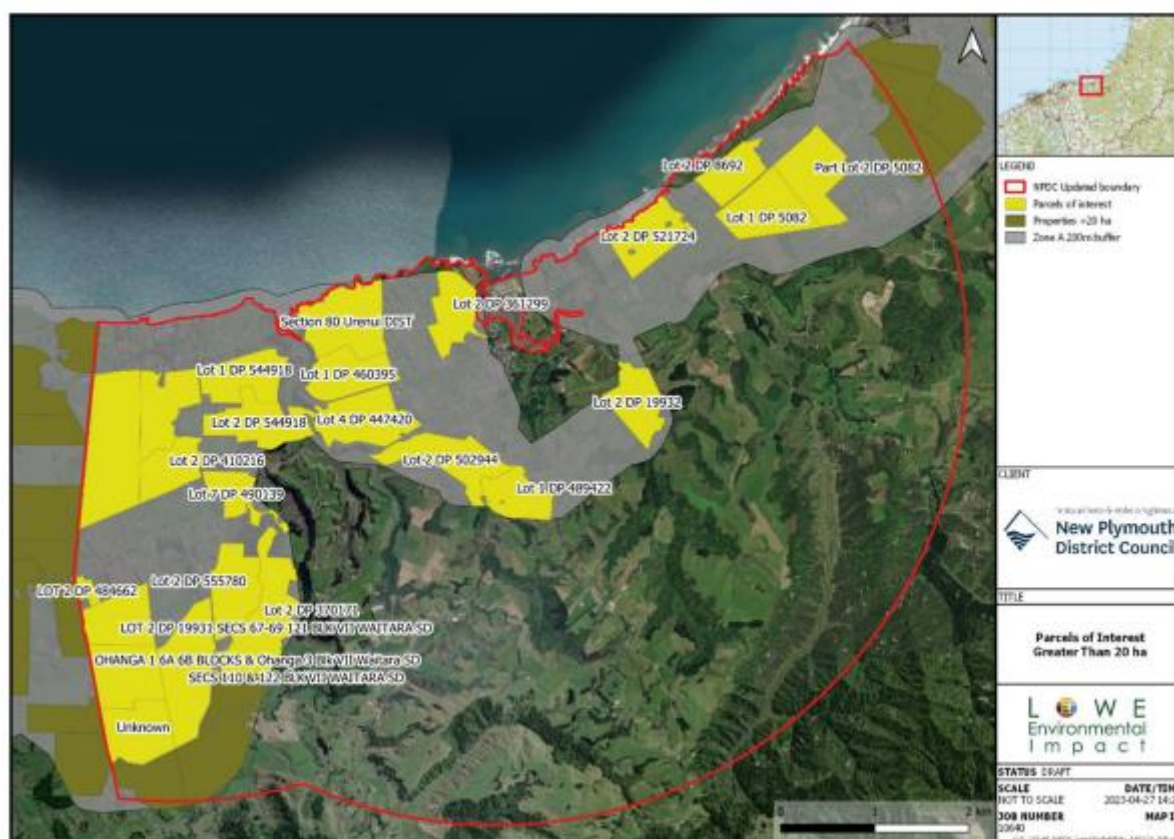


Figure 4. Properties considered for the project (Zone Aa land – identified in Appendix B)²

As noted in the long list MCA methodology (Section 4.2), the initial 23 sites were refined down to 13 sites for the long list option assessment. Reasons for excluding the sites from further assessment include:

- Nine sites were excluded due to available areas for discharge less than 10 ha following overlay of buffer areas and slopes greater than 7 degrees
- Site 17 was excluded due to the irrigable area being non-contiguous

It was then identified that site 21 was owned by multiple owners making possible purchasing arrangements difficult. Site 21 was excluded from further analysis on that basis.

Table 6 below provides an overview of key features for the 12 sites³ evaluated in the long list assessment. Appendix C also includes summary maps of the 12 sites showing property boundaries, slopes, and buffer

² The boundary of Zone Aa land was refined throughout the initial site selection process as discussed in Section 4.1 and 4.2 of this Report.

³ Note that Site 21 (as shown in Appendix B) was discounted from the long list assessment due to complicated property ownership arrangements that would have made it very difficult to obtain the site.

exclusions (150m buffer from dwellings, 50m buffer from groundwater sites, 20m buffer from Māori sites of significance, 150m buffer from the property boundary for the location of the WWTP to mitigate odour effects).

Table 6. Summary of key features of long list sites

Site	Area (ha)	Address	Legal Description	Site features
1	38.7	33 A Whakapaki Street, URENUI	LOT 2 DP 361299	<ul style="list-style-type: none"> Coastal site located on western edge of Urenui township and estuary Known area of occupation for Ngāti Mutunga and Te Pihanga Pā In proximity to heritage sites in Urenui township listed in the NPDC District Plan Small unnamed stream located in the property and eastern boundary of site is a little blue penguin nesting area
2	55.2	1237 Main North Road, URENUI	SEC 80 URENUI DISTRICT LOT 15 DP 447025 LOT 1 DP 460395	<ul style="list-style-type: none"> Coastal site located approximately 1.2km to the east of the Onaero township on the eastern side of the Onaero River Known area of occupation for Ngāti Mutunga Two tributaries of the Onaero River and a wetland located within the site Western boundary of the site is a little blue penguin nesting area
6	45.9	401 Mokau Road, URENUI	LOT 1 DP 5082 PTS LOT 2 DP 5082 LOT 1 DP 9813 SEC 7 SO 35585; 5 LOT 5A SEC 24 BLK IV WAITARA SD	<ul style="list-style-type: none"> Large flat site located approximately 2.6km to the north-east of Urenui township Several wetlands are located in the north-east corner of the site
7	45.6	1288 Main North Road, URENUI	LOT 2 DP 491893 LOTS 1-4 6-10 12 13 PT LOTS 5 11 DP 2118; LOT 4 DP 447420 PT SEC 2 URENUI DISTRICT	<ul style="list-style-type: none"> Site is located approximately 1km to the south-west of Urenui township Property contains a wāhi tapu site – Te Ngaio Pā Site includes a large gully system and unnamed tributary of the Onaero River

Site	Area (ha)	Address	Legal Description	Site features
9	46.9	Kaipikari Road Upper, URENUI	QEII COVENANT 12.5400 AREAS C D DP 18000 PT LOT 2 DP 502944; LOT 2 DP 502944; LOT 3 DP 331605; LOTS 1-2 DP 12063	<ul style="list-style-type: none"> • Site is located approximately 700m south of the Urenui township • In proximity to two Pā sites • In proximity to heritage sites scheduled in the NPDC District Plan • Kakapo Stream runs through the property • QEII covenants on native forest on the property
14	44.4	61 Ohanga Road, ONAERO, URENUI	LOT 2 DP 544918	<ul style="list-style-type: none"> • Site is located approximately 500m south-east of the Onaero township and 2km to the west of the Urenui township • In proximity to Putahi Pā • The Onaero River runs along the eastern boundary of the site • The site is bisected by a terrace that supports a mix of native and exotic forest
15	36.7	29 Ohanga Road, ONAERO, URENUI	LOT 1 DP 544918	<ul style="list-style-type: none"> • Site is located approximately 1km south-east of the Onaero township and 2km to the west of the Urenui township • The Onaero River runs along the eastern boundary of the site • An unnamed tributary of the Onaero River is present in the northern portion of the property
16	84.4	944 Main North Road, URENUI	LOT 1 DP 544918	<ul style="list-style-type: none"> • Large flat site located approximately 500m south-west of the Onaero township and 3.7km to the west of the Urenui township • Te Rau o te Huia Pā is present in the northern portion of the site • Three unnamed tributaries of Motukara

Site	Area (ha)	Address	Legal Description	Site features
19	116.3	397 Ohanga Road, ONAERO, URENUI	QEII COVENANT 4.6720HA PT LOT 1 DP 19282 PT SEC 99 AREAS A & B - LOT 1 DP 19282 SEC 1 SO 441305 SEC 1 SO 13411 LOT 2 DP	<p>Stream are present on the site</p> <ul style="list-style-type: none"> • Site is located approximately 2.4km south of the Onaero township and 3.4km to the south-west of the Urenui township • Previous filling on the site has buried two streams (likely non-compliant) • An unnamed tributary of the Onaero River flows along the eastern boundary
20	36.7	293/319 Waiau Road	Section 121 Block VII Waitara SD DP 572930, SO 8353	<ul style="list-style-type: none"> • Site is located approximately 2.9km south of the Onaero township and 4.5km to the south-west of the Urenui township • Several unnamed streams and natural wetlands are present on the property
22	69.5	363 Waiau Road	LOT 1 DP 380455, OHANGA 2 BLOCK	<ul style="list-style-type: none"> • Site is located approximately 4km south of the Onaero township and 5.2km to the south-west of the Urenui township • Several unnamed streams are present in the north-east portion of the site
23	267.5	138 Ohanga Road	SECS 50 56 BLK VI WAITARA SD NGATIRAHIRI 8G PT 8E2 BLOCK OHANGA 4A-4D 5A-5C BLOCK	<ul style="list-style-type: none"> • Site is located approximately 3km south of the Onaero township and 4.2km to the south-west of the Urenui township • Several unnamed streams are present on the property

6.2 Assessment of Long List Options

As outlined in the methodology section (Section 4), the long list sites were subject to a traffic light assessment against a range of criteria. Technical specialists engaged in a half day workshop to score each option green, amber, or red depending on how well that site met the criteria. Refer to Appendix D for more detail on this assessment.

Table 7 provides a summary of the traffic light assessment:

Table 7: Summary of long list option assessment

Long list assessment		1	2	6	7	9	14	15	16	19	20	22	23
Cultural	1a. Wāhi tapu sites	Red	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Yellow	Green	Green	Green	Green
	1b. Mauri and mahinga kai values	Yellow	Yellow	Green	Yellow	Red	Yellow	Yellow	Green	Yellow	Red	Green	Yellow
Heritage	2a. Heritage	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green
	2b. Archaeology	Red	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green
Social	3a. Number of adjoining landowners	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Yellow	Green	Yellow
	3b. Proximity of dwellings	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green
Natural environment	4a. Ecology	Red	Red	Green	Yellow	Red	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow
Engineering	5b. Access	Red	Green	Green	Green	Red	Green	Green	Green	Green	Green	Green	Green
Resilience	6a. Vulnerability to natural processes	Yellow	Yellow	Green	Green	Yellow	Green	Green	Green	Green	Green	Green	Green
Useable land	7a. Amount of suitable land available for the WWTP site	Green	Green	Green	Yellow	Red	Yellow	Red	Green	Green	Green	Green	Green

The Project Team reviewed and compared the options identified above. The following table summarises the assessment of the long list options against the seven criteria topics – cultural, heritage, social, natural environment, engineering, resilience, and useable land:

Table 8: Assessment of long list sites

Topic	Assessment
Cultural	<p>a. Due to the long history of Ngāti Mutunga occupation near the coast, most sites are near identified wāhi tapu sites. No known wāhi tapu sites were identified within the vicinity of Sites 19, 20, 22 and 23.</p> <p>b. Most sites have streams or wetland systems within or adjacent to the site and Ngāti Mutunga identified concerns around the ability to avoid contamination of the waterways with a discharge to land system. This concern was most apparent for sites 9 and 20.</p>
Heritage	<p>a. For the majority of sites, there are no heritage sites mapped in the NPDC District Plan that are in close proximity. Site 1 and Site 9 are located in</p>

Topic	Assessment
	<p>proximity to heritage sites such that when a 150m buffer zone is applied, the zone overlaps with the site.</p> <p>b. Due to the long history of Ngāti Mutunga occupation near the coast and the number of wāhi tapu sites, it was identified that there is a relatively high risk of archaeological sites in the area. Sites 16, 19, 20 are located further inland and Sites 22 and 23 were mostly within the forest line prior to European settlement: as such these sites have a lower likelihood of containing archaeological sites.</p>
Social	<p>a. Most sites are surrounded by multiple landowners and dwellings. Site 1 is in close proximity to residential dwellings at Urenui township and the remainder of sites are mostly located near lifestyle properties.</p> <p>b. For most sites, a reasonable number of dwellings were identified in proximity to a 150m odour buffer zone. Sites 16, 19, 20, 22 and 23 are large blocks of land and the WWTP could be more easily located away from dwellings at these sites.</p>
Natural Environment	<p>a. Most sites have streams, wetland and/or gully systems within a portion of the site. Sites 1 and 2 are located near little blue penguin nesting areas and Key Native Ecosystems (KNE). Site 9 has a QEII covenant over native forest on the property. Sites 14 and 15 adjoin Onaero River Scenic Reserve (Department of Conservation) land.</p>
Engineering	<p>b. Most sites have good access from State Highway 3 or local roads. The access point for Site 1 is through the Urenui township and would likely not be suitable. Internal site access at Site 9 might be problematic as the existing access track appears to be on a neighbouring property.</p>
Resilience	<p>a. Most sites have no known natural hazard risks. Site 1 and 2 are at risk of significant coastal erosion. Site 9 has a potential liquefaction and fluvial flood risk on the river flats.</p>
Useable land	<p>a. Site 9 and Site 15 do not appear to have adequate space to locate a WWTP. Site 7 and Site 14 have very limited space to locate a WWTP with a 150m odour buffer. All other sites have enough space available for a WWTP inside a 150m odour buffer zone.</p>

Based on the assessment above, options **6, 16, 19, 20, 22, and 23** proceeded to the short list stage for the following key reasons:

- a) These options are mostly sites located further inland and away from wāhi tapu sites associated with Ngāti Mutunga's long history of occupation near the coast.
- b) These options are mostly large blocks of land, where the WWTP can be located away from dwellings achieving the minimum odour buffer of 150 m and providing sufficient distance from sensitive receivers.
- c) These options avoided sites where known ecological significance exists such as mapped Significant Natural Areas, Key Native Ecosystems and QEII native forest covenants.
- d) Site 20 proceeded to the short list stage as NPDC already own the land and this provides greater certainty around the land acquisition process and timing.

Sites that were not considered further had reasonably significant challenges or constraints. While the sites that proceeded to the short list may have had some constraints, they were not significant enough to prevent further investigation.

6.3 Short List Options

Options 6, 16, 19, 20, 22, and 23 proceeded to the short list stage and these sites are shown in Figure 5 below.

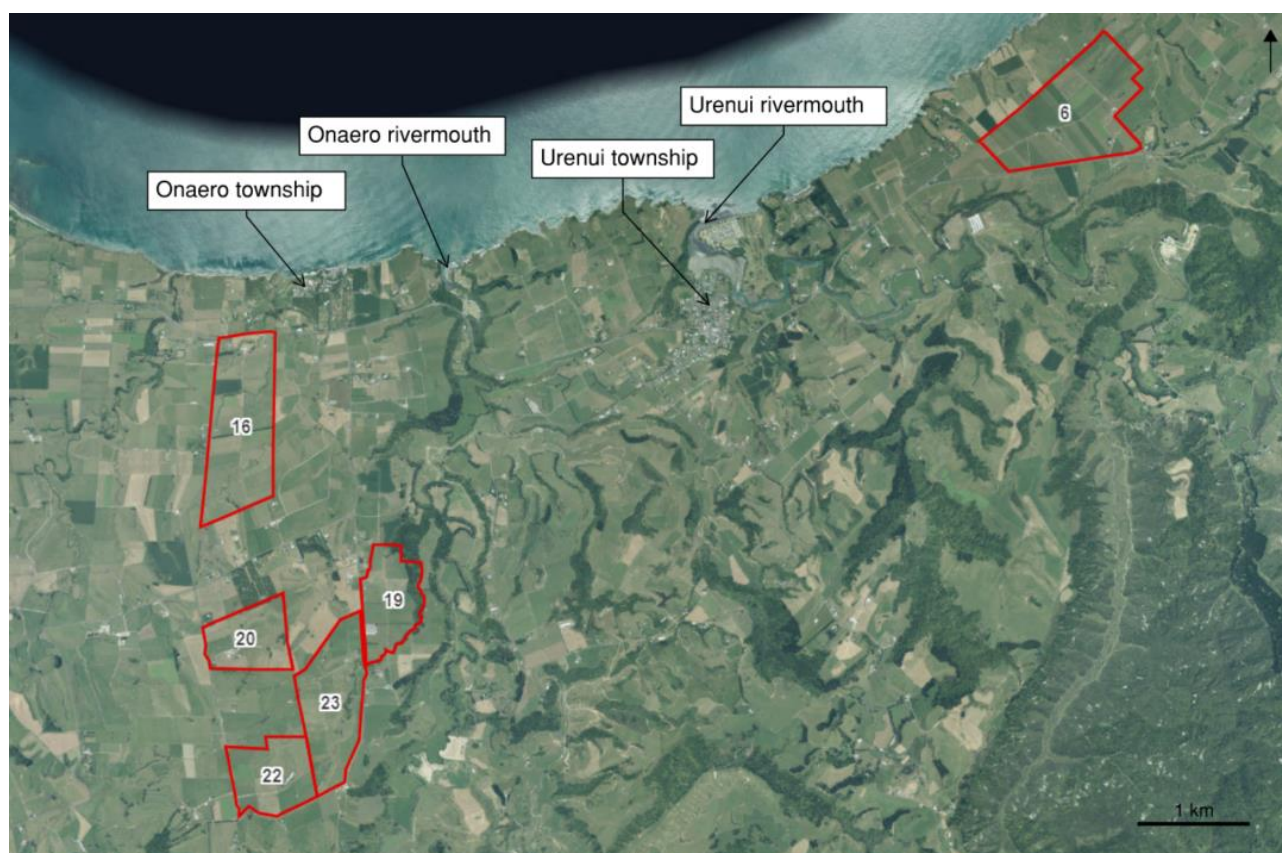


Figure 5. Map showing the location of short list sites.

6.4 Assessment of Short List Options

As outlined in the methodology section (Section 4), a scored multi-criteria assessment was used to assess the short-listed sites. In preparation for the MCA workshop, the Project Team were asked to assess the site. Site walkovers were able to be undertaken by the project ecologist and soil scientist at Sites 16 and Site 20 (Sites 6, 19, 22 and 23 were not able to be accessed). For these sites that could not be accessed desktop assessments were undertaken.

At the MCA workshop, the specialist's scores for each option were examined site by site. For each option, the expert responsible for each criterion presented to the group, explaining the basis of their assessment, general themes and comments, and the overall scoring they attributed to each option. In some cases, following the discussion of the relevant criterion, some scores were altered from what was originally assigned.

The table below provides a summary of the short list assessment. Table 9 includes the Assessment Criteria for the shortlisted options. Refer to Appendix E for more detail on this assessment.

Table 9. Summary of short list option assessment

Short list assessment - Site		6	16	19	20	22	23
Cultural	1a. Wāhi tapu sites	5	5	8	8	8	8
	1b. Mauri and mahinga kai values	8	8	6	3	8	6
Heritage	2a. Heritage	10	10	10	10	10	10
	2b. Archaeology	7	6	8	9	10	10
Social	3a. Ability to acquire land	1	5	1	10	1	1
	3b. Odour amenity	5	7	8	7	8	8
	3c. Traffic	6	7	6	6	5	5
	3d. Groundwater bores	8	10	5	5	8	5
Natural environment	4a. Terrestrial ecology	9	9	10	9	10	9
	4b. Aquatic ecology	10	9	8	8	5	8
Engineering	5a. Wastewater conveyance	8	7	6	6	4	6
	5b. Access	9	8	8	7	7	6
	5c. Services	6	8	8	8	6	8
Resilience	6a. Vulnerability to natural processes	8	9	6	9	8	7
Useable land	7a. Amount of suitable land available for disposal	9	8	8	6	7	7
Carbon	8a. Greenhouse gas emissions	9	7	6	6	4	6
Raw score		118	123	112	117	110	110

The Project Team reviewed and compared sites 6, 16, 19, 20, 22, and 23 against the short list criteria. The following table summarises the assessment of the short list options against the eight criteria topics – cultural, heritage, social, natural environment, engineering, resilience, useable land, and carbon:

Table 10: Short list assessment summary

Topic	Assessment
Cultural	<p>a. The western part of this site 6 is located between Okokio and Pukekohe pa sites and Ngāti Mutunga would not support the WWTP and irrigation areas being within the viewshaft or pathway between these two sites.</p> <p>b. The northern part of site 16 is a known occupation area for Ngāti Mutunga and has important cultural sites, however site 16 is a large property and the southern part of the property has no known wahi tapu.</p> <p>c. Potential contamination of waterways was a concern with sites 19 and 23, however the most concern was expressed for site 20 where Ngāti Mutunga had concerns with regards to contamination of ground and surface water due to the size and layout of the property.</p>
Heritage / Archaeology	<p>a. There are no heritage sites mapped in the NPDC District Plan that are in close proximity to any short-listed site.</p> <p>b. Sites 6 and 16, although having no archaeological sites recorded on the property, have the potential for archaeological sites to be discovered given their local near recorded archaeological sites. Sites 19 and 20 have a low</p>

Topic	Assessment
Social	<p>potential for archaeological discoveries, whilst the remaining sites had no recorded archaeology and low risk of archaeological sites being present.</p> <p>a. After being approached by NPDC officers, the owners of Sites 6, 19, 22 and 23 indicated that they were not interested in selling their properties. Site 20 was currently owned by NPDC and the owners of Site 16 indicated that they may be willing to sell their land.</p> <p>b. Odour amenity could be managed for the majority of short-listed sites, with potential to avoid odour issues on all sites depending on the final location of the WWTP within each site. Site 6 scored the lowest with a number of dwellings surrounding the site, however the WWTP could be located on site to avoid odour issues. Site 16 also had a number of surrounding dwellings, but again the WWTP could be located on site to avoid odour issues. Site 20 also had surrounding dwellings, however the site was considered viable from an odour perspective.</p> <p>c. From a traffic perspective, all sites scored similarly due to the need for roading improvements. Sites 22 and 23 scored the lowest due to need for intersection improvements and carriageway widening.</p> <p>d. In terms of potential effects on groundwater bores, records were reviewed and potential effects assessed. Site 19, 20 and 23 had groundwater bores either downgradient or in close proximity and scored lower. Sites 6 and 22 had a slightly potential for adverse effects, whilst site 16 scored the highest with no known groundwater bores downgradient of the site.</p>
Natural Environment	<p>a. In terms of terrestrial ecology, all sites scored highly. Wetlands and areas of vegetation are present on some sites but it was considered that adverse effects on these could be avoided by locating wastewater discharge infrastructure away from these sites.</p> <p>b. From an aquatic ecology perspective, site 22 scored lowest due to the location of a pond on the site where adverse effects would be difficult to avoid due to the layout of the site. On other sites, wetlands and stream are present, however adverse effects on these could largely be avoided by the proposed layout of the wastewater discharge infrastructure.</p>
Engineering	<p>a. In terms of wastewater conveyance, site 22 scored the lowest due to the complex pumping requirements to convey wastewater to the site. Sites 16, 19, 20 and 23 had moderate complexity in terms of wastewater conveyance, whilst site 6 scored the highest due to the proximity to Urenui Township.</p> <p>b. In terms of access to the sites, sites 20, 22 and 23 had moderate levels of access, whilst sites 6, 16 and 19 scored the highest.</p> <p>c. In terms of proximity to services, sites 6 and 22 were located furthest from Council services and scored lower. The remaining sites were located closer and scored higher.</p>
Resilience	<p>a. Site 6 and 23 scored lower due to known earthworks on site 6 and proximity to oil and gas wells. Other sites scored higher with either low risks or no known risks.</p>
Useable land	<p>a. Sites 20, 22 and 23 scored lower, as the available land was either not continuous or has several elevation changes. Sites 6, 16 and 19 scored highest.</p>
Carbon	<p>a. Site 22 scored lowest due to the longer length of conveyance pipeline required to reach the site. Site 6 had the shortest length of conveyance</p>

Topic	Assessment
	pipeline and consequently scored the highest. Other sites had moderate levels of carbon emissions associated with them.

6.5 Identification of Emerging Preferred Option

Overall, scoring between the short list sites was reasonably similar, with all sites scoring above 5 out of 10 in most categories.

Site 16 scored highest through the MCA process, although was held in private ownership. It is a large site, can easily accommodate all treated wastewater to land, and provides for sufficient buffer to sensitive activities.

Whilst site 20 was already owned by NPDC, it was a smaller site and had a lesser land area than site 16. Concern was also expressed by Ngāti Mutunga on potential adverse environmental effects of treated wastewater spray drift on waterways that run through the site. It was agreed that should this site progress this assessment would be revisited dependent upon the concept design for the discharge system being progressed further and potential effects on waterways being considered further.

Site walkovers were undertaken for sites 16 and 20 (undertaken as part of the earlier acquisition process for this site). These are presented in Appendix E.

As part of the short-list assessment process NPDC commenced property acquisition conversations with all short list sites and the property owners of Sites 6, 19, 22 and 23 ruled out selling their land. The property owner at Site 16 indicated that they would be open to selling their land and Site 20 was already owned by NPDC. Due to project timeframes and the opportunity to acquire Site 16 outside of the Public Works Act process, Sites 6, 19, 22 and 23 were eliminated from the preferred site selection process.

Based on the short list assessment and input from Ngāti Mutunga, Site 16 was identified as the preferred site over Site 20. This was mainly due to the larger size of Site 16 and the lack of waterways present on the site (Site 20 was constrained by several waterways crossing the site, constraining the available area for the disposal field and concerning Ngāti Mutunga from an environmental perspective). Although dwellings were located around the site, the large site area meant that both the WWTP and land discharge infrastructure could be placed within the site to allow for appropriate buffers between the activities and these sensitive receptors.

Property acquisition conversations continued with the owners of Site 16 and NPDC were able to successfully purchase the site.

6.6 Preferred Option

Site 16 was selected as the preferred option because it scored the highest overall in the MCA short list assessment and the property was able to be acquired by NPDC.

7 Conclusion

This assessment of alternative sites has been prepared on behalf of NPDC to support the NoR for designation and has been prepared in accordance with Section 171(1)(b) of the RMA.

This assessment has evaluated a wide range of sites for the Urenui and Onaero WWTP and discharge to land system location using a robust assessment methodology, as outlined in Section 4.

Throughout the short and long list assessments, Ngāti Mutunga were included as part of the assessment and decision making process.

Section 6 outlines the consideration of alternatives and demonstrates the longlist and shortlist assessment and the emerging preferred sites (site 16 and 20). Following a further review of the relative advantages and disadvantages of the two emerging preferred sites and engagement with Ngāti Mutunga, site 16 was selected as the preferred option.

A

Appendix A – Township Septic Tank Suitability and Land Priority for Discharge (LEI)

Urenui and Onaero Wastewater Upgrade Township Septic Tank Suitability and Land Priority for Discharge

Prepared for

New Plymouth District Council

Prepared by

L W E
Environmental
I m p a c t

November 2021



Urenui and Onaero Wastewater Upgrade Township Septic Tank Suitability and Land Priority for Discharge

New Plymouth District Council

This report has been prepared for **New Plymouth District Council** by Low Environmental Impact (LEI). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

Quality Assurance Statement		
Task	Responsibility	Signature
Project Manager:	Hamish Lowe	
Prepared by:	Katie Beecroft	
Reviewed by:		
Approved for Issue by:	Hamish Lowe	<i>H J Lowe</i>
Status:	Client draft	

Prepared by:

Low Environmental Impact
P O Box 4467
Palmerston North 4442

| T | [+64] 6 359 3099
| E | office@lei.co.nz
| W | www.lei.co.nz

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Revision Status			
Version	Date	Author	What Changed and Why
v2-2	7/06/2022	KB	Update areas based on updated flows. Update Figure 3.2.
v2-1	7/12/2021	KB	Update following NPDC review
	1/11/2021	KB	Client draft



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1 EXECUTIVE SUMMARY

New Plymouth District Council (NPDC) has responsibility to ensure that wastewater from Urenui, Onaero, Urenui Domain and Onaero Domain is managed to protect public health. These communities and facilities are serviced by individual on-site treatment and discharge systems, typically septic tank treatment and trench discharges. Much of the existing infrastructure is likely to be reaching the end of its expected life. Over time, microbial contaminants have been detected in surface water samples close to the communities. This has led NPDC to review the management of wastewater for the communities and domains, and to develop future plans.

This report evaluates the suitability of septic tank treatment and individual on-site discharge for the two communities. This evaluation assumes current design standards are met. Assessing the suitability of the land to receive wastewater has been expanded to a 10 km radius around the towns and has considered different rates and methods of discharge.

This report refers to the soil system and its ability to treat and transmit treated wastewater. In particular the unsaturated soil and geological units are considered (vadose zone). Typically this focusses on the top two meters of the land surface. Consideration of groundwater movement including the nature of the aquifer, speed and direction of groundwater movement is addressed elsewhere (Beca, 2021).

1.1 Current Septic Tank Design Standards

Manufacturing standards for septic tank systems are given in AS/NZS 1546.1:2008 – On-site domestic wastewater treatment units – Septic Tanks. Units for installation are required to meet these standards for new installations.

The standards required for design of treatment and discharge systems for on-site wastewater management are given in AS/NZS 1547:2012 – On-site domestic wastewater management.

A number of regional councils provide guidance for on-site treatment and discharge design specific to their regions and to enable Regional Plan rules to be complied with. On-site wastewater discharges are permitted by Taranaki Regional Council under Rule 22 of the Regional Fresh Water Plan where they comply with Auckland Council Publication (TP 58):

New Zealand Manual of alternative wastewater treatment and disposal systems, volume II, Part A. On-site wastewater disposal from households and institutions.’ Technical publication No. 58, second edition (Gunn, 1994).

This document has been superseded by GD006:

Z, Chen and G Silyn Roberts. (2021) On-site Wastewater Management in the Auckland Region. Auckland Council guideline document, GD2021/006.

For the purpose of this desktop investigation the design standards adopted are AS/NZS 1547:2012 with on-site considerations as follows:

- Treatment includes a two stage septic tank with outlet filter;
- Wastewater flows per household from Beca (250 l/p/d, occupancy of 4 p/dwelling over summer and 2.14 (Urenui) and 2.34 (Onaero) p/dwelling during winter);
- Discharge is to a conventional trench system;
- Design loading rate is:
 - 15-25 mm/day on elevated terrace of Urenui (New Plymouth Black Loam soils);
 - 6-10 mm/day on lower areas of Urenui close to the river (Kairanga silt and clay loams); and



- 10-15 mm/day in Onaero (Whangamomona complex soils)
- Hardstand/impermeable area of residential sized properties is 30% of site;
- Reserve area of 100% is required.

1.2 Suitability of Septic Tank Systems for Urenui and Onaero

In order to determine the suitability for septic tank discharge in the vicinity of Urenui, Onaero and the two domains, the process was as follows:

1. Utilise published soil, landscape, land use and hydrological data to determine the benefits and limitations for each area (Appendix A).
2. Combine the individual data to assign an overall suitability rating for each area (described as "Zones").
3. Determine the potential for cumulative impacts which pose a risk to human health and environmental impacts from multiple septic tank discharges.

The evaluation of the suitability for septic tank treatment and on-site discharge assumes that current good practice design standards are applied. The evaluation concludes that due to the density of discharges and the proximity to surface water there are few areas where septic tank discharges could be used.

If existing systems do not meet current design standards, resulting in lower treatment levels and/or higher discharge depths, it can be expected that a higher risk for cumulative effects exists. It is expected that most if not all properties within the two townships would be unsuited to septic tank discharge. A survey of discharge field locations and septic tank installations would be needed to confirm this.

Figures 3.1 and 3.2 (and Figures 12 and 13, Appendix A) show the suitability for a new septic tank discharge for sites within Urenui and Onaero. There are areas near the centre and south of Urenui which are likely to be suitable for septic tank discharge. This is due to larger distance to surface water paths, and to lesser overlap with upgradient plumes from other discharges.

Areas within Onaero are less suited to septic tank discharge due to proximity to the coast and the dominantly northward groundwater gradient expected in the area.

Septic tank discharges for small communities require adherence to current design standards for the protection of environmental and human health and wellbeing. Systems which do not meet current standards should be evaluated to determine performance. Further work is required if septic tank discharges are to be considered for continued use for the communities. Additional information required includes:

- Groundwater characterisation in the vicinity of the towns is undertaken to determine subsurface flow paths, groundwater gradient, existing groundwater quality and potential for attenuation of nutrients and pathogens.
- Investigations into current condition and performance of septic tanks and discharge fields within the community are undertaken.
- Grouping of systems for removal, replacement or renovation is undertaken.

1.3 Suitability of Land for Community Scale Wastewater Discharge

A potential option for future wastewater management is land based discharge. The existing discharges are a type of land disposal. The initial scope of this report was to determine the suitability for septic tank and trench discharges in their current locations and for future discharges within and near to the two towns.



The Zone map produced from the initial steps described in Section 1.2 above (1 & 2) can be used to determine the suitability of areas for a range of land discharge methods in addition to septic discharge. Prior to Step 3 the original scope of this report was expanded beyond the towns and domains to enable land suitability for wastewater application to be considered for any area within 10 km of the two towns. In addition to determining the suitability of using septic tank discharge for the towns, the Zone map (Appendix A, Figure 3) can then also be used to prioritise areas for further investigation for other types of land application.

A summary of suitability of land within 10 km of Urenui and Onaero for developing a land based discharge is as follows.

Zone	Description and Design Considerations	Area (ha)	% Investigation Area
A	Well Suited Requires smaller land area, as more water can be applied to a given area High value and/or short rotation crops Non-deficit irrigation – nil or limited storage required Greater number of irrigable days High rate of nutrient removal Routine cultivation and harvest, with short withholding periods.	4,521	18.8
B	Moderately Well Suited High value and/or short rotation crops Non-deficit irrigation or partial deficit irrigation Can irrigate in shoulder seasons (April, May, September, October) for drier than average years – some storage likely to be required Moderately high rate of nutrient removal Short withholding period for grazing or cultivation and harvest	2,978	12.4
C	Minor Limitations Pasture or restricted range of annual crops Predominantly deficit irrigation, requiring large storage or combined water discharge Larger land area requirement Withholding period prior to grazing or cultivation and harvest is extended	4,542	18.9
D	Significant Limitations Plantation forestry, pasture, shallow rooting crops Deficit irrigation over summer months, requiring larger storage/combined water discharge Low nutrient loading Limitation to cultivation and harvest Extended withholding period for stock trafficking	8,395	34.9
E	Severe Limitations Requires largest land area Conservation plantings Low deficit irrigation for short season, requiring larger storage/combined water discharge No cultivation, infrequent harvest.	261	1.0
N/A	Riparian Buffers – Excluded from area totals	3,387	14
Total	Land within a 10 km radius of Urenui and Onaero	24,084	100

Relative areas required for each Zone, based on predicted wastewater flows (Beca, pers comm) are as follows. The areas given include the area required for discharge and allowance for boundary, dwelling, waterway, raceway exclusions of an additional 30 % area.



Zone	Average daily depth of Irrigation	Land Treatment Area Required (ha)			Rapid Infiltration Area Required (ha)
		Urenui	Onaero	Urenui, Onaero and both domains	
A	5 – 1.5 mm* (Rapid Infiltration 200 mm)	8.4 - 28	2.3 - 7.5	12.8 - 42.7	0.5 Urenui 0.1 Onaero 0.7 U+O+domains
B	0.8 – 1.2 mm	52.5 - 35	14.1 - 9.4	80 - 53.3	-
C	0.5 – 0.8 mm	84 - 52.5	22.6 - 14.1	128 - 80	-
D	0.3 – 0.5 mm	140 - 84	37.7 - 22.6	213.3 - 128	-
E**	0 mm	-	-	-	-

*5 mm is considered sustainable on a Zone A site. The inclusion of 1.5 mm allows for mixed use or management of a site.

**dependent on area. Generally, no irrigation would occur, but there could be exceptions for low rate irrigation, in particular, areas of flat land that may be restricted by a clay pan or gravel beds may be suitable for low rate irrigation.

Areas which are Zoned A and B are considered to be suitable for septic tank discharges. Most areas within Onaero are Zone A. Urenui has a mix of Zone B and Zone E close to the Urenui River. This suggests that the land that the towns occupy is generally suitable for septic tank discharge.

The Zones do not address the potential for cumulative impacts due to a high density of septic tank discharges. For Step 3, the parameters considered are:

- Subsurface material composition;
- Depth of unsaturated material;
- Proximity to other discharge fields;
- Proximity to receptors (bores, surface water).

If land application is investigated further the following should be considered:

- Is there reasonable access to preferential Zone A or B land.
- Storage requirements or alternative discharge options for Zone C or D land.
- Alternative wet season discharge options for Zone C and D land.
- Property ownership, including how many owners occur within a continuous block of land large enough for the wastewater flow from the WWTP (2.3 ha to 87.0 ha; dependent on wastewater quality, irrigation method and access to Zone A and B land);
- Depth to groundwater and groundwater movement/contours;
- Land management (e.g. is preferred land operated as dairy farms?);
- Routes and costs for reticulation requirements (distance and elevation); and
- Special use locations (archaeological, historic, water take, native forest, recreational etc.).



2 INTRODUCTION

2.1 Purpose

The purpose of this report is to assess the suitability for septic tank discharges for Urenui and Onaero townships. In addition, land to prioritise in consideration of long term irrigation (or disposal) of wastewater is identified.

2.2 Background

New Plymouth District Council (NPDC) has responsibility to ensure that wastewater from Urenui, Onaero, Urenui Domain and Onaero Domain is managed to protect public health. These communities and facilities are serviced by individual on-site treatment and discharge systems, typically septic tank treatment and trench discharges. Much of the existing infrastructure is likely to be reaching the end of its expected life. Over time, microbial contaminants have been detected in surface water samples close to the communities. This has led NPDC to review the management of wastewater for the communities and domains, and to develop future plans.

A potential option for future wastewater management is land based discharge. The existing discharges are a type of land disposal. Beca engaged Lowe Environmental Impact (LEI) to undertake:

- **Soil desktop assessment:**
Investigations to understand the infiltration capacity of the soils at Urenui and Onaero (townships and campgrounds) is needed to determine the suitability of the ongoing use of septic tanks
- **Septic Tank Best Practice Review (Section 3):**
A literature review of best practice for septic tanks with regards to field/ property size, based on New Zealand Standards and common practices will be undertaken. This will include any constraints to inform whether this is a feasible option for future wastewater treatment. The findings will be included in a technical memorandum.

Subsequent to the initial scope LEI has agreed to produce a desktop evaluation of suitability for land discharge within 10 km of the townships. Details of that process and outcome are given in this report.

2.3 Scope

This document is intended to be a preliminary desktop assessment considering the suitability of land for septic tank discharge suitability. The report has been expanded to include general land application suitability for the discharge of treated wastewater from Urenui, Onaero, the Urenui Domain and Onaero Domain.

The report is **not** intended to provide any recommendation of a favoured option, but to provide a factual basis upon which NPDC may select favoured options for further consideration.

This report concerns the shallow soil environment, typically the top two meters of the land surface. Assessments of soil properties are based on typical metrics and terminology used for soil evaluations and are aligned to Fundamental Soil Layer and Land Resource Inventory systems. It should be noted that groundwater movement including the nature of the aquifer, speed and direction of groundwater movement is addressed elsewhere (Beca, 2021).



This investigation is to identify if land is potentially suitable for land treatment, prior to further investigation. Prior to final selection, areas identified as suitable in this report should be considered in terms of their current and future management suitability, and subject to a site investigation to verify if their characteristics are suitable for a land application system¹.

It is understood that identified stormwater contamination (not reviewed here) is a likely indicator that the existing septic tank discharges are not suited to continued long term use. However, a conclusion can not be drawn on the basis of this desktop investigation. On-site surveys would be needed for definitive conclusions to be drawn.

¹ No consideration has been given to land availability, and no field investigations to verify the accuracy of the mapped information have been undertaken.



3 SEPTIC TANK DISCHARGE SUITABILITY

3.1 General

Section 3 provides a summary of relevant design guidelines for new septic tank installations. Guidance is given about the suitability of retaining septic tank discharges for Urenui and Onaero **if they conform to current standards**. Information about existing treatment and discharge systems was not available for this evaluation however it is expected that current standards are not met for a significant number of discharges based on the expected age of the systems. Additional information required if the suitability of existing systems is to be evaluated is identified.

3.2 Standards and Guidelines

Manufacturing standards for septic tank systems are given in AS/NZS 1546.1:2008 – On-site domestic wastewater treatment units – Septic Tanks. Units for installation are required to meet these standards for new installations. If survey of the existing systems is undertaken then it is recommended that they are assessed in light of AS/NZS 1546.1:2008.

The standards required for design of treatment and discharge systems for on-site wastewater management are given in AS/NZS 1547:2012 – On-site domestic wastewater management. This document is a standard and so should be considered as the minimum requirement to be met.

The determination of design loading rates (DLR) for septic tank systems consider:

- Site and soil limitations, in particular, the soil type and permeability;
- The use of trenches versus beds;
- Level of treatment of wastewater (primary or improved primary);

Details of the minimum process for determining the area requirements, discharge design, engineering design, and procedures for construction, commissioning, inspection and reporting are given in Appendix L of AS/NZS 1547:2012.

A number of regional councils provide guidance for on-site treatment and discharge design specific to their regions and to enable Regional Plan rules to be complied with. On-site wastewater discharges are permitted by Taranaki Regional Council under Rule 22 of the Regional Fresh Water Plan where they comply with Auckland Council Publication (TP 58):

New Zealand Manual of alternative wastewater treatment and disposal systems, volume II, Part A. On-site wastewater disposal from households and institutions.' Technical publication No. 58, second edition (Gunn, 1994).

This document has been superseded by GD006:

Z, Chen and G Silyn Roberts. (2021) On-site Wastewater Management in the Auckland Region. Auckland Council guideline document, GD2021/006.

In addition to public health and environmental design considerations, GD006 provides guidance on the mana whenua context for wastewater management.

3.3 General Design Parameters for Urenui and Onaero Septic Discharge

For the purpose of this desktop investigation the design standards adopted are AS/NZS 1547:2012 with on-site considerations as follows:

- Treatment includes a two stage septic tank with outlet filter resulting in improved primary treatment;



- Wastewater flows per household from Beca (250 l/p/d, occupancy of 4 p/dwelling over summer and 2.14 (Urenui) and 2.34 (Onaero) p/dwelling during winter);
- Discharge is to a conventional trench system, bed or low pressure effluent distribution (LPED) system;
- Design loading rate is:
 - 15-25 mm/day on elevated terrace of Urenui (New Plymouth Black Loam soils);
 - 6-10 mm/day on lower areas of Urenui close to the river (Kairanga silt and clay loams); and
 - 10-15 mm/day in Onaero (Whangamomona complex soils)
- Hardstand/impermeable area of residential sized properties is 30% of site;
- Reserve area of 100% is required.

Zone A and B land (Section 5.3) is favoured for septic tank discharge.

3.4 Septic Tank Discharge Suitability Parameters

The parameters listed in Section 5.2.1 below describe the general suitability of land for application of wastewater. These parameters also provide a “first-pass” assessment for suitability for use of high density septic tank discharge. The described Zones apply for septic tank discharge, which is typically at a rate which is higher than occurs for land treatment. Areas of Zone A and Zone B land are best suited to septic discharges.

Within Zone A and B land (Section 5.3), a range of additional parameters can be applied. The primary aim of this parameter assessment is to determine the potential for cumulative impacts which pose a risk to human health and environmental impacts.

Septic discharge parameters include:

- Subsurface material composition;
- Depth of unsaturated material;
- Proximity to other discharge fields;
- Proximity to receptors (bores, surface water).

The townships have been delineated using a 1 km boundary. The septic tank suitability is expressed on a per parcel basis, with a rank of 1 to 5 (least suited to best suited) assigned to each property parcel.

3.5 Suitability of Septic Tank Systems for Urenui and Onaero

In order to determine the suitability for septic tank discharge in the vicinity of Urenui, Onaero and the two domains, the process was as follows:

1. Utilise published soil, landscape, land use and hydrological data to determine the benefits and limitations for each area (Appendix A).
2. Combine the individual data to assign an overall suitability rating for each area (described as “Zones”).
3. Determine the potential for cumulative impacts which pose a risk to human health and environmental impacts from multiple septic tank discharges.

The evaluation of the suitability for septic tank treatment and on-site discharge assumes that current good practice design standards are applied. The evaluation concludes that due to the density of discharges and the proximity to surface water there are few areas where septic tank discharges could be used.



If existing systems do not meet current design standards, resulting in lower treatment levels and/or higher discharge depths, it can be expected that a higher risk for cumulative effects exists. It is expected that most if not all properties within the two townships would be unsuited to septic tank discharge. A survey of discharge field locations and septic tank installations would be needed to confirm this.

3.6 Suitability from Zone Map

The Zone map (Figure 3, Appendix A) in the vicinity of Urenui is impacted by source maps identifying the area as a township resulting in a zero score for a number of parameters. The underlying land conditions were considered and the Urenui township was assessed as predominantly Zone B land above 10 m elevation and Zone D land below 10 m elevation.

Onaero falls predominantly within Zone A.

Each of the domains fall within Zone D land, while the discharge fields associated with the domains are located on Zone A land (including a polygon adjustment for Onaero Domain). The Onaero Domain discharge field is within the area predicted as lost to coastal erosion and so would not be considered for development of a septic discharge despite the adjacent land (not impacted by coastal erosion) being Zone A.

Areas identified as Zone A and B are considered to be suitable for appropriately designed septic tank discharges. Only the area of Urenui below 10 m elevation is considered to be unsuitable for septic tank discharge on the basis of the land suitability zoning.

3.7 Suitability Based on Potential Cumulative Impact

As noted in Section 3.5, when a high density of septic tank discharges occur a further evaluation of the potential for a cumulative impact on receptors is undertaken. The towns both have potable water reticulation indicating that bore water takes are unlikely, and there are few (no) downgradient groundwater receptors. Further information regarding known bores in the vicinity of the towns is given in Beca (2021). Further refinement of this assessment can be applied for individual bore takes identified. The assessed receptors for septic discharge impacted groundwater are considered to be the coastal environment and Motukara Stream at Onaero and the Urenui River and tributaries at Urenui.

As noted in Section 3.6 above the initial investigation indicated that the land within the townships is suitable for long term discharge of wastewater in respect of the hydraulic loading (ability to avoid excessive wetness and excessive drainage) and nutrient uptake potential. Due to the areas being predominantly residential the ability to meet the nutrient uptake potential is low and over time it is expected that nutrients will build up beyond the soils ability to store them. This is expected to lead to increasing groundwater concentrations and the potential for reduced pathogen removal in the soil and groundwater system. In addition, the density of septic tanks is expected to result in a cumulative impact on groundwater which will be detected in surface water at zones of seepage and springs or where surface water intercepts groundwater (river banks, estuaries and coastal boundaries).

The key concern from the towns is the public health risk and impacts on cultural and recreational values and so pathogen transport is of importance. There are a number of microbial risk assessment tools which are appropriate for this situation. Monitoring of bacteria, indicated by *e.coli* is common and has been undertaken in the vicinity of the townships. A review of that data is outside the scope of this report.



The potential risks from septic tank discharges have been considered on the basis of microbial reduction rates in the subsurface environment and the additive effect of overlapping plumes from nearby septic discharge fields. For each field the proposed rate of reduction is given in Table 3.1. The New Plymouth Black Loam soils occur on the elevated plains of both towns. The Kairanga silt and clay loam soils are found near to the Urenui River (assessed as below 10 m elevation), and the Whangamomona complex soils are found at the seaward extent of Onaero.

Table 3.1: Indicative virus log reduction (determined from Close *et al.*, 2020 and ESR, 2010)

	New Plymouth Black Loam (Urenui and Onaero)	Kairanga silt loam and clay loam (Urenui)	Whangamomona complex (Onaero)
Inlet <i>E.coli</i> (cfu/100 mL)	4.3 x 10 ⁵ to 1.4 x 10 ⁷		
Inlet norovirus (cfu/100 mL)	1 x 10 ⁴ to 1 x 10 ¹⁰		
Treatment (log ₁₀ reduction)	0.6		
Trench (log ₁₀ reduction)	0.37		
Soil (log ₁₀ reduction)	12	0.6	1.2
Vadose (log ₁₀ reduction)	1.65	0.87	0.87
Groundwater (log ₁₀ /m reduction)*	0.0153	0.085	0.085

*Dependent on a number of factors. Average value used. Values given are based on a simple linear model and assume aquifer properties. A 3D modelling tool can be used to provide a higher degree of certainty.

The values given in Table 3.1 have been used to create a risk based on proximity to receptor (typically surface water paths). Figures 3.1 and 3.2 (and Figures 12 and 13, Appendix A) show the suitability for a new septic tank discharge for sites within Urenui and Onaero. No information on the location, design, and construction of existing septic tanks and discharge fields was able to be reviewed for this investigation. There is potential that a large proportion of systems in operation in the two towns do not meet current design standards. This assessment does not apply to systems which do not meet current standards. Replacement of aged systems may be considered.

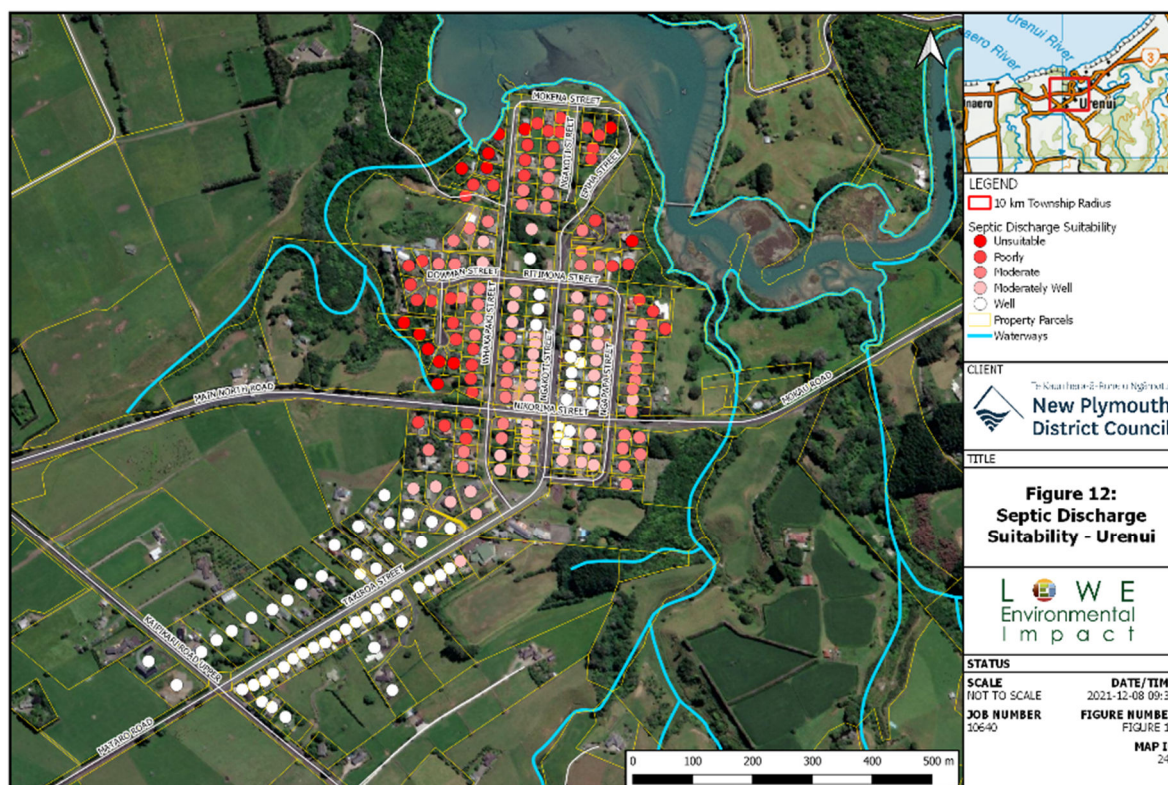


Figure 3.1: Septic Tanks Suitability for Urenui



Figure 3.2: Septic Tanks Suitability for Onaero

There are areas near the centre and south of Urenui which are likely to be suitable for septic tank discharge. This is due to larger distance to surface water paths, and to lesser overlap with upgradient plumes from other discharges.

Areas within Onaero are less suited to septic tank discharge due to proximity to the coast and the dominantly northward groundwater gradient expected in the area.

3.8 Suitability of Existing Systems

Septic tank discharges for small communities require adherence to current design standards for the protection of environmental and human health and wellbeing. Systems which do not meet current standards should be evaluated to determine performance. Further work is required if septic tank discharges are to be considered for continued use for the communities. Additional information required includes:

- Groundwater characterisation in the vicinity of the towns is undertaken to determine subsurface flow paths, groundwater gradient, existing groundwater quality and potential for attenuation of nutrients and pathogens.
- Investigations into current condition and performance of septic tanks and discharge fields within the community are undertaken.
- Grouping of systems for removal, replacement or renovation is undertaken.



4 LAND SUITABILITY FOR LAND TREATMENT OF WASTEWATER

4.1 General

Land application of wastewater can be regarded as a potential discharge option for treated wastewater from the communities of Urenui and Onaero. In developing a reticulation network for the communities, the inclusion of wastewater from Urenui and Onaero domains could be included. Treated wastewater can be beneficially applied to land to assist production, providing nutrients alongside water, supplementing fertiliser application and irrigation. Alternatively, a high rate discharge to a smaller area of land can be used where the focus is wastewater disposal, rather than beneficial use.

Suitability for septic tank treatment and discharge relies on soil properties and unsaturated depth sufficient to provide treatment to the discharge (typically 1^o treatment). In addition, the potential for attenuation in the saturated zone influences the suitability for septic tank discharge.

The land treatment assessment assumes wastewater quality equivalent to a well functioning facultative pond system or basic high-rate treatment system (basic 2^o treatment). Characteristics considered in the design of a land treatment system include:

- Wastewater characteristics including, flow, projected future flows (as provided by Beca) and wastewater quality;
- Climate and receiving environment; and
- Land management and operational considerations.

This report focusses on the land resource and land management. Other characteristics are further considered following the identification of suitable land.

4.2 Investigation Area

Land within a 10 km radius of the Urenui and Onaero townships has been assessed and is referred to as the Investigation Area and is shown in Figure 4.1 (larger version as Figure 1, Appendix A). The characteristics of land in this Investigation Area are variable, and can be broadly described as having the following landforms:

- Volcanic ring plain – being relatively flat land <7^o located predominantly west to south-west of Onaero. Soils of overlying this ring plain are allophanic, consisting of the New Plymouth Black and Sandy Loams. These soils are predominantly derived from Late Pleistocene aged debris avalanche and lahar deposits typical of the Okawa Formation (GNS Science, n.d.). Soils appear to be relatively well to moderately well-draining with the dominant land use being dairy farming and annual cropping.
- Sedimentary/uplifted marine terraces – are the flat areas predominantly to the north-east of Urenui within proximity to the coastline. These terraces are Late Pleistocene dated shoreline deposits, specifically being of the Rapanui, Hauriri & Inaha terrace coverbeds comprising shallow marine conglomerate, shell beds, dune sands and peat (GNS Science, n.d.). As with the volcanic ring plain, soils here are allophanic soils consisting of the New Plymouth Black Loam.
- Coast – is described as of unconsolidated sandy/gravelly origin and coastal sea cliffs residing within the direct vicinity of the coastline and subject to regular coastal processes. These areas are located along the seaward extent of the Investigation Area. Sandy to



gravelly beaches are relatively isolated, confined to small pockets of the coastline where material derived from surrounding rivers can accumulate.

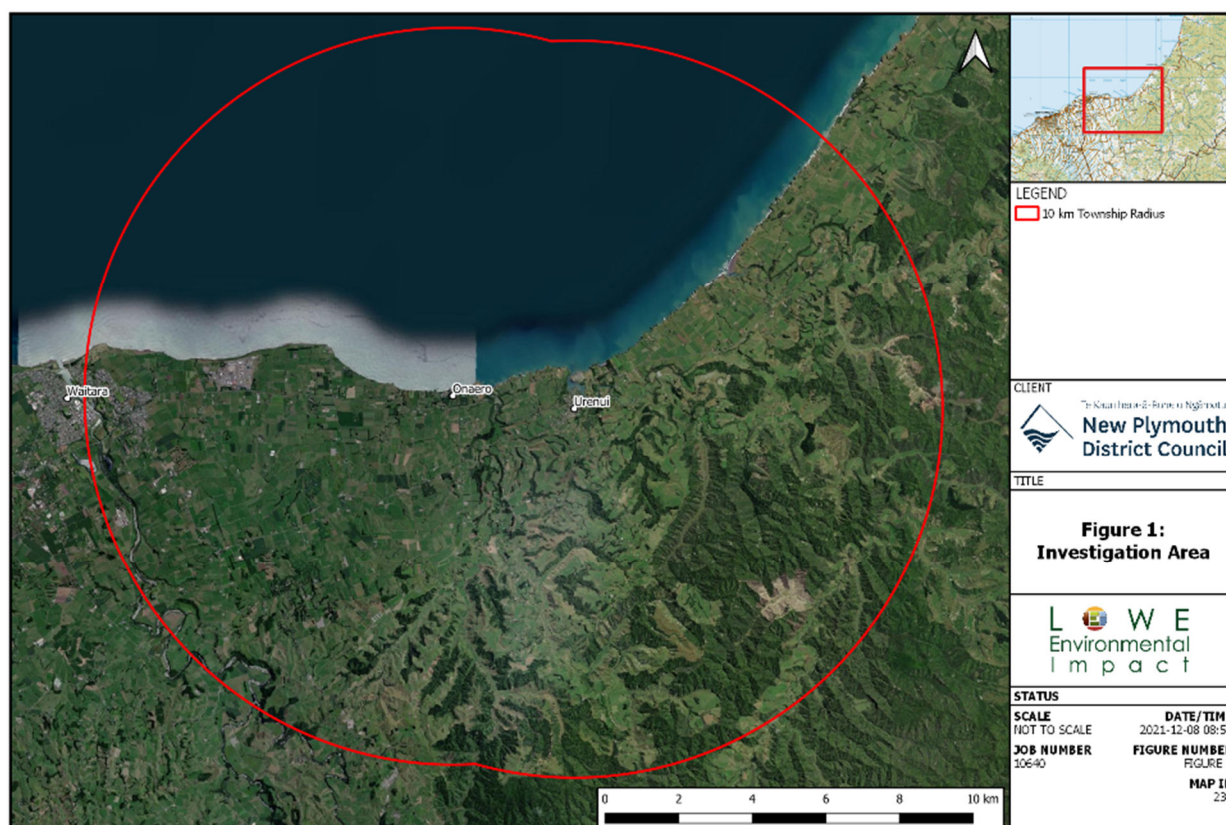


Figure 4.1: Investigation Area

4.3 Rainfall and Potential Evapotranspiration (PET)

Average monthly rainfall and potential evapotranspiration (PET) data is given in Table 4.1. The nearest climate stations with complete records that cover up-to-date data over a sufficient time span (2003 to 2020) and (1991 to 2020) are the Urenui Climate Station at Ngakoti Street (NIWA/24694) and the New Plymouth AWS located at New Plymouth airport (NIWA/2283). The Urenui Station is located approximately 600 m south of the Urenui Beach Motor Camp and approximately 2.3 km east of the Onaero Bay Holiday Park site. The New Plymouth AWS Station is located approximately 16 and 18 km west of the Onaero and Urenui sites respectively.

Table 4.1: Rainfall and PET Data for the Investigation Area

Month	Rainfall (mm)	PET (Prestley Taylor)
Jan	93	144
Feb	102	114
Mar	96	88
Apr	133	44
May	154	18
Jun	153	5
Jul	159	8
Aug	161	26
Sep	132	51
Oct	144	84



Nov	93	113
Dec	132	130
Annual Average	1,552	824
Station Name	Urenui Climate Station at Ngakoti Street New Plymouth AWS	
Period	2003 – 2020, 1991 - 2020	

Rainfall is relatively consistent throughout the year. August typically receives the highest amount of rainfall (161 mm) with January, March and November being the driest (93 – 96 mm). Average annual rainfall near the investigation area is 1,552 mm/year.

The month with the greatest amount of potential evapotranspiration (PET) is January with 144 mm and the month with the least is June with only 5 mm of PET. Average annual PET near the investigation area is 824 mm.

The consistency of rainfall throughout the year and significant difference between rainfall and PET may limit the number of days that application of wastewater could occur.

4.4 Land Application Area for Assessment Purposes

The land area required for wastewater application from the Urenui and Onaero townships and the domains are dependent on the design of the land discharge system, alternative seasonal discharges and the amount of storage available. This report considers the application to land of wastewater from each township individually and the combined townships and domains.

The future projected average wastewater discharge from each of the treatment plants are as follows (received via email from Beca, 05/05/2022):

- Urenui Township – 117,906 m³
- Urenui Domain – 26,196 m³
- Onaero Township – 31,714 m³
- Onaero Domain – 3,868 m³

The approximate land areas required to accommodate year round discharge of the average flow volumes are given in Table 4.2. These areas assume that storage of treated wastewater in the event of high soil moisture and to buffer peak flows is available. The areas given include the area required for discharge and allowance for boundary, dwelling, waterway, raceway exclusions of an additional 30 % area.

Table 4.2: Approximate Land Area Requirements (30 % buffer)

Zone	Average daily depth of Irrigation	Land Treatment Area Required (ha)			Rapid Infiltration Area Required (ha)
		Urenui	Onaero	Urenui, Onaero and both domains	
A	5 – 1.5 mm* (Rapid Infiltration 200 mm)	8.4 - 28	2.3 - 7.5	12.8 - 42.7	0.5 Urenui 0.1 Onaero 0.7 U+O+domains
B	0.8 – 1.2 mm	52.5 - 35	14.1 - 9.4	80 - 53.3	-
C	0.5 – 0.8 mm	84 - 52.5	22.6 - 14.1	128 - 80	-
D	0.3 – 0.5 mm	140 - 84	37.7 - 22.6	213.3 - 128	-
E**	0 mm	-	-	-	-

*5 mm is considered sustainable on a Zone A site. The inclusion of 1.5 mm allows for mixed use or management of a site.



**dependent on area. Generally, no irrigation would occur, but there could be exceptions for low rate irrigation, in particular, areas of flat land that may be restricted by a clay pan or gravel beds may be suitable for low rate irrigation.

The land area required for full time land treatment varies from 2.3 ha for Onaero only discharge on optimum soils, to 213.3 ha for all wastewater flows on less desirable land (Table 4.2). The wide range of areas is due to the need for different discharge regimes under different soil and land use scenarios.

An area of ~0.1 ha to 0.7 ha is needed for rapid infiltration (land disposal) options. For rapid infiltration to be a feasible option an area of excessively well drained soils would be needed. More detailed investigations would be required to locate suitable land.

Figure 4.2 (larger version as Appendix A, Figure 2) shows land parcels in the Investigation Area >20ha in area. Further work would be needed to determine which parcels are in the same ownership so that the size of contiguous land areas can be identified.

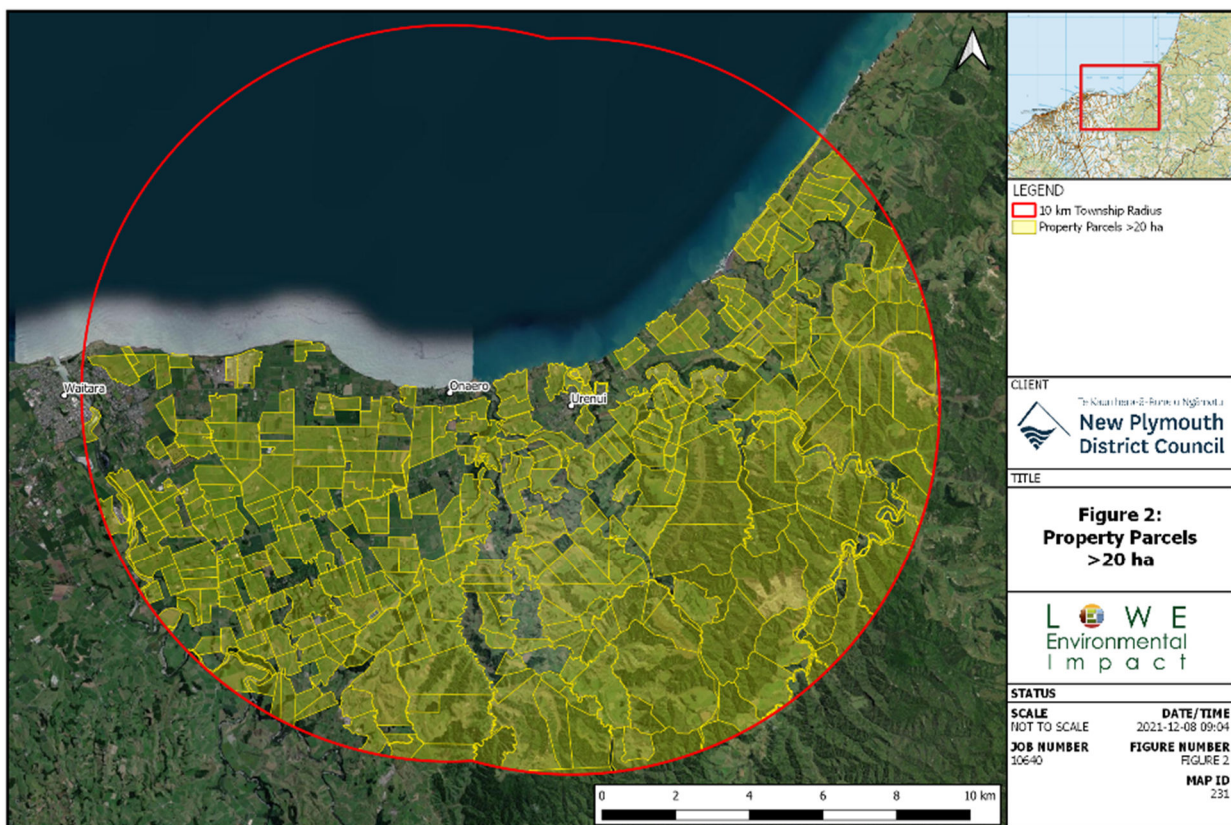


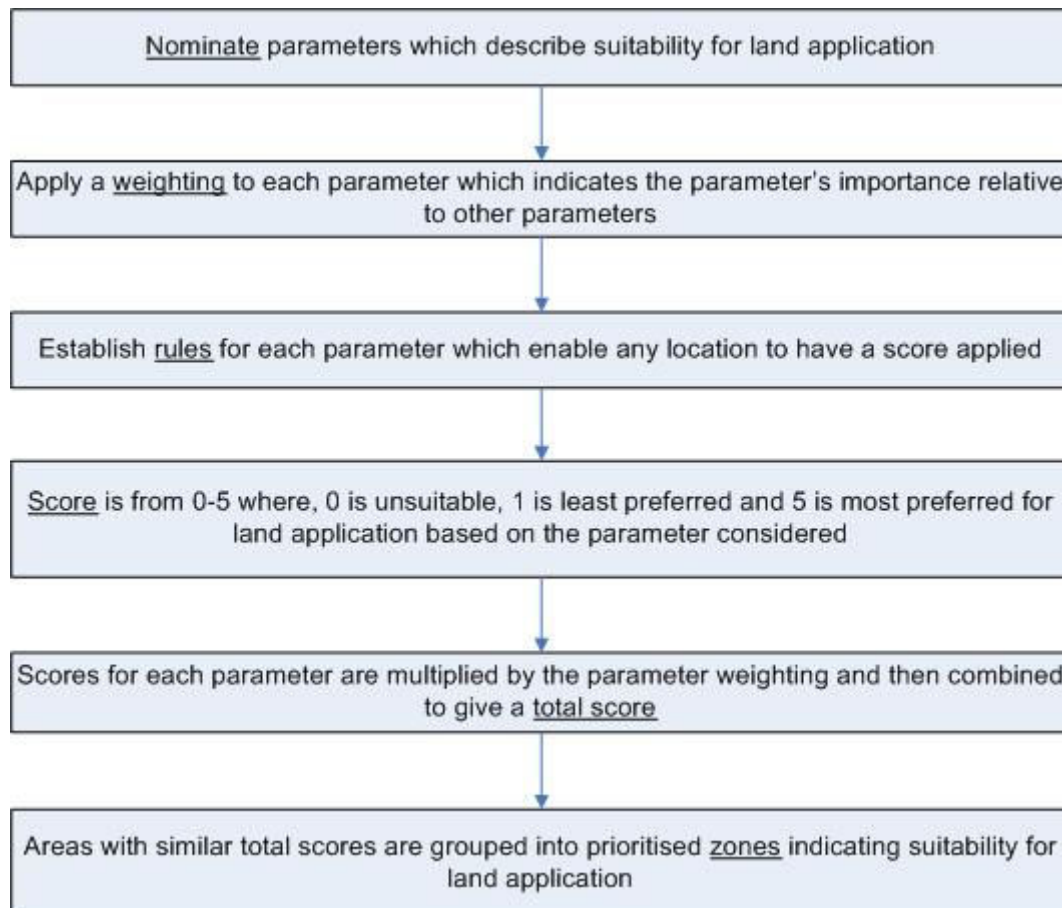
Figure 4.2: Properties Greater than 20 ha in Size



5 LAND APPLICATION ASSESSMENT METHODOLOGY

5.1 Process Overview

The process undertaken to determine the ability of areas near the Urenui and Onaero townships to receive wastewater is outlined as follows:



5.2 Parameters

There are a wide range of parameters which influence the ability of an area of land receive applied wastewater. The selection and interpretation of parameters for assessment may vary from area to area due to location specific challenges or advantages. For instance, where an investigation is near to the coast, consideration of coastal erosion may be important while this would not be considered for an inland investigation area.

The relative importance of the parameters varies and may be subjective. However, there is a need to consider the collective suitability of a particular site or area based on the merits of several parameters. This can be achieved using a weighted scoring system whereby each parameter is given a percentage (the weighting), which indicates its importance relative to other parameters. The weighting of each parameter should be informed by the values that the stakeholders hold for the project and investigation area. For this report, each parameter is given equal weighting.



5.2.1 General Parameters

A range of parameters can be considered within the Investigation Area as listed below.

- Land use;
 - Nutrient uptake potential.
 - Climate
- Soil attributes;
 - Slope and stability.
 - Soil drainage and permeability.
 - Depth to restrictive layer (DSLO).
- Hydrological and hydrogeological attributes;
 - Flood return interval and flood risks.
 - Riparian buffers.
 - Coastal hazards.

Explanation of the parameters, their relevance to the investigation, and their scoring are given in Section 6. At this stage, in depth investigations of non-technical aspects such as social and cultural considerations have not been incorporated into the assessment.

As part of a more detailed examination, which should include some field investigation, the following parameters should also be considered:

- Property ownership and residential housing;
- Land management (crop sensitivity, industry limitations);
- Reticulation requirements (distance and elevation);
- Land area available;
- Refinement of coastal hazards and sea level rise implications; and
- Special use locations and values (cultural sites, archaeological, historic, water take, native forest, recreational etc.).

Following the addition of these parameters, it is considered appropriate for the Stakeholder Group to score and weight the necessary range of assessment criteria. However, the analysis required to complete these layers is substantial and it is considered that these parameters should be examined following initial identification of preferred areas.

5.3 Development of Land Application Suitability Zones

When the scores from individual parameters for an individual point on a map are combined, they provide a total that can be compared with totals of parameters from different locations. This allows the summation of the parameters to be compared across the Investigation Area. To make the comparison easier, the combined totals can be grouped. These groupings are referred to as Land Application Suitability Zones. Five Zone groupings have been used and are given in Table 5.1, which summarises the implications of the Zones for land application system design.



Table 5.1: Land Application Suitability Zones

Zone	Suitable for
A	<p>Well Suited Requires smaller land area High value and/or short rotation crops Non-deficit irrigation – nil or limited storage required Greater number of irrigable days High rate of nutrient removal Routine cultivation and harvest, with short withholding periods.</p>
B	<p>Moderately Well Suited High value and/or short rotation crops Non-deficit irrigation or partial deficit irrigation Can irrigate in shoulder seasons (April, May, September, October) for drier than average years – some storage likely to be required Moderately high rate of nutrient removal Short withholding period for grazing or cultivation and harvest</p>
C	<p>Minor Limitations Pasture or restricted range of annual crops Predominantly deficit irrigation, requiring large storage or combined water discharge Larger land area requirement Withholding period prior to grazing or cultivation and harvest is extended</p>
D	<p>Significant Limitations Plantation forestry, pasture, shallow rooting crops Deficit irrigation over summer months, requiring larger storage/combined water discharge Low nutrient loading Limitation to cultivation and harvest Extended withholding period for stock trafficking</p>
E	<p>Severe Limitations Requires largest land area Conservation plantings Low deficit irrigation for short season, requiring larger storage/combined water discharge No cultivation, infrequent harvest.</p>

5.4 Using GIS and Aggregation of Parameter Rating Results

A GIS based approach has been used to develop the land application suitability zones, effectively resulting from an aggregation of the individual parameter scores. In GIS terms this is known as combining layers.

A score has been developed for each parameter for every point on a map in the Investigation Area. This allows a graduated map to be produced which shows how the individual parameter score varies over an area, and essentially creates the data for a single parameter layer (as represented by an individual GIS layer). The maps for each parameter are presented in Appendix A, Figures 3 to 11.

This GIS approach allows the individual parameter maps to be aggregated to produce a map which shows the summation of the combined parameters for any point within the investigation area.

Rather than a graduated scale of totals from the sum of the parameters being shown on a map, the totals can be grouped into Zones, as discussed above. The combined Zone map, indicating greatest to least preference for land application, is shown in Appendix A, Figure 3.



This process means that a transition between any one individual parameter score (layer) will not be shown, and instead boundaries will be the Zones; being as mentioned above an aggregation and grouping of the sum of scores of all parameters being considered.



6 PARAMETER ASSESSMENT

6.1 General

The parameters listed in Section 5.2.1 are described below and the method for rating them in the Investigation Areas surrounding the townships are given.

Information for each parameter is available from a number of accessible national resource databases. The data is made available as GIS information. The map scale of the data is given for each parameter and should be regarded as accurate to this scale. A higher degree of variation can be expected at field scale, however it is the purpose of this report to determine whether land application is broadly feasible within the Investigation Area.

6.2 Land Use Attributes

The land use capability (LUC) of each site along with the current land use, indicates the potential for nutrient removal from the site. For the purpose of this report, nutrient uptake was based on LUC class. This is an assessment of the land's capability for use, with consideration of its physical limitations and versatility for sustained production. LUC was determined from the national database of physical land resource information compiled by Landcare Research.

The existing land use within the Investigation Area was determined from the MfE Land Use and Carbon Analysis System (LUCAS) database. The most recent data for land use held by the MfE data service is dated June 2020. Data from LUCAS was used since it is well defined, published, consistently recorded and regularly updated. Land use parameters considered are as follows:

6.2.1 Nutrient Uptake

The versatility of land for productive use (cropping, horticulture, pastoral) is an indicator of a site's ability to remove nutrients applied in wastewater. Sites in the Investigation Area are scored as given in Table .1 and based on the land use capability (LUC) at the time.

Table 6.1: Land use capability nutrient removal rating

LUC Class	Rating	Nutrient uptake score
1	High nutrient removal	5
2	High nutrient removal	5
3	Moderately high nutrient removal	4
4	Moderate nutrient removal	3
5	Moderately low nutrient removal	2
6	Low nutrient removal	1
7	Very low nutrient removal	0
8	Very low nutrient removal	0
Lake	N/A	0
River	N/A	0
Town	N/A	0

The LUC is chosen to represent nutrient uptake potential since the LUC class identifies the land's general versatility for productive use.



6.2.2 Current Land Use

The land cover type and land management practices adopted on any site are another indicator of the site's ability to remove nutrients applied in wastewater. Sites in the Investigation Area have been identified but not scored as LUC class was the most appropriate way to determine nutrient uptake. The approximate areas in each land use are given in Table 6.2. Figure 6.1 (larger as Figure 4, Appendix A) represents the current land use within the 10 km Investigation Area. Current land use data was retrieved using the LUCAS land use map from the Ministry for the Environment.

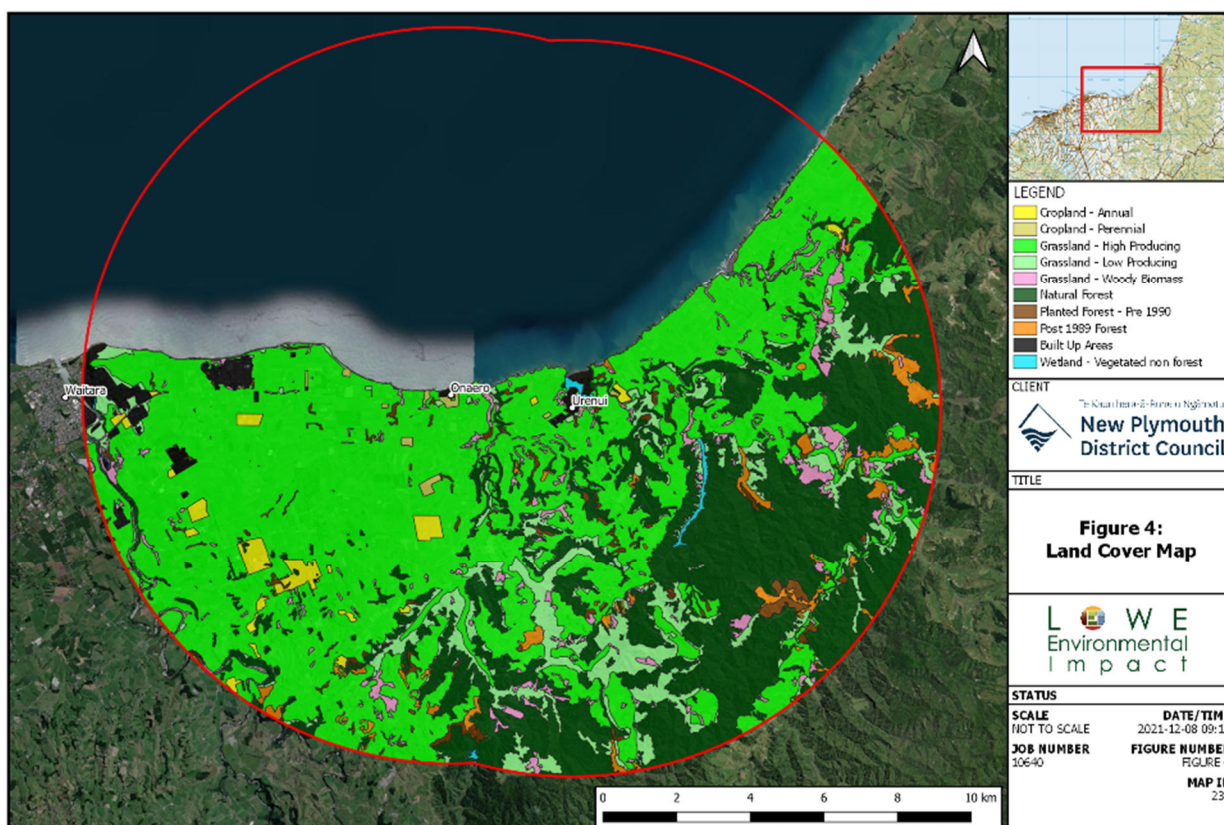


Figure 6.1: Land Cover Map

Table 6.2: Land use around Urenui and Onaero

Description	Land Area (ha)	Land Area (% of Total)
Cropland – Annual	306	1.3 %
Cropland – Orchards and Vineyards (Perennial)	57	0.2 %
Grassland – High Producing	12,753	52.9 %
Grassland – Low Producing	1,971	8.2 %
Grassland – With Woody Biomass	764	3.2 %
Natural Forest	6,846	28.4 %
Other	9	0.04 %
Planted Forest – Pre-1990	383	1.6 %
Post 1989 Forest	477	2.0 %
Urban	371	1.5 %
Wetland – Open Water	102	0.4 %
Wetland – Vegetated Non-Forest	59	0.2 %
Total Land Area	24,098*	



* Total land area for land use differs from the land suitability total land area due to minor variation in GIS polygon extent. The LUCAS layer for land use and the Fundamental Soil Layer (FSL) for land suitability parameters are derived from varying portals that thus have varying boundaries.

6.3 Soil Attributes

The soil is the primary receiving environment for applied wastewater and is the final treatment process for renovating the wastewater. The capability of the soil to avoid transmittance of wastewater derived contaminants to the wider environment, and effectively recover the nutrient resource within the wastewater for plant and biota use is key to the successful development of a low rate (irrigation) land application scheme. For the purpose of rating the land in the Investigation Area, soil parameters assessed are given below.

It should be noted that a number of the data sets were created in the 1970s and 1980s and so some details may have changed due to drains and other large scale works. Following the prioritisation of land areas, it may be necessary to confirm or review data on-site.

6.3.1 Soil Drainage

The soil's ability to drain is a function of soil texture and soil structure. Data for the Investigation Area comes from the Fundamental Soil Layer (FSL, LRIS portal) and has a scale of 1:50,000. Areas are scored as follows:

- 5 – Well drained;
- 4 – Moderately well drained;
- 3 – Imperfectly drained or excessively drained;
- 2 – Poorly drained; and
- 1 – Very poorly drained.

6.3.2 Depth to Slowly Permeable Horizon

Depth to a slowly permeable horizon describes the minimum and maximum depths (in metres) to a horizon in which the permeability is less than 4 mm/hr (Newsome, Wilde & Willoughby, 2008). DSLO classes are located in the FSL layer of the LRIS portal and are scored as follows:

- 5 – >1.50 m;
- 4 – 1.20 – 1.49 m;
- 3 – 0.90 – 1.19 m
- 2 – 0.60 – 0.89 m;
- 1 – 0.45 – 0.59 m; and
- 0 – <0.44 m.

6.3.3 Soil Slope and Stability

In the absence of suitable flat land, steeper land may be used for wastewater irrigation, but it requires specific design to manage the risk of runoff and soil movement under moist soil conditions. Data for the Investigation Area comes from the Land Resource Inventory (LRI, LRIS portal) and has a scale of 1:50,000. Areas are scored as follows:

- 5 – Slope class A (flat to gently undulating 0 - 3°);
- 4 – Slope class B (undulating, 4 - 7°);
- 3 – Slope class C (rolling, 8 - 15°);
- 2 – Slope class D (strongly rolling 16 - 20°) and E (moderately steep 21 - 25°); and
- 1 – Slope class F (steep 26 - 35°) and G (very steep >35°).



6.4 Hydrological and Hydrogeological Attributes

The prevention of wastewater derived contaminants entering water (surface or ground) is a key environmental objective of a low rate (irrigation) land treatment system design. It is generally of lesser concern in a high rate land disposal system. The main mechanisms for transport to water are drainage to groundwater and direct surface water discharge i.e. by overland flow or flooding. The system should be designed to avoid overland flow and ideally excessive drainage volumes if land disposal is to be avoided. The likelihood of insufficiently treated wastewater entering water is reduced by:

- a) Avoidance of sites with a high groundwater table;
- b) Avoidance of sites with steep slopes and low permeability soil; and
- c) Avoidance of sites with a high risk of flooding.

In addition, the hydraulic properties of the shallow groundwater can influence the impact that the increased drainage volume can have and so must be considered. Land areas have been assessed as follows.

6.4.1 Depth to Groundwater

The ability to treat and disperse applied wastewater is limited by the available unsaturated soil volume, i.e. depth to groundwater. The depth to groundwater is considered to be important in considering the suitability of land for wastewater discharge.

Section 6.3.2 describes the depth to slowly permeable horizon mapping. This is considered to adequately describe the depth to a saturated layer since it includes saturation due to a perched water table where that occurs. As a result, a separate layer for depth to groundwater is considered to be redundant, and inclusion here would be effectively double counting this parameter.

6.4.2 Flood Return Interval

Flooding along the areas adjacent to the Waitara, Onaero, Urenui and Mimitangiatua Rivers pose a risk to land application of wastewater. Flooding of a land application site causes:

- Loss of soluble applied nutrients;
- Potential loss of nutrient laden sediment;
- Damage to crops and soil quality;
- Damage to irrigation infrastructure; and
- Reduction in number of irrigable days.

The areas are scored based on the FSL Flood Return Interval as follows:

- 6 – Nil risk;
- 5 – Slight risk = <1 in 60 y;
- 4 – Moderate risk = 1 in 20 y to 1 in 60 y;
- 3 – Moderately severe risk = 1 in 10 y to 1 in 20 y;
- 2 – Severe risk = 1 in 5 y to 1 in 10 y;
- 1 – Very severe risk = >1 in 5 y.

6.4.3 Riparian Buffers

Riparian buffer zones have been identified but are not ranked. Rivers were identified using the Land Information New Zealand (LINZ) – NZ River Centrelines (Topo, 1:50k) layer. Setbacks of 25 m were added to each waterway to give an indication of the approximate buffers required within the Investigation Area. These areas are effectively setbacks from waterways where



irrigation is not recommended. This reduces the risk of over land flow to surface water. For further investigations, this distance will vary depending on width of the channel, channel shape, capacity of the waterway, topography and soils and natural vegetation already growing alongside the waterway. The Regional Freshwater Plan for Taranaki, states when discharging contaminants from on-site domestic wastewater treatment systems onto or into land, a buffer of 25 m from surface waterways shall be used as stated in Rule 22 (TRC, 2021).

6.5 Coastal Hazards

Coastal hazards have been identified and factored into the land suitability zones surrounding Urenui and Onaero. When mentioning coastal hazards, these particularly relate to sea level rise in response to the effects of climate change facilitating coastal inundation and at an extreme level, the risk of tsunamis. Tonkin + Taylor (2019) have undertaken an investigation assessing the New Plymouth District Council coastline and its susceptibility to coastal erosion. From this, a current area susceptible to coastal erosion (Current ASCE) has been identified along the Investigation Area, with this acting as a seaward boundary for wastewater application. All land within this area susceptible to coastal erosion has been excluded from the investigation.

6.6 Sites of Cultural Significance (Wāhi Tapu)

Sites of cultural significance are known to be present within the search area. A number of areas of significance are identified on NPDC District Plan Maps. Areas around the Onaero, Urenui and Mimitangiatua River mouths and coastal areas have significance to Ngāti Mutunga. The land which the Urenui Domain discharge field is located on is acknowledged as a significant site.

Culturally important sites vary in the type of site, why are they significant, their level of importance in comparison to others and to whom they are of high importance. This emphasises the need to correctly identify all culturally significant sites within the Investigation Area to appropriately recognise locations that would be unsuitable for land application. Further discussion with iwi is recommended to determine sites which should be avoided or excluded for wastewater discharge. Cultural importance within the investigation area has not been scored.

6.7 Summary

The described parameters when combined are considered to give a semi-quantitative assessment of the suitability of an area suitable for land application of wastewater at any point within the Investigation Area.



7 RESULTS OF PARAMETER ASSESSMENT

7.1 General

Assessment of each parameter has been undertaken as described in Section 6. Maps for each parameter and for the aggregated map are provided in Appendix A and the results and trends shown are detailed below.

Figure 1, Appendix A defines the Investigation Area. Orientation to the locations have been made relative to the location of the Urenui and Onaero townships that are central to the delineated 10 km radius area.

7.2 Nutrient Uptake Potential

Figure 7.1 (larger as Appendix A, Figure 5) shows nutrient uptake potential based on LUC.

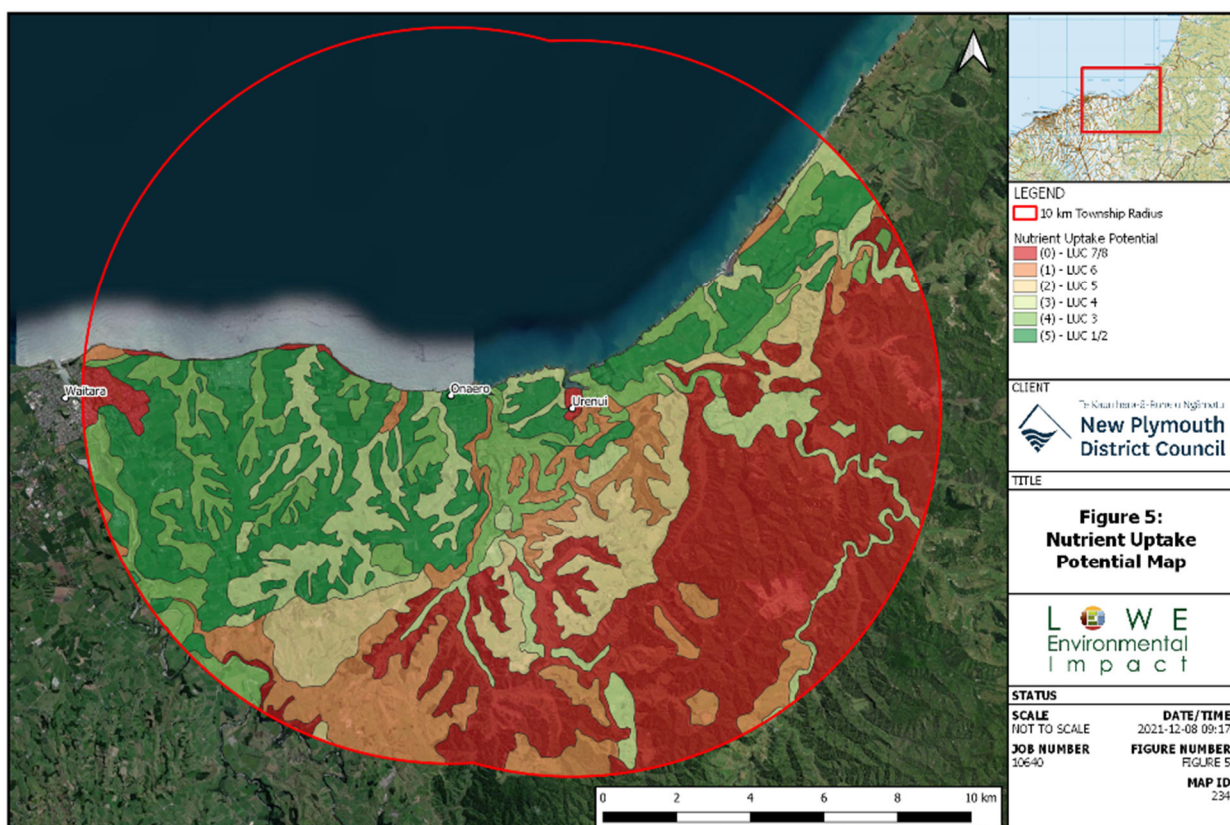


Figure 7.1: Nutrient Uptake Potential

Land having a high nutrient removal (dark green – score 5) comprises 20 % of the total area. Score 5 land, characteristic of LUC 1 and 2 class soils are located overlying the higher elevated uplifted marine terraces and ring plain soils situated to the north-east and west respectively.

Land with a moderately high to moderate nutrient removal (green to pale green areas – scores 4 and 3) each comprise 11 % of the investigation area. As with score 5 land, these areas are largely situated within the waterway channels of the higher elevated uplifted marine terraces and ring plain soils.



Land with moderately low to low nutrient removal (pale brown to brown areas – scores 2 and 1) comprise 9 % and 11 % of the total area respectively. These are confined to the foothills of the Taramoukou and Pouiatoa Forests towards the south and south-east of the investigation area as well as the higher elevated drainage channels. Although these areas do pose major limitations for year round irrigation, deficit and low rate irrigation could be considered.

Very low nutrient removal areas (red area – score 0) covers 36 % of the total investigation area and are confined to areas of extreme physical limitations or hazards that make it unsuitable for arable, pastoral, or commercial forestry use. Within the investigation area these cover slopes $>16^\circ$ with a high degree of erosion susceptibility. Most of this zone is located across the mountainous terrain of the Taramoukou and Pouiatoa Forests. Although these areas do pose major limitations for year round irrigation, deficit and low rate irrigation could be a consideration.

7.3 Soil Drainage

Figure 7.2 (larger as Figure 6, Appendix A) shows soil drainage of the surface soil within the Investigation Area.

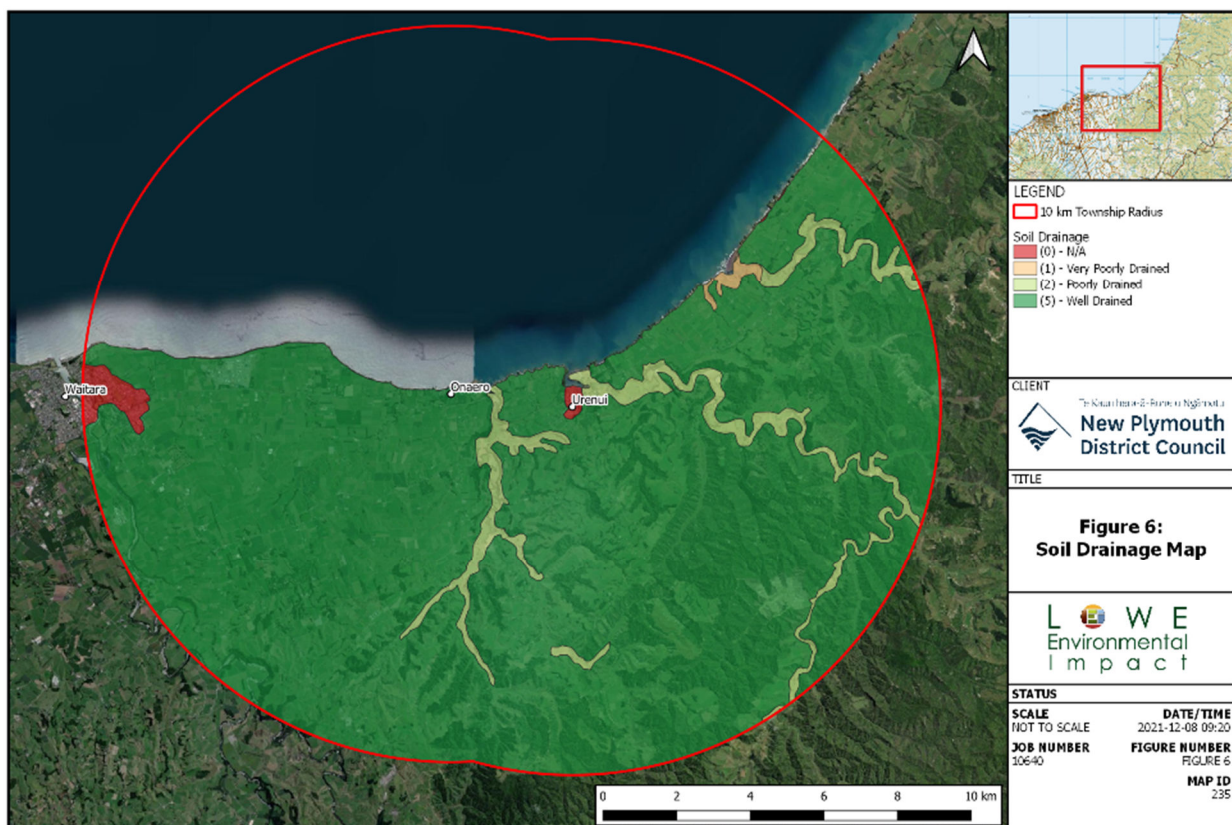


Figure 7.2: Surface soil drainage

Well drained (dark green – score 5) land comprises 94 % of the Investigation Area. Drainage in these areas is unlikely to be a limiting factor for the application of wastewater. These areas occur across the entirety of the Investigation Area outside of the Onaero, Urenui and Mimi River channels.

Poorly drained areas (light green – score 2) cover 5 % of the Investigation Area. These areas occur predominantly along the channels of the Onaero, Urenui and Mimi Rivers, where the mapped soil type consists of the Kairanga silty clay loam, an imperfectly to very poorly draining



gley soil. Although these areas are poorly drained, a light application rate of wastewater (0.3 – 0.5 mm/day/annum equivalent) may be beneficial through the summer months.

7.4 Soil Depth to Slowly Permeable Horizon

Figure 7.3 (larger as Figure 7, Appendix A) shows soil depth to a slowly permeable horizon. This may be related to the soil drainage, permeability and to the depth available for root exploration or aerobic treatment of applied wastewater.

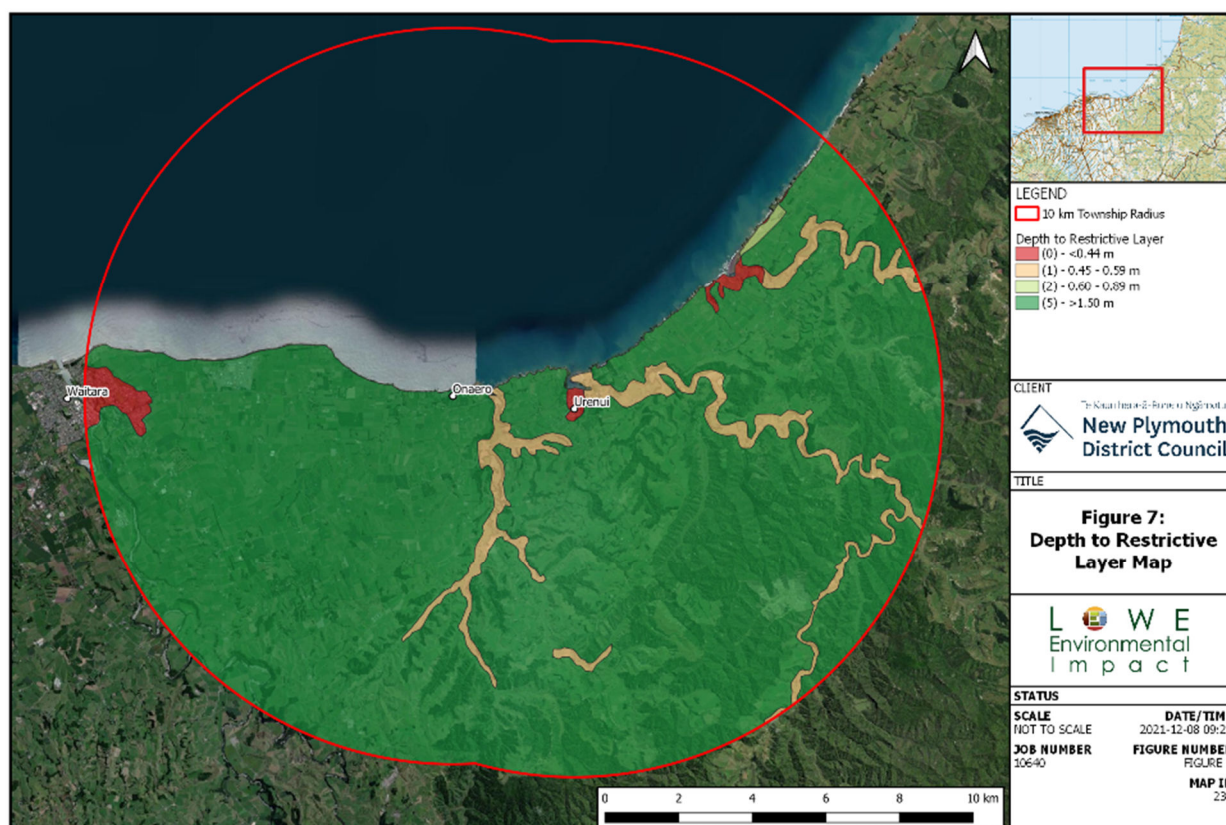


Figure 7.3: Soil Depth to Slowly Permeable Layer

Around 94 % of the Investigation Area has no observed restriction within at least 1.5 m from the soil surface. These areas occur across the entirety of the Investigation Area outside of the Onaero, Urenui and Mimi River channels.

Areas with lower scores for slowly permeable horizon (<0.89 m) mirror those areas closer to sea level along the flats surrounding the Onaero, Urenui and Mimi Rivers. Areas where pans are likely to cause restriction may be considered for a low rate, deficit irrigation system. This would avoid any potential overland flow or unnecessary ponding.

7.5 Soil Slope and Stability

Figure 7.4 (larger as Figure 8, Appendix A) slope within the Investigation area.

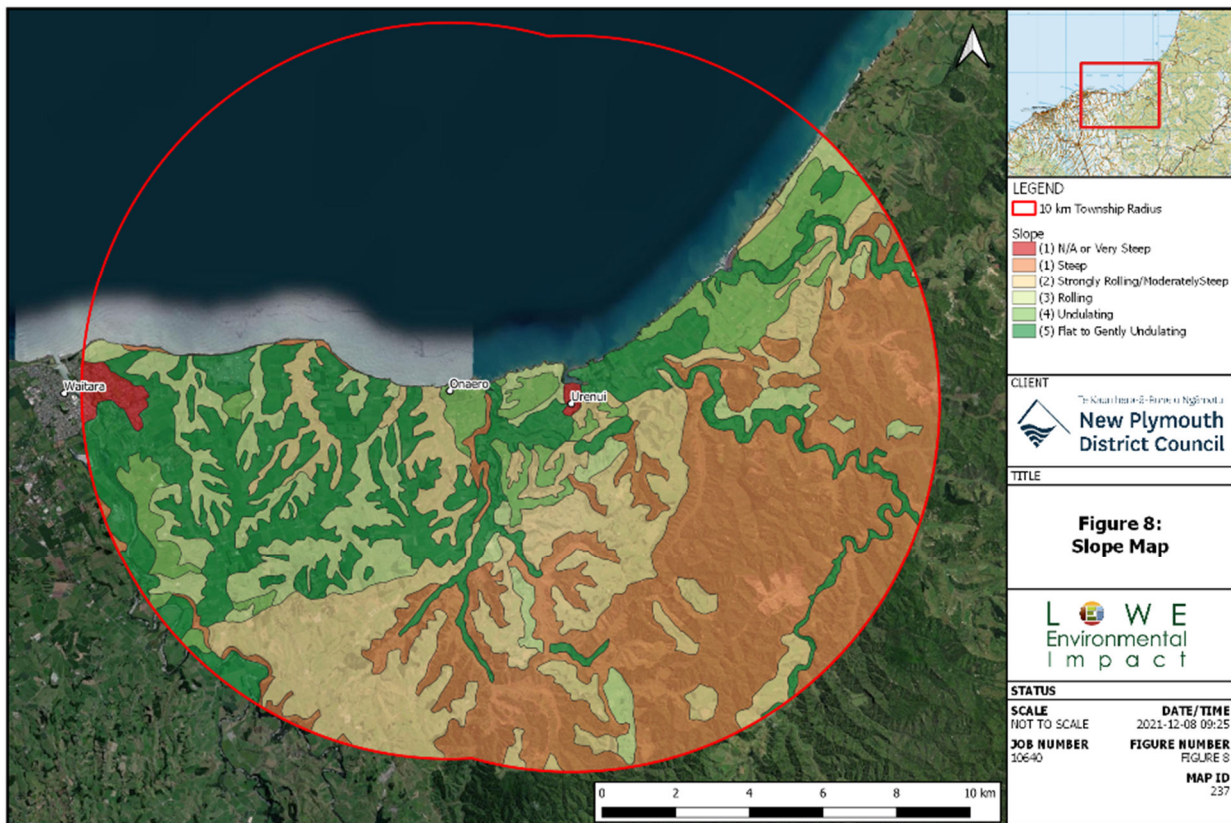


Figure 7.4: Slope

Flat to gently undulating land of 0 - 3° (dark green) is predominantly located on the alluvial plains of the larger Onaero, Urenui and Mimi Rivers as well as the river terraces of the various smaller streams between Waitara and Onaero. These regions of land account for 22 % of the total area. Flat land occurs in proximity to Urenui and Onaero minimising potential reticulation distances.

Undulating slopes of slope class 4, highlighted in lighter green (4 - 7°), cover a further 7 % of the total Investigation Area. As with class 5 land, these regions are located in proximity to the Urenui and Onaero townships, as well as on the uplifted marine terraces to the north-east.

Rolling hills highlighted in pale green (8 - 15°) account for 11 % of the Investigation Area and are located throughout the Investigation Area. Significant areas are located west of the townships, in proximity to the various river channels between Waitara and Onaero.

Strongly rolling to steep slopes highlighted in brown to dark red (>16°) account for 59 % of the Investigation Area and is located throughout. 23 % of the Investigation Area is class D land, 36 % being class E. This land covers the majority of the mountainous terrain of the Taramoukou and Pouiatua Forests to the south and south-east of the Investigation Area.

The flats within the Investigation Area are likely to withstand higher rates of irrigation, however, these will be dependent on other variables, such as drainage and wetness limitations. If areas of higher slope need to be considered, to avoid potential overland flow and runoff on steeper slopes, a deficit irrigation/low rate irrigation practice would need to be considered.

7.6 Flood Return Interval

Figure 7.5 (larger as Figure 9, Appendix A) shows the flooding risk in the Investigation Area as indicated by the flood return interval.

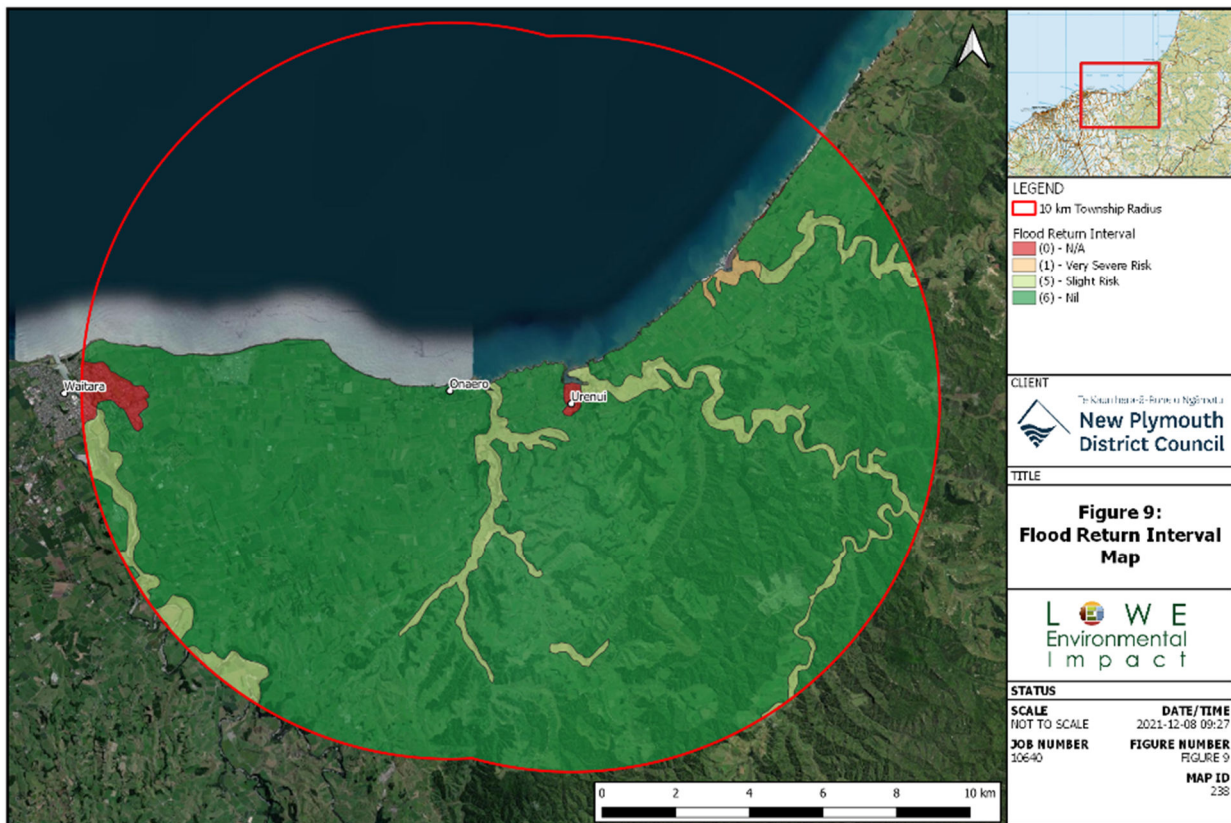


Figure 7.5: Flood Return

Around 92 % of the Investigation Area has a “nil” risk, with only 7 % having less than a 1 in 60 year flood return. <1 % of the Investigation Area has a greater than 1 in 5 year flood risk which is confined to the river mouth of the Mimi River. Slight risk regions are located along the river channels of the Waitara, Onaero, Urenui and Mimi Rivers.

Irrigation within a severe flooding risk area or greater is not advised. Since the Investigation Area contains a large portion of “nil” risk areas, there should be sufficient areas to choose from where this can be avoided.

7.7 Riparian Buffers

Within the 10 km radius Investigation Area there is an extensive network of streams which transport surface water to the main rivers or directly to the coast themselves. The more dissected an area is, the more disruption to irrigation infrastructure and the greater the total area needed. No ranking has been applied to this parameter. Figure 7.6 (larger as Figure 10, Appendix A) shows the extent of riparian buffer zones within the Investigation Area.

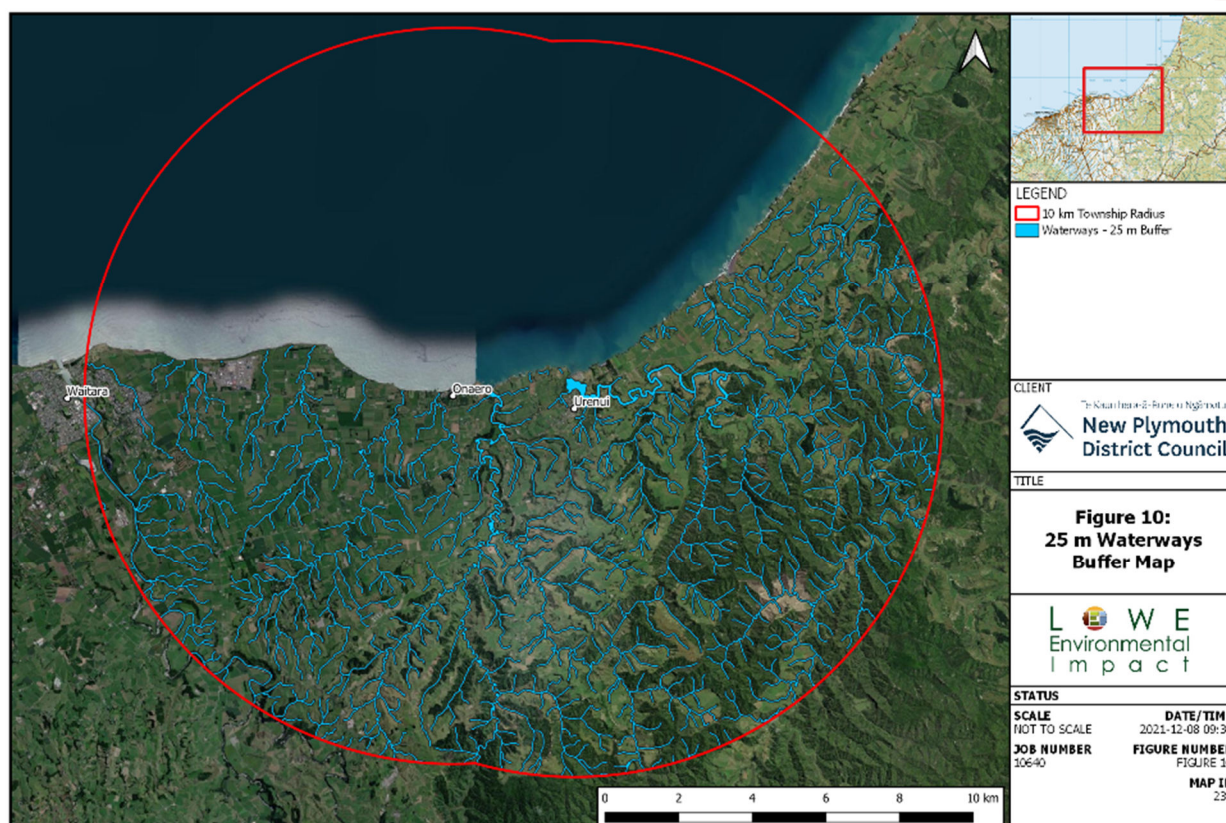


Figure 7.6: Riparian buffers

In total, approximately 3,387 ha of land is excluded within the Investigation Area due to riparian buffers. This buffer distance is equivalent to 25 m, in line with the Regional Fresh Water Plan for Taranaki. (TRC, 2021).

Table 7.1 outlines the extent of these riparian buffers within each zone. Refer to Section 8 for a discussion of the Zones. The largest portion of riparian zones are within Zone B (19.2 %), due to topography and Zone B being largely confined to a high proportion of waterway channels within the Investigation Area, thus meaning it is dissected by more streams, increasing the total riparian area.

Table 7.1: Riparian area by zone for the Urenui/Onaero Investigation Area

Zone	Riparian Area (ha)	Zone Area (ha)	% of Zone as Riparian
A	225	4,746	4.7 %
B	707	3,685	19.2 %
C	730	5,272	13.8 %
D	1,686	10,081	16.7 %
E	39	300	13.0 %
Total	3,387	24,084	14.1 %

7.8 Coastal Hazards

Figure 7.7 (larger as Figure 11, Appendix A) represents the current Areas which may be Susceptible to Coastal Erosion (ASCE). Investigations around coastal erosion within the Taranaki region has been done by Tonkin + Taylor (2019) whereby a line representing the current ASCE has been derived. For this investigation, this line delineates the seaward extent of the Investigation Area, where no land has been included seaward of this line. Approximately 100 ha of land has been excluded from the Investigation Area that is seaward of this boundary.

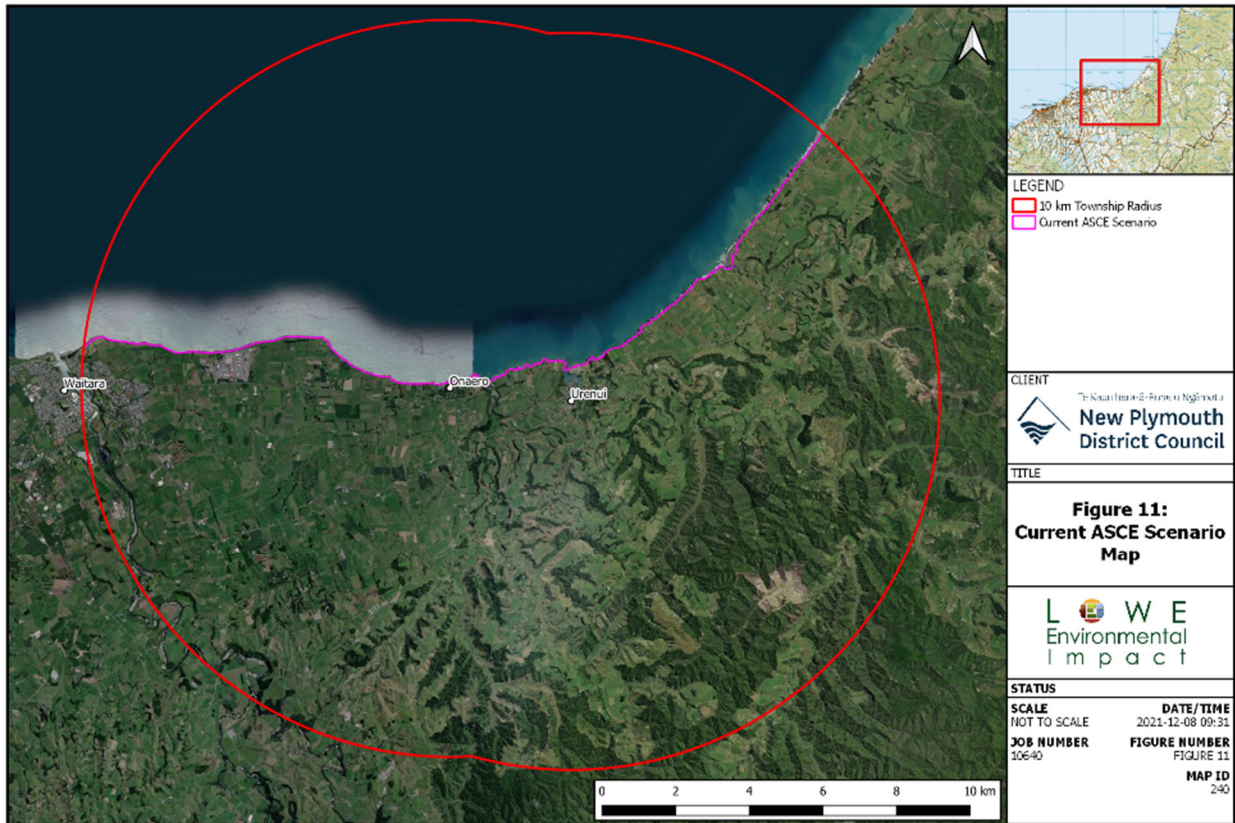


Figure 7.7: ASCE (after T&T, 2019)

7.9 Rating Summary

The parameters examined indicate that there are areas likely to be suitable for land treatment of wastewater. Different areas are constrained by different parameters. The relative suitability of areas for wastewater land application can be determined by aggregating the scores for each parameter as discussed in Section 8.



8 SUMMARY OF CAPACITY AND PRIORITY

As described in Section 5.4 above, parameter scores can be combined to create zones representing land suitability within the Investigation Area for land application of wastewater. Figure 8.1 (larger as Figure 3, Appendix A) shows these aggregated zones. Table 8.1 summarises the land area for each zone within the Investigation Area.

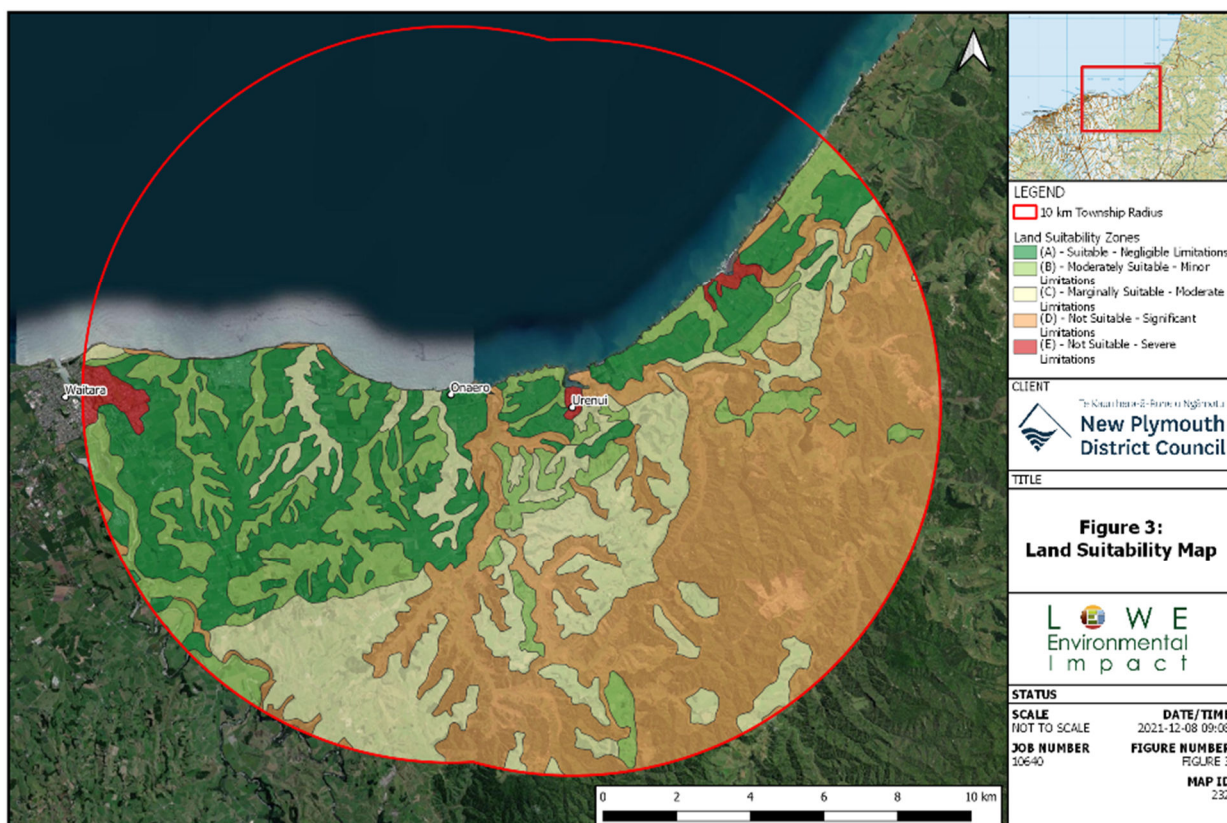


Figure 8.1: Land Suitability

Table 8.1: Irrigation Suitability – Urenui/Onaero Locality

Zone	Land Suitability	Land Area (ha)	Land Area (% of Total)
Zone A	Suitable – Negligible limitations	4,521	18.8 %
Zone B	Moderately Suitable – Minor limitations	2,978	12.4 %
Zone C	Marginally Suitable – Moderate limitations	4,542	18.9 %
Zone D	Not Suitable – Significant limitations	8,395	34.9 %
Zone E	Not Suitable – Severe limitations	261	1.0 %
Riparian Buffers	Excluded	3,387	14 %*
Total (Excluding Riparian Buffers)		20,697	

* Riparian buffers are excluded from all total areas and percentages within the above table. This total value and percentage of the Investigation Area is addition to the values represented within the table. Area associated with riparian buffers can be added to the total land area excluding riparian buffers (20,697 ha) which is 24,084 ha (the total land area within 10 km surrounding communities).



Zone A (dark green) class land is primarily located overlying the flatter, higher elevated allophanic soils between Waitara and Onaero, as well as overlying the uplifted marine terraces north-east of Urenui. This classed land is shown within Figure 1, Appendix A. The large majority of this land is located within relatively short distance from each of the townships, particularly Onaero.

Similar to Zone A land, areas of Zone B classed land (light green) are scattered throughout the Investigation Area occupying approximately 12 % (excluding buffers) of the total land area. With a similar distribution to Zone A, Zone B land is also mostly confined to regions between Waitara and Onaero, as well as to the north-east. Like Zone A, the Zone B land is also located within relatively short distance from each of the townships.

Zone C land (pale green) occupies 18.9 % of the Investigation Area. This type of land is classified as being marginally suitable for treated wastewater irrigation. Specifically, Zone C land is largely located on the strongly rolling hills to the south of the townships overlying the foothills of the Taramoukou and Pouiatoua Forests. From a wastewater irrigation perspective, this land could still potentially be workable to enhance summer productivity of north facing hill slopes which are more prone to drying out. Other benefits include the irrigation of pine/eucalypt plantations. A higher cost and management requirement are associated with irrigation of Zone C soils compared to Zone A and B soils. A proportion of this land is classified as being native forest vegetation as shown in Figure 4, Appendix A and likely contains a nationally significant conservation status which may have restrictions for discharges if the area is accessed by the public.

Areas of Zones D (brown) tend to occur in those areas described in Section 7 as having limitations due to shallow depth to a restrictive layer, slow drainage or steeper slopes. Zone D land accounts for 35 % (excluding buffers) of the Investigation Area. The alluvial flats of the Onaero, Urenui and Mimi Rivers all fall within this zone. It is evident that Zone D land reflects a combination of the DSLO and slope layers, indicating that where the depth to the restrictive layer is shallow, and the slope is greater than rolling (LUC 3) the overall zone class is also low.

Zone A and B land in proximity to Onaero and Urenui offer a number of advantages for land application including comparatively short reticulation distances, limited pumping requirements (due to comparatively low elevation changes) and ease of irrigation to flat land. Additionally, due to no restrictions with regards to restrictive layers outside of the river channels hindering vertical groundwater movement, these areas are likely to be suited to year round irrigation.



9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Assessment Conclusions

In general, there is suitable land available for the establishment of a land application system within the Investigation Area. The Investigation Area contains sufficient land suited to the land application of wastewater (Zone A and B) in proximity to Urenui and Onaero. In addition, Zone C and D land is available along the Onaero and Urenui River channels and overlying land of greater slope, however when sufficient Zone A and B land is available these areas should be the priority for any further investigations of land treatment.

Areas which are Zoned A and B are considered to be suitable for septic tank discharges. Most areas within Onaero are Zone A. Urenui has a mix of Zone B and Zone E close to the Urenui River. This suggests that the land that the towns occupy is generally suitable for septic tank discharge.

Figures 3.1 and 3.2 (and Figures 12 and 13, Appendix A) show the suitability for a new septic tank discharge for sites within Urenui and Onaero. There are areas near the centre and south of Urenui which are likely to be suitable for septic tank discharge. This is due to larger distance to surface water paths, and to lesser overlap with upgradient plumes from other discharges.

Areas within Onaero are less suited to septic tank discharge due to proximity to the coast and the dominantly northward groundwater gradient expected in the area.

9.2 Recommendations

This report considers only the technical feasibility of land application in the area. If land application is further pursued, then non-technical considerations such as cultural preference and cost to the community can be included and may alter the relative weighting of the technical attributes. It is recommended that interested stakeholders should be canvassed for views.

If a land application option is to be pursued then, based on the outcomes of this report, it is recommended that the following areas are assessed in further detail:

- Zone A and B land to the west and south of Onaero, as well as between the townships and north-east of Urenui, may warrant further investigation due to these regions being the closest Zone A and B land to the two townships. Accessibility (third party owned land) and continuity of land parcels in these areas would be a significant limitation.
- Zone C land occupying the rolling hills and stream channels west of Onaero and south to south-east of Urenui should be considered for a lower rate irrigation system if Zone A or B classed land is not suitable. These areas provide sufficient land area meaning locating land of a suitable size and distance from the townships, as well as of the correct characteristics, should be achievable.
- Flat Zone D land along the Onaero and Urenui River channels could be considered for low irrigation application if land of more suitable status is not available. This land would be beneficial due to its minimal slope and proximity to each of the townships, however depth to the restrictive layer and the drainage status of the soils occupying these channels are limiting. Summer irrigation may only be possible in these areas. Additional storage or an alternative, wet-season discharge would be required for Zone D land.

The greatest advantages to land application of Urenui and Onaero municipal wastewater is the amount of Zone A and B land in close proximity to the townships and associated smaller costs of



infrastructure resulting from smaller land areas or shorter pipe routes that will be required than if discharge to Zone C and/or D land was selected.

Septic tank discharges for small communities require adherence to current design standards for the protection of environmental and human health and wellbeing. Systems which do not meet current standards should be evaluated to determine performance. Further work is required if septic tank discharges are to be considered for continued use for the communities. Additional information required includes:

- Groundwater characterisation in the vicinity of the towns is undertaken to determine subsurface flow paths, groundwater gradient, existing groundwater quality and potential for attenuation of nutrients and pathogens.
- 3D hydrogeological modelling can be undertaken to describe movement of contaminants.
- Investigations into current condition and performance of septic tanks and discharge fields within the community are undertaken.
- Grouping of systems for removal, replacement or renovation is undertaken.

If land application is investigated further the following should be considered:

- Is there reasonable access to preferential Zone A or B land.
- Storage requirements or alternative discharge options for Zone C or D land.
- Alternative wet season discharge options for Zone C and D land.
- Property ownership, including how many owners occur within a continuous block of land large enough for the wastewater flow from the WWTP (2.3 ha to 87.0 ha; dependent on source of wastewater, irrigation method and access to Zone A and B land);
- Depth to groundwater and groundwater movement/contours;
- Land management (e.g. is preferred land operated as dairy farms?);
- Routes and costs for reticulation requirements (distance and elevation); and
- Special use locations (archaeological, historic, water take, native forest, recreational etc.).



10 REFERENCES

Close, M., Humphries, B., Tschritter, C., Sarris, T., and C Moore. (2020) *Model scenarios for a microbial risk assessment tool*. Client Report No. CSC21003

ESR. (2010). *Guidelines for separation distances based on virus transport between on-site domestic wastewater systems and wells*. ESR Client Report No. CSC1001

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Newsome, P. F. J., Wilde, W. H., & Willoughby, E. J. (2008). Land resource information system spatial data layers. Landcare Research New Zealand Ltd.

Tonkin + Taylor. (2019). *First Pass Coastal Erosion Assessment and Identification of High Risk Areas*.

TRC. (2021). *Regional Fresh Water Plan for Taranaki*. Retrieved from https://www.trc.govt.nz/assets/Documents/Plans-policies/FreshwaterPlan/Regional_Fresh_Water_Plan_for_Taranaki_PDF_with_Cover.PDF



11 APPENDICES

Appendix A: Figures

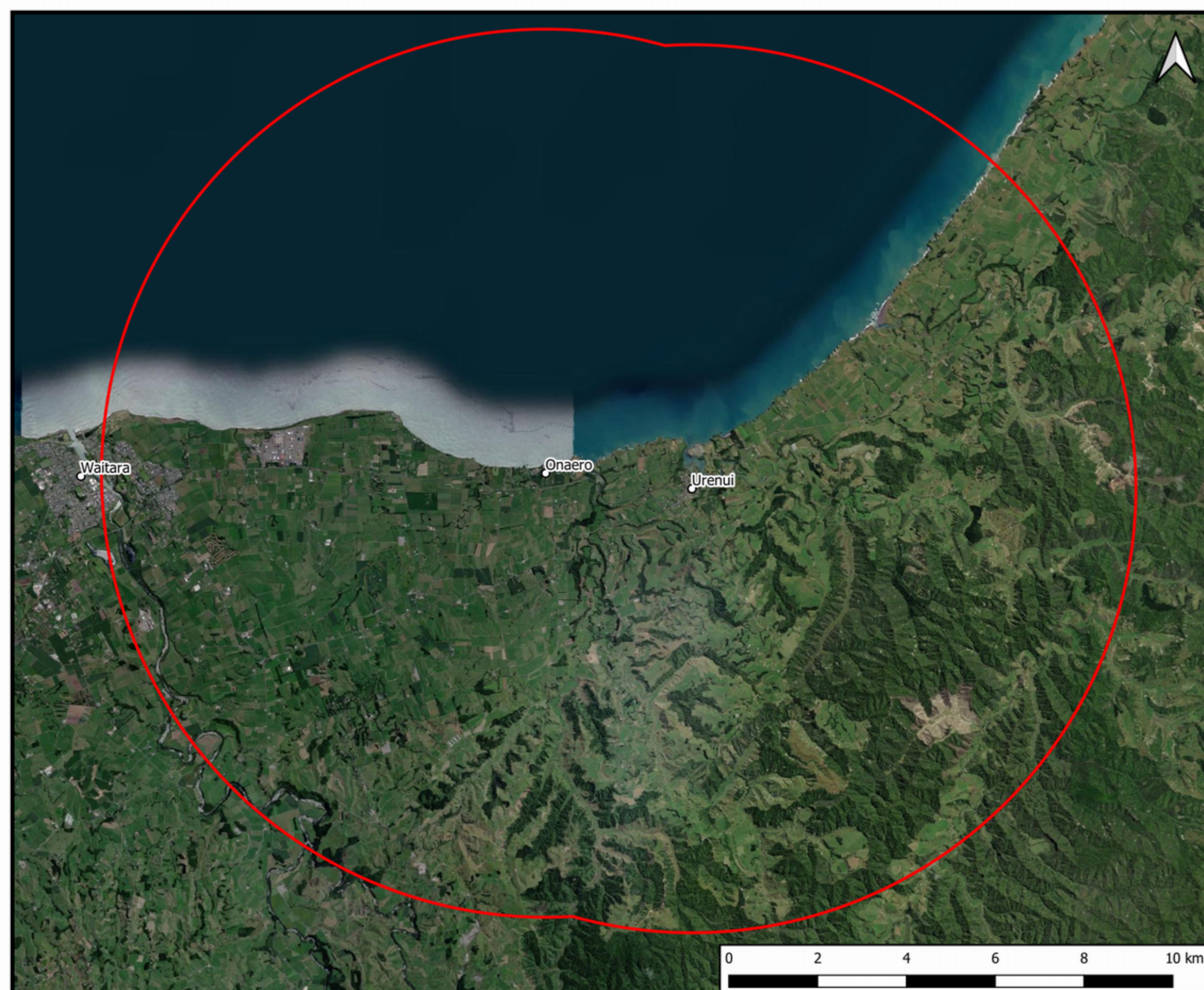
1. Investigation Area
2. Property Parcels >20 ha
3. Land Suitability Zones
4. Land Cover
5. Nutrient Uptake Potential
6. Soil Drainage
7. Depth to Restrictive Layer
8. Slope
9. Flood Return Interval
10. 25 m Waterways Buffer
11. Current ASCE Scenario
12. Septic Discharge Suitability – Urenui
13. Septic Discharge Suitability - Onaero




APPENDIX A

Figures





LEGEND
 10 km Township Radius

CLIENT
 Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE
Investigation Area

L E W E
 Environmental
 Impact

STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-26 14:57
JOB NUMBER 10640	FIGURE NUMBER FIGURE 1
	MAP ID 230



LEGEND

- 10 km Township Radius
- Property Parcels >20 ha

CLIENT



Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

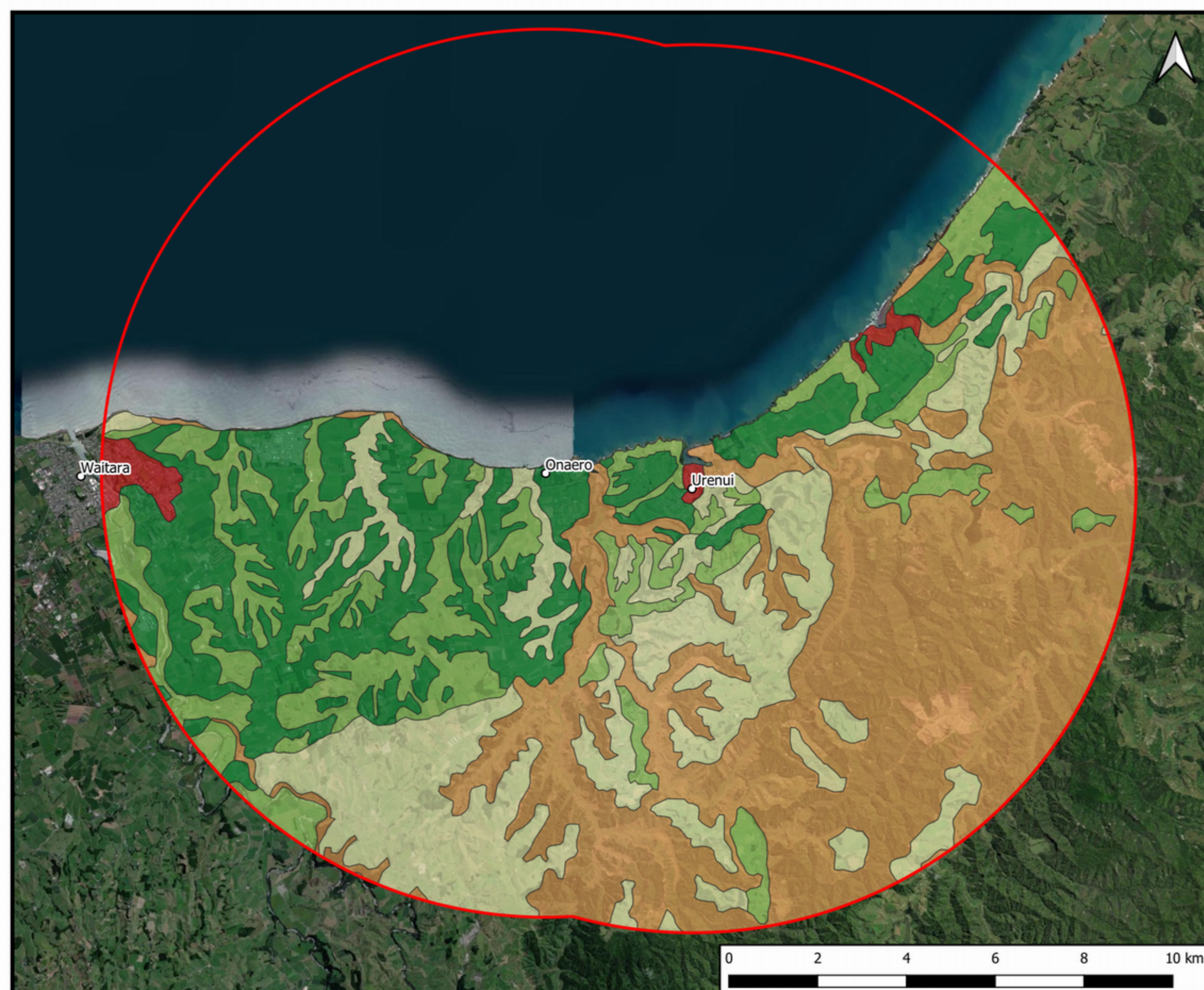
TITLE

Property Parcels >20 ha




STATUS






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JOB NUMBER 10640	FIGURE NUMBER FIGURE 2
	MAP ID 231



LEGEND

 10 km Township Radius

Land Suitability Zones

-  (A) - Suitable - Negligible Limitations
-  (B) - Moderately Suitable - Minor Limitations
-  (C) - Marginally Suitable - Moderate Limitations
-  (D) - Not Suitable - Significant Limitations
-  (E) - Not Suitable - Severe Limitations

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu
 **New Plymouth District Council**

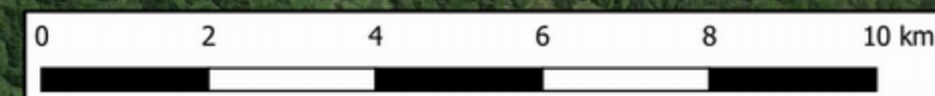
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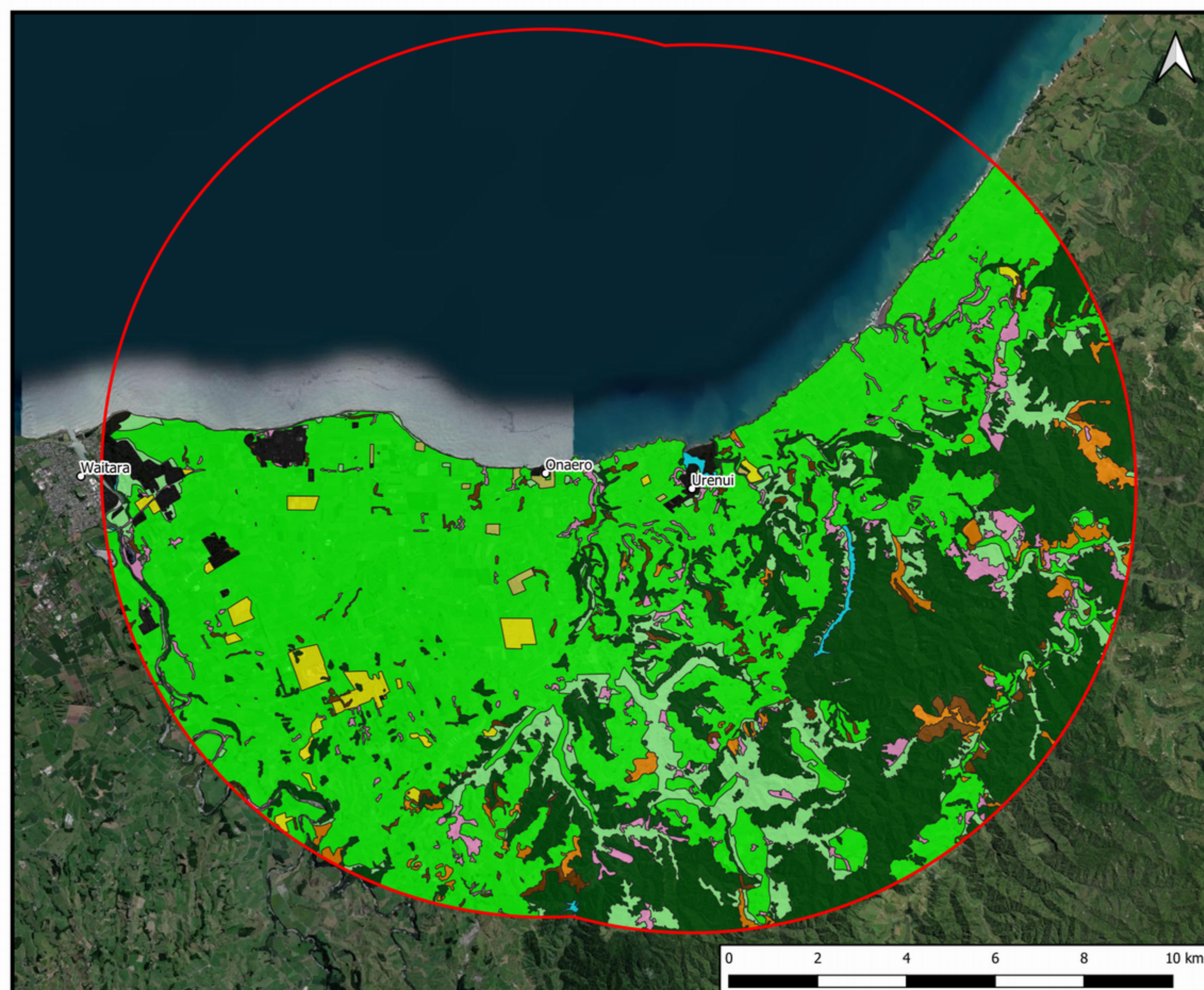
Land Suitability Map

L E W E
 Environmental
 Impact

STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-21 15:15
JOB NUMBER 10640	FIGURE NUMBER FIGURE 3
	MAP ID 232





LEGEND

	Cropland - Annual
	Cropland - Perennial
	Grassland - High Producing
	Grassland - Low Producing
	Grassland - Woody Biomass
	Natural Forest
	Planted Forest - Pre 1990
	Post 1989 Forest
	Built Up Areas
	Wetland - Vegetated non forest

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu

New Plymouth District Council

TITLE
Land Cover Map

L E W E
 Environmental Impact

STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-21 09:22
JOB NUMBER 10640	FIGURE NUMBER FIGURE 4
	MAP ID 233



LEGEND

 10 km Township Radius

Nutrient Uptake Potential

-  (0) - LUC 7/8
-  (1) - LUC 6
-  (2) - LUC 5
-  (3) - LUC 4
-  (4) - LUC 3
-  (5) - LUC 1/2

CLIENT

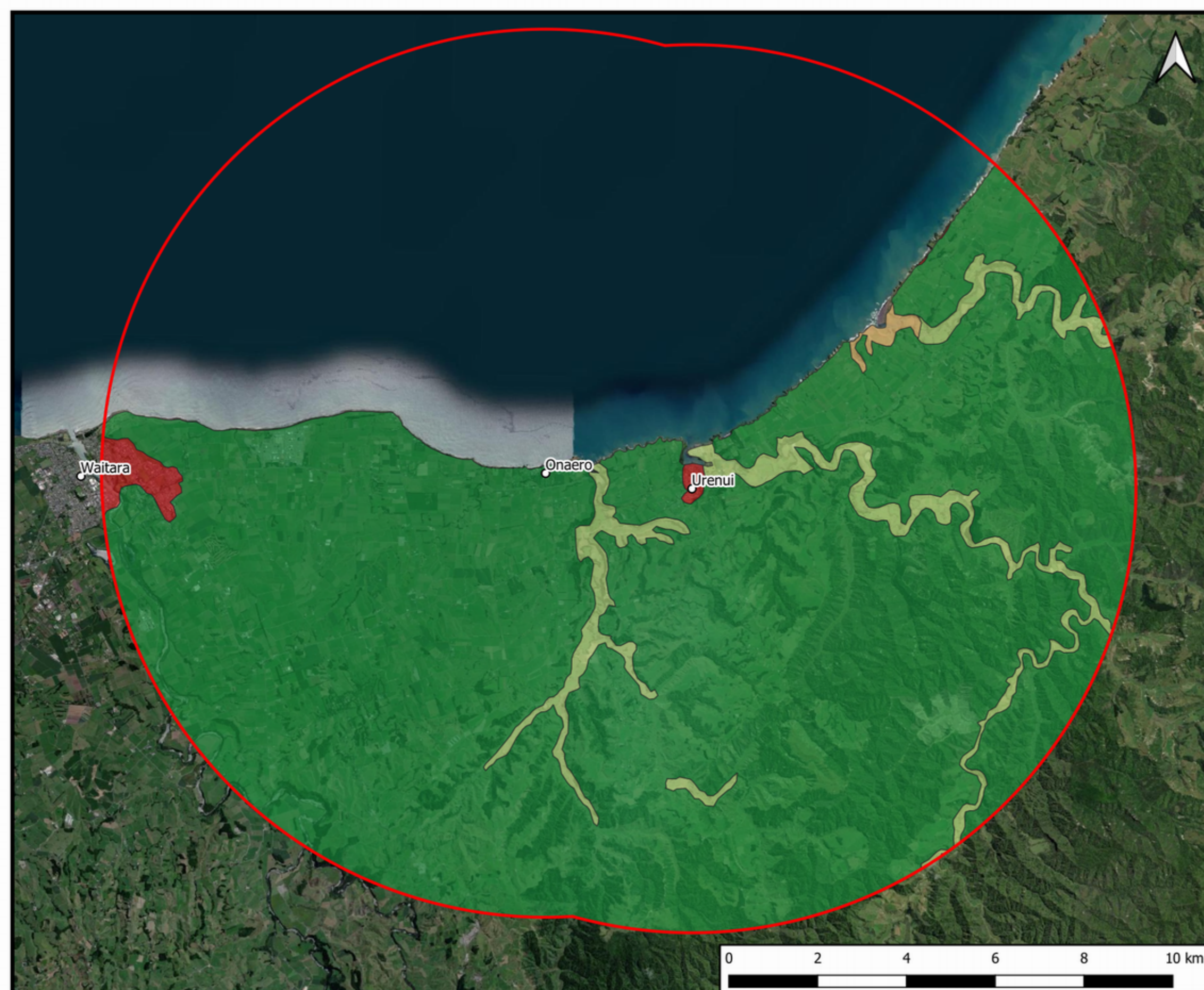
Te Kaunihera-ā-Rohe o Ngāmotu
 **New Plymouth District Council**

TITLE
Nutrient Uptake Potential Map



STATUS	
SCALE NOT TO SCALE	DATE/TIME 2021-10-21 15:01
JOB NUMBER 10640	FIGURE NUMBER FIGURE 5
	MAP ID 234





LEGEND

- 10 km Township Radius
- Soil Drainage**
- (0) - N/A
- (1) - Very Poorly Drained
- (2) - Poorly Drained
- (5) - Well Drained

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE


Soil Drainage Map

STATUS





SCALE NOT TO SCALE	DATE/TIME 2021-10-21 11:12
JOB NUMBER 10640	FIGURE NUMBER FIGURE 6
	MAP ID 235



LEGEND

 10 km Township Radius

Depth to Restrictive Layer

-  (0) - <math>< 0.44\text{ m}</math>
-  (1) - $0.45 - 0.59\text{ m}$
-  (2) - $0.60 - 0.89\text{ m}$
-  (5) - $> 1.50\text{ m}$

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu
 **New Plymouth District Council**

TITLE
 Depth to Restrictive Layer Map

L E W E
 Environmental
 Impact

STATUS	
SCALE NOT TO SCALE	DATE/TIME 2021-10-28 11:12
JOB NUMBER 10640	FIGURE NUMBER FIGURE 7
	MAP ID 236





LEGEND

 10 km Township Radius

Slope

-  (0) N/A or Very Steep
-  (1) Steep
-  (2) Strongly Rolling/Moderately Steep
-  (3) Rolling
-  (4) Undulating
-  (5) Flat to Gently Undulating

CLIENT

 Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE

Slope Map


 **L W E**
 Environmental
 Impact

STATUS





SCALE NOT TO SCALE	DATE/TIME 2021-10-26 15:29
JOB NUMBER 10640	FIGURE NUMBER FIGURE 8
	MAP ID 237



LEGEND

 10 km Township Radius

Flood Return Interval

-  (0) - N/A
-  (1) - Very Severe Risk
-  (5) - Slight Risk
-  (6) - Nil

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu
 **New Plymouth District Council**

TITLE

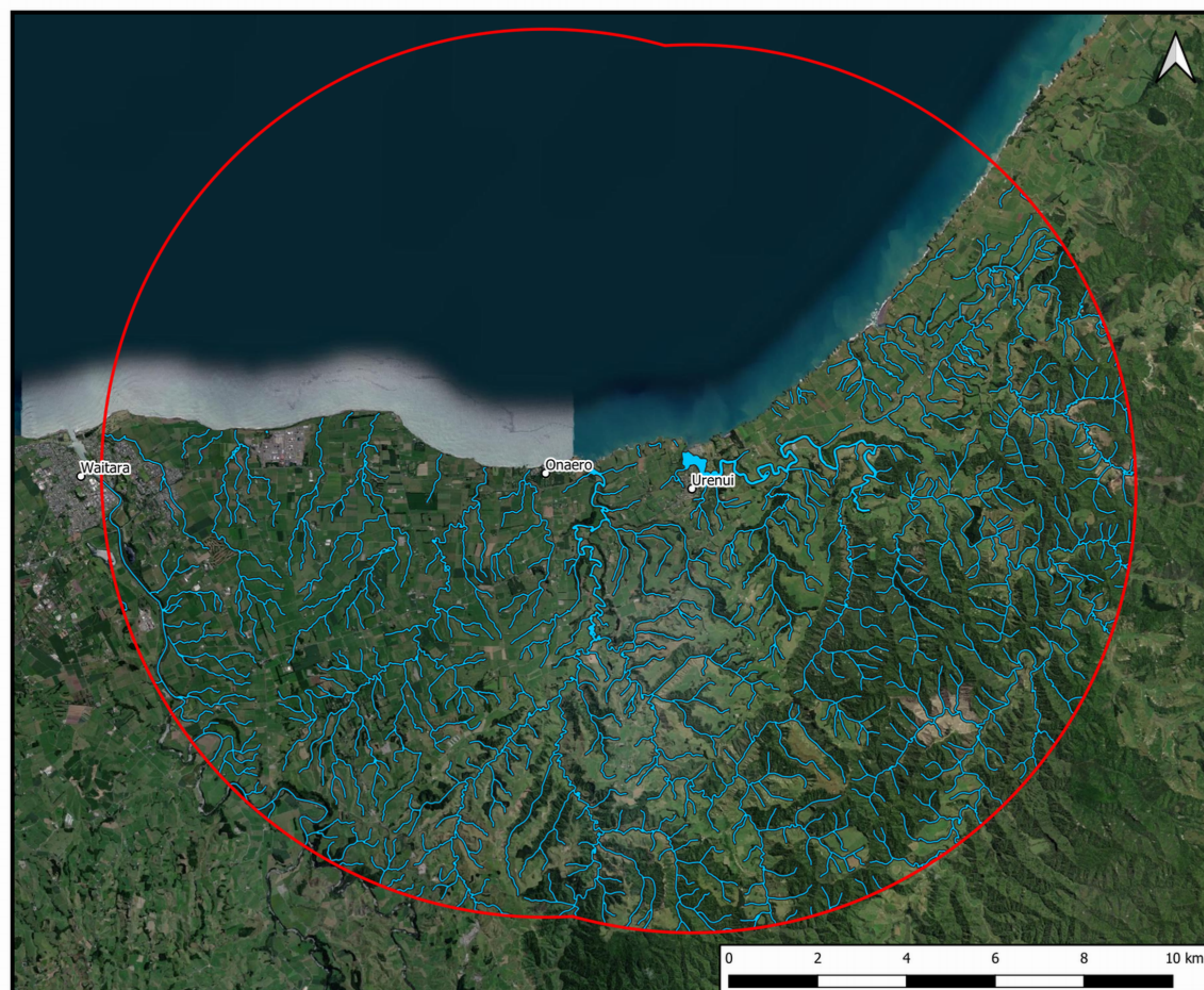
Flood Return Interval Map

L E W E
 Environmental
 Impact



STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-21 15:29
JOB NUMBER 10640	FIGURE NUMBER FIGURE 9
	MAP ID 238





LEGEND

-  10 km Township Radius
-  Waterways - 25 m Buffer

CLIENT



Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE

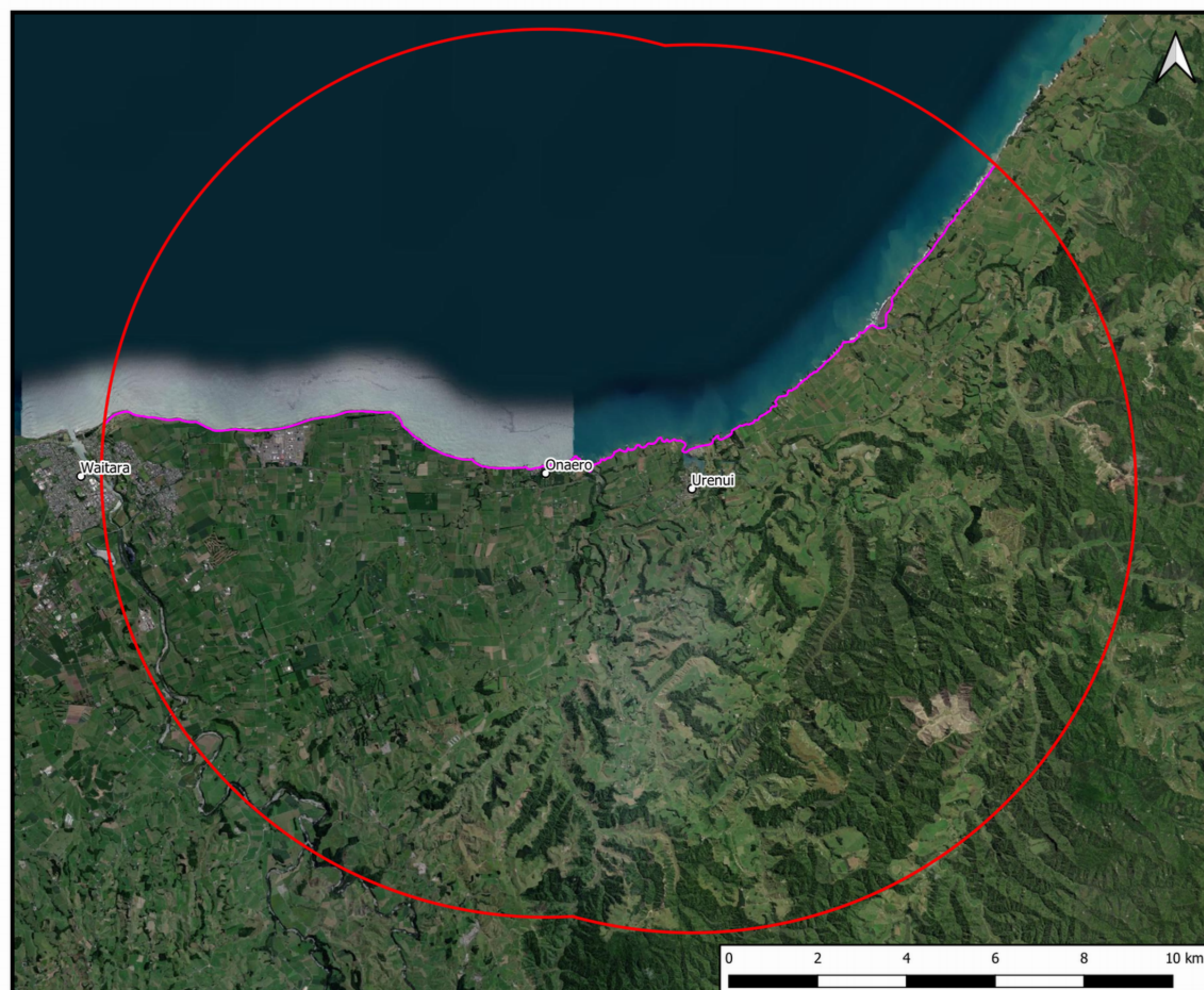
25 m Waterways Buffer Map





STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-20 15:22
JOB NUMBER 10640	FIGURE NUMBER FIGURE 10
	MAP ID 239





LEGEND

-  10 km Township Radius
-  Current ASCE Scenario

CLIENT



Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE
 Current ASCE Scenario Map



STATUS	
SCALE NOT TO SCALE	DATE/TIME 2021-10-20 15:24
JOB NUMBER 10640	FIGURE NUMBER FIGURE 11
	MAP ID 240





LEGEND

Septic Discharge Suitability

- Unsuitable
- Poorly
- Moderate
- Moderately Well
- Well
- Property Parcels
- Waterways

CLIENT

Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE

Septic Discharge Suitability - Urenui

L W E
 Environmental Impact

STATUS

SCALE NOT TO SCALE	DATE/TIME 2021-10-28 15:17
JOB NUMBER 10640	FIGURE NUMBER FIGURE 12
	MAP ID 241



LEGEND

Septic Discharge Suitability

- Unsuitable
- Poorly
- Moderate
- Moderately Well
- Well

— Current ASCE Scenario

— Property Parcels

— Waterways

CLIENT

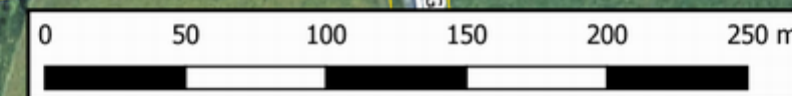
Te Kaunihera-ā-Rohe o Ngāmotu
New Plymouth District Council

TITLE

Septic Discharge Suitability - Onaero

L W E
 Environmental Impact

STATUS	
SCALE NOT TO SCALE	DATE/TIME 2021-10-28 15:07
JOB NUMBER 10640	FIGURE NUMBER FIGURE 13
	MAP ID 242



B

Appendix B – Land Suitability Analysis for Onaero and Urenui – Short Listed Area (LEI)

MEMORANDUM

Job 10640

To: David Taylor, New Plymouth District Council; Nicolette West, New Plymouth District Council; Claire Scrimgeour, Beca; Daniel Gilmour, Beca
From: Millie Taylor and Katie Beecroft, Lowe Environmental Impact
Date: Updated 7 November 2022
Subject: Land Suitability Analysis for Onaero and Urenui Wastewater – Short Listed Area

OVERVIEW

Beca, on behalf of New Plymouth District Council (NPDC) have engaged Lowe Environmental Impact (LEI) to undertake an assessment of land suitable for wastewater discharge near to Onaero and Urenui. In the first stage of this investigation, land within a 10 km radius of the townships was categorized into Zones A-E based on multiple land and water parameters relating to suitability to receive wastewater. Details of the suitability assessment are given in LEI (2021)¹.

Following review of the available areas determined in the desktop suitability assessment, a more detailed evaluation of a reduced area of interest has been undertaken. This memorandum details the further analysis. Land identified as Zone A (well suited to wastewater discharge) has been investigated and further parameters have been applied to narrow the range of properties for NPDC to investigate with regard to purchase, lease or other arrangement to enable discharge of wastewater from a new wastewater treatment facility. This memorandum has been updated to include outcomes from MCA analysis.

ANALYSIS OF ZONE A

Based on the previous work (LEI, 2021) which categorized the land into Zones A, most preferred to E, least preferred (Figure A), it was determined that sufficient Zone A land was available for consideration within the area of interest for the management of Onaero and Urenui wastewater. The second stage of the investigation would focus on Zone A land. This land occupies almost 20% of the investigation area as noted in Table 1.

Table 1: Zone A Land within 10 km of Urenui and Onaero (after LEI, 2021)

Zone	Description and Design Considerations	Area (ha)	% Investigation Area
A	Well Suited Requires smaller land area, as more water can be applied to a given area High value and/or short rotation crops Non-deficit irrigation – nil or limited storage required Greater number of irrigable days High rate of nutrient removal Routine cultivation and harvest, with short withholding periods.	4,521	18.8

¹ LEI. November 2021. Urenui and Onaero Wastewater Upgrade – Township Septic Tank Suitability and Land Priority for Discharge.

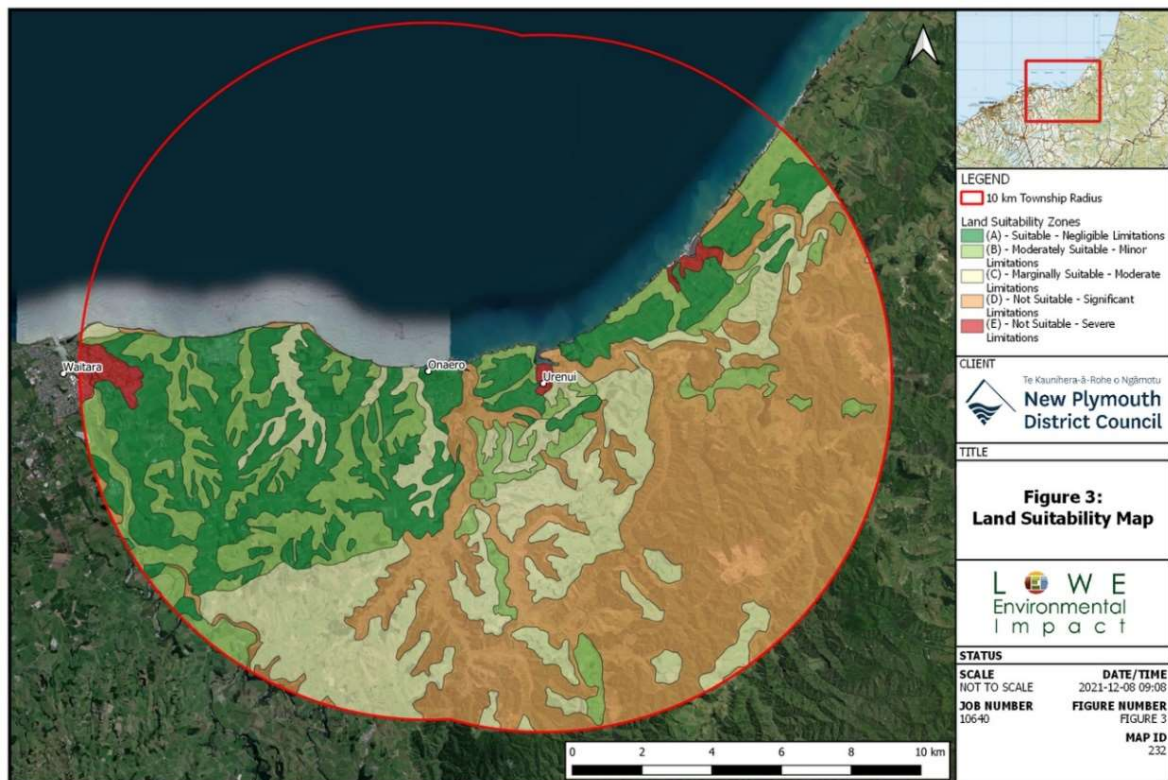


Figure A: Land Suitability Map From "Urenui and Onaero Wastewater Upgrade Township Septic Tank Suitability and Land Priority for Discharge" Report

Figure B shows the distribution of Zone A land (grey) with a buffer of 200 m (dark grey). This area has been nominated for further investigation.

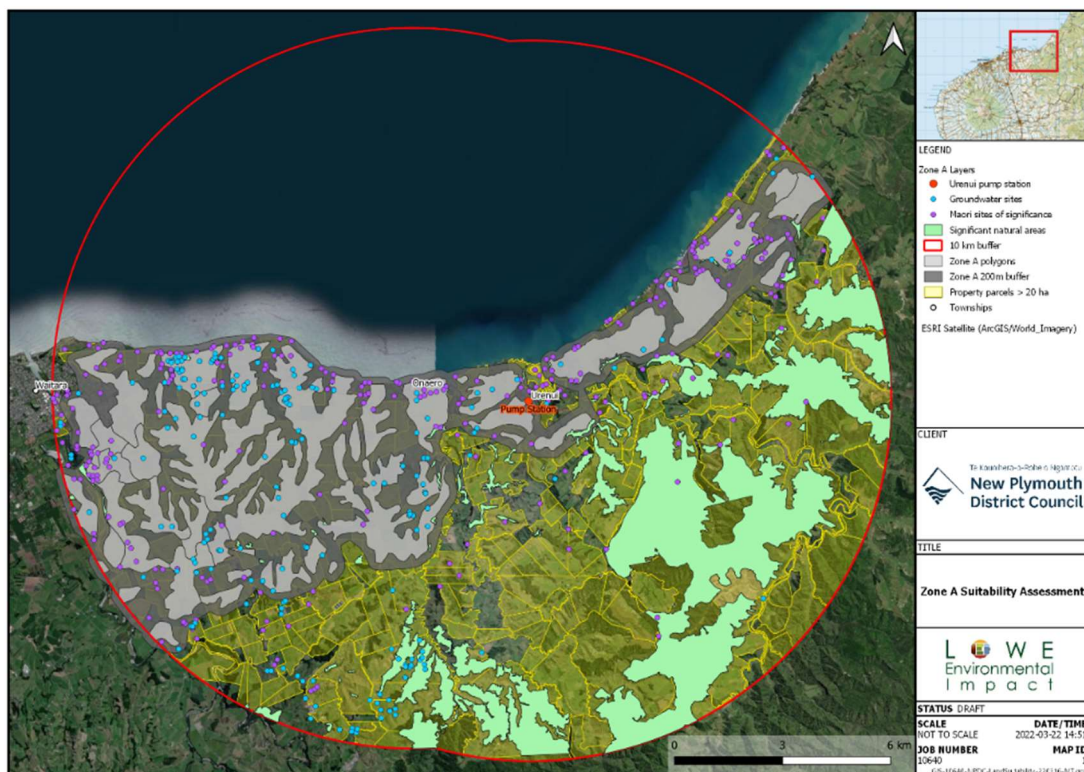


Figure B: 10 km Radius Around Urenui and Onaero



The layers used in the investigation have also been added to the Figure B map showing the property parcels, groundwater bores, Māori sites of significance, and Significant Natural Areas (SNA's). The SNA's were excluded from further analysis as there was very minimal overlap into the Zone A land.

The result of these layers is Figure C, where everything outside of the Zone A plus 200 m buffer has been removed. In this map, property parcels have been filtered to only include properties which are greater than 20 hectares in area so as to allow for buffers from the features identified in Figure B and from property boundaries and dwellings. The yellow polygons indicate properties greater than 20 hectares, grey polygons less than 20 hectares, and orange polygons which were greater than 20 hectares but have been clipped by the Zone A extent so may still want to be considered.

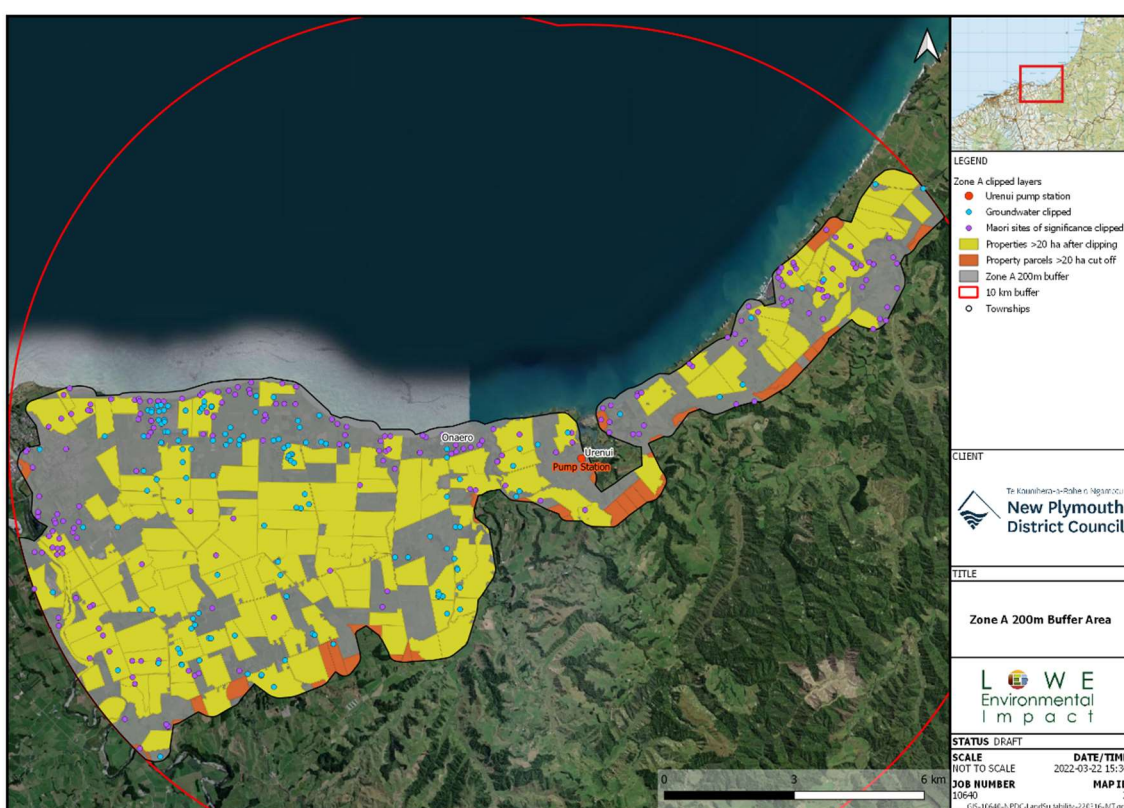


Figure C: Zone A Clipped Extent

REDUCTION OF ZONE A INVESTIGATION AREA

Zone Aa

The extent of suitable land parcels as shown in Figure C was evaluated at a meeting on 24 March 2022 with NPDC, Beca, and LEI. In consideration of potential pumpstation locations and reticulation distance, the investigation area was reduced to a 5 km radius around the towns.

Following on from this meeting, discussions were held between NPDC and Ngāti Mutunga. Ngāti Mutunga indicated that waste from Onaero and Urenui should not be discharged to another iwi's area. The result is to incorporate the rohe boundary as the western extent of



the investigation area. This subset area of Zone A is now referred to as Zone Aa and shown as the red outline. Figure D shows the extent of the investigation area.

A short list of properties was identified within the Zone Aa area. To be considered for the short list a property should meet the following criteria:

- Within the investigation area shown in Figure D below;
- At least 20 ha;
- Contain at least 10 ha of Zone A land.

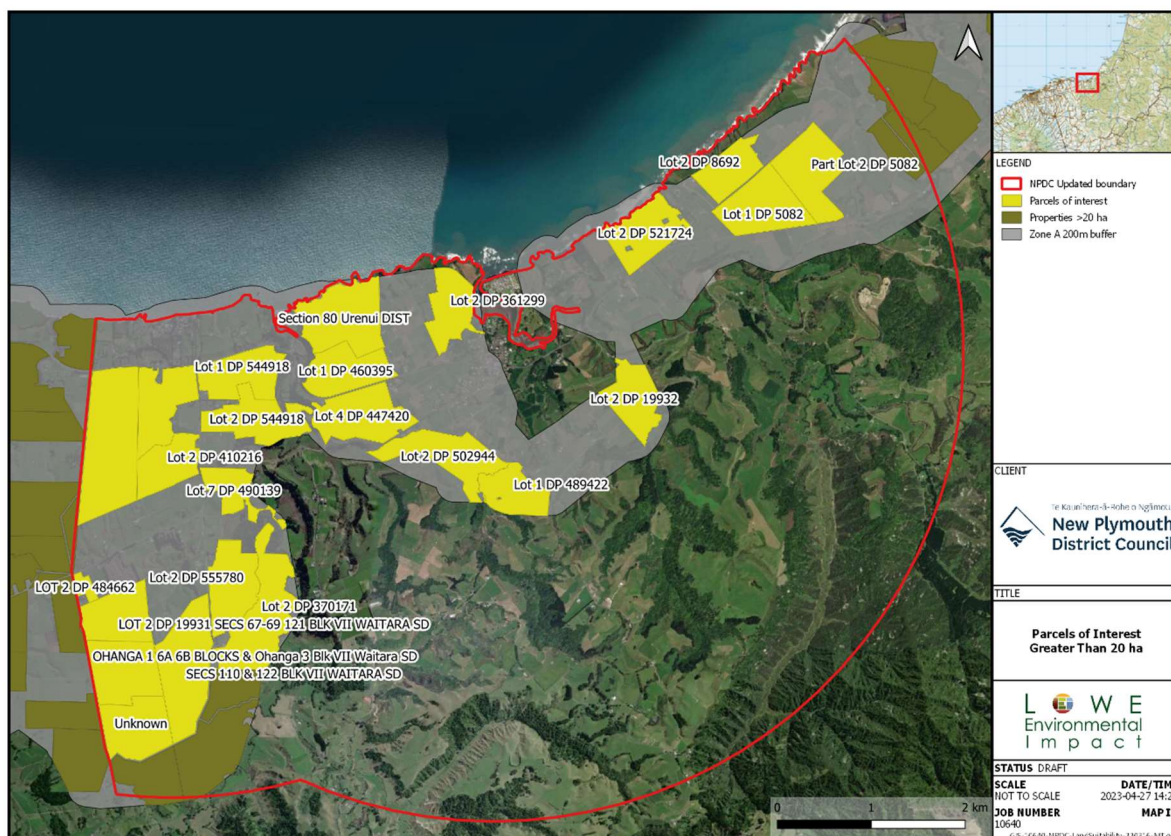


Figure D: Investigation area Zone Aa

A total of 23 property parcels which met the short list criteria were located within the Zone Aa (Figure D), reduced from the original 138 (Figure C). Additional properties may be considered if they met at least two of the above criteria and come to the market during the investigation period.

Rates and Values

To investigate the Zone Aa polygons further, the 'Rates and Values' NPDC layer was added to assess whether any of these parcels were owned under the same entity which would subsequently open up any land parcels that were collectively greater than 20 hectares.

Table 2 gives the details of the properties of interest.



Table 2: Property Details of Short List Properties

Property ID	Address	Area (ha)	Assessment no.	Legal Description
1	33 A Whakapaki Street, URENUI	38.0	11520/217.02	LOT 2 DP 361299
2	1237 Main North Road, URENUI	91.3	11520/221.02	SEC 80 URENUI DISTRICT LOT 15 DP 447025 LOT 1 DP 460395
3	201 Mokau Road, URENUI	42.3	11520/230.07	LOT 2 DP 521724 LOT 2 DP 324159
4	157 Carrs Road, URENUI	23.3	11520/232.01	Lots 3 & 4 DP 404805
5	121 Carrs Road, URENUI	36.0	11520/233.00	LOT 2 DP 8692 BLK IV WAITARA SD
6	401 Mokau Road, URENUI	94.8	11520/279.01	LOT 1 DP 5082 PTS LOT 2 DP 5082 LOT 1 DP 9813 SEC 7 SO 35585, 5 LOT 5A SEC 24 BLK IV WAITARA SD
7	1288 Main North Road, URENUI	52.4	11520/324.06	LOT 2 DP 491893 LOTS 1-4 6-10 12 13 PT LOTS 5 11 DP 2118 LOT 4 DP 447420 PT SEC 2 URENUI DISTRICT
8	158 Kaipikari Road Upper, URENUI	39.7	11520/336.15	QEII COVENANT 5.8150 HA AREA B PT LOT 1 DP 489422 - LOT 1 DP 489422
9	Kaipikari Road Upper, URENUI	57.6	11520/336.16	QEII COVENANT 12.5400 AREAS C D DP 18000 PT LOT 2 DP 502944, -LOT 2 DP 502944 LOT 3 DP 331605 LOTS 1-2 DP 12063
10	71 Wilson Road, URENUI	79.7	11520/339.01	LOT 1 DP 7356 LOT 2 DP 19932 SEC 115 BLK VII WAITARA SD SEC 10 URENUI DIST (DEFINED ON DP 384) SUB A DP 2170 SECS 11 12
11	179 Kaipikari Road Upper, URENUI	20.0	11520/358.01	LOT 1 DP 17112
12	222 Mataro Road, URENUI	38.7	11530/131.09	LOT 3 DP 307239 LOT 1 DP 412338 LOT 2 DP 450433 SEC 52 PTS SEC 2 URENUI DISTRICT AND DEFINED ON DP 107 AND DEFINED ON D
13	Ohanga Road, ONAERO, URENUI	23.4	11530/137.18	LOT 7 DP 490139
14	61 Ohanga Road, ONAERO, URENUI	44.4	11530/142.07	LOT 2 DP 544918
15	29 Ohanga Road, ONAERO, URENUI	37.1	11530/144.05	LOT 1 DP 544918
16	944 Main North Road, URENUI	84.4	11530/145.00	SEC 140 BLK VII WAITARA SD
17	1028 Main North Road, URENUI	41.4	11530/152.00	PT LOT 1 DP 1162 PT SEC 123 BLK VII WAITARA SD
18	627 Inland North Road, URENUI	68.1	11530/153.04	Lot 2 DP 410216 Lot 1 DP 316671 Secs 89 90 92 93 & Pt Secs 87 88 94 95 Blk VII Waitara SD
19	397 Ohanga Road, ONAERO, URENUI	116.3	11530/160.05	QEII COVENANT 4.6720HA PT LOT 1 DP 19282 PT SEC 99 AREAS A & B - LOT 1 DP 19282 SEC 1 SO 441305 SEC 1 SO 13411 LOT 2 DP
20	293/319 Waiiau Road	73.9	11530/150.05	Section 121 Block VII Waitara SD DP 572930, SO 8353
21	363 Waiiau Road	44.6	11530/15502,.03 ,.04	LOT 1 DP 380455, OHANGA 2 BLOCK,
22	138 Ohanga Road	122.9	11530/132.01	SECS 50 56 BLK VI WAITARA SD NGATIRAHIRI 8G PT 8E2 BLOCK OHANGA 4A-4D 5A-5C BLOCK
23	284 Ohanga Road	62.3	11530/151.00	SECS 110 & 122 BLK VII WAITARA SD



ADDITIONAL ANALYSIS

Additional considerations for the identified properties are as follows.

Areas of Sensitivity

Areas of sensitivity include Māori sites of significance, groundwater bores, and dwellings. These layers have been added to Zone Aa, seen in Figure E.

Buffer zones have been applied to the Māori sites of significance (20 m), groundwater bores (50 m), and dwellings (150 m). It should be noted that the Māori sites of significance are presented on this map as points but it is understood that site extents may incorporate a larger area. As discussed at a workshop (29 April 2022) with Marlene Benson for Ngāti Mutunga, an initially suitable buffer around sites of significance to Ngāti Mutunga is 200 m. It is intended that this parameter is re-examined in the event that a property near to a site of significance is identified for further investigation.

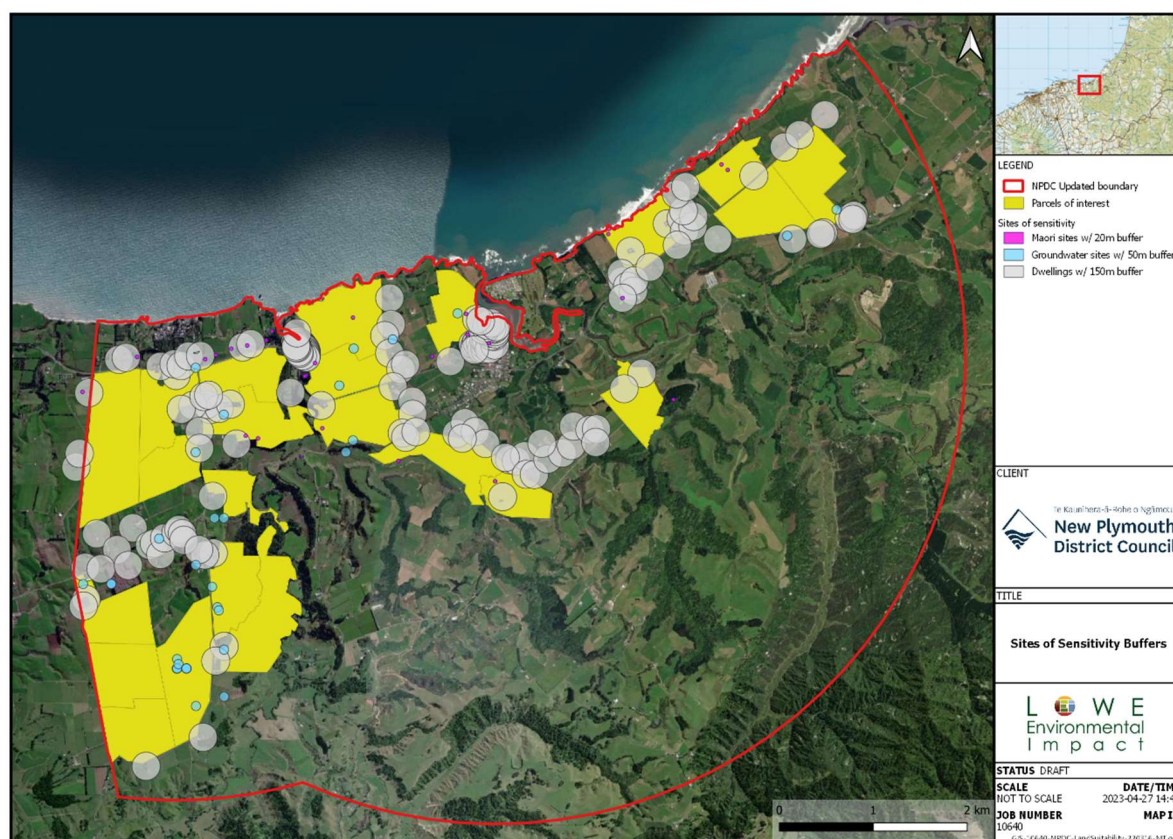


Figure E: Sites of Sensitivity: Māori significance, Groundwater Bores, and Dwellings

Land Use

The land use layer uses the LUCAS NZ Land Use Map which is a national dataset of aerial imagery vegetation analysis. The land use assessment in Figure F shows that the majority of land in the Zone Aa area is classed as 'Grassland – High Producing'. This is consistent with the



dairy farming region of Taranaki. From a land treatment perspective, this land naturally lends itself to wastewater treatment as it is predominantly low sloping land and supports a dual purpose land use if grazing or cut and carry was desired. From a cultural and industry perspective, areas supporting dairy or food production may not be appropriate for wastewater land treatment. There are also some areas of 'Natural Forest' and 'Planted Forest – Pre 1990' which are less suited to wastewater treatment.

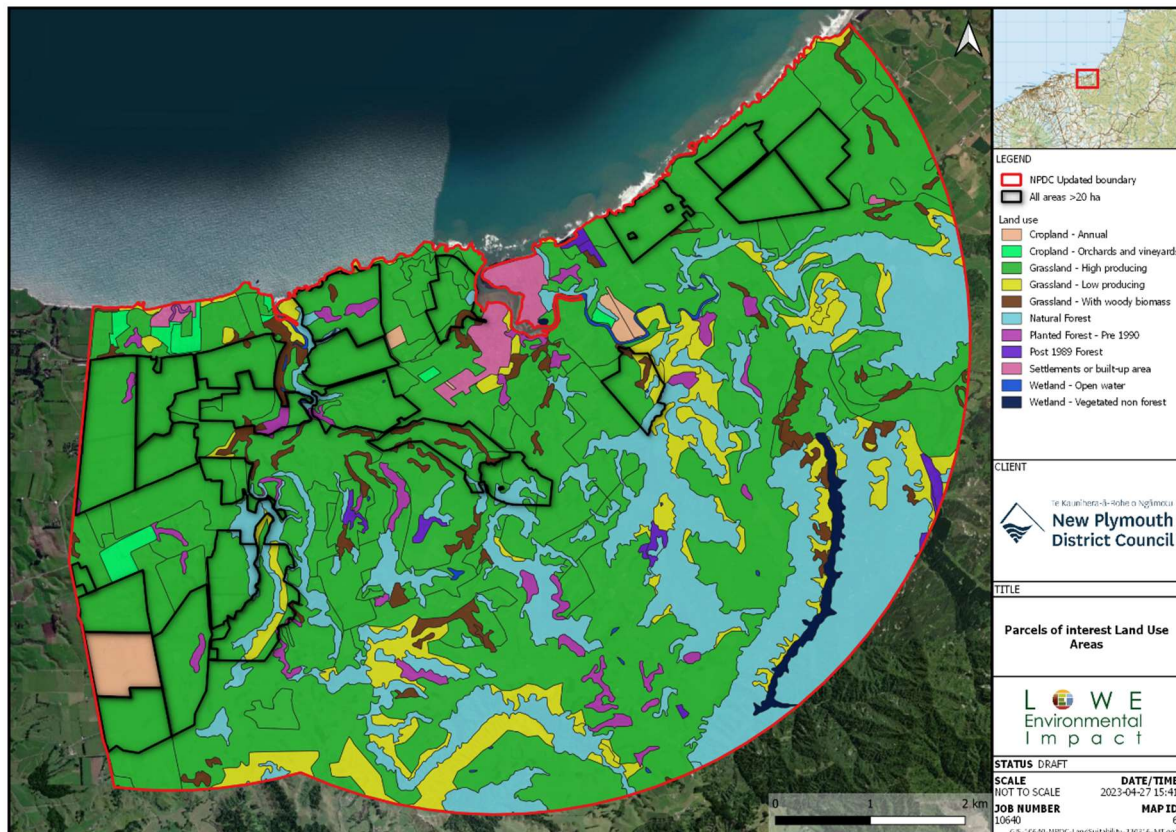


Figure F: Land Use Type for all Areas Greater than 20 Hectares

Land Parcels in Māori Ownership

An assessment of Māori land parcels was undertaken based on the data from Māori Land Online database. These are parcels under the jurisdiction of the Māori Land Court and are primarily Māori customary land, Māori freehold land and may also include Crown and other land set aside for treaty settlements. Figure G overlays the Māori land parcels against the Zone Aa land parcels of interest. Based on this figure, there are no land parcels of interest that intersect any of the Māori land parcels.

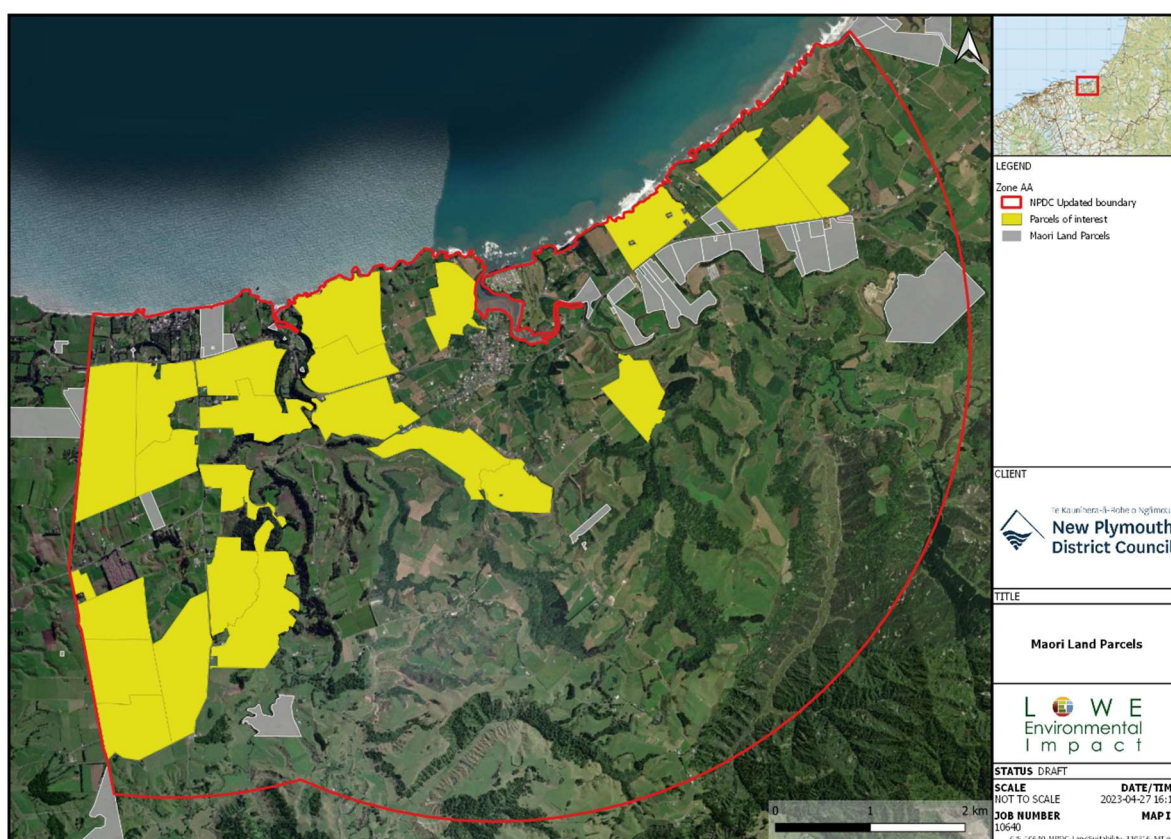


Figure G: Māori Land Parcels (in grey)

Slope Investigation

The initial desktop investigation (Figure A) considered maps at a 1:50,000 scale. Further investigation was carried out to analyse the slope of the parcels of interest based on the most recently available LiDAR for the investigation area. Through the use of DEM data, three slope grades were extracted, 0 – 7°, 7 - 15°, and greater than 15° (Figure H).

Slopes less than 7 degrees are best suited to wastewater irrigation and have thus been analysed further to extract the hectares of low slope land in the parcels of interest (Figure I). From these areas, the 150 m buffer around the properties was removed, as well as 20 m in from the property boundary. The property at 401 Mokau Road, Urenui, has had the 150 m buffer removed, however if the property is owner occupied then this area may be available for irrigation.

Outcome of Additional Analysis

Overlaying the sensitive areas, current land use, land in Māori ownership and slopes less than 7° enabled the likely area within each property that is available to be irrigated to be evaluated (Figure I). Following this analysis, 14 properties remained (Property ID 1, 2, 6, 7, 9, 14, 15, 16, 17, 19, 20, 21, 22, 23). Property 17 (1028 Main North Road) was subsequently excluded due to the irrigable area on the property being discontinuous and correspondingly, impractical for an irrigation system to be setup on. This left 13 properties for further consideration.

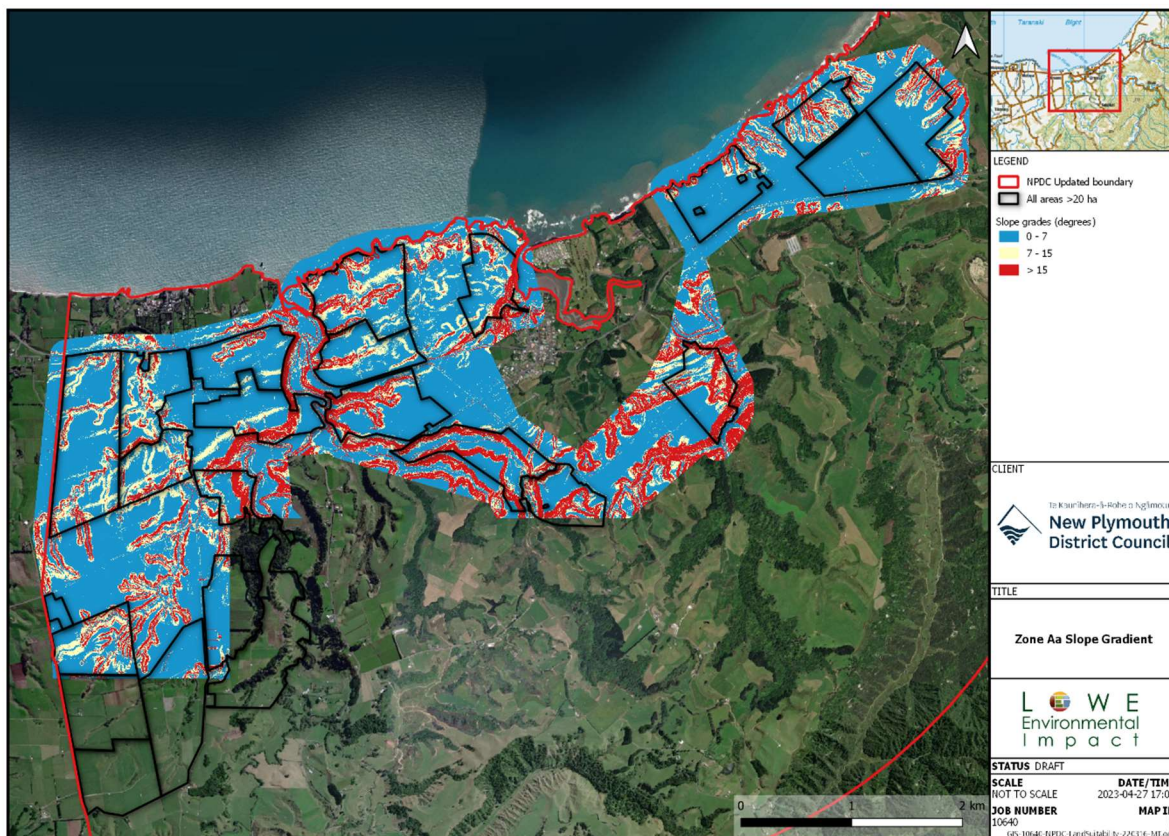


Figure H: Slope Gradients for Zone Aa. Blue 0 – 7°, Yellow 7 - 15°, Red Greater Than 15°

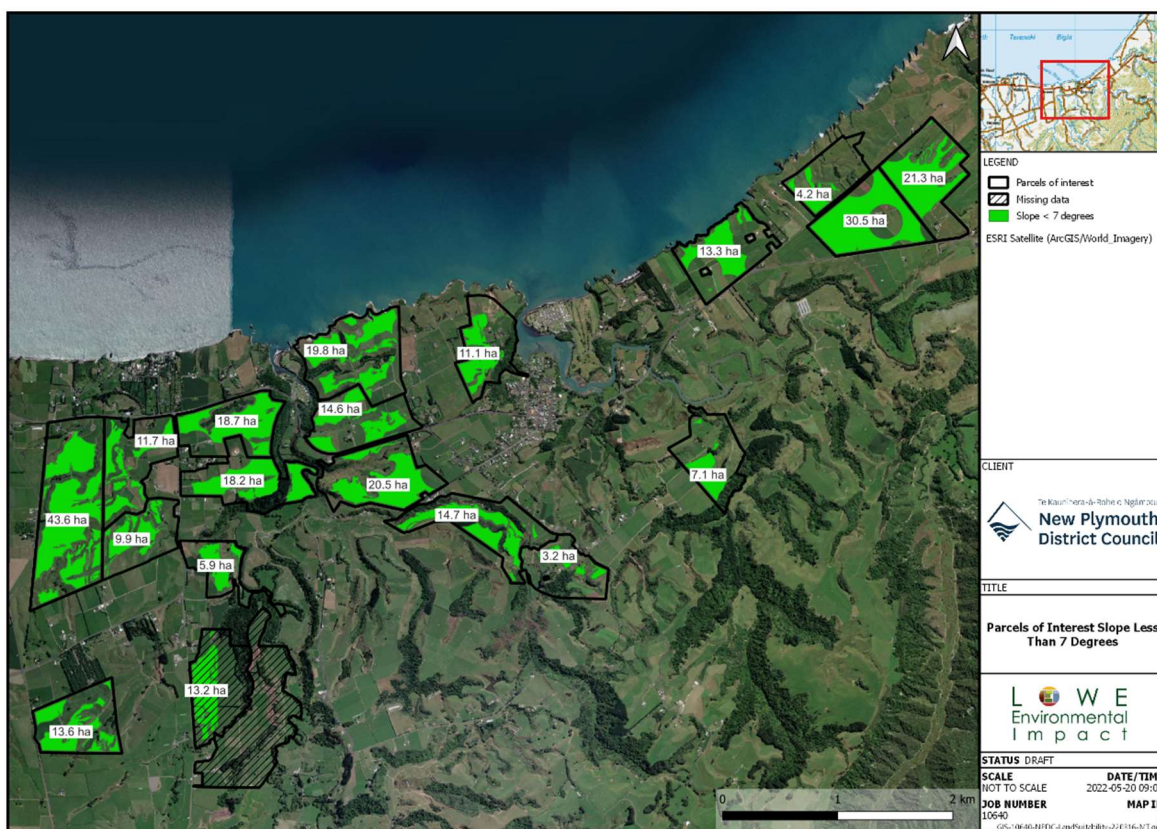


Figure I: Slopes Areas 0 - 7° (sites with available LiDAR)

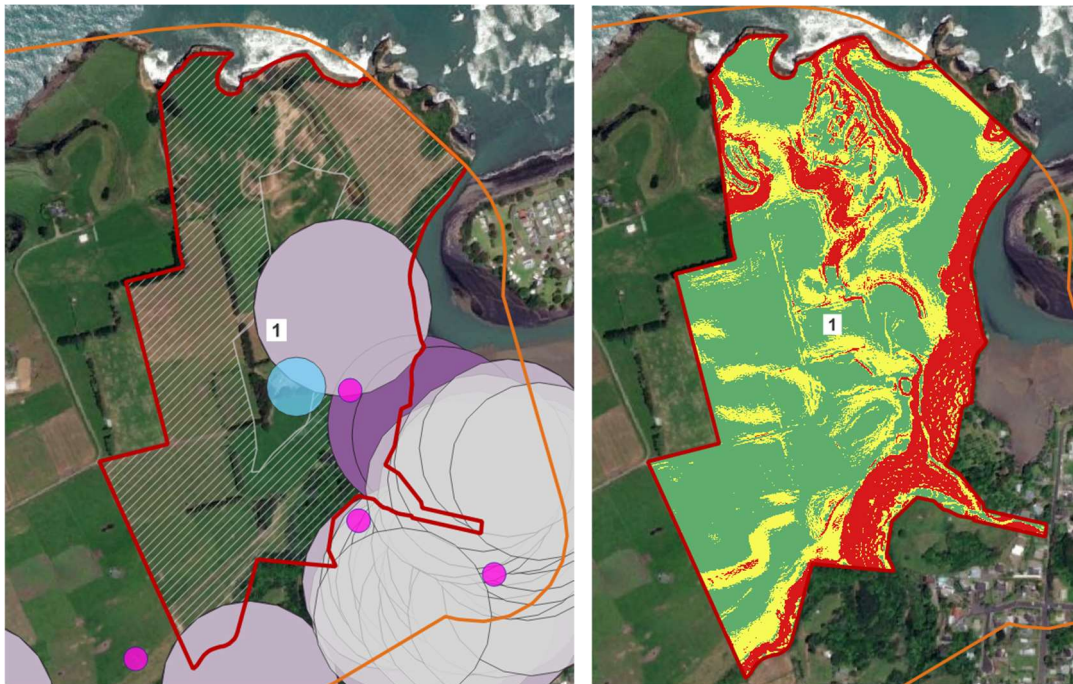


SHORTLIST REFINEMENT

Following the shortlisting of 13 properties, a desktop assessment of each site was undertaken in greater detail. Aerial views of each property were examined to determine features which weren't included in GIS layers viewed. Features for buffering were incorporated for each property. Site 21 was excluded at this stage due to multiple party ownership resulting in 12 properties for further investigation.

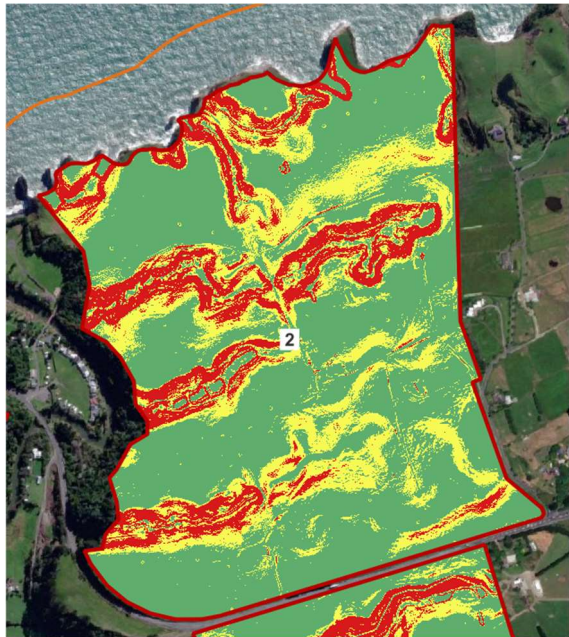
Figures for each site are shown which identify buffers around key features as previously discussed. The hatched buffer shown to the property boundary extends 150 m and is an exclusion area for locating the treatment plant but does not apply to the land application. The second figure for each site shows the slope across each property. Slopes of less than 7° (green) are preferred for both land application of wastewater and for sighting of a treatment plant and associated infrastructure.

Site 1 - 33 A Whakapaki Street, URENUI

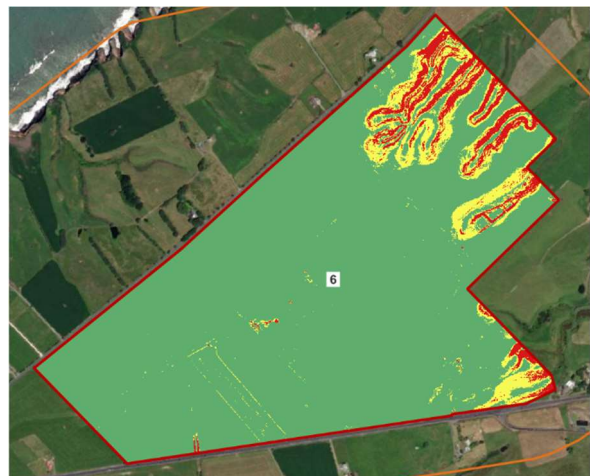




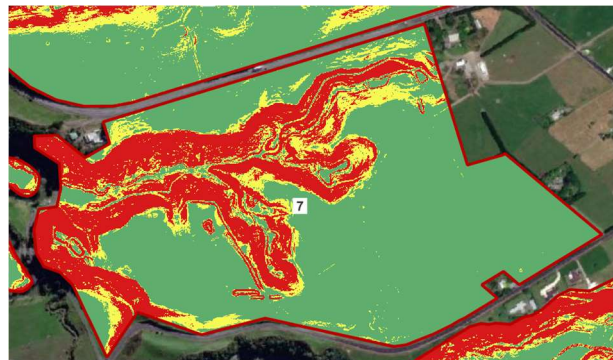
Site 2 - 1237 Main North Road, URENUI



Site 6 - 401 Mokau Road, URENUI

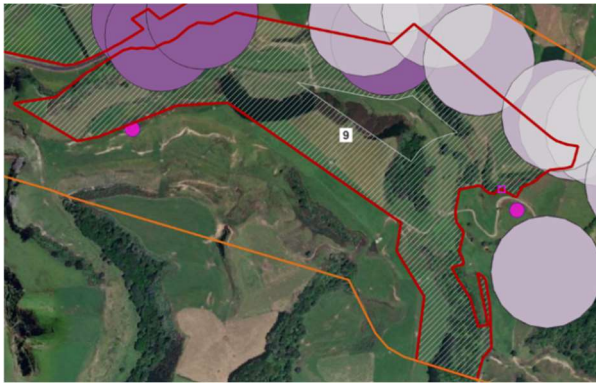


Site 7 - 1288 Main North Road, URENUI

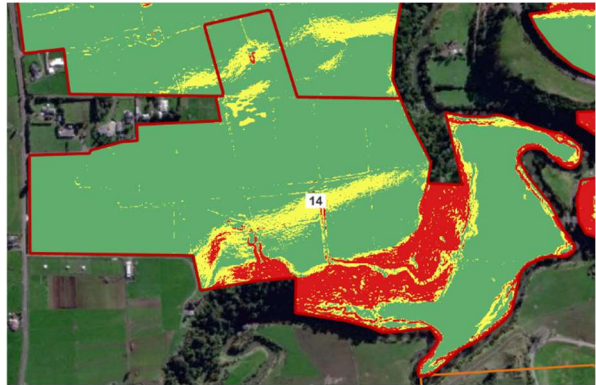
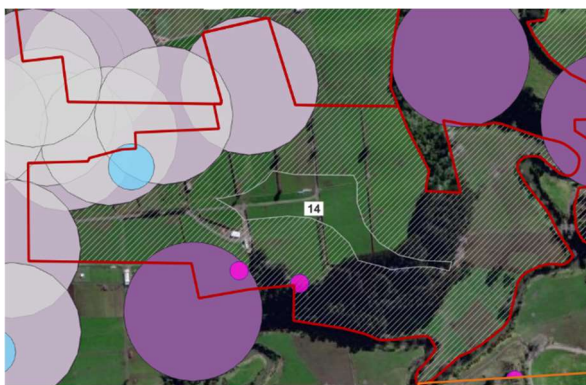




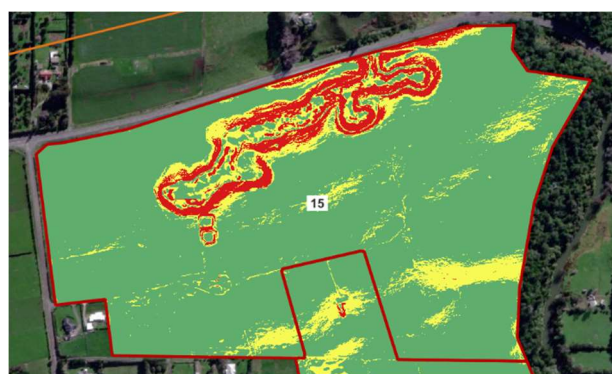
Site 9 - Kaipikari Road Upper, URENUI



Site 14 - 61 Ohanga Road, ONAERO, URENUI

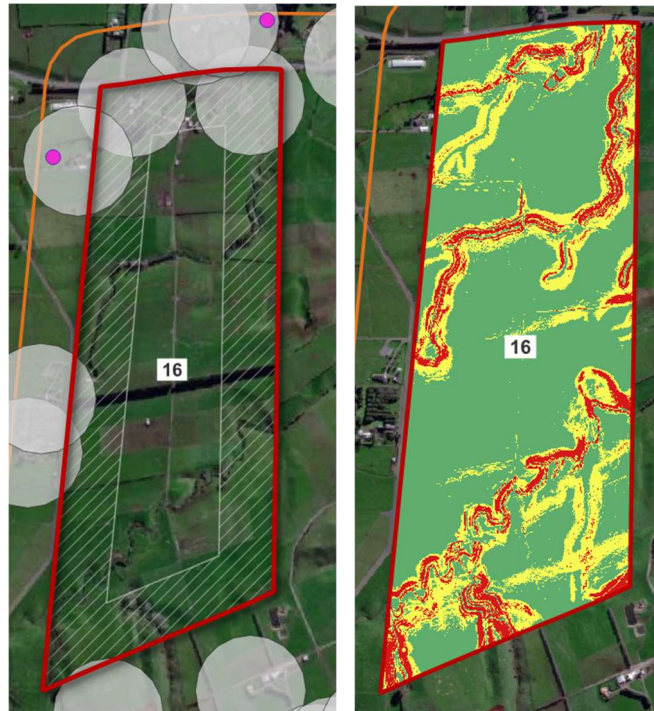


Site 15 - 29 Ohanga Road, ONAERO, URENUI



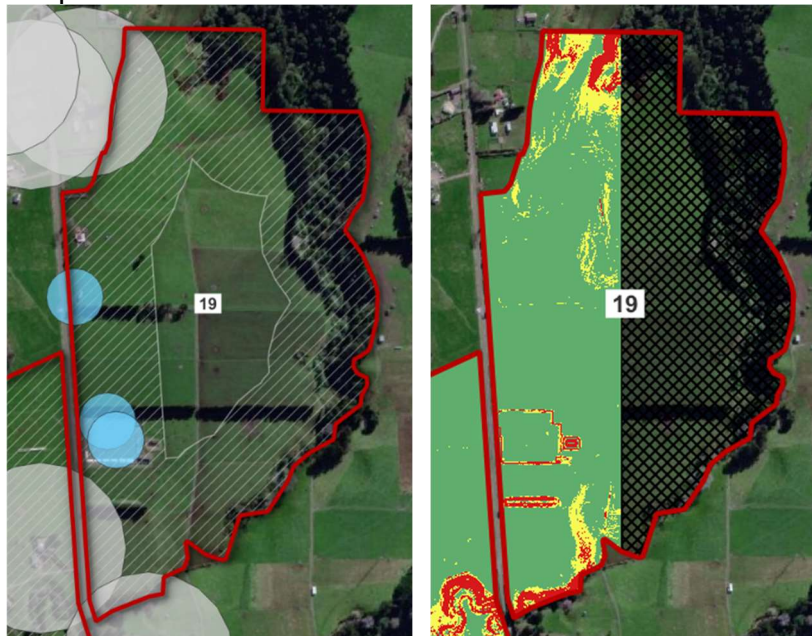


Site 16 - 944 Main North Road, URENUI



Site 19 - 397 Ohanga Road, ONAERO, URENUI

Lidar data is incomplete across this site.





Site 20 - 293/319 Waiiau Road



Site 21 - 363 Waiiau Road

Lidar data is incomplete across this site.



Site 22 - 138 Ohanga Road

No lidar data is available for this site





Site 23 - 284 Ohanga Road

Lidar data is incomplete across this site.



In order to compare each property a multi criteria analysis (MCA) was undertaken and is detailed in Beca (2022)². Key criteria ranked considered the accessibility, economic (capital and operational), cultural and environment implications for use of each site. The MCA resulted in six properties being excluded from further investigation. In total, six properties were considered for additional investigation and enquiries. The properties deemed best suited for land application of Onaero and Urenui's treated wastewater and potential for locating a treatment plant correspond to Property ID 6, 16, 19, 20, 22, 23 (additional details in Table 2 above).

SUMMARY

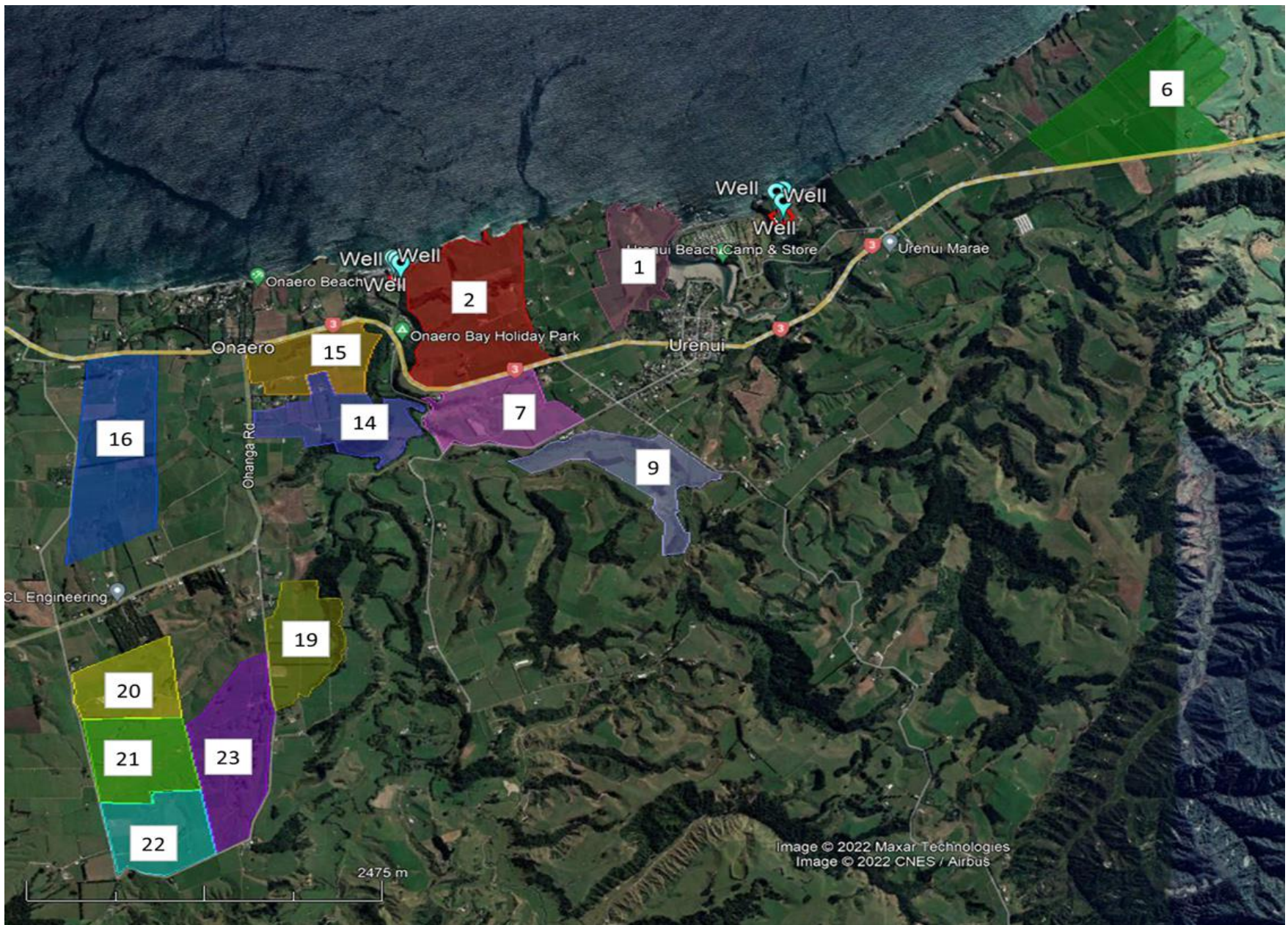
Following the desktop evaluation of the area surrounding Urenui and Onaero, a target area has undergone a more detailed assessment. Table 2 summarises a list of properties which are assessed as suitable for land treatment of wastewater and within a preferable proximity to the communities. Further analysis identifies areas within those properties that area available for irrigation at rates identified as suitable for Zone A. An MCA has identified six properties suitable for further investigation. The next steps are to review land for sale and approach land owners to discuss land availability. Thereafter due diligence including field investigations can be undertaken on specific properties.

² Beca report on MCA, in preparation

C

Appendix C – Long List Sites

URENUI AND ONAERO WWTP – LONG LIST












Site	Area (ha)	Address	Legal description
1	38.0	33 A Whakapaki Street, URENUI	LOT 2 DP 361299
2	91.3	1237 Main North Road, URENUI	SEC 80 URENUI DISTRICT LOT 15 DP 447025 LOT 1 DP 460395
6	94.8	401 Mokau Road, URENUI	LOT 1 DP 5082 PTS LOT 2 DP 5082 LOT 1 DP 9813 SEC 7 SO 35585; 5 LOT 5A SEC 24 BLK IV WAITARA SD
7	52.4	1288 Main North Road, URENUI	LOT 2 DP 491893 LOTS 1-4 6-10 12 13 PT LOTS 5 11 DP 2118; LOT 4 DP 447420 PT SEC 2 URENUI DISTRICT
9	57.6	Kaipikari Road Upper, URENUI	QEII COVENANT 12.5400 AREAS C D DP 18000 PT LOT 2 DP 502944; LOT 2 DP 502944 LOT 3 DP 331605 LOTS 1-2 DP 12063
14	44.4	61 Ohanga Road, ONAERO, URENUI	LOT 2 DP 544918
15	37.1	29 Ohanga Road, ONAERO, URENUI	LOT 1 DP 544918
16	84.4	944 Main North Road, URENUI	LOT 1 DP 544918
19	116.3	397 Ohanga Road, ONAERO, URENUI	QEII COVENANT 4.6720HA PT LOT 1 DP 19282 PT SEC 99 AREAS A & B - LOT 1 DP 19282 SEC 1 SO 441305 SEC 1 SO 13411 LOT 2 DP
20	73.9	293/319 Waiiau Road	Section 121 Block VII Waitara SD DP 572930, SO 8353
21	44.6	363 Waiiau Road	LOT 1 DP 380455, OHANGA 2 BLOCK
22	122.9	138 Ohanga Road	SECS 50 56 BLK VI WAITARA SD NGATIRAHIRI 8G PT 8E2 BLOCK OHANGA 4A-4D 5A-5C BLOCK
23	62.3	284 Ohanga Road	SECS 110 & 122 BLK VII WAITARA SD

Note: 23 sites were considered originally but 10 sites have been excluded from this traffic light assessment based on LiDAR slope analysis or layouts constrained by non-contiguous areas

URENUI AND ONAERO WWTP – LONG LIST

LEGEND

AERIAL IMAGE	BUFFER EXCLUSIONS	SLOPE
 Property boundary	 Dwellings – 150m  Dwellings (updated) – 150m  Groundwater sites – 50m  Maori sites of significance – 20m  Odour buffer for WWTP – 150m from property boundary	Slope (degrees)  ≤ 7.0  7.0 - 15.0  > 15.0

OPTION 1



OPTION 2












OPTION 6

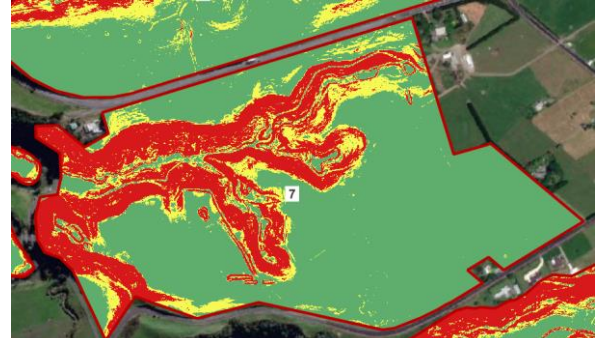


URENUI AND ONAERO WWTP – LONG LIST

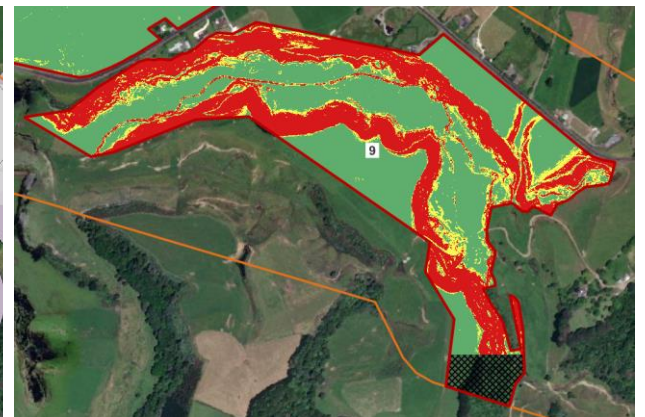
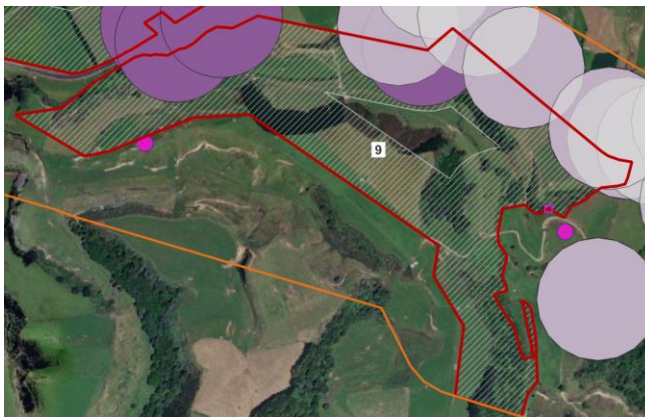
LEGEND

AERIAL IMAGE	BUFFER EXCLUSIONS	SLOPE
 Property boundary	 Dwellings – 150m  Dwellings (updated) – 150m  Groundwater sites – 50m  Maori sites of significance – 20m  Odour buffer for WWTP – 150m from property boundary	Slope (degrees)  ≤ 7.0  7.0 - 15.0  > 15.0

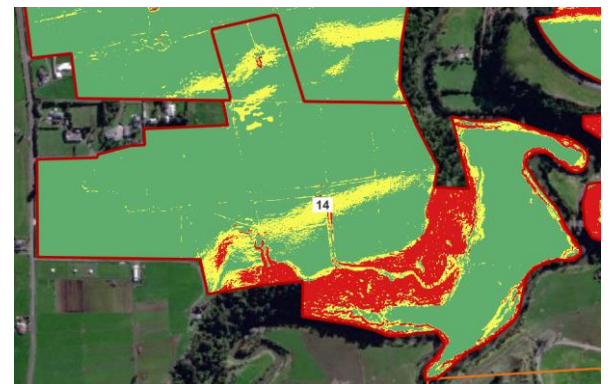
OPTION 7



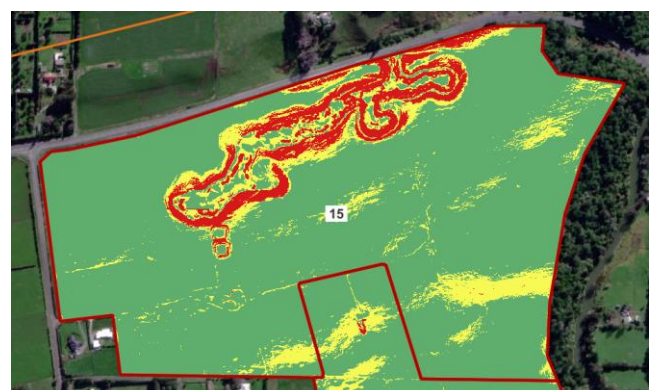
OPTION 9



OPTION 14












OPTION 15

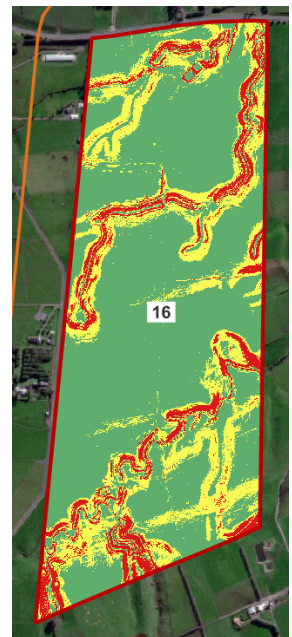


URENUI AND ONAERO WWTP – LONG LIST

LEGEND

AERIAL IMAGE	BUFFER EXCLUSIONS	SLOPE
 Property boundary	 Dwellings – 150m	 Slope (degrees) ≤ 7.0
	 Dwellings (updated) – 150m	 7.0 - 15.0
	 Groundwater sites – 50m	 > 15.0
	 Maori sites of significance – 20m	
	 Odour buffer for WWTP – 150m from property boundary	

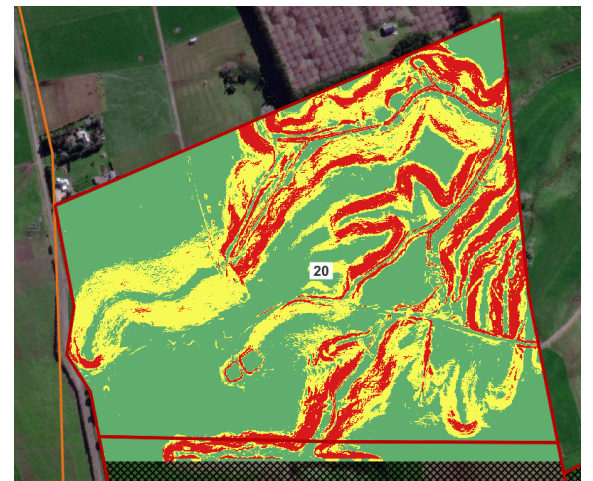
OPTION 16



OPTION 19












OPTION 20

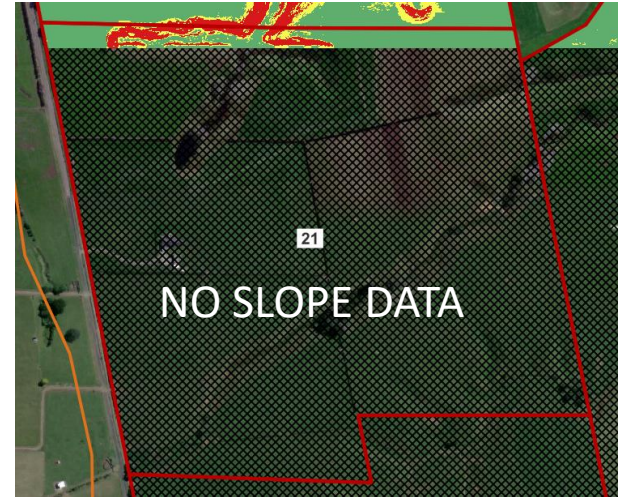
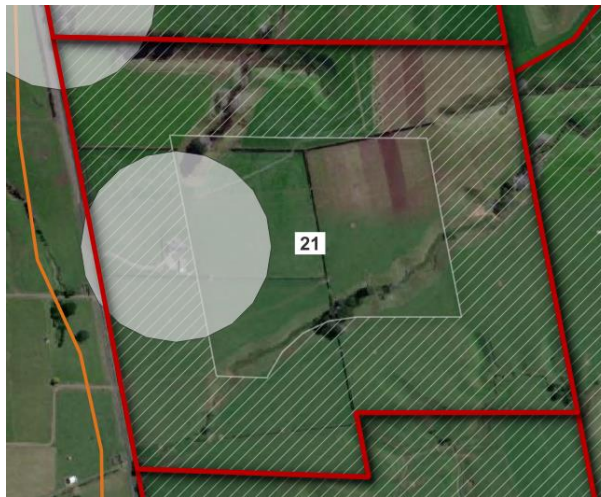
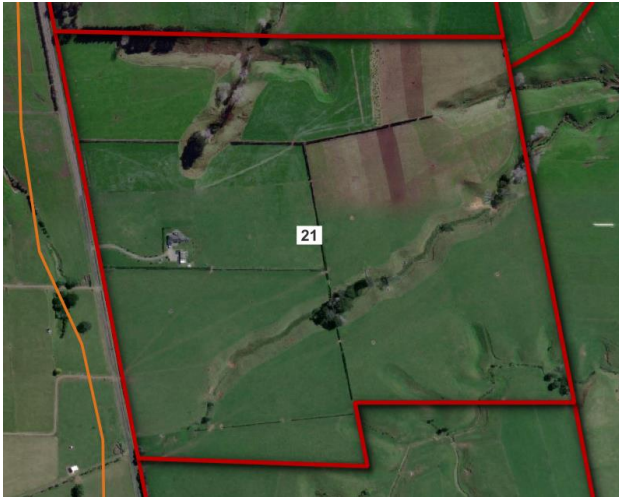


URENUI AND ONAERO WWTP – LONG LIST

LEGEND

AERIAL IMAGE	BUFFER EXCLUSIONS	SLOPE
 Property boundary	 Dwellings – 150m	 Slope (degrees) ≤ 7.0
	 Dwellings (updated) – 150m	 7.0 - 15.0
	 Groundwater sites – 50m	 > 15.0
	 Maori sites of significance – 20m	
	 Odour buffer for WWTP – 150m from property boundary	

OPTION 21



OPTION 22

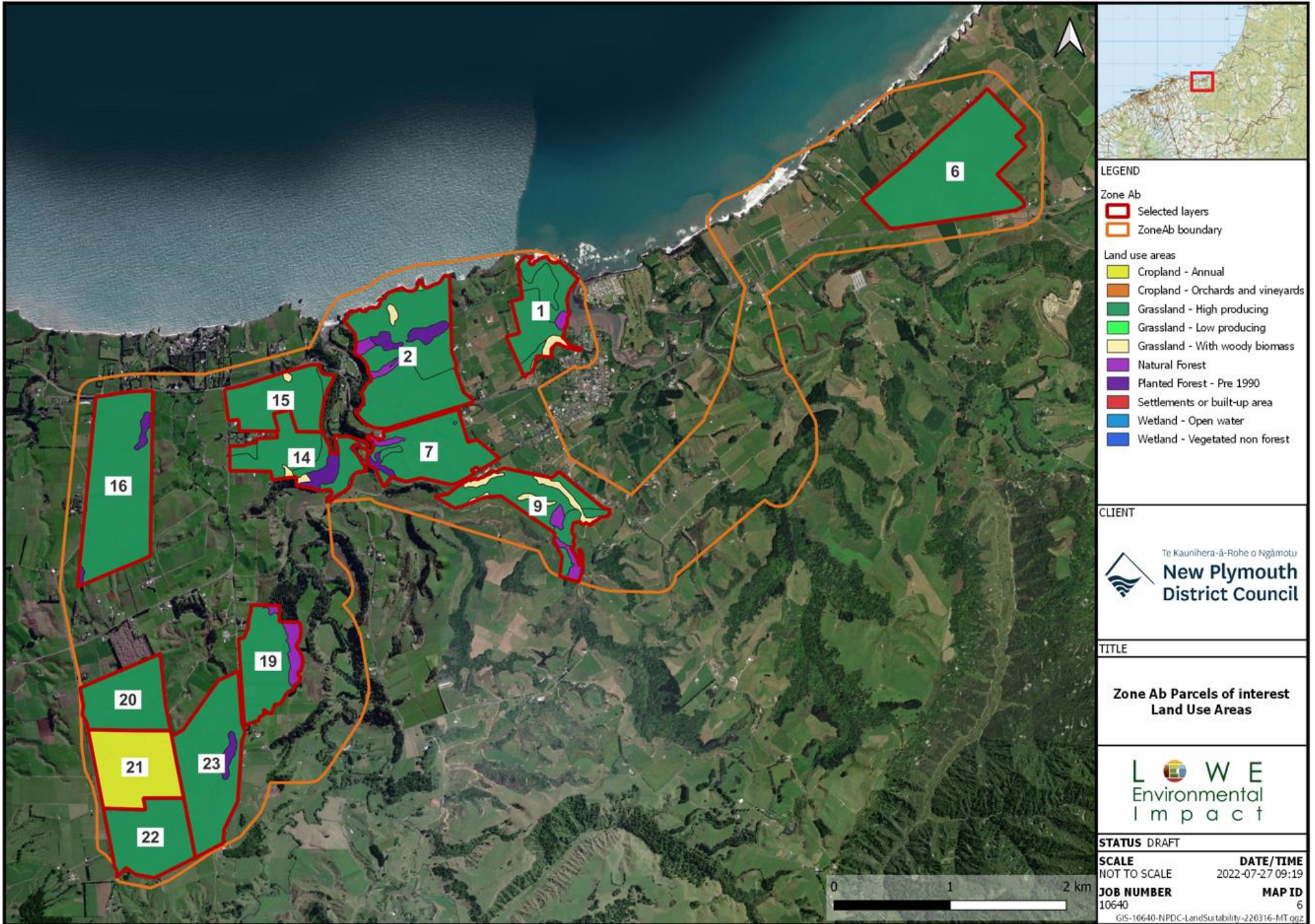


OPTION 23



URENUI AND ONAERO WWTP – LONG LIST

LAND USE TYPES



URENUI AND ONAERO WWTP – LONG LIST

HERITAGE SITES – NPDC District Plan



LEGEND

BUFFER ZONE



Heritage site – 150m*

* assuming a conservative 150m buffer zone from known heritage sites listed in the NPDC district plan, these buffer zones only slightly extend into Site 1 and Site 9 and no other long-list sites.

House at 39 Whakapaki Street, Urenui
Category B – considerable cultural heritage value

St Paul's Anglican Church
Category B – considerable cultural heritage value

Former Urenui Post Office
Category C – some cultural heritage value

Urenui War Memorial
Category A – very great cultural heritage value

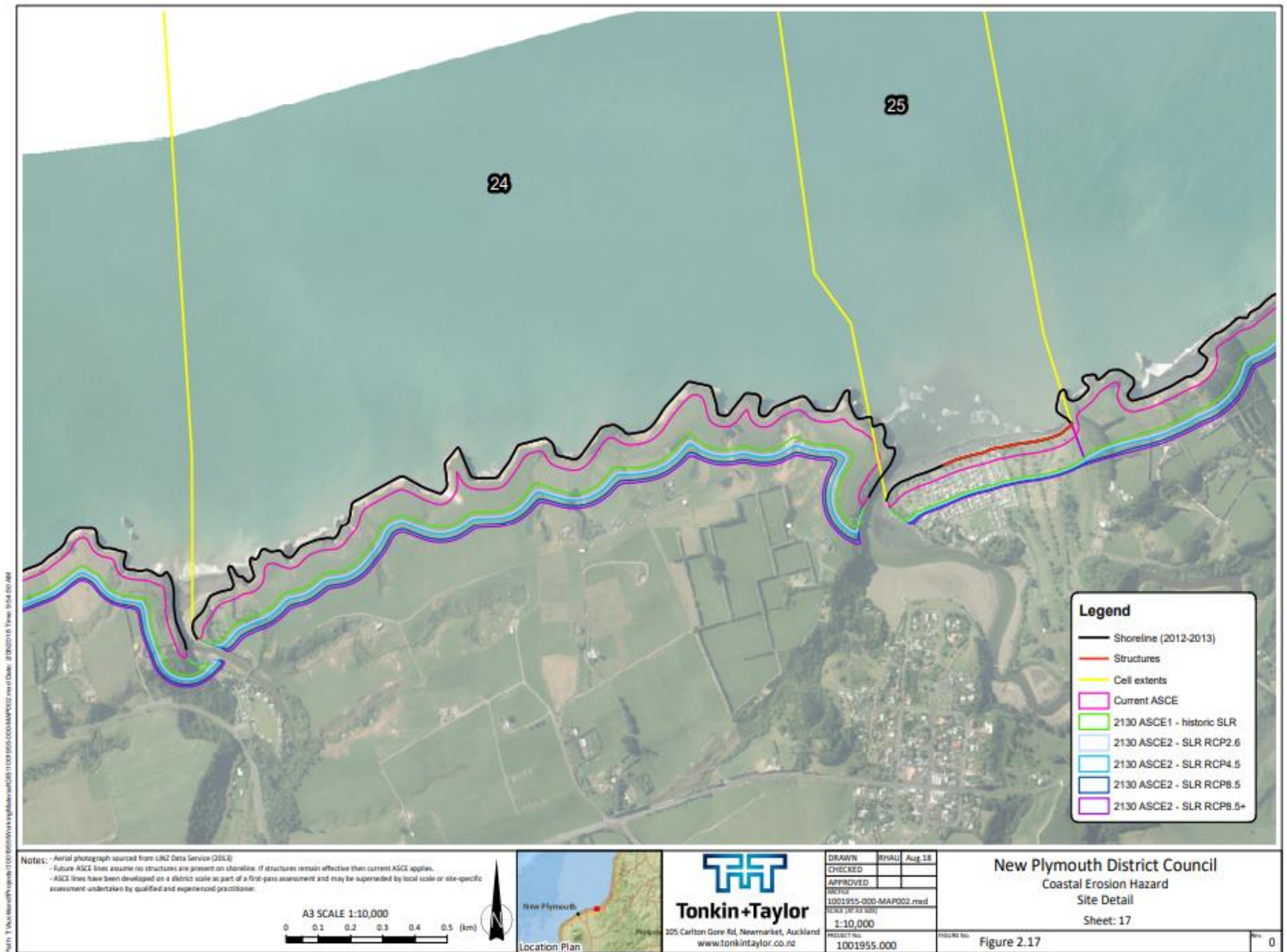
Urenui School Main Building
Category B – considerable cultural heritage value

Urenui School Classroom
Category C – some cultural heritage value

Fern Grove Cob Dairy
Category A – very great cultural heritage value

URENUI AND ONAERO WWTP – LONG LIST

COASTAL EROSION MAP



D

Appendix D – Long List Assessment

URENUI AND ONAERO WWTP - LONG LIST		Long list assessment for a new wastewater treatment plant and land discharge site to provide for settlements at Urenui and Onaero																							
		Site 1		Site 2		Site 6		Site 7		Site 9		Site 14		Site 15		Site 16		Site 19		Site 20		Site 22		Site 23	
Assessment Criteria		Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale		
1. Cultural	1a. Wahi tapu sites and areas of significance to Ngati Mutunga	3	This was a known area of occupation for Ngati Mutunga between Te Pihanga Pa (NPSC 362) and the coast so there are concerns about likelihood of damage to unidentified wahi tapu sites. Access to this site is also a concern for Ngati Mutunga as the existing access route is immediately adjacent to Te Pihanga Pa site and could only be expanded by earthworks within the extent of the pa. If able to access via lower Kaipikari road some of these concerns would be mitigated.	4	The main concerns about this site is the number of wahi tapu sites within and adjacent to this property. This increases the likelihood of damage to previously unidentified sites as this was an important occupation area for Ngati Mutunga.	4	The west part of this property is between Okoki (NPDC 359) and Pukekohe pa sites (NPDC 2249 and 2250). Ngati Mutunga would not support the WWTP and irrigation areas being within the viewshaft or pathway between these two sites - however there is probably sufficient room in the eastern part of the property that would avoid this area.	2	Property includes one known important wahi tapu site - Te Ngaiho Pa (NPDC 427), however this would potentially have advantage of providing increased access and protection of this site for Ngati Mutunga.	2	This site includes a Pa site (NPDC 420) and is also adjacent to another pa site (NPDC 437) which does not have a mapped extent and so has the potential to be within Property 9. There is also evidence (through a long history of archaeological finds) that the only area available for the WWTP and irrigation fields is a site of occupation for Ngati Mutunga.	2	The main concern about this property is the presence of two wahi tapu on the upland portion of this site - Putahi Pa (NPDC 440) and an associated site (NPDC 529) both of which do not have well defined extents. There is probably room to avoid this part of the property for the location of the WWTP and irrigation areas which is why it was not scored red.	4	There are no known wahi tapu within the property but it is directly to the south of a known area of coastal occupation for Ngati Mutunga which has a high number of pa, urupa, kainga and garden sites. This means that there is a higher risk of there being unknown sites within the property that may be damaged due to the earthworks needed for the project.	2	The northern part of this property (adjacent to the main highway) is a known occupation area for Ngati Mutunga and there are several important wahi tapu sites including Te Rau o te Huia Patupatu (NPDC 438) in the immediate vicinity. There is one site - NPDC 528 which is in the adjacent property and has a buffer zone of 250 m which directly affects this property. However this is a large property and the southern part of it has no known wahi tapu so any impact on sites of significance to Ngati Mutunga could be avoided.	2	No known wahi tapu within site or within vicinity of property.	2	There are no known Wahi tapu within or in the vicinity of this site - only site is more than 250 away from boundary of the property.	2	There are no known Wahi tapu within or in the vicinity of this site.	2	There are no known Wahi tapu within or in the vicinity of this site.
	1b. Maori and mahinga kai values of waterbodies within and immediately adjacent to the site	4	Site is adjacent to sites of high cultural and mahinga kai importance to Ngati Mutunga: Urenui Awaiestuary and fishing ledge on coast.	4	The property is close to the Onaero awa to the west and fishing reefs of the coast both of which have high mahinga kai and cultural value for Ngati Mutunga. There are also concerns about contamination of the two identified waterways within the property which drain into the Onaero awa. Would need further information to see if these areas could be avoided.	2	No concern about this site for its impact on mahinga kai/freshwater maui values as the property is large enough for the activity to be sited away from any waterways.	2	Concern if layout of site would not allow activity to avoid contamination of stream/wetland within property.	2	Concerns about the ability to avoid contamination of the Kakapo stream which has high mahinga kai and ecological values.	2	The lower part of the property is adjacent to the Onaero awa which has high cultural and mahinga kai values for Ngati Mutunga.	2	Within the property itself the major concern would be avoiding impacts on and contamination of the stream/wetland.	2	The size and layout of the site means that any contamination of streams or wetlands should be able to be avoided.	2	The only concern with this site is the unknown effect of the waterbodies that have been filled in and if this part of the property needed to be avoided for irrigation.	2	Ngati Mutunga have remaining concerns about whether it is possible to ensure that contamination of ground and surface water does not occur due to the size and layout of this property. When further information becomes available in the completion of the LEI report or a suitable engineering solution this ranking would be reassessed.	2	The only concern is avoiding contamination of waterways within the site - however due to the size and layout of the property these appear to be able to be avoided.	2	The only concern is if the activity was not able to avoid contamination of waterways within the site.
2. Heritage	2a. Heritage	4	Some heritage sites listed in the NPDC District Plan are located near the site. When applying a 150m buffer zone, the Category B house at 39 Whakapiki Street buffer zone partially overlaps with the south-eastern portion of the site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	Some heritage sites listed in the NPDC District Plan are located near the site. When applying a 150m buffer zone, the Category A Fern Grove Cob Dairy buffer zone partially overlaps with the south-eastern portion of the site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.	4	There are no heritage sites in close proximity to this site.
	2b. Archaeology	3	Te Pihanga Pa within the property (also a later redoubt). This entire area is known through oral history of Ngati Mutunga as being occupied in the past. A known wahi tapu NPDC 624 is located nearby, and likely extends into this property. This headland forms part of the rivermouth that was heavily occupied by Ngati Mutunga from the very earliest settlement of the North Taranaki coast, so is very high risk archaeologically. The archaeological risk on this property is landscape risk, rather than site specific, so it would be difficult to avoid archaeology through design.	2	Similar to Area 1, this location was extensively occupied early by Ngati Mutunga and represents a high landscape risk of archaeological sites even outside the recorded archaeological sites, which are all pa. Extensive wetlands crossing the property elevate this risk. Any earthworks within this property run a high risk of encountering unrecorded subterranean archaeology. Similar to Area 1, it would be difficult to avoid archaeology through design.	2	Relatively higher risk due to being likely associated with early coastal settlement, however no archaeology previously recorded in this location. Surrounded by recorded archaeology however, suggesting this is likely to be an archaeological landscape. Nothing obvious in near infrared aerial photographs.	2	Part of the same archaeological landscape as Area 2, and similarly occupied by a pa and associated wetland system. Te Ngaiho Pa is a relatively large pa, supporting a wider landscape of occupation.	2	Bordered by two pa sites. Elevated area represents an area of almost certain Maori occupation, easily defended by pa Q19/85 and what is likely to have been a defended position at the southern end (but with no site recorded presently), and pa Q19/102.	2	Putahi Pa (440) and defensive ditch (529) protecting southern edge of this property. Wider landscape is likely to contain evidence of Maori horticulture and settlement, but not significantly higher than the typical north Taranaki coastline.	2	Similar to Area 14, but with a large wetland system present on the property, as well as close association with an extensive cultural and archaeological landscape immediately to the north, which almost certainly extends into this area to some degree. That landscape includes very significant pa, urupa, and kainga. Any work near the wetland/gully system and the northern edge would run a very high risk of encountering archaeological material.	1	Te Rauotehua Pa on other side of SH3, aspects of which possibly extend slightly into the northern edge of this property. Northern edge of this property including 2x lifestyle and maori land. 4 across the road to the west including 1x lifestyle and maori land. Huge block, would only be using part.	1	No recorded archaeology in or around the property. Hints of possible rectangular subterranean defensive structures on one headland (northeast corner of property) in near infrared aerial photography, which could equally be natural geology.	1	No recorded archaeology in or around the property, and was previously in thick native forest prior to European farming, so unlikely to contain evidence of extensive Maori settlement. Some small risk of the forest clearing present in early historic plans being used.	1	Mostly within the forest line prior to being cleared to European farming, so unlikely to contain evidence of extensive Maori settlement. Some small risk of this being used as a resource location by Maori (wetlands/forest).		
3. Social	3a. Number of adjoining landowners	3	Residential dwellings in the north-west portion of the township of Urenui located immediately south-east of the site. Urenui beach campground is located to the east across the estuary from the site. Several other lifestyle properties are located on the western side of the site.	2	6 immediate neighbours on the northern side of the state highway. Including Ngati Mutunga. Onaero domain is across the river 16 baches. Across the state highway are another 4 neighbours.	2	Several small lifestyle sections. 10 immediate neighbours. 9 sections across the state highway.	2	Couple of lifestyle blocks to the north. Mostly big blocks surrounding. 9 neighbours. Also 5 properties across the road.	2	Block of 13 sections on north east corner all owned by the owner of the main block, potential for more dwellings in the future. 4 immediate neighbours that aren't the same owner as the large block. 3 of these are small lifestyle blocks. Property has roads on all 4 sides. 7 neighbours to the south across the road. 1 neighbour across the road to the north.	2	Block of 4 lifestyle properties to the north west. Cluster of 7 immediate neighbours. Two neighbours across the road.	3	Block of lifestyle properties to the south west of the property. 6 immediate neighbours to the south. Scenic reserve to the east. 1 neighbour across the road to the north including a lifestyle block.	2	8 immediate neighbours to the east, south, north west, including Ngati Rahiri land and one lifestyle block. 6 across the road north including 2x lifestyle and maori land. 4 across the road to the west including 1x lifestyle and maori land. Huge block, would only be using part.	2	6 immediate neighbours including DOC and 2x lifestyle. 4 neighbours across the road to the west including 2x lifestyle.	2	9 immediate neighbours including 2x lifestyle blocks. 1 neighbour across the road.	1	Three immediate neighbours that aren't across roads. One across the road to the south. One of the owners across the road to the west also owns the property, one additional neighbour to the west. All big blocks, no lifestyle blocks.	2	7 immediate neighbours to the west and north, 1x lifestyle property. 3 owners across the road, 2x lifestyle, rest of land owned by one owner.
	3b. Proximity of dwellings	4	Multiple properties directly adjacent to 150m odour buffer zone.	2	Density of baches and campground next to site and adjacent to odour buffer zone.	2	Reasonable number of dwellings in proximity to odour buffer zone.	2	Reasonable number of dwellings in proximity to odour buffer zone.	2	Reasonable number of dwellings in proximity to odour buffer zone.	2	Reasonable number of dwellings in proximity to odour buffer zone.	2	Reasonable number of dwellings in proximity to odour buffer zone.	2	Large block of land so can locate WWTP away from dwellings.	2	Large block of land so can locate WWTP away from dwellings.	2	Large block of land so can locate WWTP away from dwellings.	2	Limited dwellings near odour buffer.	2	Large block of land so can locate WWTP away from dwellings.
4. Natural environment	4a. Ecology	3	Site has multiple areas of standing water in one aerial photo (April 2017 - Google earth). May indicate presence of numerous wetlands, limiting irrigation area. Property also includes one small unnamed stream. Eastern boundary of site along estuary is a Key Native Ecosystem (KNE), SNA and little blue penguin nesting area.	2	Includes two first order tributaries of the Onaero River, and a gully in which there are four dairy effluent ponds. A natural wetland has been identified in one of the first order tributaries. Western boundary of site is a KNE and little blue penguin nesting area. Due to the number of streams, spray drift may be an issue.	2	Most of property does not appear to support significant ecological values. No SNA's or KNE's on property. Three natural wetlands in NE corner, additional one on neighbouring property at boundary (TRG). Wetlands associated with three unnamed tributaries of Waioetoe River.	2	Bisected by an unnamed tributary of the Onaero River and significant gully system. There are some small zero order tributaries as well, likely to include some natural wetlands. No sites of ecological significance.	2	Property includes the Kakapo Stream, which supports significant populations of native fish, including freshwater mussel. Contains four identified natural wetlands and probably more where terrace meets floodplain. Three QEII covenants of native forest on property.	2	Property adjoins the Onaero River, but does not appear to have any tributaries, although there may be unmarked freshwater features where the terrace meets the floodplain. It does adjoin the Onaero River Scenic Reserve (DOC Land) in north-eastern corner. The terrace edge supports a mix of native and exotic forest.	2	Property includes a well vegetated unnamed tributary of Onaero River - may include wetland features. No other obvious freshwater features. It does adjoin the Onaero River Scenic Reserve (DOC Land) along eastern boundary, which covers the terrace edge, covered in native forest.	2	Includes three unnamed tributaries of Motukara Stream. No identified natural wetlands, but three likely wetlands visible in aerial. Also may include some buried stream channels. Note with location of tributaries, northerly & southerly winds will present a risk of spray drift entering water.	2	Site includes two buried streams, likely non-compliant (completed 2018 - no resource consent visible). May present an issue in future. Boundary is unnamed tributary of Onaero River which is well vegetated with native and possibly exotic. No SNA, QEII or KNE on property. Close to DOC.	2	There are a number of streams on the property. There are also some identified natural wetlands, including large wetland on boundary with site 21. Their location may make managing spray drift difficult. Likely to have some subsurface drains that may limit suitable irrigation area. No ecological sites of significance.	2	A number of tributaries drain this site to the north east. In one of these tributaries is a dam, while the others may include some wetlands. No ecological sites of significance.	2	There are a number of zero and first order streams, and given their orientation it may cause difficulty in managing spray drift. No identified wetlands, but likely to include some.
5. Engineering	5b. Access	3	Main access point is through Urenui township which would likely not be suitable. Looks like there may be a second from Kaipikari Rd Lower but goes through neighbours property.	2	Good access internally and from SH	2	Excellent access internally and from SH and local road.	2	Good access close to highway	2	Good access off Kaipikari Rd upper. Internal access problematic, current access track appears to be on neighbouring property.	2	Good access off Ohanga Rd but would need to confirm condition of track to lower paddocks.	2	Good access of Ohanga Rd.	2	Good internal access need to consider if distance from highway is significant enough to make it orange.	2	Good internal access need to consider if distance from highway is significant enough to make it orange.	2	Good internal access need to consider if distance from highway is significant enough to make it orange.	2	Good internal access need to consider if distance from highway is significant enough to make it orange.	2	Good internal access need to consider if distance from highway is significant enough to make it orange.
6. Resilience	6a. Vulnerability to natural processes	4	significant coastal erosion expected (around 200m)	4	significant coastal erosion expected (around 200m)	4	No known risks	4	No known risks	4	Potential for liquefaction and fluvial flood risk on the river flats. Not listed as a known liquefaction risk area though.	4	No known risks	4	Lower paddocks could be vulnerable to fluvial flooding and liquefaction however impact should be minor to insignificant.	4	Possibility of liquefaction in river valleys but effect would be insignificant on operation of site. Not listed as known liquefaction risk area.	4	No known risks	4	No known risks	4	No known risks	4	No known risks
7. Useable land	7a. Amount of suitable land available for the WWTP site	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer	4	Some space available for WWTP inside 150m odour buffer but needs assessment as next to gully system	4	Does not appear to have adequate space to locate a WWTP	4	Some space available for WWTP inside 150m odour buffer but needs assessment	4	Does not appear to have adequate space to locate a WWTP	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer	4	Enough space available for WWTP inside 150m odour buffer

E

Appendix E – Short List MCA Assessment

URENUI AND ONAERO WWTP - LONG LIST		Short list assessment for a new wastewater treatment plant and land discharge site to provide for settlements at Urenui and Onaero											
Assessment Criteria	Ranking	Site 6		Site 16		Site 19		Site 20		Site 22		Site 23	
		Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale	Ranking	Rationale
1. Cultural	1a. Wahi tapu sites and areas of significance to Ngāi Mūtunga	5	The west part of this property is between Okapu (NPOC 309) and Pukekohe pā sites (NPOC 2249 and 2250). Ngāi Mūtunga would not support the WWTP and riparian areas being within the viewshed or pathway between these two sites - however there is probably sufficient room in the eastern part of the property that would avoid this area.	5	The northern part of this property (adjacent to the main highway) is a known occupation area for Ngāi Mūtunga and there are several important wahi tapu sites including Te Rau o te Haka Pākūpā (NPOC 438) in the immediate vicinity. There is one site - NPOC 528 which is in the adjacent property and has a buffer zone of 250 m which directly affects this property. However this is a large property and the southern part of it has no known wahi tapu so any impact on sites of significance to Ngāi Mūtunga could be avoided.	8	No known wahi tapu within site or within vicinity of property.	8	There are no known Wahi tapu within or in the vicinity of this site - only site is more than 250m away from boundary of the property.	8	There are no known Wahi tapu within or in the vicinity of this site - only site is more than 250m away from boundary of the property.	8	There are no known Wahi tapu within or in the vicinity of this site.
	1b. Maori and mahinga kai values of waterbodies within and immediately adjacent to the site.	8	No concern about this site for its impact on mahinga kai/freshwater maui values as the property is large enough for the activity to be sited away from any waterways.	8	The size and layout of the site means that any contamination of streams or wetlands should be able to be avoided.	6	The only concern with this site is the unknown effect of the waterbodies that have been filled in and if this part of the property needs to be avoided for irrigation.	7	Ngāi Mūtunga have remaining concerns about whether it is possible to ensure that contamination of ground and surface water does not occur due to the size and layout of this property. When further information becomes available in the completion of the LEI report or a suitable engineering solution this ranking would be reassessed.	8	The only concern is avoiding contamination of waterways within the site - however due to the size and layout of the property these appear to be able to be avoided.	6	The only concern is if the activity was not able to avoid continuation of waterways within the site due to the shape and layout of the waterways within this property.
2. Heritage	2a. Heritage	10	There are no heritage sites or notable trees listed in the NPOC district plan (operative or proposed) maps in close proximity to the site. There is a group of notable trees (Spanish Chestnut - Site ID 199) scheduled under the proposed NPOC district plan located approximately 70m north of the site on the other side of State Highway 3 - these will not be affected by the construction or operation of the WWTP.	10	There are no heritage sites listed in the NPOC district plan (operative or proposed) maps in close proximity to the site. There is a group of notable trees (Spanish Chestnut - Site ID 199) scheduled under the proposed NPOC district plan located approximately 70m north of the site on the other side of State Highway 3 - these will not be affected by the construction or operation of the WWTP.	10	There are no heritage sites or notable trees listed in the NPOC district plan (operative or proposed) maps in close proximity to the site.	10	There are no heritage sites or notable trees listed in the NPOC district plan (operative or proposed) maps in close proximity to the site.	10	There are no heritage sites or notable trees listed in the NPOC district plan (operative or proposed) maps in close proximity to the site.	10	There are no heritage sites or notable trees listed in the NPOC district plan (operative or proposed) maps in close proximity to the site.
	2b. Archaeology	7	No archaeological records sites on the property, and none identified through desktop study. Relatively higher risk due to being likely associated with early coastal settlement, however no archaeology previously recorded in this location. Surrounded by recorded archaeology however, suggesting this is likely to be a settled archaeological landscape.	6	Te Rauotehūa Pa on other side of SH3, aspects of which possibly extend slightly into the northern edge of this property. Northern edge of this property higher risk than the remaining area, which is relatively low risk for the general area. Wetlands/gullies through the property are a potential risk. Nearby fire features found previously.	8	No clear recorded archaeology in the area and relatively low risk, with the exception of the wetland/gully system. Possible named Maori settlement in nearby property to the south - "Takapūka".	9	No recorded archaeology in or around the property. Hints of possible rectangular subterranean defensive structures on one headland (northeast corner of property) in near air and aerial photography, which could equally be natural geology.	10	No recorded archaeology in or around the property, and was previously in thick native forest prior to European settlement and opening of land to farming. Some small risk of the forest clearing present in early historic plans being used.	10	Mostly within the forest line prior to being cleared to European farming, so unlikely to contain evidence of extensive Maori settlement. Some small risk of being used as a resource location by Maori (wetlands/forest).
3. Social	3a. Ability to acquire land	1	Owner wasn't keen on a site walkover and isn't interested in selling.	5	Owner allowed a site walkover. No clear indication of whether they would be willing to sell.	1	Owner wasn't keen on a site walkover and isn't interested in selling.	10	Property has been purchased by NPOC	1	Owner wasn't keen on a site walkover and isn't interested in selling.	1	Owner wasn't keen on a site walkover and isn't interested in selling.
	3b. Odour amenity	5	Low scoring reflects the number of surrounding dwellings. However this is in part due to the size of the site. WWTP could be located on site to avoid odour issues.	7	The scoring reflects the number of surrounding dwellings. However this is in part due to the size of the site. WWTP could be located on site to avoid odour issues.	8	Few surrounding dwellings. Site is visible from an odour perspective.	7	Few surrounding dwellings. Two are however located approximately 200-250m from the buffered area. Site is visible from an odour perspective.	9	One one dwelling located within 200m of the buffered area and one 300-500m. Site is visible from an odour perspective.	8	One one dwelling located within 200m of the buffered area and two 250-300m. Site is visible from an odour perspective.
	3c. Traffic	6	Site 6 has received an overall rating of 6 for the suitability of the site relating to transportation. The site will need to have some pedestrian improvements within Urenui to mitigate the possibility of conflict caused by construction traffic. Carriageway widening is required along Carrs Road to assist in two way traffic flows as the existing road is quite narrow (6m). Overall, the traffic effects are minor and relatively simple to mitigate.	7	Site 16 has received an overall rating of 7 for the suitability of the site relating to transportation. There will need to be some carriageway widening along Waiau Road to assist in two-way traffic flow and some minor improvements at the intersection with Inland North Road. Overall, the traffic effects are minor and relatively simple to mitigate.	6	Site 19 has received an overall rating of 7 for the suitability of the site relating to transportation. There is the need for some intersection improvements at the intersection of Ohanga Rd/Inland North Rd. Also some road widening is needed on a portion of Ohanga Rd (South of the intersection) to assist in two-way traffic flow. Overall, the traffic effects are minor and relatively simple to mitigate.	6	Site 20 has received an overall rating of 6 for the suitability of the site relating to transportation. There is the need for some intersection improvements at the Waiau Rd intersection with Inland North Rd. Carriageway widening is needed for a portion of the road south of the intersection. Overall, the traffic effects are minor and relatively simple to mitigate.	5	Site 22 has received an overall rating of 5 for the suitability of the site relating to transportation. There is the need for some intersection improvements at the Waiau Rd intersection with Inland North Rd. Carriageway widening is required for a portion of the road south of the intersection to assist in two-way traffic flow. The carriageway widening is required for a longer distance for this site, therefore a lower grade. Overall, the traffic effects are minor and relatively simple to mitigate.	5	Site 23 has received an overall rating of 5 for the suitability of the site relating to transportation. There is the need for some intersection improvements at the intersection of Ohanga Rd/Inland North Rd. Also some road widening is needed on a portion of Ohanga Rd (South of the intersection) to assist in two-way traffic flow. Overall, the traffic effects are minor and relatively simple to mitigate.
3d. Groundwater boxes	8	Although there are no known wells downgradient of the site there is a well 50 m upgradient of the site. We suggest investigating if upgradient well GND047 is still in use. If so, use the ranking for this site will increase.	10	There are no known wells down gradient of the site, and the nearest well is 400 m upgradient which has casing down to 18.3 m depth.	5	There is not enough data to confirm groundwater flow direction. The closest well is 150 m to the NW. The second closest is 420 m away for stockwater supply. There is potentially up to 8 other wells downgradient that are less than 1000 m away from the site. There is a well 155 m upgradient that abstracts shallow groundwater. A mapped fault also runs through the site that could act as a potential flow path. Piezometers could be drilled on site to determine groundwater flow direction. If groundwater flow is to the E or N the MCA rating will help improve.	5	GW flow direction (based on a recent desk top study of this site) appears to be N-NE. However will be confirmed from monitoring. There are two wells (GND050 and GND051) some 130 m N of the site boundary that are used for stock domestic water supply. There are no records confirming if casing is installed in these wells.	8	There is not enough data available to confirm groundwater flow direction. Depending on flow direction there could potentially be up to 3 downgradient groundwater users. The closest well is some 310 m. This well is however closed to 32.8 m and a watercourse is present between the site and the well. The nearest shallow downgradient well is some 765 m distance from the site. Piezometers could be drilled on site to determine groundwater flow direction. If groundwater flow is to the N or NW this will likely improve the MCA rating.	5	There is not enough data to confirm groundwater direction. There are two wells some 120 m away to the east - GND047 and GND048. The wells abstract water within 25 m of the ground surface and it is unknown if casing is installed in the wells. A mapped fault also runs through the site, which could also act as a preferential flow path. There are 3 further wells downgradient and located close to the fault alignment. Piezometers could be drilled on site to determine groundwater flow direction. If groundwater flow is to the N or NW this will likely improve the MCA rating.	
4. Natural environment	4a. Terrestrial ecology	9	Wetlands to the east of property may support some indigenous flora and fauna around their fringes. Projects on these areas would be adequately mitigated by providing flat land to the west for application of wastewater.	10	The majority of riparian margins are well planted with established plants which may support important fauna such as geckos. Native enrichment of riparian margins may encourage weed growth but can be managed by managing the application of wastewater. Weed control of riparian margins may also be necessary.	10	The eastern extent of the property includes a coverment that supports native flora and fauna, but no discernible impact expected due to exotic species providing a buffer between application areas and coverment.	9	Site includes an area of degraded pukatea swamp forest and a small area of indigenous vegetation which may support small populations of important fauna/flora. Nutrient enrichment of riparian margins may encourage weed growth.	10	Property does not appear to support any significant terrestrial ecological values. Pond formed by dam may have some indigenous flora nearby. No impact on enrichment of ecological values expected.	9	Site appears to include areas of native flora associated with the stream channels and gullies. Small areas of mature vegetation may support small populations of important fauna/flora. Nutrient enrichment of riparian margins may encourage weed growth.
	4b. Aquatic ecology	10	Although there are wetlands on the property, there is ample land area to avoid these areas. Due to a lack of surface waterbodies on much of the property, no adverse effects on aquatic ecology are expected.	8	The site includes a number of tributaries and also three drained gullies. There is ample room to manage irrigation so as to avoid these areas. Should wastewater enter the stream(s) via groundwater, it is unlikely to significantly influence water quality or ecological health. This is due to the stream currently being subject to runoff from the adjacent agricultural land use.	8	Site includes buried streams to the north, which may increase interaction between the irrigated water and surface water. Should wastewater enter surface water via groundwater, there may be some influence on sensitive invertebrate species, if present.	8	This site supports a number of streams, wetlands and subterranean drains. Due to current land use & management, these streams and wetlands are likely to be dominated by tolerant invertebrate species with the macrophyte beds also supporting some moderately sensitive taxa. If wastewater were to enter the streams via groundwater, it is unlikely to result in a detectable influence on these aquatic communities.	5	Site includes some small streams and a pond formed by a dam. Potential impacts on water quality in the pond are the primary concern. Increased nutrient input may result in the pond becoming eutrophic which will impact on the ecology within and downstream of the pond. This would be very difficult to remediate. The stream communities are likely to be relatively tolerant to organic enrichment.	8	There are a number of zero and first order streams that are likely to be very similar in character to those at site 20. If riparian the site may also include an area of pukatea swamp forest. The stream communities are likely to be relatively tolerant to organic enrichment. If wastewater were to enter the streams via groundwater, it is unlikely to result in a detectable influence on aquatic communities.
5. Engineering	5a. Wastewater conveyance	8	Urenui LP system to pump direct to site. Urenui domain to rising main from township. Onaero township to Onaero Domain, Onaero Domain to rising main from Urenui township. Pumping stations off road and less of them. Still significant pipe in State Highway corridor.	7	Urenui domain to township. Urenui LP system to Onaero domain. Onaero domain to Changa Rd. Changa Rd to site. Slightly less pipeline for last section, in farm.	6	Urenui domain to township. Urenui LP system to Onaero domain. Onaero domain to Changa Rd. Changa Rd to site.	6	Urenui domain to township. Urenui LP system to Onaero domain. Onaero domain to Changa Rd. Changa Rd to site.	4	Urenui domain to township. Urenui LP system to Onaero domain. Onaero domain to Changa Rd. Changa Rd to site. May need additional pump station or more complex system (or pump).	6	Urenui domain to township. Urenui LP system to Onaero domain. Onaero domain to Changa Rd. Changa Rd to site.
	5b. Access	9	Access to property from multiple points on Mōkau Road and Carrs Road possible. Within property, useable land is contiguous, predominantly flat and accessed by formed cart track.	8	Access to central portion of property from Waiau Road (sealed, narrow). Current main access is off SH3 with well formed turning bays on both sides of road. Within property, areas are well accessed by central race (in need of widening and upgrade) with one stream crossing.	8	Access is via Changa Road (sealed, unimproved). Within property, a central race accesses predominantly flat land. The race would require upgrading.	7	Access is via well formed (suitable for milk tankers) drive off Waiau Road. Paper Road is shown between Changa Road and site. Alternative access via Inland North Road (smaller parcel of land). Within property, well formed tracks access all the site. Some steep grade. Two stream crossings.	7	Access is via Waiau Road and alternative access via Changa Road. This site is the furthest inland investigated. Useable areas are more or less contiguous and accessible by existing tracks.	6	Access is via Changa Road (sealed, unimproved). Paper road shown on N boundary. Within property, access is via a network of races including up to 7 stream crossings. Tracks would require upgrade.
	5c. Services	6	Hot from Council water supply on SH3. Electricity TBC	8	Water available SH3 and Waiau Rd. Electricity TBC	8	Water available Changa Rd. Electricity TBC	8	Water available in Inland North Rd boundary. Electricity TBC	6	1.5km from Council water supply on Inland North Rd. Electricity TBC	8	Water available Changa Rd. Electricity TBC
6. Resilience	6a. Vulnerability to natural processes	8	On the other side of the Urenui River to operational land and main sources of wastewater, however probability of the SH bridge over the Urenui River failing is low. Very flat site away from river valleys.	9	No known risks	8	Recent recontouring of the site could be a risk if not done well. Oil and Gas well adjacent to the site.	8	No known risks	8	On site dam presents a risk due to potential construction issues. Higher score than 20, 19 and 6 due to having minimal streams and then being the headwaters.	7	Oil and Gas well adjacent to the site.
	7a. Amount of suitable land available for disposal	9	Largest area of suitable land (sufficient for current projections and some growth beyond projections). Land is contiguous. May have reverse sensitivity issues.	8	Sufficient suitable land with some opportunity for growth beyond projections. However suitable land is located through the middle of the property and may result in land at south of property being underutilised and having limited options to subdivide.	8	Sufficient land for projected flows with some spare. Suitable land is contiguous with main waterway feature on property boundary.	6	Sufficient land for projected flows. Suitable land is discontinuous with higher requirements for automation, pumping and unusually shaped blocks.	7	Sufficient land for projected flows. Long road boundary may result in reverse sensitivity issues however site is remote so may not be a concern.	7	Sufficient land for projected flows with some additional. Land is somewhat discontinuous with numerous elevation changes due to stream crossings.
8. Carbon	8a. Greenhouse gas emissions	9	No double pumping of Urenui township and domain flows. Shorter length of pipelines in total. Treatment plant and discharge system carbon the same for each site.	7	Slightly shorter pipeline length to site and elevation compared to 19,20,21. Similar conveyance network configuration. Treatment plant and discharge system carbon the same for each site.	8	Similar conveyance network to 20 and 23. Treatment plant and discharge system carbon the same for each site.	8	Similar conveyance network to 19 and 23. Treatment plant and discharge system carbon the same for each site.	4	Additional head in the range of 15-20m could require an additional pump station or progressive cavity pump with higher pressure rated pip. Treatment plant and discharge system carbon the same for each site.	8	Similar conveyance network to 19 and 20. Treatment plant and discharge system carbon the same for each site.

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Appendix F – Site Walkover Reports

MEMORANDUM

Job 10640

To: Nicolette West, New Plymouth District Council
From: Katie Beecroft, Lowe Environmental Impact
Date: 21 October 2022
Subject: Site walkover – 944 Main North Road, Urenui

INTRODUCTION

New Plymouth District Council is investigating land for the discharge of treated wastewater derived from the nearby area of Onaero and Urenui. NPDC has been through a process to identify land which would be suitable to receive treated wastewater irrigation. A short list of 7 properties was prepared and land owners approached. Following discussion with the owners of land at 944 Main North Road, Urenui a site inspection was arranged and on the 1st of October, Lowe Environmental Impact (LEI) undertook a site walkover with Joanne Robson(owner), Denise Rowland (NPDC) and Bart Jansma (Riverwise Consulting).

The purpose of this memo is to summarise observations made during the site walkover.

SITE DESCRIPTION

Details of the property are as follows:

- Address – 944 Main North Road, Urenui
- Legal description – SEC 140 BLK VII WAITARA SD
- Property area – 84.04 ha

Figure 1 shows an aerial view of the property. Access is via Main North Road leading past the main house to the dairy shed (Figure 2). Additional site access is available along Waiiau Road, on the property's western boundary.

Paddocks are accessed via a central race. The race is paved however, as noted by the owner, the aged pavement is breaking down. Refurbishment, widening and potentially replacement of a stream crossing may be required to enable heavy machinery access.

It is understood that there is a Chorus asset which crosses the property towards the south end. The route is marked by white posts. The route was observed at the centre race but was not mapped at the property boundaries

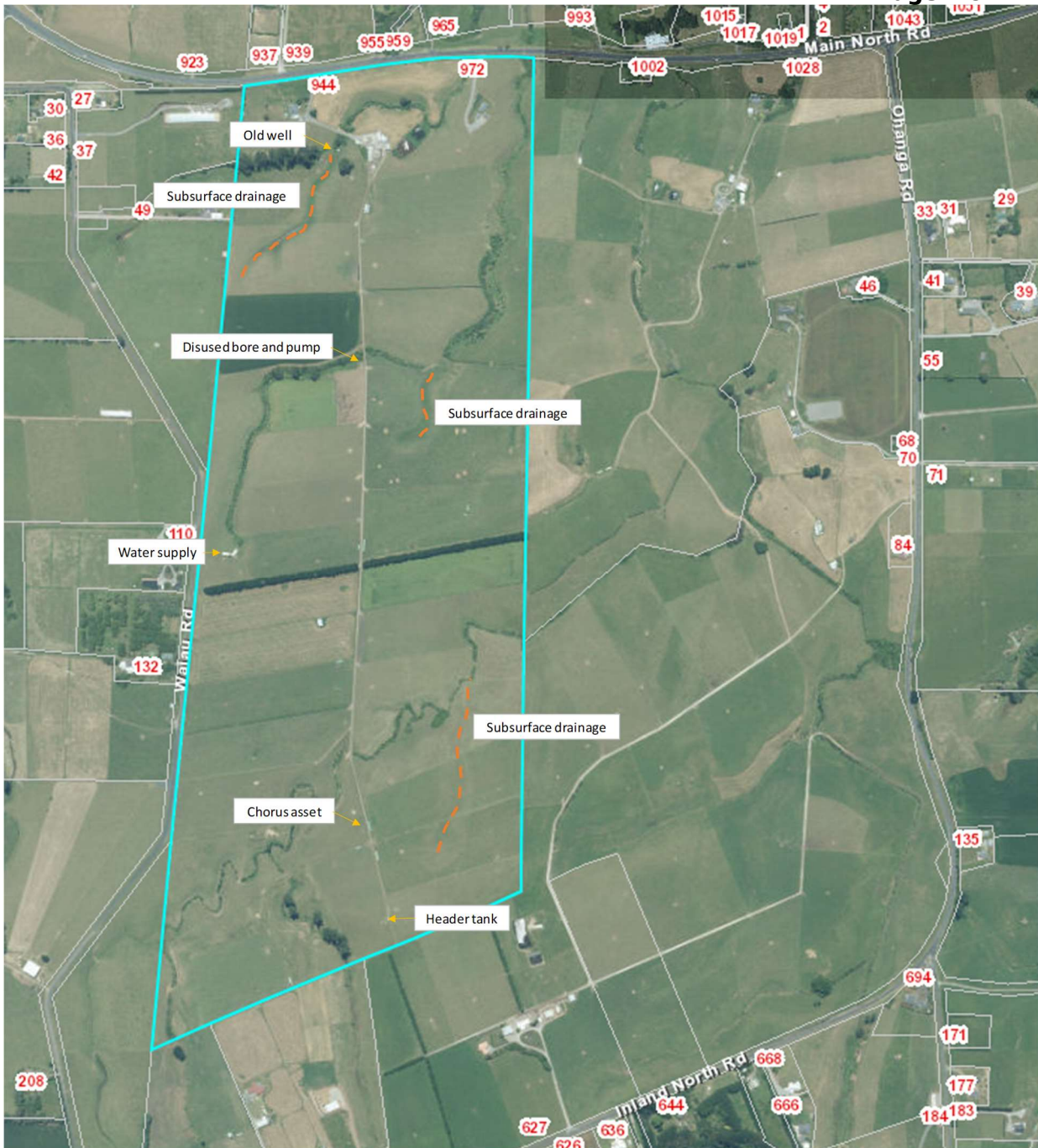


Figure 1: 944 Main North Road, Site Layout



Figure 2: Main access

SITE LAND USE

The property is currently operated as a dairy farm carrying around 180 milking cows, 50 replacements and 50 calves. The site has been in the same ownership for multiple generations and the current owner has extensive knowledge of the historic management of the site. The farm is operated by a manager living at the site.

A small herring bone shed is operated. Effluent from the shed is collected into a two pond treatment system. Historically the effluent has been discharged to surface water. A relatively new land discharge system has been installed for the paddocks closest to the shed with multiple hydrants to operate a small travelling irrigator.

The property has large areas of suitable grade for growing crops including pasture for harvest. Maize and pasture baleage have been commonly grown and harvested across the property.

WATER SUPPLY

The main water supply is understood to be from a spring located in the central, western portion of the site. The spring is dammed and covered (Figure 3). Water is transferred to a tank (likely 20,000 L PE) located near to the back (south) boundary of the site and gravity fed along the race.



Figure 3: Water supply dam

A well is located around 50 m west of the dairy shed. This supply is not believed to be in use. Water was observed at approximately 2.0 m depth below ground level in the well (Figure 4).



Figure 4: Old well

TOPOGRAPHY AND LANDFORM

The property is dominated by flat to gently rolling terrain, sloping generally towards the north (towards the coast). This surface has been dissected by waterways resulting in rolling to steep sided gullies. Figure 5 shows the topography of the property.



Figure 5: Site topography



Some soil creep was noted on upper slopes of the south eastern portion of the property. A number of small slips were visible in the south west of the property. Lifestyle properties were noted to the south of the property. No direct line of site to those properties occurred north of the header tank location i.e. activities north of this position would be unlikely to impact the visual amenity of those small block owners.

SOILS

The soils at the property are mapped as New Plymouth black loam (NZSC, LOT). Observed soil cuttings on elevated portions of the property confirm the presence of the New Plymouth black loam soils. Soils of the slope and lower lying areas are considered to be Whangamomona complex (NZSC, BOA) and transitional between Whangamomona and New Plymouth soils having a higher proportion of clay and greater plasticity.

New Plymouth black loam soils correspond to land use capability class (LUC) 1 and are considered resilient, fertile and have a high capacity to retain phosphorus. These soils are well suited to irrigation and can receive some irrigation year round. The available water capacity is in the order of 10-30 %, indicating that irrigation is unlikely to cause excessive leaching. Whangamomona complex soils at the site correspond to LUC 3 and are well suited to irrigation with appropriate management controls.



Figure 1: New Plymouth black loam soils (left), Whangamomona complex soil (right)

DRAINAGE

A detailed evaluation of the sites waterways including discussion of their values is provided by Bart Jansma who attended the site at the same time. This discussion of drainage is limited to flow paths and how they are managed.



The general fall of the property including water flow paths is to the north (towards the coast). A small section of the property at the south-eastern corner is likely to fall towards the south.

Subsurface drainage has been installed across the site. The approximate location is shown as a dashed orange line on Figure 1. The southern most drain was installed around 18 months ago and is comprised of nova-flow type pipe draining to a concrete sump and on to a stream. At the time of the inspection water could be seen and heard discharging to both the sump and the stream.

Subsurface drainage in the middle-east of the site was installed a generation ago and is constructed of tile drains. The drains and sump appear to be blocked or damaged and this area is subject to significant overland flow and plant cover suggests it is frequently to continuously wet. The sump currently presents a hazard and requires repair.

Subsurface drainage towards the north-east of the site was replaced (increased diameter nova-flow installed) within the previous season. At the time of the inspection there was a significant overland flow of stormwater occurring.

SUMMARY AND CONCLUSIONS

The property at 944 Main North Road, Urenui is well suited to irrigation with wastewater due to:

- Good access from the road, and potential to upgrade access along Waiau Road;
- Well established dairy pasture for optimal nutrient uptake;
- Large areas of suitable grade land for trafficability;
- Sufficient area for separation from waterways; and
- High quality soils.

If the property was to be developed for irrigation of wastewater, issues to be resolved include:

- Management of redundant land;
- Management of current effluent infrastructure (pond and land application);
- Potential need to manage the discharge from subsurface drainage to streams including through removal of nutrients;
- Remove or replace hazardous drainage sump;
- Improvement of central race and water way crossing; and
- Improve water supply security.

Memorandum

1 November 2022

To: Nicolette West, NPDC

From: Bart Jansma, Riverwise Consulting



Site visit – 944 Main Road, Urenui

The New Plymouth District Council have identified 944 Main North Road, Urenui, as a potentially suitable location for the treatment and disposal of wastewater collected from the Onaero and Urenui townships. Riverwise Consulting undertook a site visit to this property on 1 October 2022. The intent of the site visit was to do a high-level assessment of any freshwater features and potential terrestrial biodiversity values. This memorandum summarises the observations made at that time.

Freshwater

The freshwater features observed during the site visit are shown in the figure below. Areas that have been drained are shown in orange, while areas identified as a possible natural wetland are identified in red. There is also a small area of impounded water, identified in white. This impoundment is either a dam or created by a blocked culvert.

One potential natural wetland is currently unfenced and open to stock access. It is likely that this area will need to be protected in time, in accordance with the National Policy Statement for Freshwater Management (2020).

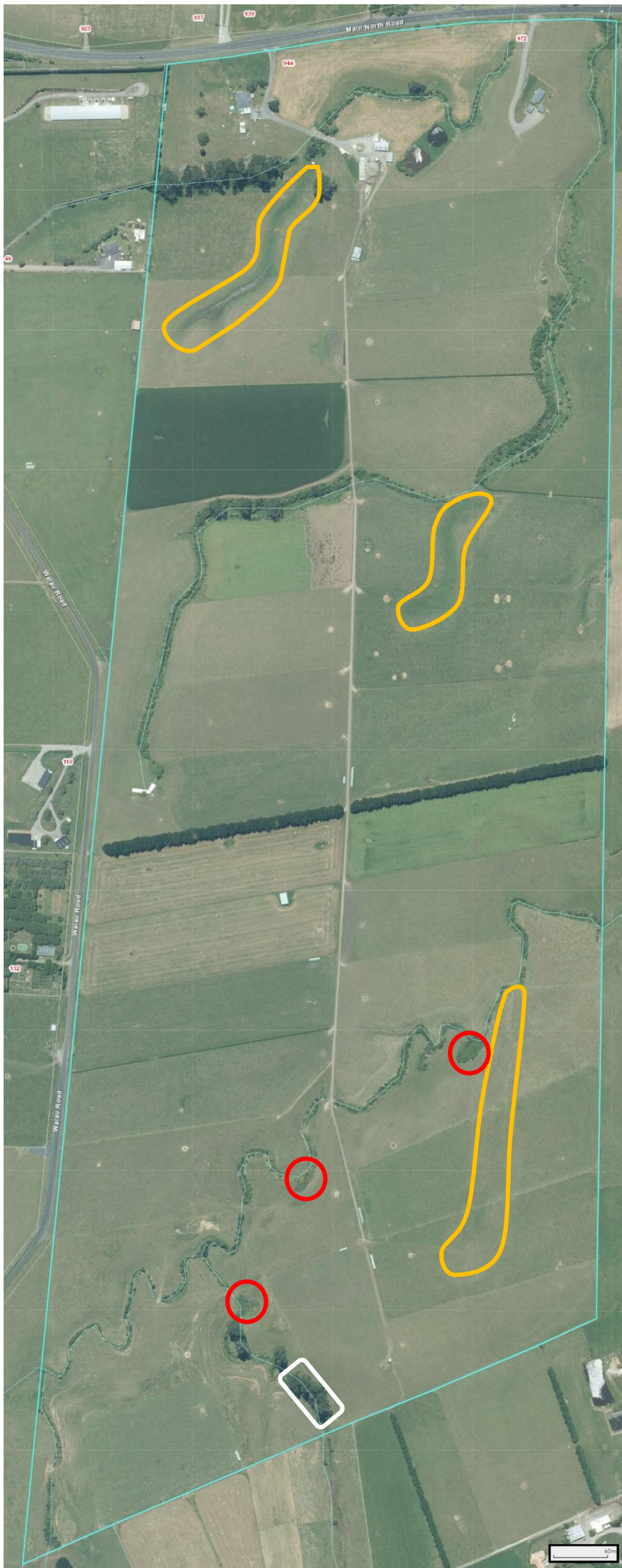
The streams on the property are all tributaries of the Motukara Stream, which enters the Tasman Sea near the township of Onaero. At the time of the site visit, water quality in these streams appeared relatively good, with a strong, clear flow. The stream bed, where visible, comprised sand and gravels. Most streams also supported healthy macrophyte growth where there was sufficient light reaching the stream. It is likely that these streams support a macroinvertebrate community that would be moderately sensitive or tolerant to organic enrichment, primarily due to the predominant landuse of the catchment being dairy farming.

Although most of the access culverts on the property appeared to be relatively small, there was no clear evidence of them having recently reached capacity during heavy rain. A number of culverts appeared to be perched and depending on what fish are able to migrate to the property, these perched culverts may present a barrier to fish passage. Assuming there are no impediments to fish passage downstream, these streams are likely to support shortfin eel, longfin eel and banded kokopu. There is also some potential that the streams may support a range of other freshwater species, including redfin bully, giant kokopu and lamprey.

Of the three areas that have been drained, two were notably wet during the site visit. The area to the north of the property had been reworked in the preceding 18 months and may have been at capacity due to recent wet weather. The area near the middle of the property was drained quite some time ago, and it is likely that the subsurface pipes have blocked and/or collapsed. The drained area to the south of the property was clear of surface water, indicating that the drains were operating as intended.

Terrestrial biodiversity

The property does not include any notable areas of significant terrestrial biodiversity, such as a stand of native forest. The majority of streams enjoy mature and well-maintained riparian planting. These established riparian margins will support improved biodiversity values, including native birds and possibly herpetofauna. Some of the riparian margins include large exotic trees (e.g. macrocarpa), but the weed burden in these margins was less than most riparian margins in Taranaki.



MEMORANDUM

Job 10640

To: David Taylor and Nicolette West, New Plymouth District Council

From: Katie Beecroft and Victoria Jones, Lowe Environmental Impact

Date: 12th May 2022

Subject: Site Walkover – 319 Waiau Road, Onaero

INTRODUCTION

New Plymouth District Council is investigating land for the discharge of treated wastewater derived from the nearby area of Onaero and Urenui. On the 11th of May, Lowe Environmental Impact (LEI) visited 319 Waiau Road in Onaero, which is currently on the market to be sold and has been identified as a possible land treatment area due to the size, the soils of the property and also the proximity to Onaero and Urenui. It currently runs beef stock and was a dairy farm in the past. It is approximately 37.5 hectares in size. The purpose of the visit was to determine if the land was indeed suitable for wastewater treatment, by assessing the property.

The purpose of this memo is to provide the information we have discovered from our assessment. Additional information is given in the desktop assessment (letter dated 10 May 2022)

SITE DESCRIPTION

Details of the property are as follows:

- Address – 319 Waiau Road, Onaero
- Legal description – SECS 121 BLK VII WAITARA SD, LOT 2 DP 484662
- Property area – 37.5 ha more or less

Access is via Waiau Road leading past the main house to a complex of farm buildings including the dairy shed. Paddocks are accessed via well formed farm tracks which follow the topography to enable access to all areas of the property. Conditions at the time of the walkover were sunny and cool with a moderate breeze off the hills (south-easterly).

An additional property is also for sale at the corner of Waiau Road and Inner North Road. This site was viewed from the 319 Waiau Road property and was noted to be predominantly flat with visible fence markers denoting the route of the gas pipeline (discussed in the desktop assessment letter – 10 May 2022) through the property. No other features of note were identified at this property and no additional limitations from the gas pipeline and proximity of neighbours are present.

Site Layout

Figure 1 shows an aerial image of the property layout and key features.



Figure 1: Site layout

Topography and Landform

The desktop assessment (letter dated 10 May 2022) considered the property likely to be flat to gently rolling. However upon our visit, it was clear that the topography of the property included flat to gently rolling (Figure 3), but was also rolling and in some areas, would be considered easy hill (Figure 2). Slips were observed on some steeper slopes, in particular, close to watercourses.

The variation in topography will reduce the suitable options for irrigation as, for instance, a centre pivot or travelling irrigator would not travel across steep and irregularly shaped areas. The application depth to rolling terrain would need to be much lower than the application rates on the flat areas to ensure the chances of runoff are mitigated and to avoid exacerbating erosion.



Figure 2: Examples of the steeper topography.



Figure 3: General site landforms and topography

There were areas of stock camp sites, especially around troughs. These areas were often muddy or pugged. Stock access ways were also obvious around the bottom of the hills, near the waterways.



Waterways

As noted in the desktop assessment (10 May 2022) there was an extensive network of water paths at the site. The site is located at the head of the Motukara Stream which discharges to the coast through Onaero. The water paths at the property were a mix of overland flow paths which include areas serviced by subsurface drainage (see below) and steep sided drains or streams.

At the time of the site walkover, the waterways had stagnant or slow moving water in most parts, with the occasional running water due to the gradient of the waterways. The waterways were mostly filled with weed of various plant species. The size of the waterways varied from 1-1.5 m from bank to bank and approximately 20 – 30 cm in water depth. A detailed description will be provided by Riverwise Consulting.



Figure 3: Typical characteristics of the waterways at the property.

There were many culverts throughout the property to allow for the water to run under access ways. At the beginning of one of the waterways, there were two surface water pipes which drained into the waterway and may have been the main source of the waterway.

Many of these waterways have been straightened and the old pathways of the streams can be seen, albeit no water or mud was present at these areas.

Drainage and Drainage Paths

As noted above, flow paths have been extensively modified across the site by infilling and straightening. Drainage pipe observed at the head of a waterway can be seen in Figure 4. See attached map for the location of that site.



Figure 4: Drainage coil discharging to waterway

Falling water could be heard at another waterway head. Drainage pipe was not observed due to vegetation coverage but is expected to be present. The area identified as infill (refer Figure 1) are likely to be artificially drained. A small area is expected to contain artificial drainage. This will act as a conduit for drainage from the soil in these areas, potentially leading to increased nutrient discharge to the surface water, in particular, nitrogen. Installation of a nutrient management device such as a wood chip reactor should be considered as a less costly and invasive option for managing nitrogen in drainage water if elevated concentrations occur.

Soils and Land Condition

The soils at 319 Waiiau Road were confirmed to be New Plymouth Black Loam Soils. These soils are considered resilient, fertile and have a high capacity to retain phosphorus. The available water capacity for the site is in the order of 10-30 %, indicating that irrigation is unlikely to cause excessive leaching. Photos of soil from the property are shown below in Figure 6.



Figure 6: New Plymouth Black Loam Soils. Photos taken at 319 Waiau Road.

The land condition was generally good, with signs of late summer dryness resulting in pasture dieback and fresh growth visible following recent rainfall (Figure 7). This indicates that the sites productive capacity would be increased by irrigation. This results in an increased removal of both water and nutrients than currently occurs.



Figure 7: Late summer/autumn pasture regrowth



Land around and including tracks, gates and troughs (Figure 3) was in good condition and showed minor tendency to pug and become muddy due to high traffic (animal or vehicle) under wet conditions (Figure 8).



Figure 8: Track and gateway condition.

Fences and buildings were generally in good to very good condition.

SUMMARY AND CONCLUSIONS

Parts of the property at 319 Waiau Road, Urenui are suited to irrigation with wastewater due to:

- Good access from Waiau Road;
- Well established dairy pasture for optimal nutrient uptake and evident summer moisture deficit;
- Good internal accessways;
- Sufficient area for separation from waterways; and
- High quality soils.

If the property was to be developed for irrigation of wastewater, issues to be resolved include:

- Design of irrigation layout to maximise access to areas of low slope, away from waterways – this is a key undertaking to ensure sufficient suitable land is available for irrigation;
- Management of current effluent infrastructure (pond);



- Potential need to manage the discharge from subsurface drainage to streams including through removal of nutrients; and
- Review water supply security.