



Department of Conservation

Waikawau Bay Farm Park

171 Waikawau Beach Road, Waikawau

Farm Photo

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1.0 Summary of Mitigations in Priority Order

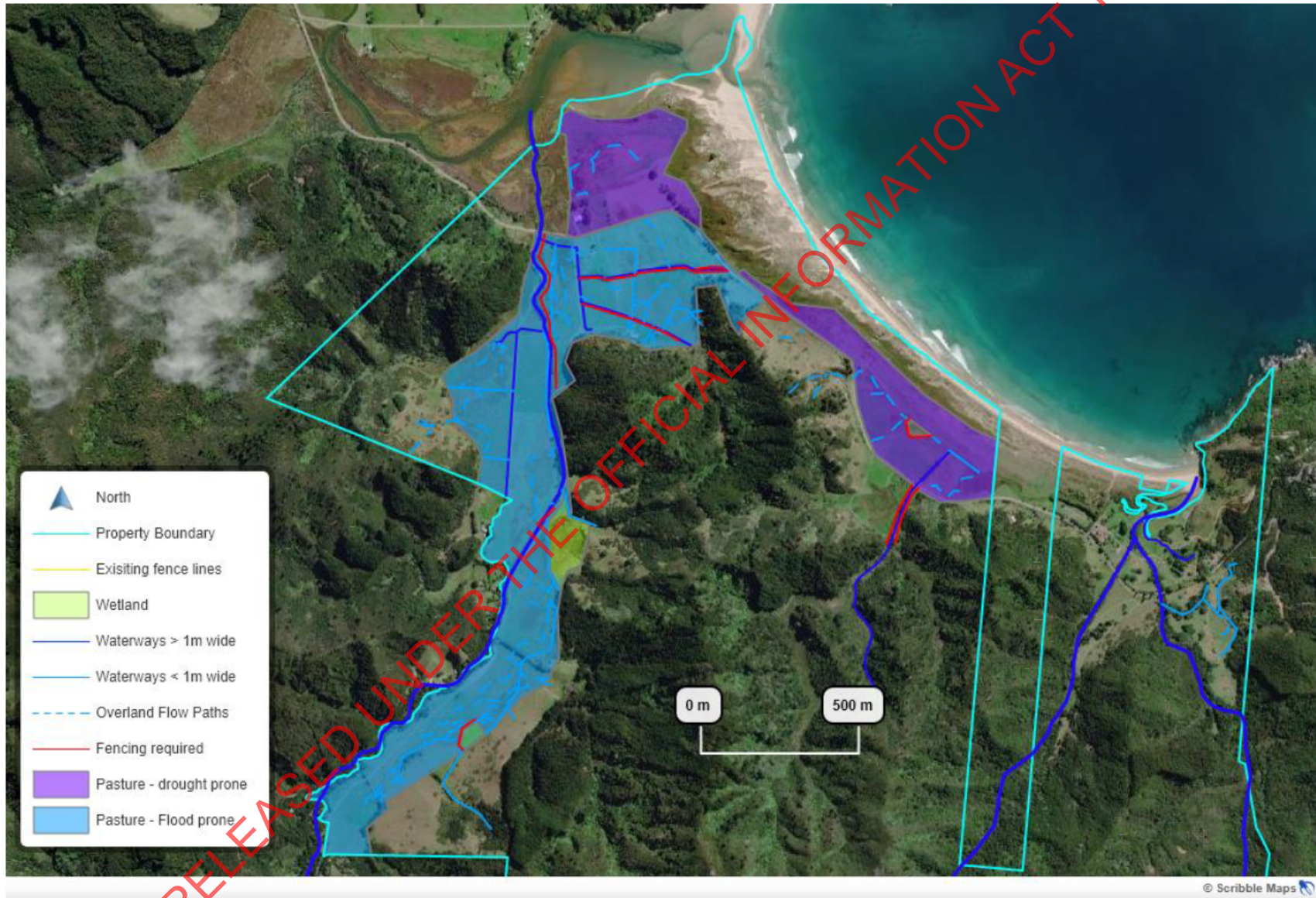
Section	Priority	Location ID	Mitigation Description	Completion Date
17.1	1	Red lines	At a minimum, install a 2-wire electric fence with a 3 m setback from the edge of a waterway along all waterways that are wider than 1 m bank to bank and are not currently fenced.	2025
17.2	1	Red lines	At a minimum, install a 2-wire electric fence with a 3 m setback from the edge of a wetland and are not currently fenced	2025
17.5	1	Entire Farm	Develop a regular soil testing programme to ensure nutrient inputs match soil requirements	Start 2021 – Ongoing
17.8	2	Flood prone area	Continue to actively manage the flood prone area to minimise stocking rate when soil is wet to reduce the risk of pasture and soil damage	Ongoing
17.8	2	Drought prone area	Continue to actively manage the drought prone area to minimise stocking rate when soil is dry to reduce the risk of wind erosion	Ongoing
17.4	2	Entire Farm	Consider retiring all LUC class 7e land from stock grazing	2025
17.3	2	Waterways <1 m wide & Overland Flow Paths	When practical and wet, temporarily exclude cattle from intermittent waterways	Ongoing – when required
17.6	3	Entire Farm	Keep Olsen P level at agronomic optimum by regularly soil testing	Ongoing
17.6	3	Entire Farm	Ensure all synthetic fertiliser applications of nitrogen remain below 190 kg N/ha/year.	Ongoing
17.7	4	Entire Farm	Consider releasing dung beetles to improve soil water holding capacity, topsoil depth, and reduce the risk of <i>E. coli</i> runoff.	When funds are available

17.9	4	Entire Farm	Maintain stock crossings to ensure contaminants do not concentrate in these areas	Ongoing
17.9	4	Entire Farm	Maintain races to reduce runoff	Ongoing
17.6	5	Entire Farm	If applying any synthetic nitrogen fertiliser in the future, consider using a slower release form of N fertiliser i.e. coated urea or sulphate of ammonia.	Ongoing

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1.1. Mitigation Map



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2.0 Client Details

Farm Owner Trading Name: Public Conservation Land – administered by Department of Conservation

Contact person for Property: Alison McDonald

Postal Address: 2/20 Joan Gaskill Drive, Whitanga

Phone: 9(2)(a)

Email Address: almcDonald@doc.govt.nz

3.0 Property Details

Property Address: 171 Waikawau Beach Road, Waikawau, Coromandel

Legal Description: ML MATAMATATAHARAKEKE 3 ML WAIKANAE SEC 3 BIK VI HARATAUNGA SD SEC 1 BIK IV HARATAUN

Valuation Number: 04790/613/00

Total Land Area (ha): 929.66

Effective Land Area (ha):

Land Use Activities: Sheep & Beef

Annual Average Rainfall: 1500 – 2000 mm

Dominant Soil Type: Te Kie – Acidic Orthic Brown

4.0 Farm Environment Planner

Name: 9(2)(a)

Phone: 9(2)(a)

Email Address: 9(2)(a)

Sign-off: 9(2)(a)

Date: Wednesday, 15 September 21

5.0 Consent Held

No consents held on this property.

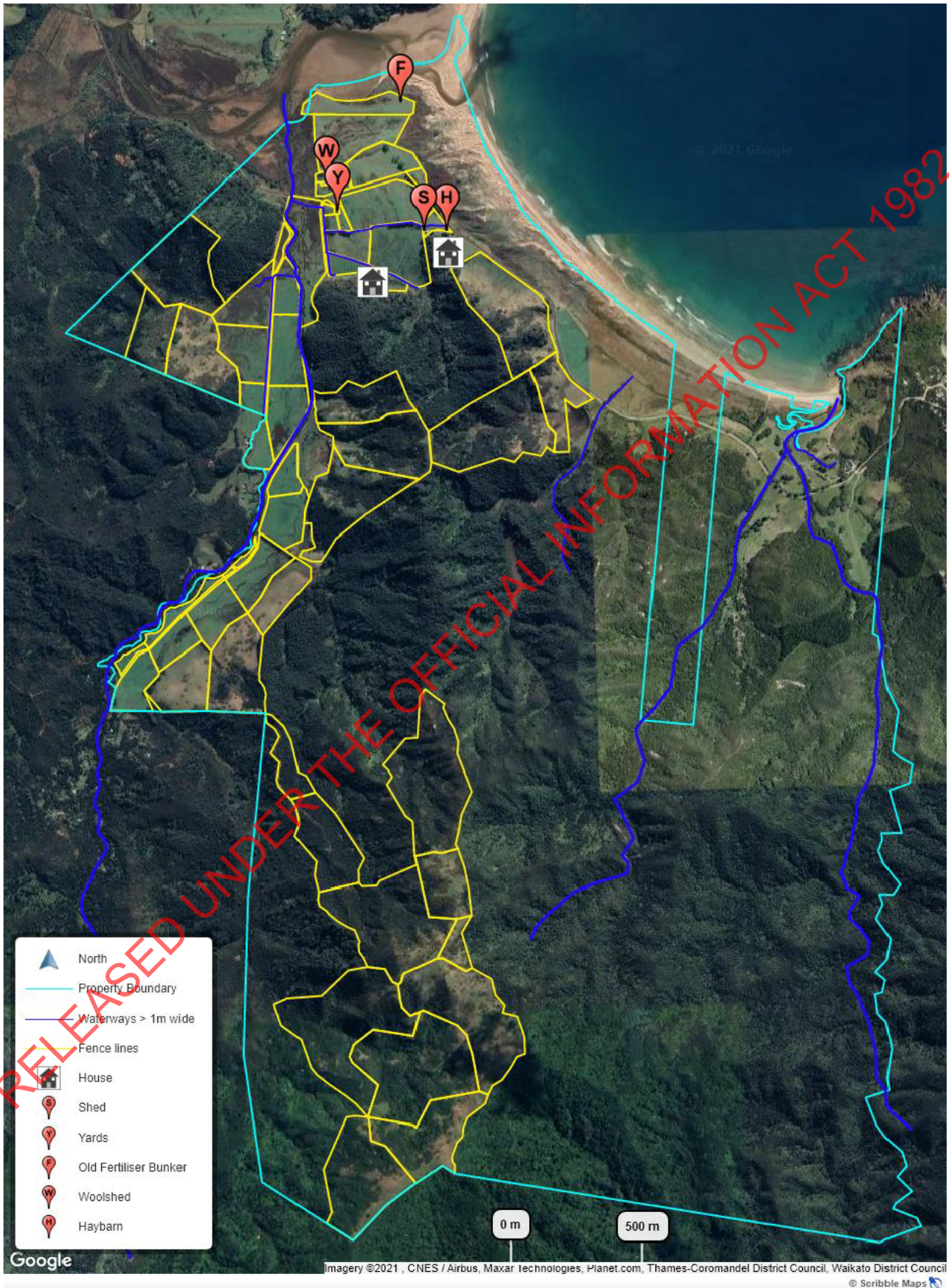
6.0 Infrastructure Management

No effluent irrigation occurs on this property.

No freshwater irrigation occurs on this property.

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7.0 Farm Map



8.0 Waikawau Bay Farm Park Details

Waikawau Bay Farm Park is a recreation reserve managed by the Department of Conservation (DOC). The total reserve area is approximately 928.5 ha, however about 245.7 ha is grazed via a grazing licence.

Waikawau Bay Farm Park Recreation Reserve was first Gazetted as a Recreation Reserve in 1976. Grazing licence records for the reserve (with the Minister of Conservation as the lessor) date back to 1989. Over the years many hectares from the original grazed area have been retired from pastoral use. The grazing regime for the last two decades has been sheep and beef stock.

The current grazing licence consists of a small area of flat land (close to the seaward margin), backing into steeper hill-country. Most of the land is exotic pasture land – however smaller pockets of manuka/kanuka scrub, broadleaved indigenous hardwoods and wetlands have been identified. At least 17 known archaeological sites (middens, pits/terraces) sit within the licence area.

Within the reserve, but outside the grazing licence area, includes the Waikawau Bay Campground which is DOC's largest campground in the North Island. Also, lying to the east of the grazing land is the DOC maintained Matamataharakeke Track, which is a ~6.5 km loop track.

There are significant areas of regenerating native bush, with small pockets of mature indigenous forest. There are also wetland areas which provide habitat to multiple threatened species, including pāteke/brown teal and matuku/Australasian bittern.

The reserve is currently subject to Treaty of Waitangi claims and a majority is due to return to iwi (Ngāti Tamaterā) upon settlement.

The Reserve is significant environmentally and culturally as demonstrated in an extract from the Waikato Conservation Management Strategy:

“Fantail Bay, Port Jackson, Fletcher Bay, Stony Bay, Sandy Bay and Waikawau Bay Recreation Reserves adjoining the Moehau Range (Coromandel Forest Park) complete the continuum of protected forest and undeveloped scenery from mountain to sea...

Northern Coromandel has important cultural heritage values and, along with Mt Moehau (892 m above sea level), is of great significance to Hauraki Whānui. The coastline surrounding Moehau contains evidence of almost continuous Māori occupation that extends back to approximately 1250–1300 AD, when the first Polynesian migrants are thought to have arrived in the area.”

9.0 Waikawau Bay Farm Park's Farm System

This section looks at what Good Management Practices are implemented, stock system, fertiliser inputs, and supplements fed.

9.1. Good Management Practices

The Good Management Practices (GMP) below are derived from the Matrix of Good Management (MGM) project.

GMP	MGM Environmental Topic	Definition	N/A / ✓ / ✗	Date to be Completed	Notes
GMP 1	Farm Planning and Recording	Identify the physical and biophysical characteristics of the farm system, assess the risk factors to water quality with the farm system, and manage appropriately.	✓	-	Farm Environment Plan completed
GMP 2		Maintain accurate and auditable records of annual farm inputs, outputs and management practices	✓	-	How are records kept?
GMP 3	Cultivation and Soil Structure	Manage farming operations to minimize direct and indirect losses of sediment and nutrients to water, and maintain or enhance soil structure, where agronomically appropriate.	✓	-	No cultivation occurs on this property. There are two main grazing areas on this property – the loamy, waterlogging soil areas, and the sandy, drought prone areas. This creates an ideal all year-round grazing scheme. When the loamy, waterlogging prone soils are wet over winter, stock are taken off and grazed on the sandier, dry areas which have little risk of causing soil damage. In the summer, stock graze the sandier areas less

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					as the pasture stops growing, but it also prevents any open ground areas which causes wind erosion. The Visual Soil Assessment (VSA) conducted on the 20 April 2021 supports this information (refer to section 13.2 on page 27 for results). All locations showed good soil structure, colour and surface relief, with a range of average to good soil porosity. This indicates soil structure is being actively managed to avoid pugging and compaction. Earth worm populations was results were less desirable and should aim to be improved.
GMP 4	Ground Cover	Manage periods of exposed soil between crops/pasture to reduce risk of erosion, overland flow and leaching.	N/A	-	Soil is not exposed as there are no crops/pasture planted.
GMP 5		Retire all land use capability (LUC) class 8 and either retire, or actively manage, all class 7e to ensure intensive soil conservation measures and practices are in place.	✓	-	Refer to LUC Map on page 28. There is no LUC 7e or 8 within the grazed areas on this property. Areas are retired to native bush.
GMP 6	Sediment, Phosphorous and Faecal Bacteria	Identify risk of overland flow of sediment and faecal bacteria on the property and implement measures to minimize transport of these to water bodies.	✓	-	Refer to Farm Map above to see overland flow paths (page 9). Overall, the risk is low due to the low stocking rate and the non-intensive farming system. If an overland flow path is actively running or there is potential for soil to be exposed due to extremely wet conditions, a temporary fence will be installed around the overland flow path with a grass buffer to exclude stock. Ideally,

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					the path will be excluded to the waterway, to minimise the risk of contaminants being transported into the waterway via the overland flow path, especially when wet.
GMP 7		Locate and manage farm tracks, gateways, water troughs, self-feeding areas, stock camps, wallows and other sources of runoff to minimize the risks to water quality.	✓	-	Refer to section 15.3 on page 32 to see how these areas will be managed and mitigated.
GMP 8		To the extent that is compatible with landform, stock class and intensity, exclude stock from waterways.	x	By 1 July 2025	Stock is not excluded from all waterways that require stock exclusion, according to the Resource Management (Stock Exclusion) Regulations 2020, where any waterways wider than 1 m bank to bank must exclude stock with a 3 m setback from the edge of the waterway, unless an existing fencing (pre 3 September 2020). Refer to Mitigation Map on page 6 to visually see where fences need to be installed to exclude stock from waterways.
GMP 9		Monitor soil phosphorous levels and maintain them at or below the agronomic optimum for the farm system.	x	Starting 2021	No soil testing has been completed on this property. Soil testing has occurred on the 20 April 2021 and should ideally occur at least every 2 or 3 years to monitor soil phosphate levels.
GMP 10	Nutrient Management	Manage the amount and timing of fertiliser inputs, taking account of all	x	-	The only fertiliser currently applied is a home-brew liquid seaweed fertiliser, which is sprayed on by the tenant. Liquid seaweed provides excellent soil and pasture benefits, and it is

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		sources of nutrients, to match plant requirements and minimize risk of losses.			applied in March to take advantage of the autumn pasture flush. However, it would be beneficial to complete regular soil testing to ensure there are no other limiting factors affecting production.
GMP 11		Store and load fertiliser to minimize risk of spillage, leaching and loss into water bodies.	x	2022	Need to develop a plan to minimize the risk of fertiliser spills, leaching and loss into waterbodies.
GMP 12		Ensure equipment for spreading fertilisers is well-maintained and calibrated.		2022	Fertiliser is spread by the tenant using a spray unit. Therefore, a plan needs to be created to ensure spreading equipment is maintained and calibrated.
GMP 13	Irrigation and Water Use	Manage the amount and timing of irrigation inputs to meet plant demands and minimize risk of leaching and runoff.	N/A	-	No freshwater irrigation occurs on this property.
GMP 14		Design, calibrate and operate irrigation systems to minimize the amount of water needed to meet production objectives.	N/A	-	No freshwater irrigation occurs on this property.
GMP 15	Feed	Store, transport and distribute feed to minimize wastage, leachate and soil damage.	✓	-	Conventional hay bales are harvested and stored on farm in the hay barn and under cover in the sheep yards. All hay is hand spread to stock typically using the quad bike or farm vehicle. No heavy machinery is used to feed out.

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GMP 16	Farm Effluent and Wastewater Management	Ensure the effluent system meets industry-specific Code of Practice or equivalent standard.	N/A	-	No effluent storage or irrigation occurs on this property.
GMP 17		Have sufficient, suitable storage available to enable farm effluent and wastewater to be stored when soil conditions are unsuitable for application.	N/A	-	No effluent storage or irrigation occurs on this property.
GMP 18		Ensure equipment for spreading effluent and other organic manures is well-maintained and calibrated.	N/A	-	No effluent irrigation occurs on this property.
GMP 19		Apply effluent to pasture and crops at depths, rates and times to match plant requirements and minimise the risk to water bodies.	N/A	-	No effluent irrigation occurs on this property.
GMP 20	Intensive Grazing	Select appropriate paddocks for intensive grazing, recognizing and mitigating possible nutrient and sediment loss from critical source areas.	✓	-	Intensive grazing does not typically occur. However, if intensive grazing is required, paddocks without waterways should be chosen first. If this is not practical, then a temporary fence will be installed creating a 3 m vegetative buffer between grazing land and any waterway that is carrying any level of water. Additionally, if a sacrifice paddock is required then a 10 m vegetative buffer will occur around any waterway that is carrying any level of water.

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GMP 21		Manage grazing to minimize losses from critical source areas.	x	By 2025	<p>The main critical source areas related to this property in relation to grazing, the unfenced waterways. These areas require fencing, and ideally planting if funds are available.</p> <p>All other critical sources areas are actively managed (refer to section 15.3 on page 32).</p>
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9.2. Stock System

Effective ha:		Calving Date:	August
Peak Cattle:	340	Weaning Date:	February
Peak Sheep:	120	Sheep Breed:	Mixed breeds
Peak Stocking Rate (SU/ha):		Lambing %:	90%
Average Stocking Rate (SU/ha):		Lambing Date:	August
Cattle Breed:	Dairy Graziers and Dairy x Beef	End Lambing Date:	October
		Weaning Date:	1 December

Waikawau Bay Farm Park is a dairy grazer, sheep, and beef farm. The dairy graziers make up most of the stock, however, are only on the property from May to August. All year round the farm carries 120 mixed aged breeding ewes, and 20 beef x dairy breeding cows. Angus bulls are put over the breeding cows.

All lambs are typically sold in May/June, with ewe lambs rarely kept as replacement stock due to the small flock. All calves are weaned and sold at the weaner fair in February. Refer to Appendix 1 for a stock reconciliation of the 2020/2021 season.

9.3. Fertiliser Inputs

Fertiliser inputs are not currently determined by soil test results. It would be appropriate in the future to start moving towards this management practice with the aim of replenishing soil deficiencies while avoiding applications of unnecessary inputs. Table 1 below represents the last soil test results on this property in 2021.

The optimum soil testing target range in Table 1 below is for properties aiming for near-maximum pasture production. Only highly productive farms growing 12 – 15 t DM/ha/yr and running 15 – 20 SU/ha, should aim to achieve these targets.

On most sheep and beef farms, it is more economical and practical to achieve and maintain soil test results below the target soil test range, which Waikawau Bay Farm Park achieve. Only magnesium and pH ideally need attention – magnesium is very high and pH is slightly too low. A high level of magnesium can cause soil hardness, causing issues for pasture production and rainfall infiltration, which could be contributing to drought characteristics on the sandy area and flood characteristics. An acidic pH creates an unfavourable habitat for soil organisms, which is showed in the moderate to low worm count in the Visual Soil Assessment (VSA) (refer to page 27). Applying calcium can help offset magnesium, and it would also help lift the pH which would be beneficial. All other soil measurements are within appropriate ranges.

Table 1: Waikawau Bay Farm Park soil test results from 2021. Note soil sampling was undertaken by Fertco and soil analysis was conducted by Eurofins laboratory in Auckland.

Below optimal range	Within optimal range	Above optimal range
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Soil test areas	Sample date	Eurofins						
		Ca MAF	Mg MAF	K MAF	Na MAF	pH	Olsen P (mg/L)	Sulphate – S (mg/kg)
Optimal Range		4-10	8-10	7-10	5-20	5.8-6.2	20 - 30	10 - 12
Terry Driveway	20/4/21	12	108	12	10	5.3	16	15
Waikanae	20/4/21	9	69	11	11	5.1	21	18
Woolshed	20/4/21	6	50	7	6	5.3	18	5

For the 2019/2020 season, the only fertiliser applied was liquid seaweed fertiliser in March at a rate of 5 litres/ha.

This seaweed fertiliser is made by the tenant, therefore the exact nutrient inputs are unknown, therefore a nutrient analysis is unable to be completed. DIY seaweed fertilisers typically involve soaking seaweed in water, and leaving the nutrients and good bacteria to infuse and develop. It is then sprayed onto pasture using a spray unit. Therefore, the nutrient component can vary greatly between batches based on the quality of seaweed used.

Liquid seaweed fertilisers are a nutrient super-food for soil, plants and animals. They are full of minerals, vitamins, growth promotants, trace elements and amino acids, which helps to unlock the minerals and nutrients in the soil and make them bio-available and ready to be absorbed by the root of the plant. It also helps increase the biological activity in your soil improving the quality, fertility and soil structure. Seaweed fertiliser also provide the benefits of increased root length and mass, improved soil structure (aeration, drainage, can withstand traffic), a deeper humus layer (nutrient storehouse of your soil), more natural nitrogen fixation (reduced need for synthetic fertilisers), less pulling, increased germination rates for cropping and re-grassing, increased crop yield and pasture quality, farm holds longer and recovers quicker in drought, and there is no withholding period for stock.

Without being able to complete a nutrient analysis, it is unviable to confidently determine if the property is compliant with regulation. However, it is safe to assume this property is **compliant** with Central Government's Essential Freshwater Policy.

The rule is:

- Annual synthetic nitrogen fertiliser applications must stay below 190 kg N/ha/year

It is vital to consider this rule when making management decisions in the future.

It is also vital to start matching soil testing results with fertiliser inputs in the future, especially with respect to phosphate, to ensure the property is operating at a high but sustainable production level.

9.4. Supplement Feed

This property is predominately pasture-based; however, hay is fed out to great roughage in the cattle's diet and help maintain weight gain over winter. Typically, 6-8 bales are fed out per day from July to August, but this is very dependent on weather conditions. All hay fed out is harvested on-farm.

Importing supplement feed can increase the risk of nutrient loss because external nutrients are introduced into the cycle. Supplement feed, especially high protein feeds (above 30% crude protein), increases the level of nitrogen in the body, which increases the N content in the urine increasing the risk of N leaching from urine patches. However, all supplements fed out are harvested on-farm therefore additional nutrients are not imported, so the risk is eliminated.

Table 2: Supplement feed consumed. CP = Crude Protein

Supplement Type	Fed to	Average kg DM/cow/day	Period	Feed Out Location	CP%	Source
Hay	Cattle	14.2	July - August	Paddock	20	Storage

10.0 Ecosystem

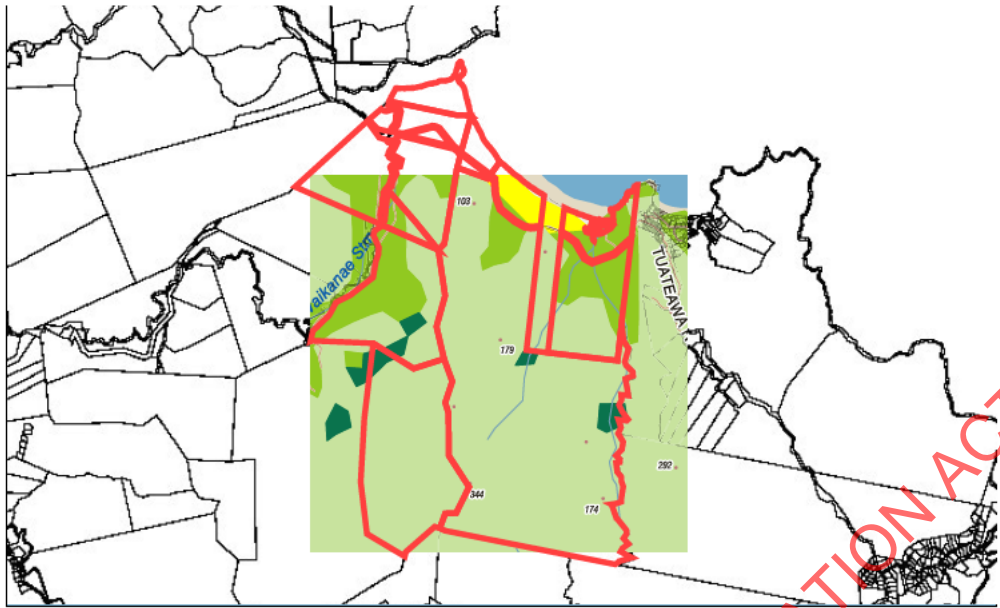
This property has the potential for kauri forests, dunelands, podocarp (native conifers), and rimu-tawa forests.

- Kauri forests could include Kauri/taraire-kohekohe-tawa forest. Sizeable areas of dense old-growth kauri are confined to the Hokianga district, whilst the most extensive areas of abundant young kauri are between the Bay of Islands and Whangarei and on Great Barrier Island.
- Dunelands are hilly areas of sand found behind beaches, most extensive along the west coast of the North Island in Northland, Auckland, Waikato and Manawatu, and in coastal Canterbury and Southland.
- Podocarp (native conifers) are Kahikatea-pukatea-tawa, Matai-kahikatea-totara, Kahikatea-totara and Rimu-matai-miro-totara/kamahi, Rimu-matai-miro-totara/kamahi forest types.
- Rimu-Tawa consist of Rimu/tawa-kamahi forest. Softwoods tend to be very occasional in this class, though rimu, the commonest by far is usually a large tree. Formerly common on hill country over most of the North island, but much reduced by logging and clearing. Fairly large tracts remain between Mt Pirongia and Wanganui and in the northern Urewera country.

If any planting is to occur on this farm in the future, these ecosystems should be considered (refer to **Figure 1** below).

Figure 2 shows there has been minimal indigenous ecosystem loss from the property and the surrounding Waikawau Bay area.

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OURENVIRONMENT



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Figure 1: Image showing title boundaries and potential native vegetation. Printed 24 August 2020 (Landcare Research, 2018).

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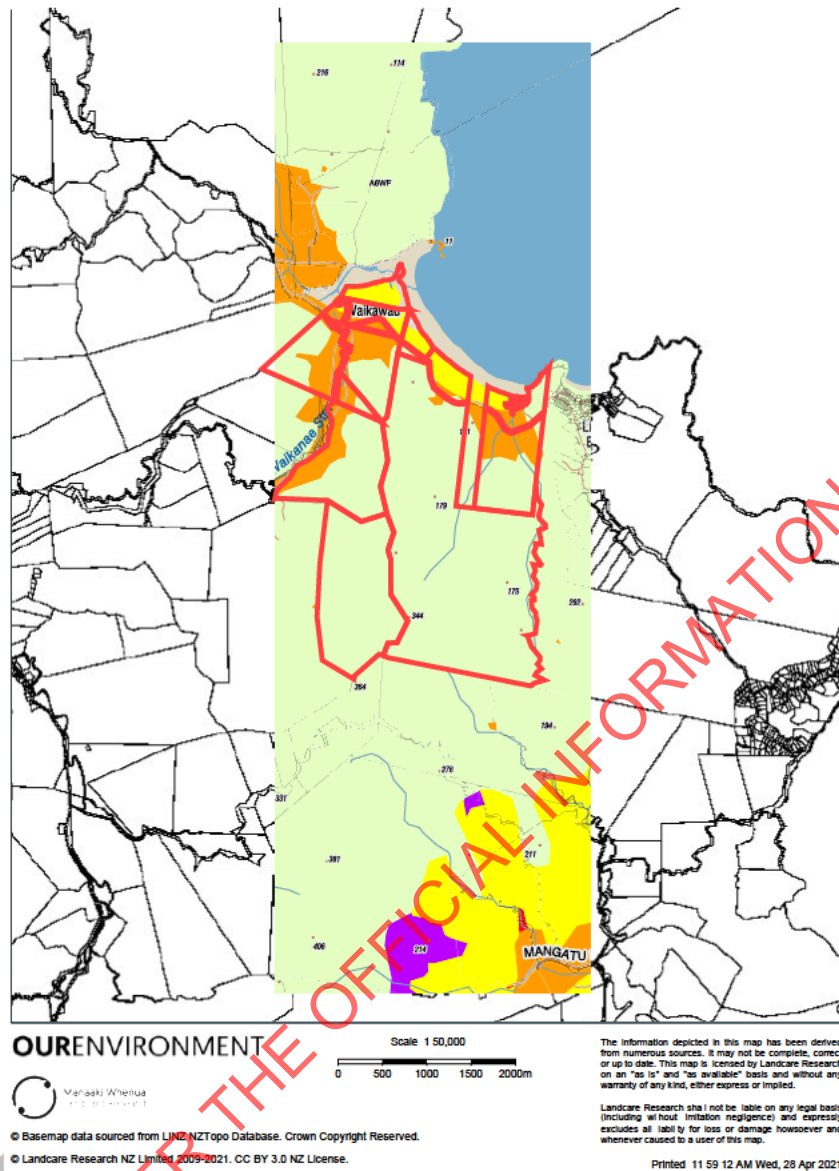


Figure 2: Threatened Environment Classification from Landcare Research, 2018. Printed 28 April 2021.

Legend:			
	< 10% indigenous cover left		>30% left and <10% protected
	10-20% indigenous cover left		>30% left and 10-20% protected
	20-30% indigenous cover left		>30% left and >20% protected

11.0 Climate

The largest climatic risk would be flooding on the flat areas due to large catchment area in the hills above the property. This large catchment also creates high water flow due to the steepness of the surrounding catchment. The coast and exposed areas are subjected to high winds which has the potential to cause wind on the dunes and sandier soils. Annual rainfall is 1500 to 2000 mm.

12.0 Topography

This property only has a range of flat to very steep topography (refer to Figure 4 below). Figure 3 below shows the proportion of slope classes found on this property.

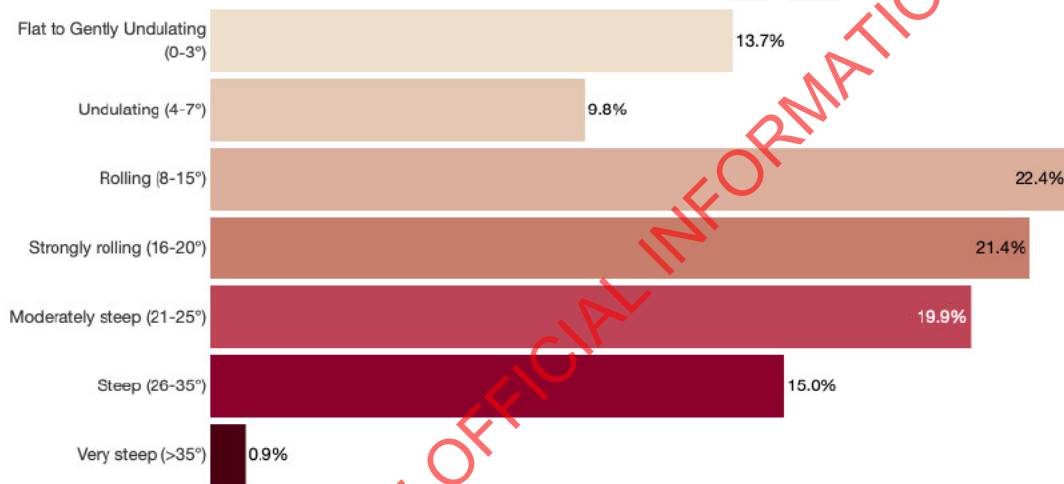


Figure 3: Graph showing the proportion of slope classes within the property (Landcare Research, 2018).

12.1. Flat to Undulating (0-7°) Risk Assessment

This topography class is the lowest risk category in relation to contaminant loss. The largest risk of contaminant loss would be from nutrient leaching; however, soil type largely influences the risk level.

12.2. Rolling (8-15°) Risk Assessment

This topography class has a moderate risk of contaminant loss due to the increased risk of overland flow potentially causing nutrient and *E. coli* runoff, and sediment loss via surface erosion and runoff.

12.3. Strongly Rolling to Moderately Steep (16-25°) Risk Assessment

This topography class has a high risk of contaminant loss due to the high risk of overland flow and erosion potentially causing nutrient and *E. coli* runoff, and sediment loss via surface erosion and runoff.

12.4. Steep to Very Steep (26-35°+) Risk Assessment

This topography class has the highest risk of contaminant loss due to the very high risk of overland flow and erosion potentially causing nutrient and *E. coli* runoff, and sediment loss via surface erosion and runoff.

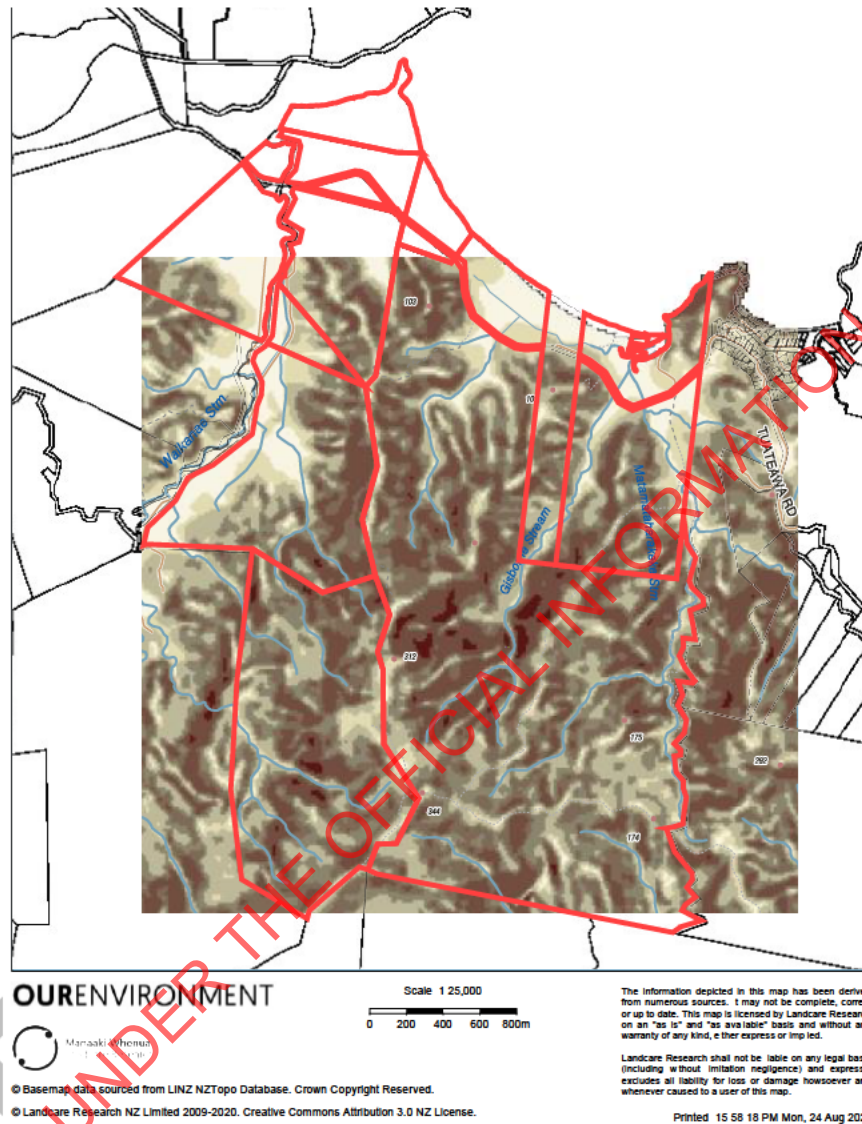










Figure 4: Steepness map highlighting the topography on the property (Landcare Research, 2018).

Key:	 Flat to Gently Undulating	 Moderately Steep
	 Undulating	 Steep
	 Rolling	 Very Steep
	 Strongly Rolling	 Property Boundary

13.0 Soil Type

There are seven soil types found on this property. They include Te Kie 1, Te Kie 2, Price, Waitawa, Burnwood, Parangi and Paeroa (refer to **Figure 5** below). Refer to Appendix **2** for a detailed description of each soil type.

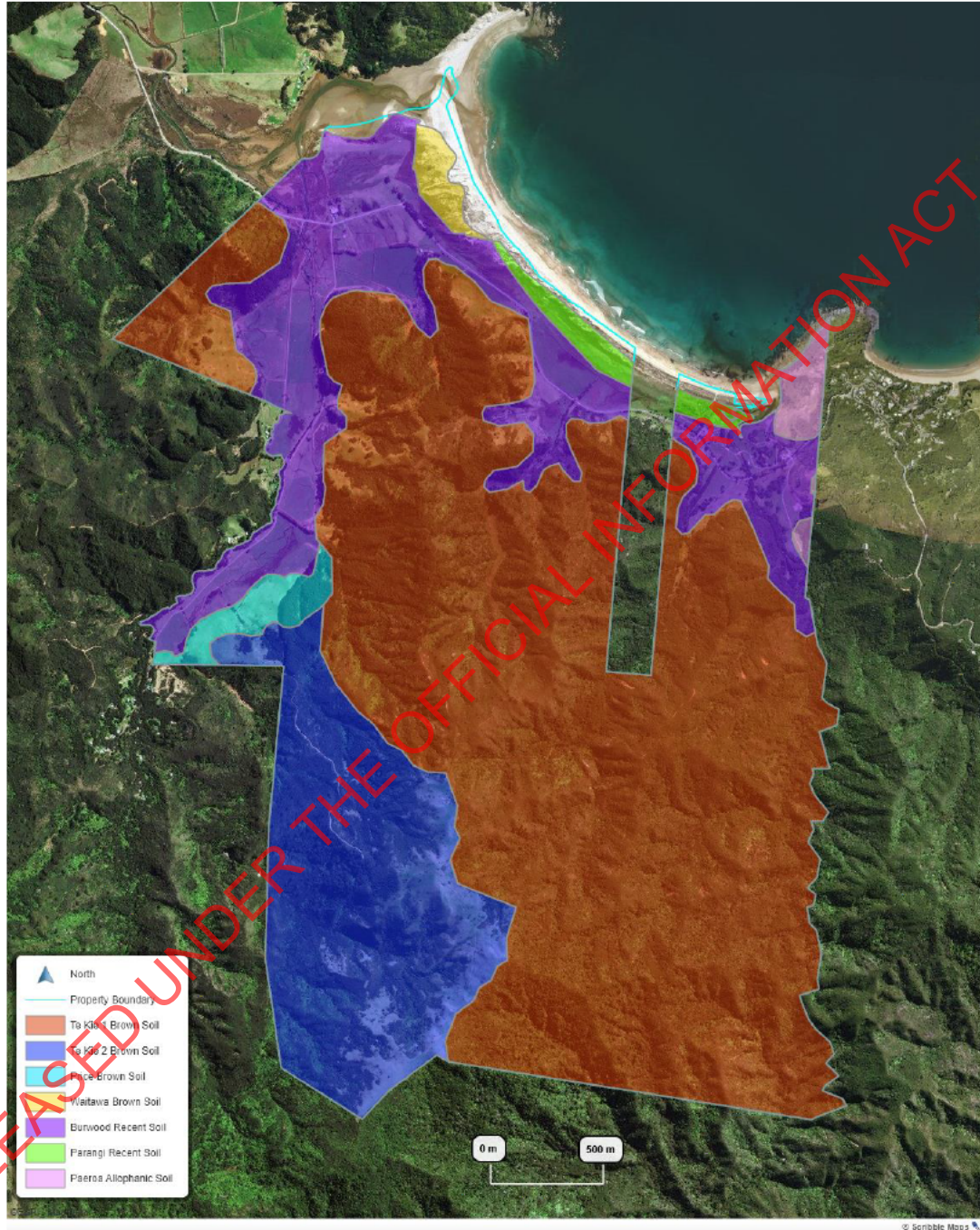


Figure 5: Soil map outlining the different soil types found on this property. The map is based on Landcare Research’s S-Map at a 1:10,000 scale. It is not farm-scale accurate.

13.1. Summary of Soil Characteristics

Soil Name	Approx. area occupied – 902 ha total		Drainage	Waterlogging Vulnerability	Soil Water Holding Capacity	Drought Vulnerability	N Leaching Potential
	Area (ha)	Percentage (%)					
Te Kie 1	575 ha	63.7%	Well drained	Low	Moderate to low	Moderate	High
Te Kie 2	149 ha	16.5%	Well drained	Low	Moderate to low	Moderate	High
Price	141 ha	15.6%	Well drained	Very low	Moderate to low	Moderate	High
Waitawa	12 ha	1.3%	Imperfectly drained	Moderate	High	Low	Low
Burwood	10 ha	1.1%	Imperfectly drained	Moderate	Very High	Low	Low
Parangi	8 ha	0.9%	Well drained	Very Low	High	Low	Low
Paeroa	7 ha	0.8%	Well drained	Very Low	High	Low	Low

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13.2. Summarised Visual Soil Assessment (VSA)

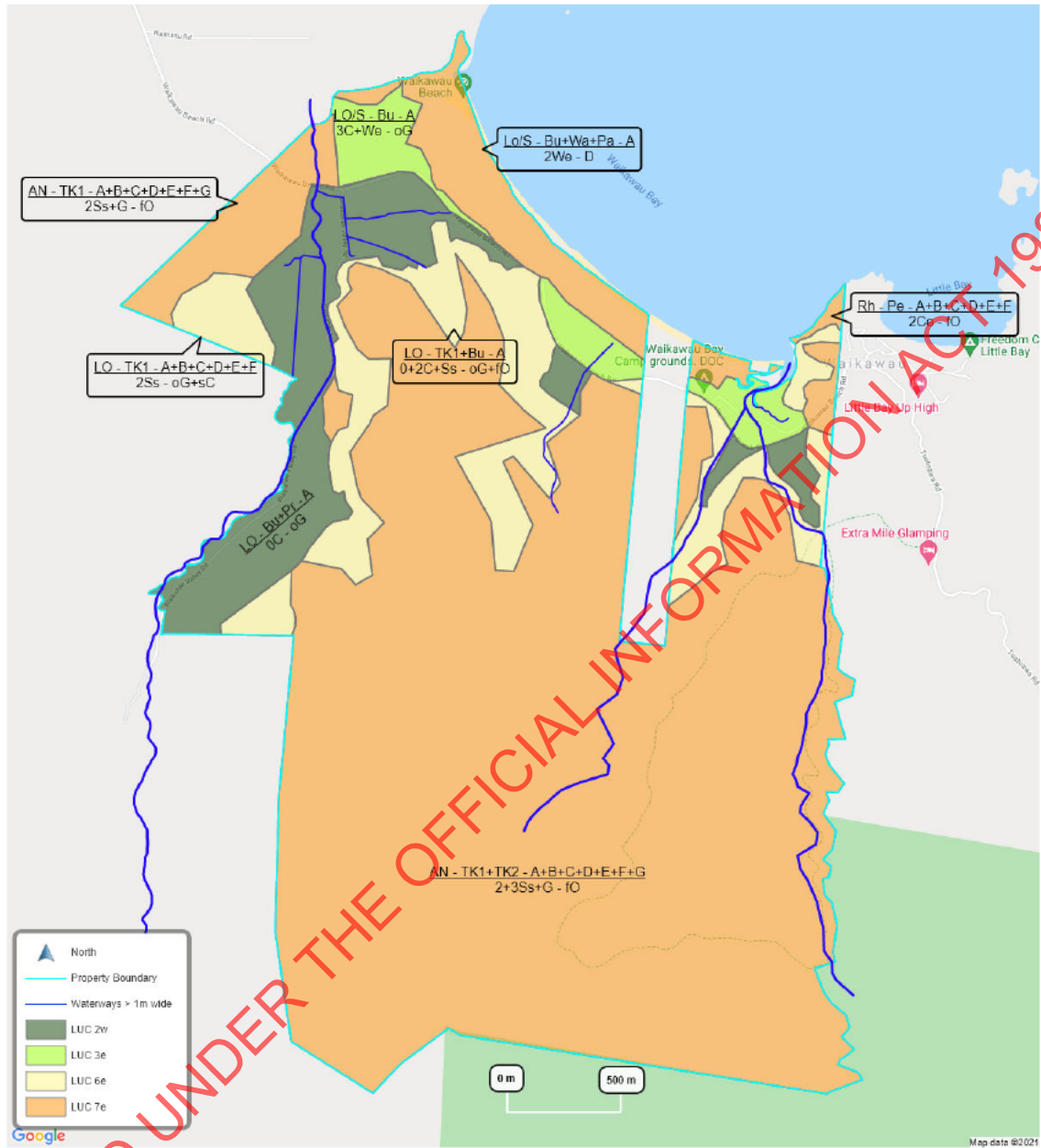
The soil's physical properties are vital to the ecological and economic sustainability of the land. The physical properties control the movement of water and air through the soil and the ease with which roots penetrate the soil. Damage to the soil structure can change these properties and reduce plant growth, regardless of nutrient status. The decline in soil physical properties takes considerable expense and many years to correct and can increase the risk of soil erosion by water or wind. All the soils on this property have a moderate or very high vulnerability to structural damage, apart from the Paeroa soil, which has a very low vulnerability (refer to Appendix 3). Additionally, the Waitawa and Burwood soils are moderately prone to waterlogging, predominately due to poor drainage. Therefore, this property has the potential for good soil structure.

Table 3: Summary of VSA results – tested 20 April 2021

Indicator	Location	Baseline (2021)	Comments
Soil Indicator (VS Score)	1	22 - Good	Refer to Appendix 3 for photos
	2	25 - Good	Test is scored from 0 to 28
	3	22 - Good	Average earth worm population was the main reason for not reaching top marks. Test area 4 and 5 showed slight compaction issues, but considering the flood risk and soil type, the areas have been well managed to minimise soil compaction.
	4	20 - Moderate	
	5	19 - Moderate	
Pasture Indicator (VS Score)	1	27 - Good	Test is scored from 0 to 30
	2	27 - Good	Pasture species mix really benefits the property – it provides good compositions and regrowth rates, with good utilisation and allows little to no bare ground to be visible and minimal evidence of drought stress.
	3	27 - Good	
	4	27 - Good	
	5	27 - Good	

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14.0 Land Use Classification (LUC) Map



Symbology:	Rock Type – Soil Unit – Slope Class			Erosion Severability:	0 – Negligible	2 – Moderate
	Erosion Severability & Type – Vegetation Cover				1 - Slight	3 - Severe
Rock Type:	LO – Loess LO/S – Sandy Loess	AN – Andesite Rh - Rhyolite		Erosion Type:	Ss – Soil Slip G – Gully erosion Ce – Costal erosion	C – Compaction We – Wind erosion
Soil Unit:	TK1 – Te Kie 1 TK2 – Te Kie 2 Bu – Burwood Pr - Price	Wa – Waitawa Pa – Parangi Pe - Paeroa		Vegetation Cover:	fO – native bush oG – original pasture D – Sand dunes sC- Scrub	
Slope:	A = 0-3 B = 4-7	C = 8-15 D = 16-20*	E = 21-25 F = 26-35	G = 35+		

14.1. Extended LUC Legend

LUC	Ha	Description	Soil	Slope	Vegetation	Erosion	Land Use Suitability	Considerations
2w	88.0	Arable with very good multiple-use land and only slight wetness limitations.	Burwood	0-3°	Existing pasture mix - ryegrass, white clover, kikuyu, red clover, cocksfoot, broome, plantain and other varieties.	Negligible	<ul style="list-style-type: none"> Intensive pastoral Viticulture/horticulture Silage/hay production Summer cropping Berry fruit Tree crops Forestry 	<ul style="list-style-type: none"> Good shelter already in place Area does become very wet/potential flooding in winter Great summer production
3e	32.8	Arable, with moderate erosion limitations that restricts crop type and intensity of cultivation.	Burwood and Parangi	0-3°	Existing pasture mix	Severe	<ul style="list-style-type: none"> Intensive pastoral Silage/hay production Winter cropping Berry fruit Tree crops Forestry 	<ul style="list-style-type: none"> Wind erosion of soil must always be considered when managing this block. Always avoid minimal vegetation cover. Summer dry – great winter production
6e	98.57	Non-arable, but productive pastoral hill country. Slight to moderate limitations to pastoral use, suitable for pasture, tree crops and forestry and in some cases vineyards. Erosion is the dominant limitation.	Te Kie 1, Price, Te Kie 2, Paeroa and Burwood	4-25°	Native bush, scrub and pockets of existing pasture mix	Negligible and moderate	<ul style="list-style-type: none"> Pastoral Silage/hay production on flat areas Tree crops Forestry Conservation – retirement to natives 	<ul style="list-style-type: none"> Lower production areas – consider retiring to native bush Avoid heavy stock over winter/when wet
7e	731.03	Non-arable. Moderate to very severe limitations to pastoral use. High-risk land requiring active management to achieve sustainable production. Can be suited to grazing with	Parangi, Te Kie 1, Paeroa, Te Kie 2, Burwood	8-35+°	Native bush	Moderate and severe	<ul style="list-style-type: none"> Carbon farming Conservation 	<ul style="list-style-type: none"> Maintain native bush

		intensive soil conservation measures.	and Waitawa					
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15.0 Contaminant Loss Risk Assessment

This section looks at the risk level of contaminant loss based on climate, topography, soil type and land use.

15.1. Greenhouse Gases

Figure 6 below is a model estimate of greenhouse gas emissions based on regional stock numbers and spatially distributed using the lands potential carrying capacity based on soil type. Based on this, the greenhouse gas emissions are very low. However, an Overseer file will provide a more tailored estimate of greenhouse gas emissions to compare.



Figure 6: Greenhouse gas emissions from Landcare Research, 2018, based on 2010 to 2016.

Scale:		4.1 – 6.0 t CO ₂ equiv/ha/yr
0 – 1.0 t CO ₂ equiv/ha/yr		6.1 – 8.0 t CO ₂ equiv/ha/yr
1.1 – 2.0 t CO ₂ equiv/ha/yr		8.1 – 10.0 t CO ₂ equiv/ha/yr
2.1 – 4.0 t CO ₂ equiv/ha/yr		>10.0 t CO ₂ equiv/ha/yr

15.2. Sub-Catchment Nutrient Priorities

Currently, there is no water quality monitoring data available for the Waikanae Stream, Gisborne Stream or Matamataharakeke Stream, therefore the nutrient priorities are unknown.

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15.3. Critical Source Areas

A critical source area, or hotspot, is anywhere on farm that is a risk for losing contaminants. The four contaminants are nitrogen (N), phosphate (P), sediment (S), and *E. coli* (E).

Critical Source Area	Risk Level No risk, very low, low, moderate or high	Associated Contaminant				Notes
		N	P	S	E	
Raceways	Very low	✓	✓	✓	✓	Good central races with good access. Races are well maintained and do not become boggy or pugged as they are metaled. Well maintained races will also reduce the risk of lameness and the loss of concentrated contaminants.
Stream & River Crossings	Low	✓	✓	✓	✓	All permanent waterways obtain stock crossings to prevent stock walking directly through the stream. The stream banks are too steep for cattle to cross therefore crossings are vital. Additionally, all paddocks have reticulated water in troughs.
Cultivated Land & Bare Ground	No risk	✓	✓	✓	✓	Risk is eliminated as no cultivation occurs on this property.
Winter Grazing Crops In-situ	No risk	✓	✓	✓	✓	Risk is eliminated as no winter in-situ crop grazing occurs.
Slips/Slumps & Earth Flows	Low		✓	✓		There is an increased risk of soil erosion on the LUC 6 and 7 areas due to topography and soil type. At the time of the farm visit, there was no evidence of large slips/slumps or earth flows, only very small slips. This is due to the low stocking rate, good subdivision resulting in well managed rotational grazing, and maintaining good vegetation cover. Additionally, the LUC 7 area is completely retired to native bush which eliminates the risk due to stock. These factors result in a low risk for soil slips/slumps or earth flows. To reduce the risk to very low, it is recommended to retire stock from the LUC 6 areas.

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Stock Campsites & In-Paddock Feed Areas	Very Low	✓	✓	✓	✓	During the farm visit there was no evidence of bare ground from stock campsites or in-paddock feed areas at all. Hay is fed out in-paddock however, the bales are hand spread out across the paddock, which means the stock are not concentrated in one area. Additionally, stocking rates and stock class are appropriate for the property, and all water troughs are well placed.
Silage Pits or Feed Bunkers	No risk	✓				Risk is eliminated as there is no silage pit or feed bunker on the property.
Yards & Animal Holding Areas	Very Low	✓	✓	✓	✓	On this property, there are one sets of yards and a woolshed. Both areas pose a very low risk as the yards have a concrete floor which eliminates the risk of pugging and therefore sediment loss and greatly reduces the risk of nutrient and E. coli loss. Also, the woolshed is only used once a year.
Intermittent/ Ephemeral Waterways	Moderate	✓	✓	✓	✓	There are several ephemeral waterways on the property. When these areas are flowing/wet they are a high risk as they transport contaminants typically into permanent waterways. Currently these areas do not exclude stock when wet.
Wetlands and Permanent Streams	High	✓	✓	✓	✓	There is one wetland and three permanent streams on this property – Waikanae Stream, Gisborne Stream and Matamataharakeke Stream. They wetland and majority of streams exclude stock, however there are some areas that require stock exclusion (refer to Mitigation Map on page 6). When stock have access to these areas, they greatly increase the level of contaminant loss.

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15.4. Sediment and Phosphate Loss Risk Assessment

Potential ecological impacts of elevated sediment and Phosphate in waterways

Excessive sedimentation in waterways can infill habitats, increase turbidity and reduce water clarity. Fine suspended particles reduce the penetration level of sunlight suppressing macrophyte growth (particularly in lakes). Excess phosphate (P) and nutrient-rich sediment increase algal growth, reducing the vision of fish to swim, eat and breed. Additionally, sediment can infill habitats and harm fish and aquatic invertebrate gills, which overall reduces the health and wellbeing of the waterway.

Risk Assessment for Sediment and Phosphate Loss from Waikawau Bay Farm Park

Table 4 below demonstrates a summary of the likelihood risk of sediment and phosphate entering a waterway, versus the impact sediment and phosphate would have on a waterway. These two risk levels then provide an overall risk assessment of sediment and phosphate loss to waterways from Waikawau Bay Farm Park.

Table 4: Summary risk assessment for sediment and phosphate loss from Waikawau Bay Farm Park

Risk Level		Likelihood Level			
		Very Low	Low	Moderate	High
Impact Level	Low	Very Low	Low	Moderate	High
	Moderate	Low	Moderate	Moderate	High
	High	Low	Moderate	High	<u>Serious</u>
	Serious	Moderate	High	<u>Serious</u>	<u>Serious</u>

Likelihood Risk Level Assessment

There is a moderate likelihood risk stock will enter waterways causing contamination of sediment and P as stock is not completely excluded and there are multiple waterways on the property. Due to stock access in some areas, there is a moderate likelihood stock will cause sediment and P to directly enter waterways via bank erosion, carrying sediment on hooves, and defecating in the waterways. However, once stock exclusion is fully implemented, the likelihood risk will reduce to low, providing there are no drastic changes to the current farming system. This is due to:

- Olsen P is just below the optimum, which means if sediment and P enter a waterway, there is less available P to contaminant waterways (refer to section 9.3 on page 17 for soil test results).
- Fertiliser application are applied once a year using a sprayer in March – the risk of sediment and phosphate loss is very low.
- Topography has a range of risk; however, the dominant topography category is 16 - 25° which has a moderate likelihood risk, as seen in Figure 7 below (refer to section

12.0 on page 23 for more information). However, the steeper topography is actively managed, with most of the area retired to native bush.

- Low stocking rate (7.6 SU/ha), and light, young stock means the risk of soil erosion and damage greatly decreases.
- Erosion severability is estimated to be negligible, moderate, and severe (refer to Figure 8 below).
- There is an increased risk of erosion due to a combination of steep topography, weak igneous rock and loose sedimentary rock (refer to Figure 7, Figure 8 and Figure 9). However, the long-term erosion rates are modelled to be very low (refer to Figure 10).

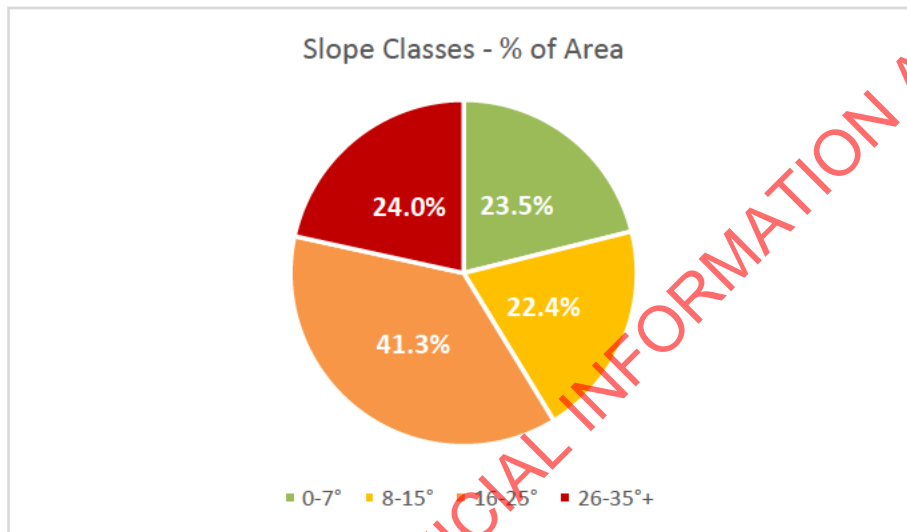
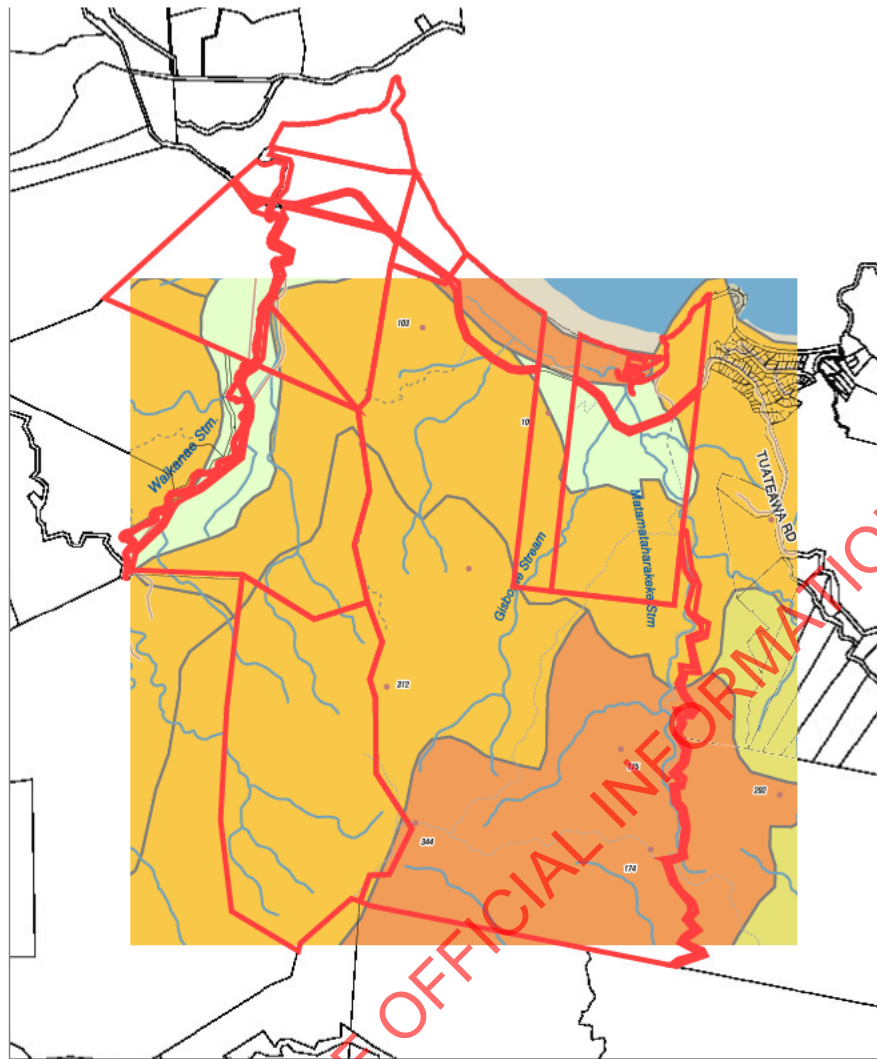


Figure 7: Graph showing the percentage of hectares for the range of topography on the property. Based on Landcare Research's steepness map (refer to section 12.0 starting on page 23).



OURENVIRONMENT Scale 1:25,000

0 200 400 600 800m

Manage: Whenua
Landcare Research

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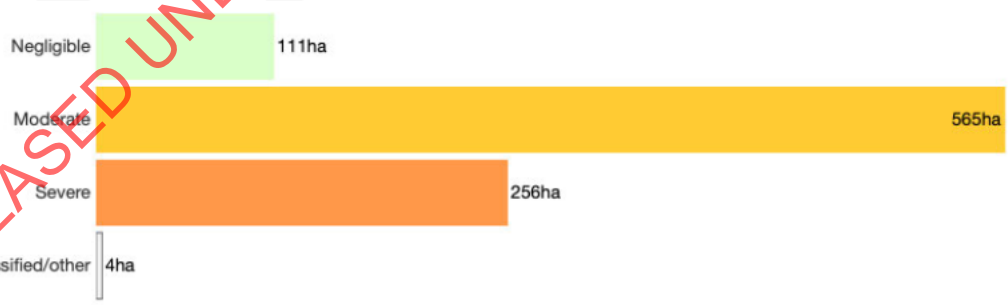


Figure 8: Map and graph demonstrating observed erosion severability on the property (Landcare Research, 2018).

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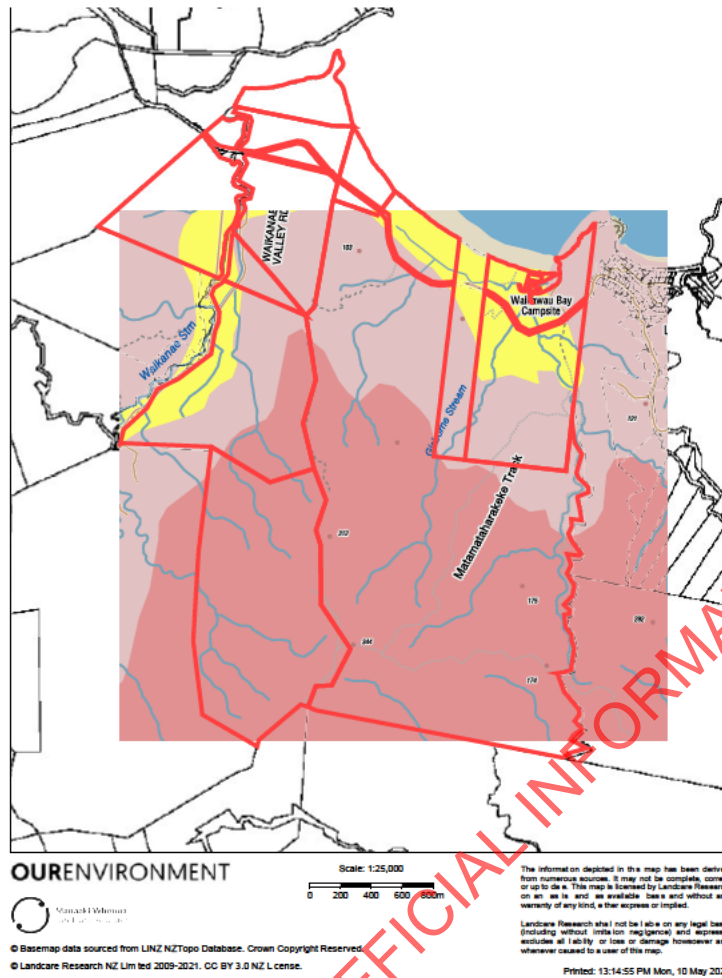








Figure 9: Surface rock type. Printed 10 May 2021 (Landcare Research, 2018).

Legend:			
	Weak Igneous		Loose Sedimentary
	Strong Igneous		Weak Sedimentary
	Metamorphic		Strong Sedimentary

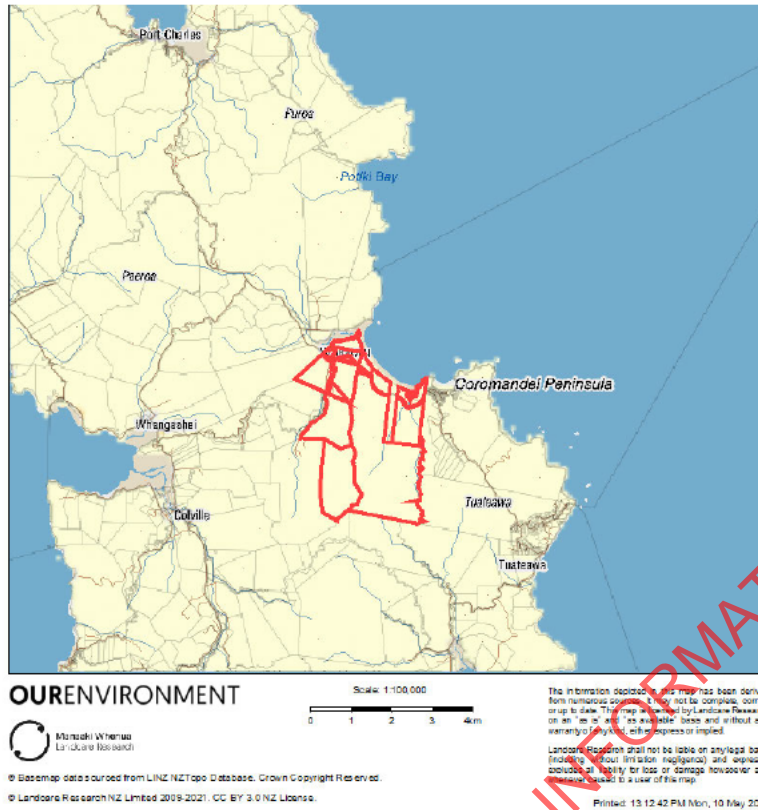










Figure 10: Sediment Loss (2012) showing long-term mean erosion rates = 0 - 2,500 t soil/km²/yr. Printed 10 May 2021 (Landcare Research, 2018).

Legend:			
	0 – 2,500 t soil/km ² /yr		15,001 – 20,000 t soil/km ² /yr
	2,501 – 5,000 t soil/km ² /yr		20,001 – 25,000 t soil/km ² /yr
	5,001 – 10,000 t soil/km ² /yr		25,001 – 30,000 t soil/km ² /yr
	10,001 – 15,000 t soil/km ² /yr		>30,000 t soil/km ² /yr

Impact Risk Level Assessment

The impact sediment and phosphate can have on surface water is potentially high, as explained above. However, without understanding what the sediment and phosphate levels are in the applicable waterbodies, it is difficult to accurately determine the impact level.

Therefore, the impact assessment can only be based on land management practices. As there is little highly soluble P fertiliser applied, no stock feeding areas, low stocking rate, a good mix of heavy cattle and light sheep, and most Good Management Practices are implemented means the impact level is moderate. It would reduce to low once stock are completely excluded from the applicable waterways, assuming any future water quality results are good for sediment and phosphate.

15.5. Nitrogen Loss Risk Assessment

Potential ecological impacts of elevated N in waterways

Nitrogen (N) influences eutrophication and algal blooms, which reduces the overall health and wellbeing of the waterway. Nitrogen can be lost via two methods: leaching and runoff.

Leaching occurs when dissolved nutrients move down the soil profile, with percolating water, to below the root zone. Overland flow or runoff occurs when the soil is at saturation so excess liquid pools on the surface and runs over land. Both provide little soil contact time and drastically decreases the opportunity to attenuate nitrogen. Topography and infiltration rates influence the extent and rate of overland flow. Leaching is the primary method of N loss with N sources being urine and dung patches and fertiliser.

Risk Assessment for Nitrogen Loss from Waikawau Bay Farm Park

Table 5 below demonstrates a summary of the likelihood risk of nitrogen entering a waterway, versus the impact nitrogen would have on a waterway. These two risk levels then provide an overall risk assessment of nitrogen loss to waterways from Waikawau Bay Farm Park.

Table 5: Summary risk assessment for nitrogen loss from Waikawau Bay Farm Park

Risk Level		Likelihood Level			
		Very Low	Low	Moderate	High
Impact Level	Low	Very Low	Low	Moderate	High
	Moderate	Low	Moderate	Moderate	High
	High	Low	Moderate	High	<u>Serious</u>
	Serious	Moderate	High	<u>Serious</u>	<u>Serious</u>

Likelihood Risk Level Assessment

There is a moderate likelihood risk stock will enter waterways and deposit nitrogen via urine and dung as stock is not completely excluded and there are multiple waterways on the property, hence the likelihood risk level in the table above. However, once stock exclusion is fully implemented, the likelihood risk will reduce to very low, providing there are no drastic changes to the current farming system. This is due to:

- All remaining critical source areas (i.e., raceways, stock crossings, slips, stock campsites, in-paddock feed areas, and intermittent waterways) are all managed in the best possible way to completely minimise the risk of nitrogen loss.
- Very little nitrogen fertiliser, in the natural form of liquid seaweed fertiliser, is applied
- Topography has a range of risk; however, the dominant topography category is 16 - 25° which has a moderate likelihood risk of nitrogen runoff, as seen in Figure 7 above (refer to section 12.0 on page 23 for more information on topography). However, the steeper topography is well managed as it is retired to native bush.

- Low stocking rate (7.6 SU/ha), and light, young stock means there are less, smaller urine patches.

If any other forms of nitrogen fertiliser are applied in the future, consideration needs to be taken for the soil types that have a high N leaching potential, which occupies approx. 96% of the property area as seen in Figure 11 below (refer to section 13.1 on page 26 for more information). However, most of these high-risk areas are retired to native bush, therefore the risk is very low. The only high-risk soil within the farming area is Price (refer to the soil map on page 25). Also, please note that any synthetic nitrogen fertiliser applied onto land must not exceed 190 kg N/ha/year.

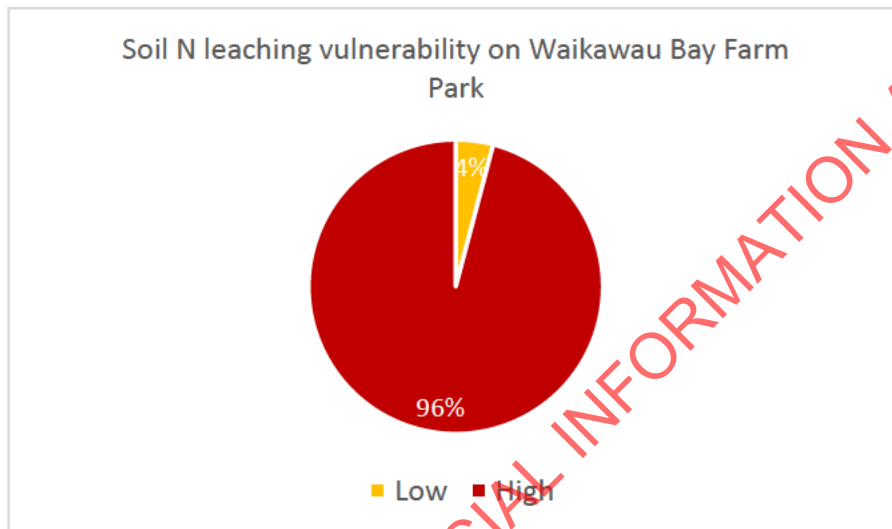


Figure 11: Graph showing the percentage of hectares for the range of N leaching vulnerabilities on the properties. Based on s-map information in section 13.1 on page 26.

Impact Risk Level Assessment

The impact nitrogen can have on surface water is potentially high, as explained above. However, without understanding what the nitrogen levels are in the applicable waterbodies, it is difficult to accurately determine the impact level. Therefore, the impact assessment can only be based on land management practices. As there is little highly soluble nitrogen fertiliser applied, no stock feeding areas, low stocking rate, a good mix of heavy cattle and light sheep, most Good Management Practices are implemented, and most of the high-risk nitrogen leaching soils are retired to native bush means the impact level is moderate. It would reduce to low once stock are completely excluded from the applicable waterways, assuming any future water quality results are good for nitrogen.

15.6. *E. coli* Loss Risk Assessment

Potential ecological impacts of elevated *E. coli* in waterways

E. coli is a microbial pathogen that comes from faeces of any organism and reduces the quality of surface water because it can cause illness when ingested. Guidelines require *E. coli* levels to stay below 540 cfu/100 mL to ensure the water is safe.

Risk Assessment for *E. coli* Loss from Waikawau Bay Farm Park

Table 6 below demonstrates a summary of the likelihood risk of *E. coli* entering a waterway, versus the impact *E. coli* would have on a waterway. These two risk levels then provide an overall risk assessment of *E. coli* loss to waterways from Waikawau Bay Farm Park.

Table 6: Summary risk assessment for *E. coli* loss from Waikawau Bay Farm Park

Risk Level		Likelihood Level			
		Very Low	Low	Moderate	High
Impact Level	Low	Very Low	Low	Moderate	High
	Moderate	Low	Moderate	Moderate	High
	High	Low	Moderate	High	<u>Serious</u>
	Serious	Moderate	High	<u>Serious</u>	<u>Serious</u>

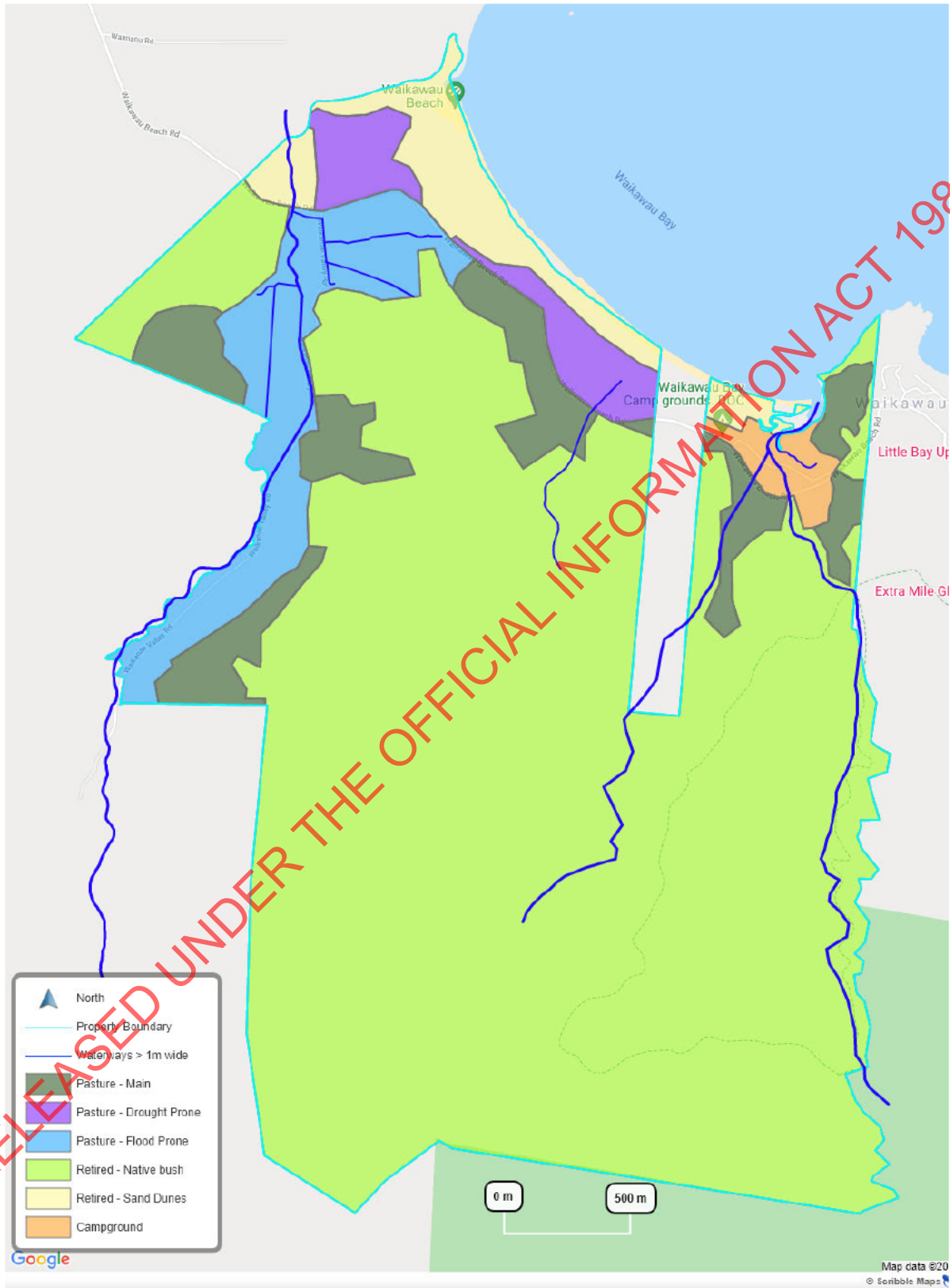
Likelihood Risk Level Assessment

Stock not being completely excluded from waterways, results in a moderate likelihood of stock defaecating in or near a waterway, and therefore contaminating the waterway with *E. coli*. However, once stock exclusion is fully implemented, the likelihood risk will reduce to very low, providing there are no drastic changes to the current farming system. Because *E. coli* contamination in waterways has very few pathways to contaminate waterways, so once stock is excluded there is a low likelihood *E. coli* can reach the waterway. However, the risk would reduce to low as flooding occasionally occurs, but stock are typically not grazed during the time of a high flood risk. Also, the stocking rate is low (7.6 SU/ha).

Impact Risk Level Assessment

The impact *E. coli* can have on surface water is potentially high, as explained above. However, without understanding what the *E. coli* levels are in the applicable waterbodies, it is difficult to accurately determine the impact level. Therefore, the impact assessment can only be based on land management practices. As there are no concentrated stock feeding areas, low stocking rate, and most Good Management Practices are implemented means the impact level is moderate. It would reduce to low once stock are completely excluded from the applicable waterways, assuming any future water quality results are good for nitrogen.

16.0 Land Management Unit's (LMU) Map



16.1. Strengths & Weaknesses

LMU	Area (ha)	Description	LUC	Strengths	Weaknesses
Pasture: other	70.1	Primarily used to graze dry dairy cattle, beef cattle and sheep. Undulating to rolling topography with good soil. Good subdivision – high production area.	6	<ul style="list-style-type: none"> • Free draining • Moderate topsoil • Good soil water holding capacity • Good soil structure • Resistant to pugging • Well aerated soil • Stable (little erosion) • Good pasture quality • Low in weeds • Good stock access to water • Good machinery access • Crossings over waterways/drains to prevent stock walking through 	<ul style="list-style-type: none"> • Low natural fertility • No recent soil tests conducted yet • Exposed to high winds • High nutrient leaching
Pasture: drought prone	28.7	Primarily used to graze dry dairy cattle, beef cattle, sheep and harvest hay. Flat topography with good soil. Good subdivision – high production area.	3	<ul style="list-style-type: none"> • Free draining • Good soil structure • Resistant to pugging • Well aerated • Winter grazing friendly • Low in weeds • Good stock access to water • Crossings over waterways/drains to prevent stock walking through 	<ul style="list-style-type: none"> • Poor soil water holding capacity • No recent soil tests conducted yet • Low natural fertility • Shallow topsoil • Drought prone • Erosion prone • Excessively steep • Exposed to high winds • Low quality pasture • Large paddocks

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Pasture: flood prone	65.9	Primarily used to graze dry dairy cattle, beef cattle, sheep and harvest hay. Flat topography with good soil. Good subdivision – high production area.	2	<ul style="list-style-type: none"> • Free draining • Moderate topsoil • Good soil water holding capacity • Good soil structure • Resistant to pugging • Well aerated soil • Stable (little erosion) • Good pasture quality • Low in weeds • Good stock access to water • Good machinery access • Crossings over waterways/drains to prevent stock walking through 	<ul style="list-style-type: none"> • Flood prone
Native Bush	734.4	Retired native bush	6	<ul style="list-style-type: none"> • Native trees • Increasing biodiversity • Adds shelter to some paddocks • Possibility for carbon credits • QEII Covenant 	<ul style="list-style-type: none"> • Possum refuge
Sand Dunes	36.0	Retired sand dunes area	7	<ul style="list-style-type: none"> • Native tussock grasses and sand dune plants • Increasing biodiversity • Greatly reduces the risk of sand erosion via wind • Helps protect the land from sea storms 	<ul style="list-style-type: none"> • High risk of erosion
Camp ground	11.2	Public campground	2 and 3		

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17.0 Mitigations

This section looks at how each mitigation will improve water quality and compares water quality improvements to on-farm cost versus on-farm benefit.

	Cost	Benefit
Low \$	Limited farmer input of time and/or expenditure. Limited practice change required.	Little change to farm profit as a result of this practice or may require small changes to farm infrastructure.
Medium \$\$	Moderate farmer input of time and/or expenditure. Some practice change required.	Practice likely to result in a moderate increase in profitability or improved management.
High \$\$\$	Significant farmer input of time and/or expenditure. Significant practice change required.	Very profitable practice or results in improved management e.g. Large reduction in operational costs.

17.1. Stock Exclusion from Waterways Wider than 1 m

Location ID from Map: Red lines (refer to Mitigation Map on page 6)

Mitigations: At a minimum, install a 2-wire electric fence with a 3 m setback from the edge of a waterway along all waterways that are wider than 1 m bank to bank and are not currently fenced. Cattle must be excluded, sheep are optional.

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	M	H	M	\$\$-\$\$\$	\$\$-\$

Timeframe: 2025

Notes: This mitigation will ensure cattle are excluded from all waterways that are required to have stock excluded on the property according to the national *Resource Management (Stock Exclusion) Regulation 2020 (2020/175)*.

The stock excluded areas **do not** have to be planted, but it is a good opportunity to help reduce contaminant loss to waterways, as well as creating stock shade and potentially offsetting greenhouse gas emissions. Planting effectiveness improves as margin size increases. Planting helps filter run off and leaching, improves bank stability and reduces the risk of stream bank erosion, provides habitat for wildlife, and creates instream shade for fish and insects.

17.2. Stock Exclusion from Wetlands

Location ID from Map: Red lines (refer to Mitigation Map on page 6)

Mitigations: At a minimum, install a 2-wire electric fence with a 3 m setback from the edge of a wetland and are not currently fenced. Cattle must be excluded, sheep are optional.

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
H	H	H	H	\$\$-\$\$\$	\$\$-\$\$\$

Timeframe: 2025

Notes: This mitigation will ensure cattle are excluded from all wetlands that are required to have stock excluded on the property according to the national *Resource Management (Stock Exclusion) Regulation 2020 (2020/175)*.

Stock excluded areas **do not** have to be planted, but it is a good opportunity to help reduce contaminant loss to waterways, as well as creating stock shade and potentially offsetting greenhouse gas emissions. Planting within a wetland greatly increases the effectiveness of the wetland, while creating a habitat for wildlife.

17.3. Other Waterways -do not require permanent stock exclusion

Location ID from Map: All other streams (refer to Mitigation Map).

Mitigations: When wet and practical, temporarily exclude cattle from intermittent waterways

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	M	M	L	\$	\$

Timeframe: Ongoing – when required

Notes: Temporarily fence these areas when wet and stock have access when grazing. Ensure a grass buffer is left to help filter out any contaminants.

17.4. Retire LUC Class 6e

Location ID from Map: LUC Class 6e (refer to Mitigation Map).

Mitigations: Consider retiring all LUC class 6e land from stock grazing – not mandatory

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit

L	M	M	L	\$-\$\$	\$
Timeframe: If appropriate					
<p>Notes: This mitigation is not a legislative requirement. The LUC 6e areas already have minimal quality pasture and manuka/kanuka regeneration occurring. If it appropriate from a farming business perspective, it would be beneficial to let these areas regenerate and focus on farming the higher production areas.</p>					

17.5. Soil Chemistry

Location ID from Map: Entire property					
Mitigations: Develop a regular soil testing programme to ensure nutrient inputs match soil requirements					
Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	M	-	-	\$	\$\$ - \$\$\$
Timeframe: 2021					
<p>Notes: Soil chemistry should be within the optimal limits in order to generate an ideal soil physical structure and improve soil biology. Depending on soil test results, soil testing and applying fertiliser accordingly could reduce the amount of fertiliser applied, while improving the plants ability to uptake nutrients which could increase farm productivity and improve animal health.</p>					

17.6. Nutrient Management

Mitigation: Keep Olsen P level at agronomic optimum by regularly soil testing					
Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
-	M	-	-	\$	\$\$\$
Timeframe: Ongoing					
<p>Notes: Soil test is required first. Keeping within the agronomic optimum Olsen P avoids unnecessary P fertiliser applications and will reduce costs as well as reducing the risk of P loss.</p>					

Mitigation: Ensure all synthetic fertiliser applications of nitrogen remain below 190 kg N/ha/year.

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	-	-	-	\$\$	\$

Timeframe: Ongoing

Notes: To remain compliant with national regulations, ensure all synthetic nitrogen applications remain below 190 kg N/ha/year.

Mitigation: If applying any synthetic nitrogen fertiliser in the future, consider using a slower release form of N fertiliser i.e. coated urea or sulphate of ammonia.

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	-	-	-	\$	\$ - \$\$

Timeframe: Ongoing

Notes: Based on fertiliser costs and the response seen in pasture growth, there is the potential to reduce fertiliser inputs, therefore save on fertiliser and spreading costs. Additionally, it is expected a larger nitrogen response will be seen if the soil's chemistry is within optimum levels. Refer to the Fertiliser Association's Code of Practice for Nutrient Management. Moderate water-soluble nitrogen fertilisers are available for plant uptake quickly after application, which increases grass growth rapidly, especially when conditions are ideal. However, due to the moderately quick release of nitrogen a portion of nitrogen will move down through the soil profile to below to root zone before the plant is able to uptake it, therefore is lost. A slower release form of nitrogen will provide a lower but constant supply of nitrogen to the plant meaning more of the nitrogen is utilised and less is lost. Additionally, apply N fertiliser in accordance with feed budget, climatic conditions, and soil temperatures above 10°.

17.7. Dung Beetles

Location ID from Map: Whole Farm

Mitigations: Consider releasing dung beetles to improve soil water holding capacity, topsoil depth, and reduce the risk of *E. coli* runoff.

Likely Water Quality Benefits		Potential Impact for Farm Business	
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N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	M	-	H	\$	\$\$ - \$\$\$
Timeframe: 2021					
Notes: Dung beetles provide a range of benefits including improve soil water retention allowing pasture to have access to available water for a longer period of time when dry. Additionally, more nutrients are naturally released from dung as it is buried in the soil. Consequently, the risk of N, P and <i>E. coli</i> loss via runoff and leaching is drastically reduced at the dung beetles have stored the dung underground. Additionally, soil is aerated due their movements which improves the overall health and wellbeing of the soil.					

17.8. Stock Management

Location ID from Map: Flood prone LMU (refer to Mitigation Map)					
Mitigations: Actively manage the flood prone area to minimise stocking rate when soil is wet to reduce the risk of pasture and soil damage					
Likely Water Quality Benefits			Potential Impact for Farm Business		
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	M	H	M	\$	\$ - \$\$
Timeframe: Ongoing management					
Notes: Already actively managed – continue this work to ensure paddocks and soil are not damaged. Also improves animal health.					
Location ID from Map: Drought prone LMU (refer to Mitigation Map)					
Mitigations: Actively manage the drought prone area to minimise stocking rate when soil is dry to reduce the risk of wind erosion					
Likely Water Quality Benefits			Potential Impact for Farm Business		
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	L	H	-	\$	\$ - \$\$
Timeframe: Ongoing management					
Notes: Already actively managed – continue this work to ensure vegetation cover remains high to greatly reduce the risk of wind erosion.					

17.9. Infrastructure and Staff

Location ID from Map: Entire property					
Mitigation: Maintain stock crossings to ensure contaminants do not concentrate in these areas					
Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	M	M	M	\$	\$
Timeframe: Ongoing					
Notes: Requires regular maintenance but can improve stock mustering, reduce lameness and long-term maintenance costs.					
Mitigation: Maintain races to reduce runoff					
Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	M	M	M	\$	\$\$
Timeframe: Ongoing					
Notes: Requires regular maintenance but can reduce lameness, water damage and long-term maintenance costs.					
Mitigation: Ensure any new troughs and gateways are away from areas of high-water flow					
Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
L	M	M	M	\$	\$
Timeframe: Ongoing					
Notes: These areas of concentrated stock use have high nutrient loads and reduced vegetation cover, so are higher risk for runoff.					
Mitigation: Staff training to ensure environmental management practices are actively managed and embedded					

Likely Water Quality Benefits				Potential Impact for Farm Business	
N	P	Sediment	<i>E. coli</i>	Cost	Benefit
M	M	M	M	\$	\$
Timeframe: Ongoing					
Notes: Will depend on staff members experience in environmental practices and ability to influence on farm practice change.					

18.0 Nitrogen Management

Season	Nitrogen Leaching (kg N/ha/yr)	Nitrogen Efficiency	Fertiliser Input (kg N/ha/yr)	Production (kg N/ha/yr)
Not available				

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Appendix 1 – Stock Reconciliation

Stock numbers, effective ha and stock units per hectare (SU/ha) over the season.

Need to add table once farm map is complete

Appendix 2 – Extended Soil Information

Brown Soils

Brown Soils have a brown or yellow-brown subsoil below a dark grey-brown topsoil. The brown colour is caused by thin coatings of iron oxides weathered from the parent material. It is formed in fresh to moderately weathered rock, from andesite parent material.

The two Te Kie soils both have a topsoil which typically has a loam texture and is moderately stony. The subsoil has dominantly loam textures, with a rock contact at less than 100 cm of the mineral soil depth. Both soils have restricted plant rooting depths due to massive rock that mechanically impedes root growth and has extremely low capacities to store water and oxygen.

The Price soil is has a plant rooting depth restriction at 45 - 70 cm, due to soil material of high density and/or high penetration resistance. The topsoil typically has loam texture and is stoneless. The subsoil has dominantly clay textures, with gravel content of less than 3%.

Lastly, the Waitawa soil has a topsoil that typically has a sandy loam texture and is stoneless. The subsoil has dominantly sandy loam textures, with gravel content of less than 3%. The plant rooting depth extends beyond 1m.

Te Kie 1 - Acidic Orthic Brown

This soil has a plant rooting depth of 40 - 90 cm. Generally the soil is well drained with low vulnerability of water logging in non-irrigated conditions, and has moderate to low soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a high N leaching potential, which should be accounted for when making land management decisions.

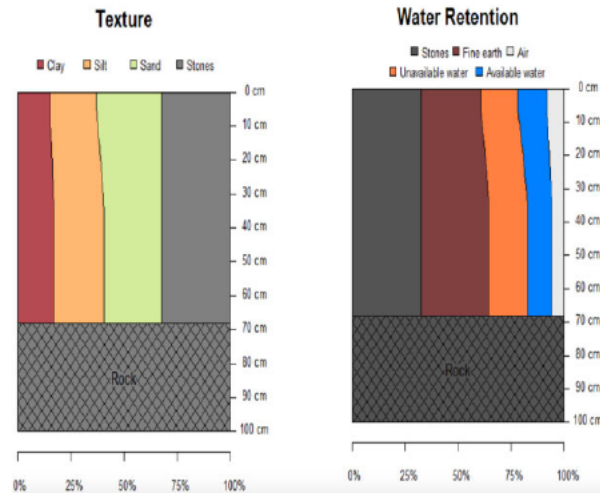


Figure 12: Te Kie 1 Texture and Water Retention graphs. The values for the graphs above have been generated from horizon and pedotransfer data. These values have then been splined to create continuous estimates of soil water holding capacity and particle size distribution the soil profile (Landcare Research, 2020).

Te Kie 2 - Acidic Orthic Brown

This soil has a plant rooting depth of 50 - 90 cm. Generally the soil is well drained with low vulnerability of water logging in non-irrigated conditions, and has moderate to low soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a high N leaching potential, which should be accounted for when making land management decisions.

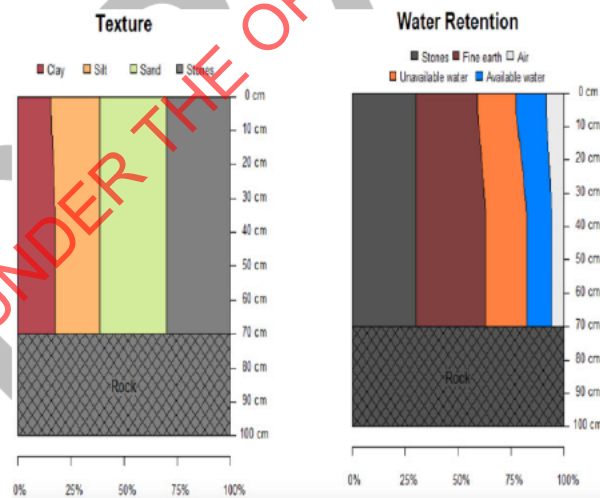


Figure 13: Te Kie 2 Texture and Water Retention graphs (Landcare Research, 2020).

Price - Typic Orthic Brown

Generally the soil is well drained with very low vulnerability of water logging in non-irrigated conditions, and has moderate to low soil water holding capacity. Inherently these soils have a moderate structural vulnerability and a high N leaching potential, which should be accounted for when making land management decisions.

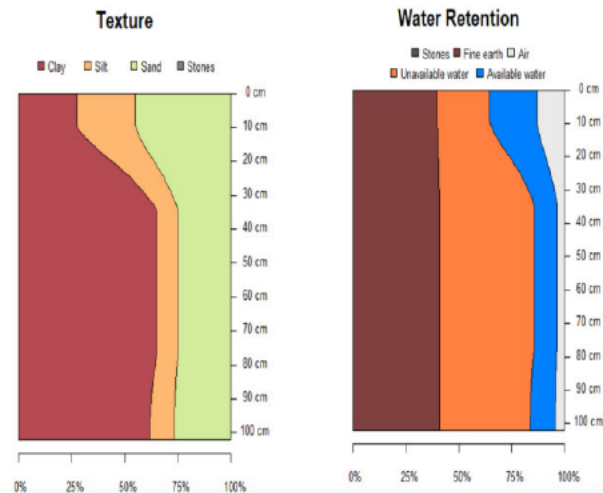


Figure 14: Price Texture and Water Retention graphs (Landcare Research, 2020).

Waitawa - Mottled Sandy Brown

Generally the soil is imperfectly drained with low vulnerability of water logging in non-irrigated conditions, and has high soil water holding capacity. Inherently these soils have a very high structural vulnerability and a low N leaching potential, which should be accounted for when making land management decisions.

Recent Soils

Recent Soils are weakly developed, showing limited signs of soil-forming processes although a distinct topsoil is present, a B horizon is either absent or only weakly expressed. It is formed in alluvial sand silt or gravel deposited by running water, from rhyolite parent material.

Both soil types has a topsoil with a typically sandy loam texture and is stoneless. The subsoil has dominantly sandy loam textures, with gravel content of less than 3%. The plant rooting depth extends beyond 1m. The main difference is the sand content. The Parangi soil has a higher percentage of sand, which results in lower retention of plant available water, when compared to the Burwood soil (refer to Figure 15 and Figure 16 below).

Burwood - Mottled Sandy Recent

Generally the soil is imperfectly drained with low vulnerability of water logging in non-irrigated conditions, and has very high soil water holding capacity. Inherently these soils have a very high structural vulnerability and a low N leaching potential, which should be accounted for when making land management decisions.

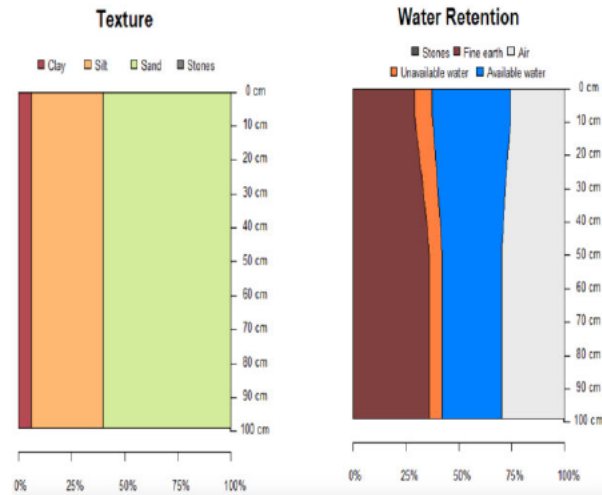


Figure 15: Burwood Texture and Water Retention graphs (Landcare Research, 2020).

Parangi - Typic Sandy Recent

Generally the soil is well drained with very low vulnerability of water logging in non-irrigated conditions, and has high soil water holding capacity. Inherently these soils have a very high structural vulnerability and a low N leaching potential, which should be accounted for when making land management decisions.

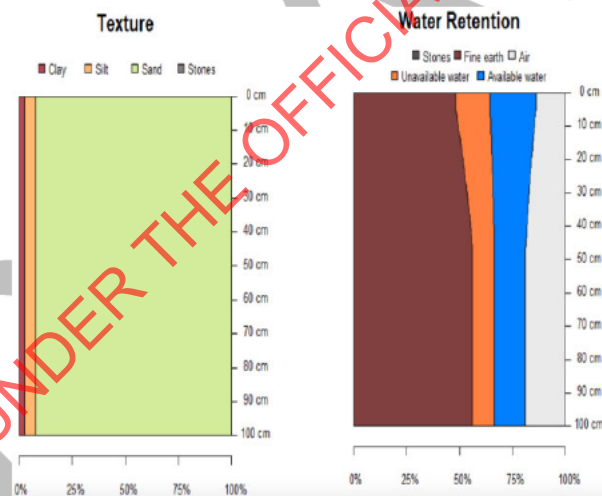


Figure 16: Parangi Texture and Water Retention graphs (Landcare Research, 2020).

Allophanic Soils

Allophanic Soils are dominated by allophane (and also imogolite or ferrihydrite) minerals. These stiff, jelly-like minerals coat the sand and silt grains and maintain a porous, low density structure with weak strength. The soils are identified by a distinctly greasy feel when moistened and rubbed firmly between the fingers. The soil is easy to dig and samples

crumble easily when crushed in the hand. It is formed in fragmental material erupted from a volcano, from rhyolite parent material.

The topsoil typically has loam texture and is stoneless. The subsoil has dominantly loam textures, with gravel content of less than 3%. The plant rooting depth extends beyond 1m.

Paeroa - Typic Orthic Allophanic

Generally the soil is well drained with very low vulnerability of water logging in non-irrigated conditions, and has high soil water holding capacity. Inherently these soils have a very low structural vulnerability and a low N leaching potential, which should be accounted for when making land management decisions.

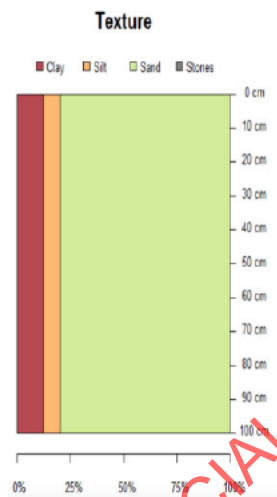


Figure 17: Paeroa Texture graph (Landcare Research, 2020).

Appendix 3 – Photos from VSA Testing



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Location ID

1



Good soil structure and colour but average soil porosity and earth worm population. This is due to imperfect drainage and moderate risk of waterlogging. Demonstrating light compaction issues.

2



Good soil structure, porosity and colour but average earth worm population. This is due to imperfect drainage and moderate risk of waterlogging. Earth worm population could benefit from lime.

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3



Nice dark soil with good soil structure and porosity. This location was sandier compared to the other loamier sites. Poor earth worm population - should be addressed.

4



Good soil structure and colour but average soil porosity earth worm population. A few more mottles were present at this location, which is typically an indication of poor drainage. Earth worm population could benefit from lime. This location was slightly clayey compared to the other loamier sites.

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5



Good soil structure and colour but average soil porosity and poor earth worm population. This location was slightly clayey compared to the other loamier sites.

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Department of Conservation
Te Papa Atawhai

1.1.1 INDEPENDENT CONTRACT AGREEMENT

VEGETATION MAINTENANCE BY GRAZING AT Waikawau Bay Farm Park Recreation Reserve

1.1.2 **THIS AGREEMENT** is made this 15th day of March 2022

1.1.3 PARTIES

1. The Director-General of Conservation, (“the Director-General”)
2. Ngati Tamatera Limited (“the Contractor”)

1.1.4 BACKGROUND

- A. The Director-General is the administrative head of the Department of Conservation Te Papa Atawhai (“the Department”). The Department is responsible for managing and promoting conservation of the natural and historic heritage of New Zealand on behalf of, and for the benefit of, present and future New Zealanders.
- B. In order to carry out its functions, the Department from time to time requires certain services in support.
- C. The Director-General wishes to contract for the Services described in Schedule 2 (“the Services”).
- D. The Contractor has the skills and expertise necessary to carry out the Services and wishes to contract for the performance of the Services.
- E. The parties wish to record the terms and conditions of their agreement in this document and its Schedules.
- F. Under section 53 of the Conservation Act 1987 the Director-General has the power to enter into contracts and agreements necessary for exercising such powers as to enable the Department to perform its functions.

1.1.5 OPERATIVE PARTS

1. The parties agree that the Contractor will perform the Services as specified in the Schedules in accordance with the Department’s Standard Terms and Conditions of Independent Contracts Version 1.8.
2. The Contractor acknowledges receipt of a copy of the Department’s Standard Terms and Conditions of Independent Contracts Version 1.8.

SIGNED on behalf of the Director-General of Conservation by Nick Kelly acting under delegated authority.

9(2)(a)
Signature: [Redacted]

In the presence of (witness)

9(2)(a)
Signature: [Redacted]
Name: Alison McDonald
Occupation: Community Ranger
Address: 9(2)(a) [Redacted]

SIGNED by

9(2)(a)
Signature: [Redacted] Director
In the presence of (witness)

9(2)(a)
Signature: [Redacted]
Name: [Redacted]
Occupation: Family Start Worker
Address: 9(2)(a) [Redacted]

A copy of the Instrument of Delegation may be inspected at the Director-General's office at Conservation House Whare Kaupapa Atawhai, 18 - 32 Manners Street, Wellington 6011

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Schedule 1

1.	Site (clause 3.6.1)	As marked on the attached plan or map in Schedule 4 Physical description/ Common name: Part Waikawau Bay Farm Park Recreation Reserve; AND Part Recreation Reserve - Waikanae Creek Land Status: Recreation Reserve under S17 of the Reserves Act 1977 Location ID: 28887; 42696 Area: 245.7 ha
2.	Activity	Managing the land by: i) light grazing at a density commensurate with land productivity, water supplies and fencing; ii) cutting of hay; iii) allowing reforestation of native bush where land is to be retired from grazing; iv) use of farm buildings in order to carry out the above activities.
3.	Term	2 Years commencing on 15 March 2022
4.	Renewal(s)	None
5.	Final Expiry Date	15 March 2024
6.	Review	Annually
7.	Fee	In consideration for managing the pasture, the Contractor may keep the proceeds of any sale of hay from the land.
8.	Fee Instalment(s) and Fee Payment Date(s)	N/A
9.	Insurance (To be obtained by Contractor) (clause 12)	Types and amounts: Public Liability Insurance for: (a) General indemnity for an amount no less than \$1,000,000.00; and (b) Forest and Rural Fires Act extension for an amount no less than \$250,000.00; and Third party vehicle liability is not required. Subject to review on each Concession Fee Review Date
10.	Access arrangements over private land to be organised by the Contractor.	The written consent of any adjoining landowners to cross their property to gain access to the Site.
11.	DOC Supervisor	Nick Kelly, Operations Manager
12.	Health and Safety (clause 4.5)	Audited Safety Plan: Not required
13.	Fires on the Site (clause 5.5.4)	Permit only

14.	Addresses for service	The Director-General's address for service is: DOC Whitianga 2/20 Joan Gaskell Drive Whitianga 3510 The Contractor's address for service is: Business One, 433 Pollen Street Thames 3500
15.	Special Conditions	See Schedule 3.

Note: The clause references are to the Department of Conservation's Standard Terms and Conditions of Independent Contracts Version 1.8.

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Schedule 2

Description of Services

1. **THE SERVICES**

- 1.1. The Contractor must assist the Director-General to maintain the natural, historic and recreational values of the Land.
- 1.2. The Contractor must help keep the Land free from plant and animal pests in compliance with the Biosecurity Act 1993 and relevant pest management strategies.
- 1.3. The Contractor must use and manage the Land in a good and husband like manner, and not impoverish or waste its soil.
- 1.4. The Contractor must take all practical steps to prevent domestic stock entering all streams and waterways which pass through or adjacent to the Land.
- 1.5. The Contractor must apply fertilizer, lime and other soil nutrients to the land in accordance with normal farm management practices in the district.
- 1.6. The Contractor must keep all buildings, fences, gates, drains and other improvements now or hereafter upon the Land, in good order, condition and repair

2. In meeting the obligations in Clause 1 the Contractor **may**:

- 2.1. graze on the Land subject to the following conditions Refer to Section 3 – Special Conditions:
 - 2.1.1. The Contractor must monitor stock at regular intervals to ensure that:
 - 2.1.1.1. they are contained within the Land, and
 - 2.1.1.2. there is sufficient feed available on the Land to discourage stock from grazing other land administered by the Director-General not included in this Contract.

- 2.1.2. The Contractor must not develop wintering pads or silage pits on the Land without the express written permission of the Director-General.
 - 2.1.3. The Contractor will not erect any structures on the Land without the prior consent of the Director-General.
 - 2.1.4. The Contractor will not store hazardous materials on the Land, nor dispose of general farm or household refuse, or store other materials on the Land where they may obstruct the public or create a nuisance.
 - 2.1.5. The Contractor must at the Contractor's own expense, ensure that stock is adequately contained within the Land.
 - 2.1.6. The Contractor will not call upon the Director-General to contribute to the costs of any boundary fencing between the Land and any adjoining land of the Director-General if the purpose of the fencing is to assist the Contractor to comply with Clauses 2.1.1 and 2.1.5.
3. The Contractor acknowledges that the Land is open to the public for access and that the Director-General may close public access during periods of high fire hazard.
 4. The Director-General may temporarily suspend public access during those periods when contract operations could endanger the public while on the land.
 5. The Director-General will not be liable for any cost incurred in re-establishing the supply of any utility in the event of any utility becoming unavailable for any reason.
 6. The Contractor is to report any new archaeological feature or artifact encountered on the Land to the Director-General immediately and cease work at that site to prevent further damage. The Contractor must ensure they follow the archeological provision of the Heritage New Zealand Pouhere Taonga Act 2014 if applicable.
 7. At locations frequently used by the public the Director-General may erect and maintain such signs as are necessary to ensure that the public are informed as to their rights of access over the Land.
 8. The Contractor shall ensure that appropriate public information is provided verbally upon request and shall maintain a high standard of public relations with visitors to the Land.
 9. If the Contractor wishes to surrender this Contract during the currency of the Term, then the Director-General may accept that surrender on such conditions as the Director-General considers appropriate, including a condition that the Contractor will be required to bear and pay any levies payable under the Concession, from the date of acceptance of the surrender, until the date at which the Contract would have expired had surrender not been accepted.
 10. If the whole or any portion of the Land is required for use by the Director-General, the Director-General may terminate this Contract any time in respect of the whole or any portion of the Land upon the Director-General giving to the Contractor one calendar months' notice in writing of the Director-General's intention so to terminate this Contract. If this Contract is terminated, then the Director-General may adjust the Fee payable or refund any Fee paid in advance at the Director-General's sole discretion.

Schedule 3

SPECIAL CONDITIONS

1.	Type of stock	The Contractor may graze the following types of stock: Cattle (dry-stock only) and sheep and horses only.
2.	Stock matters	The Contractor must monitor stock at regular intervals to ensure that: <ul style="list-style-type: none">(a) they are contained within the Land; and(b) there is sufficient feed available on the Land to discourage stock from grazing other land administered by the Grantor and not part of this Concession; and(c) they do not graze to a level resulting in damage to, or pugging of, the Land. The Contractor must not develop wintering pads, stand off pads or silage pits on the Land. The Contractor must not graze, nor permit to be grazed on the Land, any stock, which the Contractor knows or ought to have reasonably known, would be dangerous to any person entering the Land.
3.	Land to be retired from grazing	Where the Contractor wishes to retire land from grazing, the land must be actively managed to avoid persistent infestations of weeds. Native plants may be allowed to regenerate naturally from nearby Public Conservation Land and/or native plants may be planted. Where any native planting occurs plants must comply with the Department's <u>eco-sourcing principles for a restoration project</u> .
4.	Farm vehicles	The Contractor may use farm vehicles for the purposes of the Concession Activity and for pest management.
5.	Facilities	The Contractor may make use of on-site facilities, including the farm house, for the purposes of carrying out the Activity. The Contractor may make repairs or upgrades to existing facilities, provided they comply with the Department's Standard Terms and Conditions of Independent Contracts

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		Version 1.8.
6.	Firearms	The Contractor may use firearms for the purposes of the Concession Activity and for pest management.
6.	Dogs and horses	The Contractor may use dogs and horses for the purposes of the Concession Activity and for pest management.
7.	Noxious pests and plants	<p>The Contractor shall keep the land free of all plant and animal pests. In particular, weeds such as ragwort, thistles and blackberry must be sprayed or otherwise cleared regularly. In doing so however, the passage of herbicide into any nearby streams or waterways whether by wind drift or surface runoff, must be minimised.</p> <p>DOC will ensure any earthworks are undertaken in such a way to prevent the unnecessary spread of weeds, including kikuyu, and soil that could contain harmful pathogens.</p>
8.	Crops	The Contractor must obtain the approval of the Grantor before breaking ground for crops, other than grass pasture or hay.
9.	Fencing and Access	<p>The Contractor must at the Contractor's own expense, ensure that stock is adequately contained within the Land.</p> <p>It is the responsibility of the Contractor to maintain the internal fences and any boundary fences that require maintenance during the course of the term.</p> <p>The Contractor must must at the Contractor's own expense maintain all fences, gates, stiles, bridges, culverts, and drains in good condition for the use by the Contractor themselves.</p> <p>The Contractor must ensure the Land is fenced to prevent stock access to any watercourses adjoining or on the Land and that an adequate ungrazed vegetation strip is maintained along all watercourses to minimize effluent from stock entering watercourses to the satisfaction of the Grantor and consistent with Resource Management (Stock Exclusion) Regulations 2020.</p> <p>Access by DOC (or any parties contracted to work for DOC) across the Land is dependent on approval from the Contractor 48 hours prior.</p> <p>Details of existing vehicle tracks and fencing can be seen in</p>

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		Waikawau Bay Farm Environmental Plan – a copy can be emailed to the Contractor for reference.
10.	Adverse effects	<p>If, in the opinion of the Grantor, stock effluent discharge occurring as a result of the Concession Activity is having an adverse effect on any adjoining or downstream river, stream, waterway or wetland, then the Grantor may require the Contractor to modify the Concession Activity or the manner in which it is carried out so as to avoid, remedy or mitigate that adverse effect.</p> <p>If, in the opinion of the Grantor, the Concession Activity is having or may have an adverse effect on the Land or adjoining bush or riparian margins administered by the Grantor, the Grantor may require the Contractor to comply with all reasonable notices and directions by the Grantor concerning the activities conducted by the Contractor including but not limited to notices or directions regarding the numbers of stock that may be grazed on the Land or any part of the Land.</p>

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Schedule 4

MAPS / PLANS

Waikawau Bay Farm Park Environmental Plan – can be requested from the Grantor

Map: Grazing Areas on Part Waikawau Bay Farm Park Recreation Reserve; AND Part Recreation Reserve - Waikanae Creek

