8th February 2024

Agricultural Land Use Assessment

69 Inland Kaikoura Road, Peketa, Kaikoura ("site")

Purpose of Report

The purpose of this report is to review and consider the potential agricultural uses of the site within the context of its *Rural* zoning by Kaikoura District Council, and the application to change the zone to Light Industrial, and the National Policy Statement classification as Class 2 Highly Productive land on part of the site.

This report assesses the technical and economic feasibility of a range of agricultural options and their suitability on the site and viability in the long-term for land based primary production purposes.

Author Expertise

I am a self-employed Registered (NZIPIM) Farm Management Consultant primarily working in Canterbury but with client base between Central Otago and Nelson, and including Central Plateau, with specialisation in pastoral and arable land use systems and development.

I hold the qualifications of Bachelor Agricultural Science, Lincoln University

I work with farmers, local and central government organisations, and industry interest groups.

I specialise in advising in farm and agribusiness management with particular expertise in grazing and stock management systems, arable farming, irrigation & farm development, financial management, and supervise and contract-manage development projects.

I am familiar and experienced with all the farming practises, soils, and climate of the Central and North Canterbury area in general including the site in question.

I have worked for MAF Advisory Services Division based in Nelson and North Canterbury prior to forming my own consultancy practice, Dunham Consulting Ltd, in 2002

I regularly research and undertake feasibility and financial viability analysis for potential farming options. This has included land development strategy options for unimproved and irrigated land and intensification of land use through conversion to more intensive land use policies. This work has been over a full range of land types and farming systems.

I have acted as an expert witness in relation to various issues including land use planning, land development, farm machinery development disputes and animal welfare prosecutions.

My qualifications as an expert are set out above. The matters addressed in this report are within my area of expertise, however where I make statements on issues that are not in my area of expertise, I have stated where information has been sourced from. I have not omitted to consider material facts known to me that might alter or detract from the opinions included in this report.

SCOPE

In this report I address the following issues:

(a) The land use capability of the site

(b) The range of pastoral, arable and horticultural options that could be physically operated on a long-term basis on the site.

(c) Consideration of the climate, soils, and water environments of the site

(d) The type and extent of support industries and resources, contractors, and expertise required for a sustainable and viable farming operation.

(e) The infrastructure on the site or required on site to support a viable farming business.

(f) The site's neighbouring land uses and the potential impact of viable land use activities onto the neighbours.

(g) The economic viability of operating a business or use of the site compatible with the site's District Zoning and designated under the National Policy Statement.

Site

The land ("site") is located at 69 Inland Kaikoura Road, Peketa, Kaikoura.

Two allotments are combined as one site for the purposes of this report.

<u>Eastern most parcel</u>
Legal Description: LOT 20 DP 578956
Record of Title: 860763
Gross Area: 10.53 hectares

<u>Western most parcel</u>
Legal Description: LOT 2 DP 501321
Record of Title: 815749
Gross Area: 11.0197 hectares

Total Area: 21.5513 hectares

Site

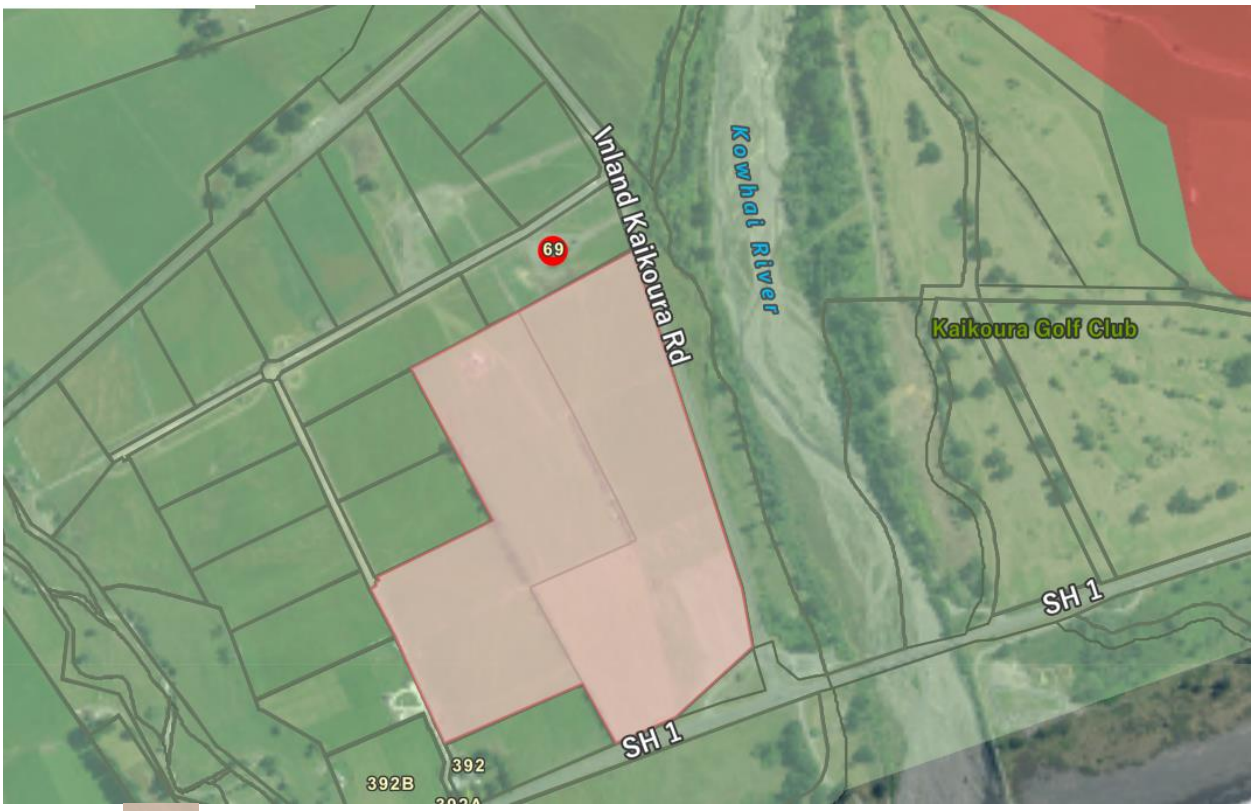
The Site is located on the corner of Inland Kaikoura Road and State Highway One (SH1), at Peketa, and is orientated approximately north-south in parallel with Inland Kaikoura Road. See Image 1.

Image 1

Site Zones and Classifications

District Zoning

Kaikoura District Council [KDC] Zone: *Rural*



Site

Image 2

Rural Zone

Residential Zone

National Zoning

The site contains National Environmental Standard (NES) classification land designation:

Highly Productive Land: Class 2 and 6 [National Policy Statement of 17th October 2022 (NPS-HPL)]

The purpose of the NPS-HPL is to manage the subdivision, use and development of this non-renewable resource (soil), *providing a framework for Councils to enhance protection for highly productive land from inappropriate subdivision, use, and development and ensure it is available for growing vegetables, fruit, and other land-based primary production, now and into the future.*

This includes all land that is zoned General Rural or Rural Production and classed as Land Use Capability (LUC) 1, 2 or 3 which is considered as highly productive land for the purpose of the NPS-HPL.

Land Use Capability of the Site

Ref Map: LRIS Portal: NZLRI Land Use Capability 2021

Class 2

Image 3

Class 6

Image 4

The site is covered by two Land Use Classes:

- LUC 2 land as identified in blue polygon in Image 3
- LUC 6 land as identified in the blue polygon in Image 4

The two polygons from Images 3 and 4 are overlaid onto the land parcels of the site as in Image 4. Class 2 is identified in blue, and Class 6 is identified in green.

Image 5

The LandCare Research Portal rounds land area to the nearest hectare, consequently the area of Class 2 is between 3.5 hectares if rounding down to 21.0 hectares or 4.0 hectares if rounding up to 22.0 hectares. For the purposes of this report, 3.8 hectares is used as the area of Class 2 land, which

is the land classified as Highly Productive Land (LUC Classes 1, 2 and 3).

The detailed Land Use Class descriptions –

Hectares	LUC group	LUC Description
3.8000	2	2e 1
17.7513	6	6s 8*

21.5513

* The LUC polygon is more correctly described as *LUC 6s 8 + LUC 4s 6.* As Class 4 & 6 are outside the NPS- HPL definition the descriptor 6s 8 has been adopted for this report

Image 6

Interpretation of land Use Class Descriptions

Land Class	**2**	[versatility class]
Land Class Unit	**2e**	[restrictions to versatility]
Land Class Units	**2e 1**	[degree of versatility restriction compared to other 2e polygons]

The **Land Class** of the Site is '2' meaning:

'Land with slight limitations for arable use and suitable for cultivated crops, pasture or forestry'.

The **Land Class Unit** is '2e' where:

- *'e' erodibility – where erosion susceptibility, deposition, or the effects of past erosion damage first limits production*

The **Land Class Units** is '2e 1' meaning:

The third numeral associates and orders polygons below the level of LUC subclass and can be disregarded as it simply allows location of land polygons with similar restriction characteristics and ranks them according to increasing degree of limitation to use.

Refer to Appendix A for Land Use Capability Definitions.

Site LUC polygon characteristics and limitations

The site is covered by two LUC polygons that are larger than the site itself. A summary of the two polygons is included in Image 7 below.

	Class II	Class VI
Hectares	3.8	17.75
LUC	2e 1	6s 8
Erosion risk type	wind	wind
Present erosion severity**	0% - 10%	10% - 20%
Potential erosion severity**	10%	10% - 20%
- How?	When cultivated	When cultivated
Description	Flat to undulating loess mantled terraces, and fans from alluvium from various sources below 300m asl with deep moderately well to imperfectly drained Pallic (yellow grey earth) soils in low (<800 mm) rainfall districts, liable to slight wind erosion especially when cultivated.	Flat to undulating floodplains, low terraces and fans below 300m asl with very shallow (<20 cm) and stony silt loam textured, Recent and Pallic (recent and yellow grey earth) soils in low to moderate (500-900mm) rainfall areas, with a marked summer moisture deficit and a potential for slight to moderate wind and streambank erosion.

Table Ref: LRIS Portal: NZLRI Land Use Capability 2021

** Severity is % of land area affected by sheet wind erosion

Image 7

Note that the Class 6 polygon erosion assessment also includes slight to moderate Streambank Erosion, but this is for areas of the polygon that include the true left of the Kowai Stream. As the Site does not include any streams, this detail has been omitted from the comparison.

The Class 2 land is limited by its erosion risk, specifically the risk of sheet wind erosion during cultivation. Current erosion is assessed as between *negligible* and *slight* and could potentially affect up to 10% of the Class 2 area if erosion events occur.

The Class 6 land has a higher sheet wind erosion risk than the Class 2 land, being rated as between *slight* and *moderate*. Despite this higher erosion risk, this is as secondary risk on the Class 6 polygon land as soil moisture limitations are assessed as being the primary limitation followed by the erosion risk (secondary limitation), hence the LUC designation is '6s 8' ('s' standing for *soil limitations)*.

Site Soils

There are two types of soil identified on the site, Waimakariri silts and Rakaia loams, with four different types (siblings) of Rakaia loams. [reference: Landcare Research S-Maps]

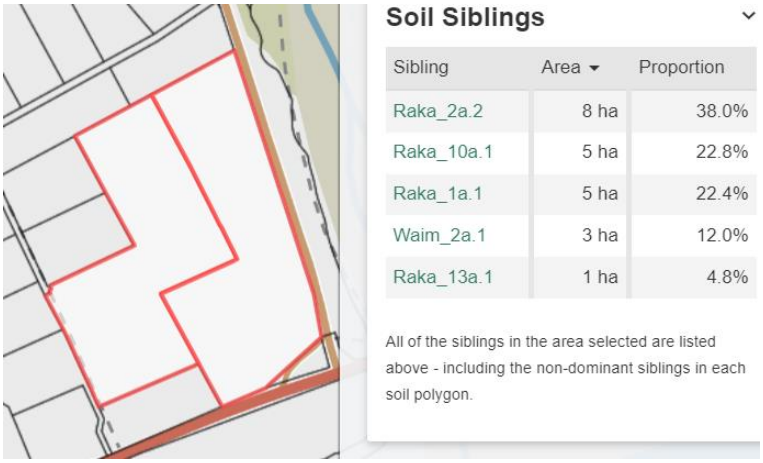


Image 8

Comparison of soils on Class 2 and Class 6 land on the site

Site Soils Physical Characteristics

Approx hectares		ratio	Texture	Depth	PAW (100cm)	Structural Vulnerability	N Leaching Vulnerability
3.80	Waimakariri_2a.1	50%	silt	Mod deep	164	high	low
	Rakaia_1a.1	30%	loam	shallow	88	high	high
	Rakaia_13a.1	20%	loam	v. shallow	72	high	high
					123		
17.75	Rakaia_2a.2	50%	loam	shallow	95	high	high
	Rakaia_10a.1	30%	loam	v. shallow	62	high	very high
	Rakaia_1a.1	20%	loam	shallow	88	high	high
					84		

		ratio	Drought Vulnerability	Water Logging Vulnerability	
3.80	Waimakariri_2a.1	50%	low	very low	Mod. Deep, well drained recent river silts
	Rakaia_1a.1	30%	moderate	very low	Shallow, well drained recent river loams
	Rakaia_13a.1	20%	moderate	very low	Very shallow, well drained recent river loams
17.75	Rakaia_2a.2	50%	moderate	very low	Shallow, well drained recent river loams
	Rakaia_10a.1	30%	moderate	very low	Very shallow, well drained recent river loams
	Rakaia_1a.1	20%	moderate	very low	Shallow, well drained recent river loams

Approx hectares		ratio	Rooting Barrier	Topsoil Stoniness
3.80	Waimakariri_2a.1	50%	n/a	stoneless
	Rakaia_1a.1	30%	60-100cm - extreme gravel	slightly
	Rakaia_13a.1	20%	60-90cm - extreme gravel	moderate
17.75	Rakaia_2a.2	50%	60-90cm - extreme gravel	moderate
	Rakaia_10a.1	30%	70-100cm - extreme gravel	very
	Rakaia_1a.1	20%	60-100cm - extreme gravel	slightly

Key: LUC Class II soils LUC Class VI soils

Image 9

The soils on the site are classified as *Recent* being geologically young, formed from floodplains primarily from the Kowai River to the east of the site.

The soils across the whole site are not all randomly mixed together, rather they are located in seams or strips of each soil roughly in parallel to each other and parallel to the Kowai River, formed by sequences of depositions with variations in depth and proportions of silt and stone from each flood event.

The key difference between the Class 2 land and the Class 6 land is that the Class 2 land has more silt and deeper silt (Waimakariri soil), interspersed with seams of stonier and shallower loams (Rakaia soils). The Class 6 land overall comprises shallower and stonier topsoil, with rooting barriers starting from approximately 60cm deep (variations of Rakaia soils).

Consequently, the Class 6 land is significantly more drought prone than the Class 2 land.

The site has an average rainfall of 821mm per annum and an Evapotranspiration (PET) of 1029mm [data source: Overseer V6.5.4], indicating an approximate annual moisture deficit of 210 mm moisture, which primarily occurs December to March, during which pastures, crops and perennial tree crops will be under significant moisture stress.

The Profile Available Water (PAW) in the top 100cm averages 123mm in the Class 2 land and 84mm in the Class 6 land. The consequence is that the Class 2 land holds approximately half as much additional moisture (+46%) in the rooting zone than the Class 6 land, so the pastures are more drought resilient and produce more herbage especially over the high ET summer months, so are able to graze more livestock (annual average stocking basis).

Productivity

Land productivity as assessed by LandCare Research between the two land classes is that Class 2 land supports double the stocking rate for the average farmer, and nearly three times the stocking rate for top farmers and for potential productivity (without scale, technological or economic limitations).

Note that these definitions of stock units and stocking rates were made in the 1970's and 1980's and are different to current definitions of stock units and stocking rates but remain a valid means of direct comparison between land use polygons.

		Class II	Class VI	Site
Hectares		3.8	17.75	21.55
LUC		2e 1	6s 8	2e 1 + 6s 8
Stocking Rate*	Average	10	5	5.9
	Top Farmers	17	6	7.9
	Potential	20	7	9.3

Table Ref: LRIS Portal: NZLRI Land Use Capability 2021

* LRIS definitions of stock units are used for purposes of land polygon comparison

Image 10

Current district farming practise in this location and on similar soil types are benchmarked against Beef & Lamb Farm Class Survey data and from local knowledge of livestock farming practices.

		Current District Stocking Rates**		Site Average**
Hectares		3.8	17.75	21.55
LUC		2e 1	6s 8	2e 1 + 6s 8
Stocking Rate	Average	14	9.5	10.3
	Top Farmers	16	12	12.7

** Beef & Lamb NZ: Farm Class Survey; local knowledge of farming systems

Image 11

Discussion

A farmer will determine a sustainable farm stocking rate as a weighted average of the site that can be maintained year to year, balancing the strengths and weaknesses of the soils and physical characteristics of the land.

Therefore, a current farmer is expected to be grazing approximately 222 stock units. If a farmer only farmed the Class 6 land, there would be a loss of balance of soil type, soil moisture resilience and herbage productivity, so the effective stocking rate falls to 9.5 su/ha and approximately 169 stock units in total.

	Hectares	SU/ha	SU
Current District Stocking Rate	21.55	10.3	222
Farming Class 6 only	17.75	9.5	169
Stock unit loss from Class 2	3.8	14	53

Image 12

It is therefore assessed that the loss of the Class 2 Highly Productive Land, is 53 stock units (3.8 ha at 14.0 su/ha).

Neighbouring land use of Class 2 land, and Class 2 land infrastructure

The site is surrounded by a subdivision containing 19 residential lots to the north, west and south, and 2 existing lots (Lot 3 and Lot 4 at 2.0 and 2.1 hectares respectively) in the south-west corner.

The site is bounded by Inland Kaikoura Road to the east and partially by SH1 to the south.

Access to the Class 2 land is only through the Class 6 land on the site, east of the Class 2 land, which would require an easement to formalise access if Class 2 land is not owned by the same entity. It is assumed that all farm machinery, including all the commonly used cultivation implements used by contractors, plus spray rigs, balers, header harvesters, etc, can access the site through any easement provided. An indicative route is shown (red line) in Image 13.

The Class 2 land has five immediate neighbouring residential lots to the north, west and south of the [9, 8, Lot 3, Lot 4, Lot 19). Using the distance from the centre of each residential lot to the nearest boundary of the Class 2 land as a measure of separation of residential houses to potential land uses and therefore a measure of the potential impacts of agriculture activities from the Class 2 land on the

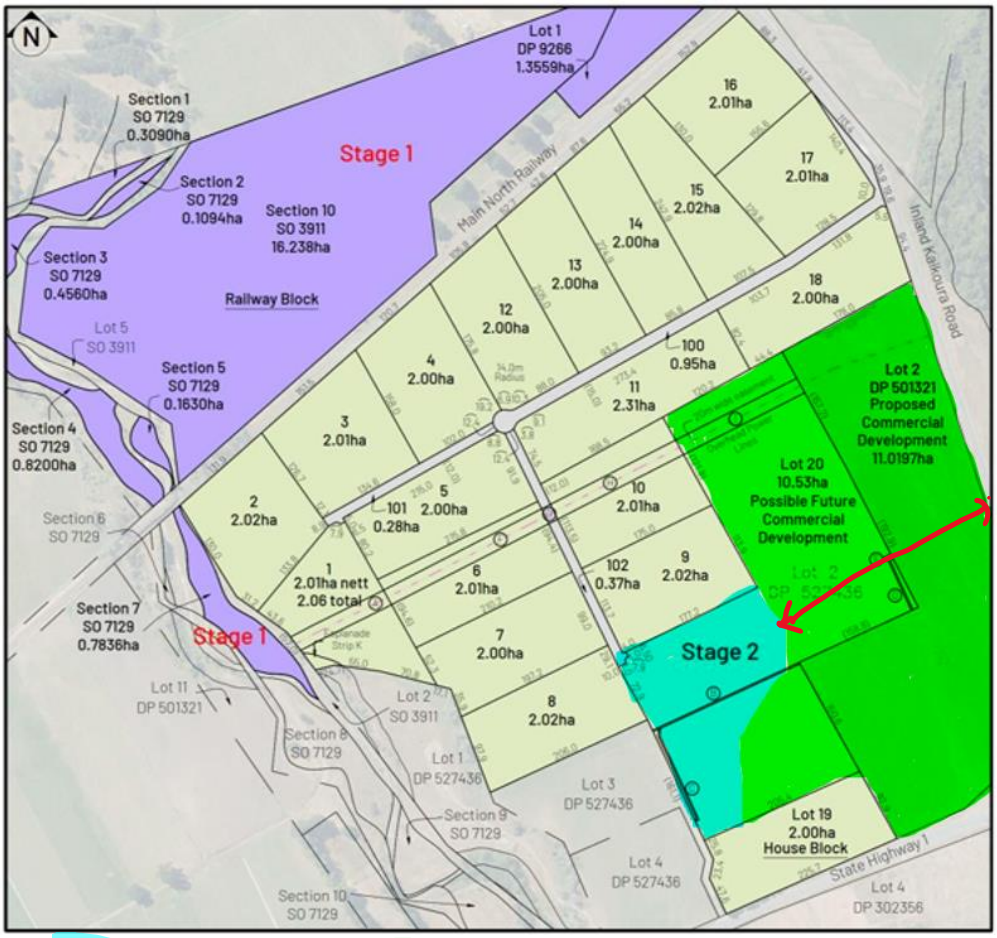
neighbours, the distances range between approximately 40m (existing house, Lot 19) to 120m, with an average distance of 81m. It should be noted that all 21 lots around the site including the Class 2 land specifically, are approximately 2.0 hectares in size and all lie within approximately 630m direct line to the Class 2 land and that the Class 2 non-immediate neighbours will also potentially be impacted by possible land use activities on the Class 2 land.

Potential impacts include agricultural chemical spray drift, dust from land cultivation and fertiliser spreading, and noise pollution from machinery and vehicle use.

The Class 2 land is dryland and has no farming consents on it. It is currently livestock fenced into two paddocks of perennial pasture. There are two concrete water troughs and water reticulation via alkathene pipework. Currently the site has no livestock water source.

The site has no irrigation water as the previous irrigation consent (CRC183918) has been converted to community water supply for Kaikoura Business Park 2021 Limited at 69 Inland Road (CRC240909 - 310 cubic metres of groundwater per day from bore O31/0155 which is screened from 15.5-18.6 m deep), effective November 2023.

Livestock water was also provided from the irrigation well using a separate pump, which has subsequentially been disestablished.



Key: Class 2 land Class 6 land indicative access route Image 13

In order to analyse possible primary production land uses on the Class 2 land, the following assumptions have been made.

Physical Access
Access is through the Class 6 land to the east of the Class 2 land.

Livestock Water
Livestock water will be required in order to graze livestock on the Class 2 land. It is assumed that a shallow bore would be installed specifically for this site, including 35,000 L tank, pressure pump, generator, small weather-cover structure. Cost approximately $20,000 – see later discussion.

Electricity Supply
Electric fence power is currently provided by way of mains power to an electric fence energizer located on the site. It is assumed that once the Class 2 land is separated from the Class 6 land that livestock fencing power would be provided by way of batteries or portable solar panels (cost approximately $500) and pumping of livestock water is done by way of small petrol or diesel generator (cost included in livestock water).

Alternatively, permanent access to a metered mains power source will need to be provided.

Stock yards and load-out ramp
There are no yards on the Class 2 land. A small set of yards that can handle sheep and cattle, and with a load out ramp would cost approximately (materials & labour) $10,000.

Shearing shed
There are no buildings on the Class 2 land. Normally a shearing shed is needed, but given the small number of sheep, it is assumed that shearing outdoors with electric battery shears is sufficient to harvest wool and meet sheep welfare requirements (flystrike, etc).

Fencing
It is assumed that the Class 2 land has permanent livestock fencing around it. It is currently fenced into two paddocks. Any further fencing is assumed to be provided by temporary electric fencing, powered by solar powered battery.

Contractors
It is assumed that all contractors required, depending on the type of land use activity, are available in the district, and are not limiting in terms of potential land use choices available.

Class 2 Primary Production Land Use Options

Stock water

While water demand for sheep is relatively low, and higher for cattle, livestock water is required for production and for animal welfare reasons.

A shallow bore can be installed to source water for stock use. Environment Canterbury designate livestock water as a permitted activity from groundwater sources as long as take is less than 10m³ per property per day, which is more than would be required for the Class 2 land.

It is estimated that an < 25m installed well with a surface pump driven by a small pump run from a petrol or diesel generator, auto switch on/off controls, 35,000-litre tank, and a small protective pump-shed would cost approximately $17,000 - $22,000 and depending on final depth.

Annual running costs of approximately $400/year for fuel.

Irrigation water

While the Class 2 land is rated as having high Water Holding Capacity at 123mm PAW_{100}, the dry summers typically experienced at the site mean that the high evapotranspiration rates place pastures or crops in moisture deficit conditions typically between December to late March in most years. A pasture-based stock system can be designed around this limitation with its implicit lower summer animal productivity performance, but any more intensive or higher productivity requirements, or intensive arable crop or soil based horticultural activity will require irrigation water.

The cost of a bore, screen, pump, & electrics, 3-phase power supply to the Class 2 land (assuming consents and easements are achieved across neighbouring land), and a water application system tailored to the land use activity (but assumed to be sprinkler based) would cost approximately $200,000 - $250,000 including consenting fees, depending on final well depth, and distance, route to mains electricity supply, and underground/overhead supply requirements.

Annual running costs are seasonally dependent, estimated at $2,000 - $2,500/year, with annualized consent renewal fees, consent audit fees, Farm Environment Plan costs, water use monitoring charges estimated at an additional $1,500-$2,000/year.

Irrigation consents would be required to take and to use water. This is not guaranteed and gaining appropriate consents with satisfactory water use conditions that don't restrict crop irrigation timing or volumes (the water must be reliable in daily flow during the crop growing to harvest period, and with sufficient volume (annual cubic metres). Consent application would also require that the applicant's well would not impact on existing wells and bores within 1.5km of the planned well site, including in this case the Community Water Supply located on the Class 6 land (CRC 240909).

It is considered that the likelihood of obtaining irrigation consents is low to very low. The applicant will also need to be prepared to take a total loss of approximately $50,000 - $60,000 if the consent is not granted (drilling a test well, flow rate testing, preparation of application, ECAN application fees, etc).

In summary, as the likelihood of being granted an irrigation consent is highly unlikely. Primary production land use activities that require irrigation have been ruled out. This excludes viticulture and horticulture and market gardening activities; while these could be pursued as dryland ventures, in my opinion no prudent land user would undertake the level of investment with the degree and extent of summer and autumn drought risk involved.

Horticulture

No viable horticultural options are feasible without irrigation water.

Farming Land Use Options

Technically feasible options for this site are:

- Dry-stock sheep
- Dry-stock cattle
- Dairy heifer contract grazing
- Dairy cow winter contract grazing
- Arable cropping & dryland sheep ("mixed farming")
- Sale of hay and baleage

Dry stock Sheep
There are a number of sheep policy permutations, but district practise sheep policy would be grazing breeding ewes, selling the progeny finished to a processor or store to other farmers to finish. Usually with small flocks, replacement ewes are purchased, rather than bred and grown out.

Using the *Beef & Lamb NZ Economic Service; Class 6 SI Finishing Breeding – Marlborough & Canterbury* as a benchmark, the site would carry 53 stock units (or 46 breeding ewes). However, and typically, small blocks carry slightly higher stocking rates, at +10% or 15.5 su/ha, and would therefore carry 59 stock units (or 51 breeding ewes).

Dry stock cattle
The usual small block cattle policy is to purchase yearling cattle and graze for approximately 12-14 months before sale to meat processors. Using the Beef & Lamb Economic Service data, and at +10% higher small block stocking rate, this site would be expected to carry 12 head.

Dairy heifers and dairy cows
There are two dairy contract grazing options that while technically feasible are highly unlikely to occur as no dairy farmer would entertain placing such small numbers of stock (respectively 14 heifer calves per year (Rising 1yr old & Rising 2yr old), or 20 mature in-calf cows per winter) grazing on the site when grazing contracts typically are for herd sizes of 125 -150 calves, and 350 – 1000 cows.

Mixed Farming
Dryland arable cropping is carried out in Canterbury/Marlborough on a small scale and as part of an integrated crop and stock policy. Typically, a cereal grown is feed barley, and sometimes low-specification old varieties of perennial grass seed. Given the erosion risk vulnerability of the soils, the crops would need either to be direct-drilled after spraying out with herbicide or minimum-tilled (shallow cultivated).

Typically, pasture-crop rotations would be either autumn or spring sown barley, to permanent pasture for 4-5 years, then repeat; with sheep or cattle grazing the pasture.

Dryland barley yields average 5.5 t/ha, and barley straw at 4 medium round bales per hectare; and during pasture years 51 breeding ewes.

Supplementary feed hay or baleage
Permanent perennial pasture commonly includes two spring and early summer cuts, and two mid-late autumn cuts provided there has been sufficient autumn rainfall. Harvest approx. 114 bales of hay or baleage (9+9+4+8 = 30 bales per hectare). The first two cuts are generally reliable with good soil moisture levels. The third cut is the most variable as it occurs during the period of high ET rates and high soil moisture deficit; in three to five years out of ten, no third cut may be taken. The furth cut is also variable but to a lesser extent, depending on timing of autumn rains.

Note: in all scenarios, perennial pastures require replacement after 6-8 years to maintain quality & vigour.

Economic Viability

The four technically feasible options able to be undertaken as part of normal farming practise year-in-year-out are:

- Dry-stock sheep
- Dry-stock cattle
- Mixed farming (with dry-stock sheep or cattle)
- Sale of hay and baleage

The economic viability of each option is detailed on page 16, Image 14.

Summary

All land use options are able to generate sufficient income to cover direct operating expenses, with an average $5,225 Net Trading Result.

	Net annual trading result (rounded)
• Dry-stock sheep	+$7,200
• Dry-stock cattle	+$4,800
• Arable cropping	+$5,900
• Sale of hay/baleage	+$3,000

Capital investment is required to purchase livestock and to provide the infrastructure to efficiently carry out most land use options. If the cost of capital required is calculated at 5.0% and principle payments are made over 5-years for livestock and 10-years for infrastructure, then Net Annual Cash Result is:

	Total investment	Net annual cash result (rounded)
• Dry-stock sheep	$30,500	+$900
• Dry-stock cattle	$30,500	-$2,700
• Arable cropping	$30,500	-$100
• Sale of hay/baleage	$0	+$2,800

Only the dry-stock cattle policy is unable to generate sufficient income to cover direct expenses, cost of livestock and cost of infrastructure improvements (interest & principle), while dry-stock sheep and mixed farming are essentially at breakeven financially.

While making and selling of supplementary feed makes the highest net cash surplus at $2,800 this is primarily due to not requiring infrastructure improvement or to purchase any livestock. This $2,800 cash surplus is considered to be small with low profit resilience and combinations of input cost increases and normal seasonal variations in yield resulting from poor climatic conditions (primarily late spring and longer summer dry periods) would easily result in a breakeven position at best in approximately five years in ten.

In this analysis there is no provision for owner's labour time committed to managing the activities, or other labour costs (excluding contractors labour) and there is no allowance made for cost of capital invested in purchasing the Class 2 land.

No prudent farmer would view any of these options as economically viable on this site.

Sheep

Policy: 51 ewes, 140% lambing, all lambs to kill, 4.2 kg wool/ssu, 5.1% deaths

Effective Hectares	3.80				
SU/ha (+10% higher)	15.50				
Total SU	58.90				
Gross Income - incl sire costs		**$10,122**			
Direct Farming Expenses					
Rates (pro rata)	$867				
Insurance	$182				
Animal health	$200				
Shearing	$590				
Annual fertiliser	$640				
Pasture renewal - annualised	$100				
Hay/Baleage made	$243				
R&M	$53				
Freight IN	$55				
ACC	$43				
Administration contribution	$0				
Vehicle Opex Contribution	$0	**$2,973**		**$7,148**	A
Livestock Loan Interest	$333	5.0%	$6,658		
Livestock Loan Principle	$1,332	5-years			
		$1,665		**$5,484**	B
Improvements Loan Interest	$1,525	5.0%	$30,500		
Improvements Loan Principle	$3,050	10-years			
		$4,575		**$909**	C

Beef

Policy: 12 yearling purchased, 12 killed at 26mths, no deaths

Effective Hectares	3.80				
SU/ha	15.50				
Total SU	58.90				
Gross Income - net of purchase costs		**$7,657**			
Direct Farming Expenses					
Rates (pro rata)	$867				
Insurance	$182				
Animal health	$41				
Shearing	$0				
Annual fertiliser	$640				
Annual Pasture renewal	$100				
Hay/Baleage made	$605				
R&M	$53				
Freight IN	$295				
ACC	$43				
Administration contribution	$0				
Vehicle Opex Contribution	$0	**$2,826**		**$4,831**	A
Livestock Loan Interest	-$589	5.0%	-$11,780		
Livestock Loan Principle	-$2,356	5-years			
		-$2,945		**$1,886**	B
Improvements Loan Interest	$1,525	5.0%	$30,500		
Improvements Loan Principle	$3,050	10-years			
		$4,575		**-$2,689**	C

Mixed Farming (Barley + drystock sheep)

Policy: 1yr Barley at 5.5 t/ha, 4b straw & 5yrs sheep

Effective Hectares	3.80				
SU/ha	15.50				
Total SU	58.90				
Gross Income - annualised		**$8,869**			
Barley price average last 5yrs less 10% for sale off header					
Direct Farming Expenses					
Rates (pro rata)	$867				
Insurance	$182				
Animal health	$167				
Shearing	$492				
Annual fertiliser	$533				
Pasture renewal - annualised	$100				
Hay/Baleage made	$202				
R&M	$53				
Freight IN	$55				
Barley Crop Direct Exp	$313				
ACC	$43				
Administration contribution	$0				
Vehicle Opex Contribution	$0	**$3,007**		**$5,862**	A
Livestock Loan Interest	$277	5.0%	$5,548		
Livestock Loan Principle	$1,110	5-years			
		$1,387		**$4,475**	B
Improvements Loan Interest	$1,525	5.0%	$30,500		
Improvements Loan Principle	$3,050	10-years			
		$4,575		**-$100**	C

Hay/Baleage Supplement

Annual Policy: 121 bales (4x cuts) grass, stored & sold during winter

Effective Hectares	3.80				
SU/ha	15.50				
Total SU	58.90				
Gross Income		**$10,032**			
Direct Farming Expenses					
Rates (pro rata)	$867				
Insurance	$182				
Animal health	$0				
Shearing	$0				
Annual fertiliser	$888				
Pasture renewal - annualised	$150				
Hay/Baleage made	$4,902				
R&M	$11				
Freight IN	$0				
ACC	$43				
Administration contribution	$0				
Vehicle Opex Contribution	$0	**$7,043**		**$2,989**	A
Delayed sale Interest	$5,790	5.0%	$217		
		$217		**$2,772**	B
Improvements Loan Interest	$0	5.0%	$0		
Improvements Loan Principle	$0	10-years			
		$0		**$2,772**	C

Image 14

Summary and Conclusions

- Part of the site (3.8 hectare) is classified as Land Use Class *2e1* which brings it under the NPS Highly Productive Land regulations. The remainder of the site (17.75 ha) is Class 6s 8 land and therefore is not NPS-HPL land.
- The soils on the Class 2 land are vulnerable from sheet wind erosion during cultivation which needs to be considered first in both selection of land use options and the strategies used to operate each land use option on the site.
- Soils with wind erosion risk, require minimum-tillage or direct drilling during pasture or crop establishment in order to minimise wind-blow risk. Consequently, the frequency of land cultivation needs to be low favouring long periods in perennial pasture or perennial crops.
- Arable crops or green feed crops can be grown, if grown infrequently with long periods of pasture in-between to minimise soil blow risk primarily during windy equinox periods.
- The Class 2 land is summer drought prone with significant soil moisture deficit experienced from mid-December to late-March requiring conservative stocking rates, animal growth rate, and arable & supplement yield expectations.
- The Class 2 site is dryland and has no current source of stock water or mains electricity, or stock yards.
- Irrigation consents are highly unlikely to be granted on this site, so only dryland land use options are available.
- Even in the unlikely event of irrigation consent being granted, the high capital cost of up to $250,000 would add approximately $12,500 per year in interest costs (5%) and $12,500 per year in principle repayments (20-year term)
- Provision of livestock water via a bore (Environment Canterbury permitted activity) would cost approximately $20,000 with annual running cost of $400.
- Generators (for water pumps) and portable batteries or solar panels (for fencing) are expected to be used instead of mains power connection.
- There is expected to be a high potential impact on adjacent rural residential subdivision neighbours to the north, west and south from dust & spray-drift, and noise pollution as well as mud & debris on access roads.
- There are six technically feasible land use options, but two rely on supply of contract grazing dairy cattle which is not likely on a site of this size.
- Potential land use options include dryland sheep, dryland beef cattle, mixed farming (arable crop & sheep), and selling supplementary feed (hay and baleage)
- All options are able to gross sufficient income to cover direct operating costs and standing charges with an Operating Surplus of between +$3,000 and +$7,200 per year. Average +$5,200 per year.
- Total development and livestock capital requirements, on average over the four options is $22,900 with a range between $0 and $30,500.
- After including the cost of capital (5.0%) and principle payments the average Net Cash Result is +$900 per year with a range between -$2,700 and +$2,800 per year.

- Only one option (making and selling of supplementary feed) is able to make a Net Cash Profit at +$2,800 per year, principally because no infrastructure investment is required. How ever, this is not considered a financially resilient or reliable result given normal climate variability, and breakeven is likely five years in ten.

- Economic viability has been calculated using stocking rates 10% higher than the benchmark stocking rates, which indicates that higher stocking rates are not able to overcome lack of economic viability while at the same time increasing productivity risk with more stock being grazed during summer drought months.

- It is difficult to see any prudent land user placing themselves under these kinds of financial risks to farm the land on this site and with little likelihood of recouping any capital invested into land improvement and infrastructure, or the initial land purchase investment.

- The small scale of the site, no electricity, no irrigation water, no livestock water, future access to be provide by easement, high relative cost of providing limited infrastructure to graze livestock, on summer drought-prone soils vulnerable to wind erosion means that there is no long term economically viable primary production land use for this site of Class 2 soil.

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Appendix A

Land Use Capability Definitions

Land Classes 1 to 4 are suitable for arable cropping (including vegetable cropping), horticultural (including vineyards and berry fields), pastoral grazing, tree crop or production forestry use.

Land Classes 5 to 7 are not suitable for arable cropping but are suitable for pastoral grazing, tree crop or production forestry use, and, in some cases, vineyards and berry fields. The limitations to use reach a maximum with LUC class 8.

Land Class 8 land is unsuitable for grazing or production forestry and is best managed for catchment protection and/or conservation or biodiversity.

LUC 1	Land with virtually no limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 2	Land with slight limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 3	Land with moderate limitations for arable use and suitable for cultivated crops, pasture, or forestry.
LUC 4	Land with moderate limitations for arable use and suitable for occasional cultivated crops, pasture, or forestry.
LUC 5	High producing land unsuitable for arable use, but only slight limitations for pastoral or forestry use
LUC 6	Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forestry
LUC 7	Non-arable land with severe limitations for use under perennial vegetation such as pasture or forestry
LUC 8	Land with very severe to extreme limitations or hazards that make it unsuitable. for cropping pasture or forestry.

Land use capability subcategory

Each LUC unit has a subcategory of the LUC class through which the main kind of physical limitation or hazard to use is identified. Four limitations are recognised:

- 'e' erodibility – where erosion susceptibility, deposition, or the effects of past erosion damage *first* limits production
- 'w' wetness – where soil wetness resulting from poor drainage or a high-water table, or from frequent overflow from streams or coastal waters *first* limits production
- 's' soil – where soil physical or chemical properties in the rooting zone such as shallowness, stoniness, low moisture holding capacity, low fertility (which is difficult to correct), salinity, or toxicity *first* limits production.
- 'c' climate – where climatic limitations such as coldness, frost frequency, and salt-laden onshore winds first limits production