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memorandum

TO	Doyle Richardson	FROM	Alana Bowmar, Hilary Lough
	Mitchell Daysh	DATE	13 September 2022
RE	Matters of Clarification [APP-20222295]		

The memorandum has been prepared by Pattle Delamore Partners Ltd (PDP) to respond to the queries raised by Ryan Hodgson, Environment Southland (email, 12 August 2022). Ryan's queries are provided as headings, with responses directly below.

What is the maximum total volume of effluent to be discharged each day from all sources including wastewater, biosolids, stockyard solids, paunch and grit.

Please see a summary of maximum daily treated wastewater volumes below.

Table 1: Wastewater Volumes

Source	Volume (m^3/d)
Wastewater	1,500
Biosolids	(included in wastewater volume)
Stockyard solids, paunch, grit [1]	6
Total	**1,506**

Notes:

1. *Assumed density of 500 kg/m^3, and a peaking factor of 2.0.*
2. *The maximum daily wastewater has been provided based on the maximum daily water take. This volumetrically will be split into the wastewater and biosolids lines in varying proportions depending on wasting rates, biosolids concentrations etc. etc.*

Please confirm that 157,000 m^3/year of treated wastewater from the slaughterhouse and 57,797 m^3/year of biosolids (WAS) will be discharged each year and if this volume is an increase on what was previously discharged annually as this volume will be based on a 12 month meat processing season rather than the previous 10 month season. Please also confirm what the annual volumes of discharge was when the plant was being operated over 10 months. Furthermore, please also state the volumes of effluent being discharged from stockyard solids, paunch and grit from the previous 10 month season and the proposed 12 month season.

PDP can confirm that based on the forecasted growth (including an increase to a 12-month processing season), conservative water use per unit processed rates, and estimated stormwater contributions from potentially contaminated hardstand areas and rainfall directly to the lagoons; that blue sky pastures may discharge up to:

- 157,100 m^3/yr of treated wastewater; and
- 57,797 m^3/yr of biosolids.

These volumes are greater that previous annual discharge volumes, which are elaborated on below.

Limited flow record data has been made available to PDP, and all of the data provided appears to cover between a 10 and 11-month processing period. Data available included:

- Groundwater take data from 11 June 2018 to 24 February 2021.
- Flowmeter data from the Sequencing Batch Reactor (SBR) to the Irrigation Storage Lagoon from 1 July 2020 to 30 June 2021 (e.g. the 2020/2021 annual monitoring period).
- Flowmeter data from the waste activated sludge (WAS)/biosolids line 1 July 2020 to 30 June 2021 (e.g. the 2020/2021 annual monitoring period).

The following summaries provide an indication of previous years wastewater and WAS generation:

- Annual water take (July to June) was 109,000 m^3/yr in 2018/19 and 137,000 m^3/yr in 2019/20.
- Combined annual flow (July to June) from the SBR decant and biosolids combined was 154,000 m^3/yr in 2020/21 (including stormwater ingress and direct rainfall inputs).

There are no records kept for paunch, stockyard solids and grit. BSM's has advised that this is typically around 1 - 1.5 tonnes/day. This has conservatively been assessed as 500 tonnes/yr to allow for a 12-month processing period.

The new wastewater treatment plant, improved management (including riparian planting) and/or substantial expansion of the land treatment system into the third-party farms, mitigates the increase in wastewater volumes that are planned for irrigation.

It must be noted that for a food processing plant, the use of water is a hygienic requirement and may change without notice under the requirements from Ministry of Primary Industries in accordance with any changes to food safety. There is enough conservatism provided in this assessment to allow for minor changes in water use for food safety requirements.

Please clarify or confirm that the BSM-owned land is 130ha with a discharge area of 77ha and the 3rd party owned land is 122ha with a discharge area of 101ha and the total land area is 152ha with a total discharge area of 178ha.

Please find Table 2 provided below to clarify irrigation and land areas.

Table 2: Summary of BSM Land Treatment Areas

Ownership	Irrigable Area (ha)	Total Area (ha)
Blue Sky Meats Owned	77	130
Third-party Owned	101	122
Total	**178**	**252**

Please confirm how much effluent storage is needed to ensure there is enough storage capacity to enable differed irrigation for when a soil moisture deficit exists. A effluent storage calculation such as a Massey DESC equivalent would be sufficient to show there is enough storage.

The application is for a year-round, **non-deficit irrigation activity** on the BSM owned land (refer to Page 1 of the Technical AEE). The non-deficit irrigation does not require storage subject to the ability to dispose of the treated wastewater onto land. This is a normal land discharge practice, where discharges to land is required all year round.

Blue Sky Meats do not propose to store treated wastewater until soil moisture deficit exists. Comparisons of this activity (non-deficit irrigation of treated industrial wastewater) with applications of untreated farm dairy effluent, and the typical controls surrounding that activity, should be treated with caution and is not applicable. In particular, dairy shed operations and effluent production are reduced over winter drying off periods where dairy cattle do not produce milk for 6 to 8 weeks reducing storage requirements. Furthermore, the production of dairy effluent is proportional to dairy stock numbers and available farm area, meaning there is typically enough land available to limit dairy effluent storage requirements.

The current site storage volume (15,000 m^3) is available to for the purposes of deferring irrigation during large wet weather events, irrigation system maintenance and shut-down periods only (when irrigation staff are offsite) for the purposes of managing the land discharge system. The storage capacity provided allows for mitigating runoff and ponding risks that are elevated during large wet weather events. The provided irrigation storage provides for 10 days storage of peak wastewater flows.

The use of the storage is cautiously utilised as this presents the risk of having to dispose of the stored wastewater as well as the normal production wastewater and could result in higher hydraulic loading onto land. Under normal operations the purpose of the storage is to moderate the peak discharges so that a uniform hydraulic loading is undertaken for the land treatment system.

Long-term storage of secondary treated wastewater is not proposed, as it has its own set of challenges, including:

- Significant odour risk, requiring air discharge consent and likely requiring aeration.
- Triggering dam classification and potential dam consents, monitoring and maintenance requirements.
- Nuisance bird life, especially with large resident seagull population in the vicinity of the processing plant with risk of higher faecal load in the irrigation water.
- Significant capital costs, and operational costs. Removal of some irrigable land (> 2ha) for the purposes of storage.

However, to answer this question, we have used our daily soil moisture model (as described in the PDP Technical Memorandum A03220205M002 (9 March 2022) titled: “Soil Moisture Modelling for Land Treatment System” to model differed irrigation and assess the storage requirements to achieve deficit irrigation. For this model run, we have added an additional control on the irrigation, to only occur when soil moisture levels are below field capacity, i.e., when soils are above field capacity, no irrigation occurs, and the wastewater is diverted to storage until there is a soil moisture deficit. The results of this assessment are summarised by Table 3, Figure 1 and Figure 2 below.

Table 3: Storage Requirements

Scenario Description	Area (ha)	Storage Volume Required (m^3)
Future WW Flows, Climate Change Adjusted rainfall and PET, BSM Land Only, and 10-year Level of Service.	77	85,000
Future WW Flows, Climate Change Adjusted rainfall and PET, BSM and Third-party Land, and 10-year Level of Service.	178	65,000

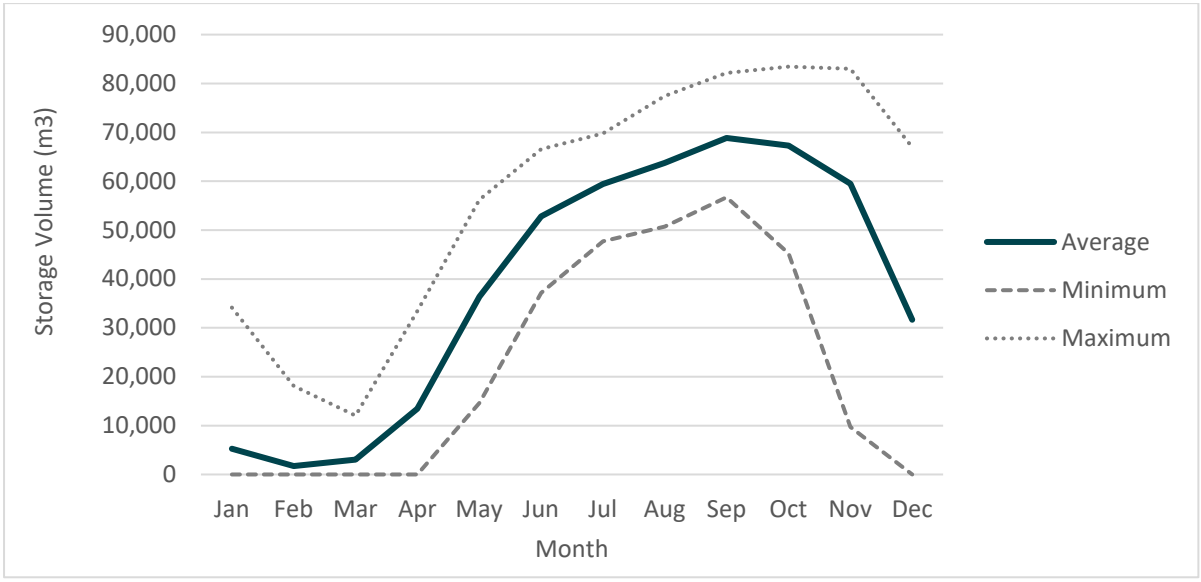

Figure 1: Monthly Summary of Storage Volumes (BSM Land Only)

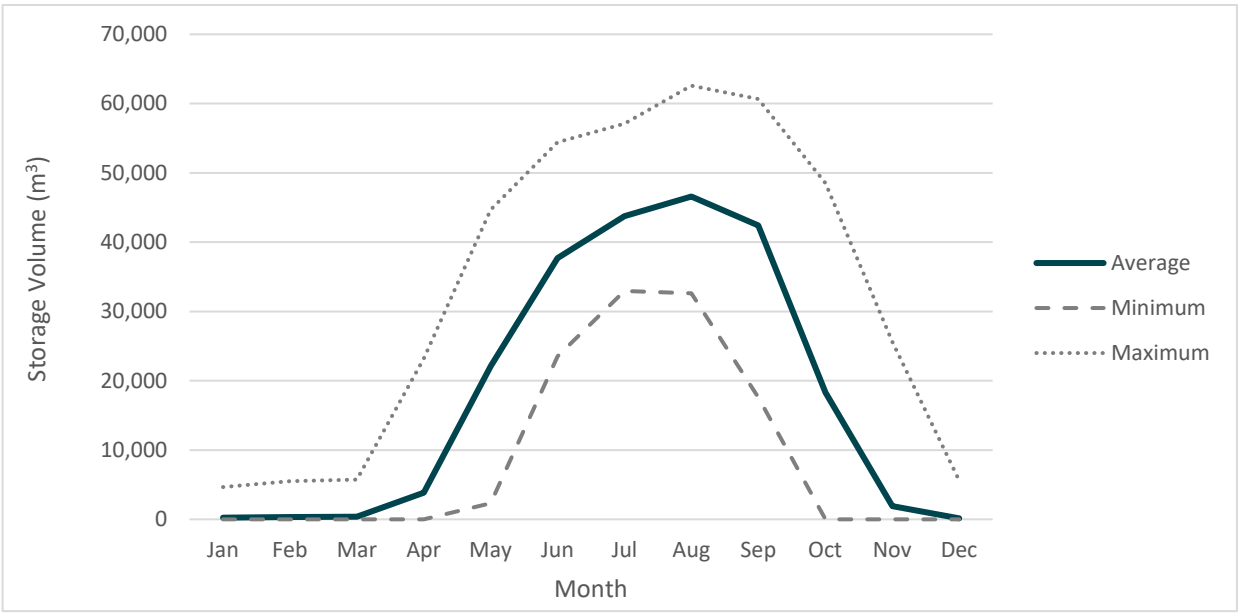

Figure 2: Monthly Summary of Storage Volumes (BSP and Third-party Land)

We consider that based on the modelling requirements and the risks for managing treated wastewater, in terms of algal growth, microbial load increase, there is no need for storage at the BSM site.

Please confirm what the rate of take is for the water abstraction in litres per second and confirm if there is any water storage tanks and how much volume they can store.

Previously, the consent has only had a daily volume specified. If a peak instantaneous rate is to be included in the consent, this should be 40 L/s, so that it is sufficiently high to accommodate current requirements and any future changes to pumps/pumping regimes etc (e.g. short term pumping at higher rate). This is set on the peak pump capacity of the 3-bore pumps currently on site (each with a pump rate of 46 m^3/hr).

At continuous pumping at a rate of 40 L/s, the daily volume of 1,500 m^3 would be used up within 10.5 hours. Due to the large distance to neighbouring supply bores in the confined aquifer system, the greatest predicted drawdown interference occurs after a number of days of abstraction as presented in the AEE. It is controlled by the daily volume of 1,500 m^3 rather than the short term instantaneous rate of 40 L/s and therefore this peak rate proposed does not change the drawdown assessment provided. As per the AEE, effects on shallow bores and stream depletion effects are further delayed and attenuated so are not impacted by the short term instantaneous rate.

The following water storage is available onsite:

- Office rainwater tanks (6 No. 15 m^3)
- Rendering plant:
  - Cold potable (3 No. 35 m^3)
  - Hot water (1 No. 65 m^3 and 1 No. 30 m^3)
- Yards tanks potable and recycled (3 No. 35 m^3)
- Salt shed tanks potable and rainwater (3 No. 35 m^3)
- Water plant storage (134 m^3)
- Fire tank (100 m^3)

Please confirm what the discretionary allocation of the confined aquifer is and the amount currently allocated for the confined aquifer in the RWP. I note that an assessment was provided against the relevant appendices of the pSWLP including appendix L.6 but not the RWP.

The assessment method for determining allocation from a confined aquifer in the RWP is the same as the pSWLP, in terms of being based on the percentage of aquifer throughflow. Both the RWP and pSWLP have a threshold at 75% of throughflow (for example Rule 23 (d)(iii) of the RWP for discretionary activity status). As per section 4.2.1 of the PDP Technical Report No. A03220205 (28 June 2022) titled '*Blue Sky Meats Groundwater take Consent Application: Technical Assessment of Environmental Effects*', the groundwater abstraction has been assessed as less than 75% (at between 15 to 41% of the throughflow for the maximum daily abstraction of 1,500 m^3) and the other consented abstractions in the confined aquifer are of small magnitude (168 m^3/d and 78 m^3/d) so, in combination, will not cause an exceedance of the 75% allocation threshold.

Please clarify how the discharge of dewatered groundwater and stormwater to surface water should be considered under rule 3 in the RWP and not rule 1 or 2 of the RWP.

The dewatered groundwater and stormwater system discharges to a farm drainage canal, and therefore is considered an artificial watercourse, rather than a natural watercourse.

Please confirm what the NZTM2000 coordinates are of the discharge point into the open drain from dewatered groundwater and stormwater.

The NZTM coordinates for the dewatered groundwater and stormwater outfall are:

- E 1,265,121
- N 4,857,701

Can you please provide the Overseer report and access to the Overseer budget so I can assess this information against that provided in the application and can have it peer reviewed if necessary.

Please find the Overseer report attached. Please contact Alana Bowmar (Alana.Bowmar@pdp.co.nz) for additional access and provide the email address of who is to be given access.

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Blue Sky Meats (NZ) Ltd and others (not directly contracted by PDP for the work), including Mitchell Daysh. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This memorandum has been prepared by PDP on the specific instructions of Blue Sky Meats (NZ) Ltd for the limited purposes described in the memorandum. PDP accepts no liability if the memorandum is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Prepared by

Alana Bowmar

Service Leader – Water Infrastructure

Reviewed and Approved by

Hilary Lough

Technical Director – Water Resources

Appendix A: Overseer Reports

Blue Sky Pastures LTS

729 Woodlands-Morton Mains Road, Morton Mains 9871, New Zealand

OverseerFM

Proposed Activity - BSP + Third-party - 200 kgN/ha

Analysis type	Predictive
Is publication	No
Application version	4.3.3.3
Printed date	21 Aug 2022, 5:53PM
Model version	6.4.3

Farm details

N 11 kg/ha | 2,876 kg P 0.3 kg/ha | 77 kg GHG 3,264 kg/ha | 822.5 tonnes NCE: 80 v6.4.3

Total area	252 ha
Productive block area	220.30 ha
Nitrogen conversion efficiency (NCE)	80%
N Surplus	27 kg/ha
Region	Southland

Total liveweight brought (kg/ha grazed)	243	Percent male beef animals	60
Total liveweight reared (kg/ha grazed)	62	Beef / dairy grazing stock rate (RSU)	30
Total liveweight sold (kg/ha grazed)	400	Sheep stock rate (RSU)	1414

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N IN DRAINAGE (PPM)	N SURPLUS/HA	P LOSS	P LOSS/HA	BLOCKED AREA %	N FARM LOSS %
BSP Irrigated	Cut and carry	77	1,024	13	2	3	21	0.2	33	36
BSP Non-irrigated	Cut and carry	24.7	124	5	1	-166	3	0.1	10	4
Third-party Irrigated	Pasture	101	1,146	12	2	93	32	0.3	43	40
Third-party Non-irrigated	Pasture	17.6	180	10.2	2	80	5	0.3	7	6
Kale	Fodder crop	4	298	75	14	-9	2	0.4	-	10
Trees	Trees and scrub	13.1	33	2	0	0	2	0.1	6	1
Trees1	Trees and scrub	2.7	7	2	0	0	0	0.1	1	0
Other sources	Other	-	63	-	-	-	13	-	-	-

Farm soils

S-MAP REF/NAME	GROUP/ORDER	DRAINAGE CLASS	MODIFIED	TOTAL AREA (HA)	% OF PROD. BLOCKS	BLOCKS
Paro_4a.1	Sedimentary/Gley	Poor	No	17	7.7	2
Waiki_34a.1	Sedimentary/Brown	Well	No	116.5	52.9	4
Wood_29a.1	Sedimentary/Brown	Imperfect	No	86.8	39.4	4
Ymai_25a.1	Sedimentary/Gley	Poor	No	0	0	0

Enterprises

STOCK NUMBERS

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	-	-	-	-	10	30	30	-	-	-	-	-
R2 Heifers Class: Heifers and cows | Breed: Hereford	-	-	-	-	10	10	10	-	-	-	-	-
MA Bulls Class: Bulls | Breed: Jersey	-	-	-	-	-	20	20	-	-	-	-	-
Sheep	1580	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Ewes Class: Breeding ewes (mixed age) | Breed: Romney	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
Hogs Class: Ewes and female hoggets | Breed: Romney | Age: 10 months	380	-	-	-	-	-	-	-	-	-	-	-

RSU

NAME	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Beef	0	0	0	0	4	13	13	0	0	0	0	0
Sheep	108	140	227	207	216	96	68	93	82	62	53	61

Irrigators

NAME	AREA COVERED	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
SPRAYLINES Wastewater Irrigaor	174.8 ha												

Structures

No structures exist.

Supplements

CATEGORY	FEED	SOURCE	DRY WEIGHT?	AMOUNT	DESTINATION
Silage	-	BSP Irrigated (110), BSP Non-irrigated (35)	Yes	145 tonnes	Off farm (145)
Baleage	-	BSP Irrigated (838.7), BSP Non-irrigated (265.3)	Yes	1104 tonnes	Off farm (1104)
Baleage	-	Third-party Irrigated (340), Third-party Non-irrigated (60)	No	400 bales	Sheep (400)
Hay	-	Third-party Irrigated (17), Third-party Non-irrigated (3)	No	20 bales	Sheep (20)
Silage	-	Third-party Irrigated (169.7)	Yes	169.7 tonnes	Off farm (169.7)

Fertiliser

MANUFACTURER/MATERIAL	NAME	TOTAL APPLIED (KG)	N	P	K	S	CA	MG	NA
Ravensdown	10% Potash Super	3,192	-	259	160	316	575	-	3
Custom soluble fertiliser	Dry Season Irrigation Nutrients	-	11,197	2,367	-	-	-	-	-
Custom soluble fertiliser	Wet Season Irrigation Nutrients	-	3,810	1,699	-	-	-	-	-
Custom organic fertiliser	WAS-Other organic material	44,816,000	9,860	4,033	-	-	-	-	-
TOTAL		**44,819,192**	**24,867**	**8,358**	**160**	**316**	**575**	-	**3**

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,876	11
Phosphorus	77	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other	99	34	1	1	2	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	36	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	11	0.3	24	11	36	12	50
As product	4	1	0	1	1	0	0
As prunings	0	0	0	0	0	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	18	0	0	0	0	0	0
As supplements and crop residues	104	15	112	9	22	5	14

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-2	16	0	-15	0	0	0
Standing plant material	-3	0	-3	0	0	0	0
Inorganic mineral	0	5	-17	0	-2	-3	-3
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	1	-3	-116	0	-53	-7	-24
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	3	0	1	1	1	0	0

Blocks

BSP Irrigated

Cut and carry - Flat, 77 ha

N	P
13 kg/ha | 1,024 kg	0.2 kg/ha | 21 kg

BLOCK DETAILS

Area	77 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

60% WAIKI_34A.1
46.2 ha Brown

40% WOOD_29A.1
30.8 ha Brown

FODDER CROP ROTATIONS

Kale

ARTIFICIAL DRAINAGE

Drainage method	None

SUPPLEMENTS

Harvested (DM)	948.7 tonnes

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Waiki_34a.1	Wastewater Irrigaor	46.2 ha (60%)	616 kg	13 kg/ha	2.1 ppm	3 kg/ha	194 kg/ha	12 kg	0.2 kg/ha	N/A	N/A	N/A
Wood_29a.1	Wastewater Irrigaor	30.8 ha (40%)	408 kg	13 kg/ha	2.1 ppm	3 kg/ha	194 kg/ha	9 kg	0.3 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Waiki_34a.1	Wastewater Irrigaor	46.2 ha (60%)	642 mm	0 mm	698 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigaor	30.8 ha (40%)	642 mm	0 mm	698 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

Estimated change in soil test values for samples taken to 7.5cm:

- Increase in Olsen P test of 1 units
- Decrease in QT K test of 4 units
- Decrease in QT Mg test of 2 units

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,024	13
Phosphorus	21	0.2

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	194	70	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	29	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	13	0.2	29	9.2	47	16	63
To atmosphere	5	0	0	0	0	0	0
As Supplements	221	33	254	19	49	10	36

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-16	24	0	-23.2	0	0	0
Inorganic mineral	0	7	-15	0	-2	-3	-4
Inorganic soil pool	0	6	-265	0	-90	-16	-59

BSP Non-irrigated

Cut and carry - Flat, 24.7 ha

N	5 kg/ha | 124 kg	P	0.1 kg/ha | 3 kg

BLOCK DETAILS

Area	24.7 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

41% PARO_4A.1	35% WAIKI_34A.1	24% WOOD_29A.1
10.1 ha Gley	8.7 ha Brown	5.9 ha Brown

FODDER CROP ROTATIONS

Kale

ARTIFICIAL DRAINAGE

Drainage method	None

SUPPLEMENTS

Harvested (DM)	300.3 tonnes

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Paro_4a.1	-	10.1 ha (41%)	50 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	2 kg	0.2 kg/ha	N/A	N/A	N/A
Waiki_34a.1	-	8.6 ha (35%)	44 kg	5 kg/ha	1.1 ppm	-165 kg/ha	0 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Wood_29a.1	-	5.9 ha (24%)	30 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	0 kg	0.1 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Paro_4a.1	-	10.1 ha (41%)	446 mm	0 mm	699 mm	246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	8.6 ha (35%)	459 mm	0 mm	685 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	5.9 ha (24%)	459 mm	0 mm	685 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for P, K, Ca

Wood_29a.1/No irrigation - 5.9 ha (24%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Waiki_34a.1/No irrigation - 8.6 ha (35%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 2 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Paro_4a.1/No irrigation - 10.1 ha (41%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units

- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, February, March, April, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	124	5
Phosphorus	3	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	42	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	5	0.1	4	8.3	13	5	21.6
To atmosphere	0	0	0	0	0	0	0
As Supplements	208.3	28	195.9	18	47.6	14	8.6

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-171.3	16	0	-21.1	0	0	0
Inorganic mineral	0	3	-47.4	0	-2	-3	-4
Inorganic soil pool	0	-47	-150.2	0	-55.2	-8.6	9.4

Third-party Irrigated

Pasture - Flat, 101 ha

N	12 kg/ha | 1,146 kg

P	0.3 kg/ha | 32 kg

BLOCK DETAILS

Area	101 ha	Average temp	10.1 ℃	Average rainfall	1,147 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

55% WAIKI_34A.1
55.5 ha Brown

45% WOOD_29A.1
45.5 ha Brown

FODDER CROP ROTATIONS

Kale

PASTURE

Pasture growth	11,013 kg DM/ha/yr	Removed	1810 kg DM/ha/yr
Utilisation	70 %	Sheep	11.36 rsu/ha
Intake	6,442 kg DM/ha/yr	Beef	0.25 rsu/ha

SUPPLEMENTS

Harvested (DM)	169.7 tonnes	Harvested	357 bales

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Waiki_34a.1	Wastewater Irrigaor	55.6 ha (55%)	632 kg	12 kg/ha	2.2 ppm	93 kg/ha	103 kg/ha	17 kg	0.3 kg/ha	Low	Low	N/A
Wood_29a.1	Wastewater Irrigaor	45.4 ha (45%)	514 kg	12 kg/ha	2.2 ppm	94 kg/ha	103 kg/ha	15 kg	0.3 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Waiki_34a.1	Wastewater Irrigaor	55.6 ha (55%)	534 mm	0 mm	695 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigaor	45.4 ha (45%)	534 mm	0 mm	695 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

Olsen P (53) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Decrease in QT K test of 1 units
- Decrease in QT Mg test of 1 units

Soil Mg status is slowly declining. Mg containing fertiliser will eventually be needed to maintain current production.

Soil Na status is slowly declining. Check pasture Na status, especially on pumice soil, to ascertain need for Na supplementation.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 130 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	1,146	12
Phosphorus	32	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	103	30	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	1	0	0	0	0
Rain/clover fixation	44	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	12	0.3	36	12.6	46	14	56
As product	9	1	0	1	2	0	0
Transfer	2	0	2	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	34	0	0	0	0	0	0
As supplements and crop residues	44	5	41	3	8	2	6

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	48	17	0	-11.6	0	0	0
Inorganic mineral	0	7	-15	0	-2	-3	-4
Inorganic soil pool	0	-0.5	-61	0	-51	-5	-22

Third-party Non-irrigated

Pasture - Flat, 17.6 ha

N	10.2 kg/ha | 180 kg	P	0.3 kg/ha | 5 kg

BLOCK DETAILS

Area	17.6 ha	Average temp	10.1 ℃	Average rainfall	1,147 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

39%	PARO_4A.1	35%	WAIKI_34A.1	26%	WOOD_29A.1
6.9 ha	Gley	6.1 ha	Brown	4.6 ha	Brown

FODDER CROP ROTATIONS

Kale

PASTURE

Pasture growth	11,411 kg DM/ha/yr	Removed	74 kg DM/ha/yr
Utilisation	70 %	Sheep	14.05 rsu/ha
Intake	7,936 kg DM/ha/yr	Beef	0.28 rsu/ha

SUPPLEMENTS

Harvested	63 bales

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Paro_4a.1	-	6.9 ha (39%)	62 kg	9 kg/ha	2.1 ppm	80 kg/ha	0 kg/ha	3 kg	0.5 kg/ha	Low	Low	N/A
Waiki_34a.1	-	6.2 ha (35%)	68 kg	11 kg/ha	2.5 ppm	80 kg/ha	0 kg/ha	1 kg	0.2 kg/ha	Low	Low	N/A
Wood_29a.1	-	4.6 ha (26%)	50 kg	11 kg/ha	2.5 ppm	80 kg/ha	0 kg/ha	1 kg	0.2 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Paro_4a.1	-	6.9 ha (39%)	448 mm	0 mm	699 mm	246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	6.2 ha (35%)	462 mm	0 mm	685 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	4.6 ha (26%)	462 mm	0 mm	685 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

Wood_29a.1/No irrigation - 4.6 ha (26%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 50 kg/ha/yr pure lime. Review soil pH and lime requirement.

Waiki_34a.1/No irrigation - 6.2 ha (35%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 50 kg/ha/yr pure lime. Review soil pH and lime requirement.

Paro_4a.1/No irrigation - 6.9 ha (39%)

Soil P loss status is high. Consider reducing Olsen P levels.

Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 40 kg/ha/yr pure lime. Review soil pH and lime requirement.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	180	10.2
Phosphorus	5	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	12	8	15	27	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	1	0	1	0	0	0	0
Rain/clover fixation	93.6	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	10.2	0.3	8	27	16.2	5	21.6
As product	11	1	0	1	3	0	0
Transfer	3	0	3	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	37.8	0	0	0	0	0	0
As supplements and crop residues	1	0	1	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	32	12	0	-8	0	0	0
Inorganic mineral	0	3	-20.7	0	-2	-3	-4
Inorganic soil pool	0	-5	19	0	12.8	5.4	17.4

Kale

Fodder crop - 4 ha (rotation)

N 75 kg/ha | 298 kg

P 0.4 kg/ha | 2 kg

BLOCK DETAILS

Area	4 ha

ROTATES THROUGH

BSP Irrigated, BSP Non-irrigated, Third-party Irrigated, Third-party Non-irrigated

ARTIFICIAL DRAINAGE

Drainage method	None

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	298	75
Phosphorus	2	0.4

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	12	8	15	27	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	2	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	75	0.4	5	23	81	9	28
As product	9	1	0	1	2	0	0
Transfer	2	0	2	0	1	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	45	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-155	-23	0	-38	0	0	0
Standing plant material	-180	-21	-162	-11	-18	-12	-7
Inorganic mineral	0	4	-12	0	-2	-3	-4
Inorganic plant available	40	34	89	0	-87	6	10
Root and stover residuals	166	17	88	45	53	7	9

Trees

Trees and scrub - 13.1 ha

N 2 kg/ha | 33 kg

P 0.1 kg/ha | 2 kg

BLOCK DETAILS

Area	13.1 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	759 mm/yr

Distance from coast	24 km
Bush type	Pines

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	33	2
Phosphorus	2	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Rain/clover fixation	2	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	2	0.1	3	5	3	7	36

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Inorganic mineral	0	0	0	0	0	0	0

Trees1

Trees and scrub - 2.7 ha

N 2 kg/ha | 7 kg

P 0.1 kg/ha | 0 kg

BLOCK DETAILS

Area	2.7 ha	Average temp	10.1 ℃	Average rainfall	1,144 mm/yr	Annual PET	757 mm/yr
Distance from coast	24 km						
Bush type	Pines						

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	7	2
Phosphorus	0	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Rain/clover fixation	2	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	2	0.1	3	5	3	7	36

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Inorganic mineral	0	0	0	0	0	0	0

Blue Sky Pastures LTS

729 Woodlands-Morton Mains Road, Morton Mains 9871, New Zealand

OverseerFM

Proposed Activity - BSP - 350 kgN/ha

Analysis type	Predictive
Is publication	No
Application version	4.3.3.3
Printed date	21 Aug 2022, 5:55PM
Model version	6.4.3

Farm details

N 24 kg/ha | 3,101 kg | P 0.3 kg/ha | 33 kg | GHG 2,183 kg/ha | 283.8 tonnes | NCE: 90 | v6.4.3

Total area	**130 ha**
Productive block area	**101.70 ha**
Nitrogen conversion efficiency (NCE)	**90%**
N Surplus	**20 kg/ha**
Region	**Southland**

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA	N IN DRAINAGE (PPM)	N SURPLUS/HA	P LOSS	P LOSS/HA	BLOCKED AREA %	N FARM LOSS %
BSP Irrigated	Cut and carry	77	2,913	38	5	87	25	0.3	66	94
BSP Non-irrigated	Cut and carry	24.7	124	5	1	-166	3	0.1	21	4
Trees	Trees and scrub	13.1	33	2	0	0	2	0.1	11	1
Trees1	Trees and scrub	2.7	7	2	0	0	0	0.1	2	0
Other sources	Other	-	26	-	-	-	3	-	-	-

Farm soils

S-MAP REF/NAME	GROUP/ORDER	DRAINAGE CLASS	MODIFIED	TOTAL AREA (HA)	% OF PROD. BLOCKS	BLOCKS
Paro_4a.1	Sedimentary/Gley	Poor	No	10.1	9.9	1
Waiki_34a.1	Sedimentary/Brown	Well	No	54.9	54	2
Wood_29a.1	Sedimentary/Brown	Imperfect	No	36.7	36.1	2

Enterprises

STOCK NUMBERS

There are no animal enterprises on this farm.

RSU

There are no animal enterprises on this farm.

Irrigators

Irrigators

NAME	AREA COVERED	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
SPRAYLINES Wastewater Irrigator	77 ha												

Structures

No structures exist.

Supplements

CATEGORY	FEED	SOURCE	DRY WEIGHT?	AMOUNT	DESTINATION
Silage	-	BSP Irrigated (110), BSP Non-irrigated (35)	Yes	145 tonnes	Off farm (145)
Baleage	-	BSP Irrigated (838.7), BSP Non-irrigated (265.3)	Yes	1104 tonnes	Off farm (1104)
Silage	-	BSP Irrigated (58.1)	Yes	58.1 tonnes	Off farm (58.1)

Fertiliser

MANUFACTURER/MATERIAL	NAME	TOTAL APPLIED (KG)	N	P	K	S	CA	MG	NA
Custom soluble fertiliser	Dry Season Irrigation Nutrients	-	11,197	2,402	-	-	-	-	-
Custom soluble fertiliser	Wet Season Irrigation Nutrients	-	3,810	1,699	-	-	-	-	-
Custom organic fertiliser	WAS-Other organic material	44,816,000	9,860	4,033	-	-	-	-	-
TOTAL		**44,816,000**	**24,867**	**8,134**	-	-	-	-	-

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	3,101	24
Phosphorus	33	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other	191	63	0	0	0	0	0
Irrigation	4	0	3	4	16	4	16
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	10	0	3	5	3	8	37

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	24	0.3	19	10	43	13	53
As product	0	0	0	0	0	0	0
As prunings	0	0	0	0	0	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	9	0	0	0	0	0	0
As supplements and crop residues	185	26	197	16	40	9	24

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-13	17	0	-16	0	0	0
Standing plant material	0	0	0	0	0	0	0
Inorganic mineral	0	4	-18	0	-2	-2	-3
Crop framework	0	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Inorganic soil pool	0	15	-192	0	-62	-9	-22
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	0	0	0	0	0	0	0

Blocks

BSP Irrigated

Cut and carry - Flat, 77 ha

N 38 kg/ha | 2,913 kg

P 0.3 kg/ha | 25 kg

BLOCK DETAILS

Area	77 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

60% WAIKI_34A.1
46.2 ha Brown

40% WOOD_29A.1
30.8 ha Brown

ARTIFICIAL DRAINAGE

Drainage method **None**

SUPPLEMENTS

Harvested (DM) **1006.8000000000001 tonnes**

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Waiki_34a.1	Wastewater Irrigator	46.2 ha (60%)	1,750 kg	38 kg/ha	5.3 ppm	87 kg/ha	323 kg/ha	14 kg	0.3 kg/ha	N/A	N/A	N/A
Wood_29a.1	Wastewater Irrigator	30.8 ha (40%)	1,163 kg	38 kg/ha	5.3 ppm	87 kg/ha	323 kg/ha	11 kg	0.3 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Waiki_34a.1	Wastewater Irrigator	46.2 ha (60%)	724 mm	0 mm	706 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigator	30.8 ha (40%)	724 mm	0 mm	706 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

Estimated change in soil test values for samples taken to 7.5cm:

- Increase in Olsen P test of 8 units
- Decrease in QT K test of 5 units
- Decrease in QT Mg test of 1 units

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for P

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	2,913	38
Phosphorus	25	0.3

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	323	106	0	0	0	0	0
Irrigation	7	0	5	7	27	6	27
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	2	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	38	0.3	29	12	67	18	68
To atmosphere	15.4	0	0	0	0	0	0
As Supplements	246	36	270	21	52	11	38

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	33	24	0	-21	0	0	0
Inorganic mineral	0	7	-15	0	-2	-3	-4
Inorganic soil pool	0	40	-277	0	-87	-12	-39

BSP Non-irrigated

Cut and carry - Flat, 24.7 ha

N	5 kg/ha | 124 kg	P	0.1 kg/ha | 3 kg

BLOCK DETAILS

Area	24.7 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

SOILS

41% PARO_4A.1	35% WAIKI_34A.1	24% WOOD_29A.1
10.1 ha Gley	8.7 ha Brown	5.9 ha Brown

ARTIFICIAL DRAINAGE

Drainage method	None

SUPPLEMENTS

Harvested (DM)	300.3 tonnes

SOIL/IRRIGATION - RESULTS

			NITROGEN					PHOSPHORUS				
SOIL	IRRIGATOR	AREA	TOTAL LOST	LOST	DRAINAGE [1]	SURPLUS	ADDED [2]	TOTAL LOST	LOST	SOIL P LOSS RISK	FERT P LOSS RISK	EFF P LOSS RISK
Paro_4a.1	-	10.1 ha (41%)	50 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	2 kg	0.2 kg/ha	N/A	N/A	N/A
Waiki_34a.1	-	8.6 ha (35%)	44 kg	5 kg/ha	1.1 ppm	-165 kg/ha	0 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Wood_29a.1	-	5.9 ha (24%)	30 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	0 kg	0.1 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

SOIL/IRRIGATION - OTHER VALUES

						TO 60CM				TO 150CM			
SOIL	IRRIGATOR	AREA	DRAINAGE	RUNOFF	AET	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Paro_4a.1	-	10.1 ha (41%)	446 mm	0 mm	699 mm	246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	8.6 ha (35%)	459 mm	0 mm	685 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	5.9 ha (24%)	459 mm	0 mm	685 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

MODEL NOTES

Overview

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for P, K, Ca

Wood_29a.1/No irrigation - 5.9 ha (24%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Waiki_34a.1/No irrigation - 8.6 ha (35%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 2 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Paro_4a.1/No irrigation - 10.1 ha (41%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units

- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, February, March, April, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	124	5
Phosphorus	3	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	42	0	3	5	3	7	36

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	5	0.1	4	8.3	13	5	21.6
To atmosphere	0	0	0	0	0	0	0
As Supplements	208.3	28	195.9	18	47.6	14	8.6

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	-171.3	16	0	-21.1	0	0	0
Inorganic mineral	0	3	-47.4	0	-2	-3	-4
Inorganic soil pool	0	-47	-150.2	0	-55.2	-8.6	9.4

Trees

Trees and scrub - 13.1 ha

N 2 kg/ha | 33 kg

P 0.1 kg/ha | 2 kg

BLOCK DETAILS

Area	13.1 ha	Average temp	10.1 ℃	Average rainfall	1,145 mm/yr	Annual PET	759 mm/yr
Distance from coast	24 km						
Bush type	Pines						

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	33	2
Phosphorus	2	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Rain/clover fixation	2	0	3	5	4	8	38

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	2	0.1	3	5	4	8	38

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Inorganic mineral	0	0	0	0	0	0	0

Trees1

Trees and scrub - 2.7 ha

N 2 kg/ha | 7 kg

P 0.1 kg/ha | 0 kg

BLOCK DETAILS

Area	2.7 ha	Average temp	10.1 ℃	Average rainfall	1,144 mm/yr	Annual PET	757 mm/yr
Distance from coast	24 km						
Bush type	Pines						

NUTRIENT BUDGET

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	7	2
Phosphorus	0	0.1

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Rain/clover fixation	2	0	3	5	4	8	38

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leaching, runoff and direct losses	2	0.1	3	5	4	8	38

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Inorganic mineral	0	0	0	0	0	0	0