192FARM ENVIRONMENT PLAN

Owners: Dick & Gaylene Brough
238 Republican Road
Rerewhakaaitu

Report prepared by
Perrin Ag Consultants, Rotorua
Rachael Mitchell, CNMA

18 December 2017

FUNDED BY:

beef+lamb new zealand | BY FARMERS. FOR FARMERS

BAY OF PLENTY REGIONAL COUNCIL TOI MOANA

REPORT PREPARED BY

PERRIN
AG CONSULTANTS

REGISTERED FARM MANAGEMENT CONSULTANTS

Perrin Ag Consultants Limited
1330 Eruera Street, P O Box 596, Rotorua

Phone: 07 349 1212, Fax: 07 349 1112
Mobile: 021 457 511 (Rachael Mitchell)
Email: consult@perrinag.net.nz

Report Dated: **18 December 2017**

DISCLAIMER

The information presented in this report is based on conservative current prices and returns to the best of the author's knowledge. Where nutrient losses have been modelled, OVERSEER® v6.2.3 has been used, along with Best Practice Data Input Standards. Data supplied by the client has been verified wherever possible. No guarantees are given for the final result, which may be affected by factors outside the author's control.

FARM ENVIRONMENT PLAN (FEP)

1.1. This FEP has been created in line with Beef & Lamb's Level 2 FEP as part of the Lake Tarawera Project funded by Bay of Plenty Regional Council (BOPRC) and Beef & Lamb New Zealand (B&LNZ).

1.2. A farm visit was carried out on November 22 by Rachael Mitchell of Perrin Ag Consultants. Both Dick & Gaylene Bough and Garth & Mel Fraser participated with the farm visit and data collection.

2. CRITICAL SOURCE AREAS

2.1. Critical Source Areas (CSAs) are identified below, and numbered consecutively on the Land Management Map (Figure 2). Accompanying photos are attached in Appendix 1 and labelled referring their relevant CSA.

2.2. A checklist summary of the CSAs and their priority is in Table 1, to allow for easy monitoring of progress.

2.3. A high-level documentation of each CSA is in the following table, Table 2, overleaf

2.4. Where poplar poles are suggested for planting, refer to Plant & Food Research 'Trees for the Farm' leaflet

Table 1: CSAs by Priority

High	Date	X	Medium	Date	X	Low	Date	X
CSA 3 Wet Stream head	Jul-20		CSA 2 Tutu Seep	Jul-20		CSA 6 Remove old poplars	Jul-20	
CSA 4 Gully erosion	Jul-20		CSA 11 Perm fence seep	Jul-22		CSA 12 Perm fence seep	Jul-24	
CSA 5 Riparian at creek	Jul-19		CSA 13 Perm fence seep	Jul-22				
CSA 6 New poplar poles	Jul-19		CSA 15 Move trough	Jul-18				
CSA 9 & 10 New poplar poles	Jul-19		CSA 11-13 Reticulate water	Jul-20				

Table 2: Critical Source Areas (CSA) for 238 Republican Road, Rerewhakaaitu

CSA	Issue	Mitigation	Timeframe	Benefits
1	Seep from retired trees running through paddock	• Create small duck pond where seep leaves bush, novaflow below and then recontour a meandering flow path. Exclude stock while pasture is re-established	Current	• Duck shooting dam • Water protected to exit point at stock excluded creek • Retain in effective area, increasing productivity of an historically wet area
2	Tutu Seep with receding gully head, and water flowing through paddock	• Fence around seep and accompanying water way, down to southerly fence o Retirement fence to extend to take in steepest contour and large proportion of remnant Tewherowhero trees. o Remaining paddock will be cattle in summer only, sheep all year round. o Remove Tutu and replant with natives.	Jul 2020	• Prevent seep creeping up hill face • Prevent edges of seep exit being further broken down and eroding • Protect water course (goes underground after retirement area) • Opportunity to increase native retired/ regeneration area • Summer grazing for cattle with shade
3	Wet stream head – basin to retire	• Contact BOPRC to see what financial and planning support is available. • Re-align existing fence in south-east corner to become part of the stock exclusion fence o Fence to approximate area outlined on LMU map to take in steepest contour and wet spots. o Consider some plantings – natives plus poplars to stabilise steeper faces o Designate paddock as predominantly sheep paddock, cattle in summer to remove seed-head	Jul 2018 Jul 2020	• Preventing degradation of wetland area • Protect water course – almost all fenced from here to stock excluded creek • Habitat/biodiversity

4	Gully head erosion in the steepest gully at the head of this spring head system. Exacerbated by overland flow from western plateau above the gully exiting down this feature	• Pair plant poplar poles on either side of the slope, with 10-15m spacings between pairs down the gully • Spaced poplar plantings above the head of the gully – 10-15m spacings • Designate paddock as predominantly sheep paddock, cattle in summer to remove seed-head (will have to electric fence off poles for first 4-5yrs)	Jul 2020	• Prevent gully head retreating up through the fence line • Erosion reduction • Summer shade and shelter • Retain in effective area
5	Riparian area on the retired creek edge that has never been fenced off	• Extend fence around this area and incorporate into the already retired creek	July 2019	• Prevent cattle access into creek area • Habitat/biodiversity
6	Eroding gully, historical 'soil conservation' paired poplar plantings to stabilise water course, but reaching the end of their life. Receiving area at base of gully is collecting sediment and building. Wetting and drying of this area is causing erosion on the adjacent hill slopes	• Remove some of the mature poplars • Intersperse some new paired poplar poles in gaps • Plant poles further down the slope to the edge of the wetland triangle, 10-15m spacings between pairs • Plant poplars or willows around the edges of the wetland triangle to stabilise the hills and de-water the area - 10-15m spacings	July 2020 July 2020 July 2019 July 2019	• Protect the soil conservation work already done • Food for stock, poplars could be felled as summer fodder • Prevent erosion on steep faces • Retain in effective area
7	Water from CSA 6 crossing silage paddocks. Permanently flowing not currently stock excluded	• Do not disturb current waterway, which is well grassed and showing no signs of stock egress or damage. Use grass to trap nutrients, clean out as necessary to prevent an increase in the water table on these well drained paddocks • Use an electric tape to exclude cattle when grazed in this paddock • No action retired when shut up for silage	As required From 2017	• Retain in effective area • Little to no maintenance

8	Silage pit on bare ground but not in ephemeral flow path	• Ensure silage stack is always located well away from ephemeral flow paths • Making good silage will reduce leachate from the stack	From 2017	
9 & 10	Gully head erosion on escarpment side, exacerbated by overland flow from top plateau	• Pair plant poplar poles down either side of the ephemeral flow path at 10-15m spacings down the slope • Space plant poplar poles between the gully erosion and the adjoining fence at 10-15m spacings	July 2019	• Prevent gully head retreating up through the fence line • Retain in effective area • Shade and shelter
11	Seep 1 at the base of the escarpment. Eroding gully head, erosion from stock access and stock have access to overland flow to stock excluded creek	• Permanently retire the seep above the track by August 2019 and stock exclude with electric tape in the interim • Leave water course below track accessible to stock until reticulated water troughs are installed in this area • Install reticulated water to block and stock exclude from all of the seep	July 2019 Current July 2020	• Small area to protect with stock exclusion. • Habitat/biodiversity • Retain access to stock water
12	Seep 2 at the base of the escarpment. Stock access to overland flow, seep has least erosion of this series	• Install reticulated water to block • Consider fencing and retiring once other retirement work is done in this block	Post July 2022	

13	Seeps 3 and 4, eroding gully heads and erosion from stock access. Area below track is very wet and acting as a sediment trap, before water exits through small fenced off unplanted wetland area	• Permanently retire the seep above the track by August 2019 and stock exclude with electric tape in the interim • Consider electric tape around wettest areas below the track when stock are in the paddock – allowing access to drinking water but not pugging of wettest parts. • Install reticulated water to block and stock exclude from all of the seep	July 2019 Current By July 2020	• Retirement of this whole area will take little out of production but will remove some difficult country from stock access • When wetland is retired it will provide an excellent nutrient trap • Habitat/biodiversity • Retain access to stock water
14	Ephemeral wetland in paddock. Area could be considered for pasture renovation, no current issues	• If area is to be cultivated ensure areas that will be wet when the water table is high are not sprayed or cultivated		• Potential to improve productivity of this area as long as care is taken to protect the wetter areas.
15	Water trough at head of ephemeral flow path	• Remove in a north-easterly direction along the fence line to slightly higher ground	July 2018	• Less pugging round water trough • Nutrients and contaminants will not be deposited directly into the ephemeral flow path
16	Historical erosion under pine tree on steep slope	• Removal of deer has led to a gradual and continued improvement. • No mitigation now, monitor and re-assess at next FEP update	Post July 2022	
17	Silage pit on bare ground but not in ephemeral flow path	• Ensure silage stack is always located well away from ephemeral flow paths • Making good silage will reduce leachate from the stack	From 2017	

3. MANAGEMENT OF THE FARM

3.1. With over half of the farm leased, it is important that the current lessees and any future ones adhere to the principles of this FEP.

3.2. Key points of action for the owner and any lessees are:

- Where a silage stack is placed in the paddock on grass, it will be sited well away from ephemeral flow paths
- Any new troughs will be sited to avoid ephemeral flow paths
- Cattle will be prevented access from the relevant CSAs identified in Section 9. Until permanent fencing is completed, this will be with temporary electric fencing.
- Mature cattle or dairy animals will be avoided on contour over 15°, these blocks are designated Sheep only, DG Hill Block and DG Steep. These blocks will be reserved for animals under 24 months of age, or sheep.
- An agreed weed control programme will be maintained on the contour over 15° to prevent the re-establishment of broom and other noxious weeds
- Nitrogen fertiliser will not be applied in the months of May, June or July.
- Phosphate fertiliser applications will be avoided in the months May to August inclusive, and will not be carried out within 3 days of a forecast heavy rain event.
- A whole farm soil test will be undertaken by a professional in February 2018, and thereafter bi-annually to establish trends in the soil tests.
- Fertiliser on all parts of the farm will be applied as part of a fertiliser recommendation plan from a reputable fertiliser company.
- Fertiliser will be applied as per the Fertiliser Association's 'Code of Practice for Nutrient Management'
- A plan will be developed for any spraying to protect the bee hives on the property

4. FARM DESCRIPTION

4.1. Gaylene and Dick Brough own this 134.8ha property on Republican Road, Rerewhakaaitu. Legal description for this property is SEC 1 SO 57221 BLK II KAINGAROA SD.

4.2. The farm is divided east/west by a small tributary of the Rangitaiki River, which begins in the neighbouring property of FJ Ramsey. The northern part of the farm, is being farmed by the Broughs, supports the following:

Table 3: Brough farm activities

Class	**Number**	**On**	**Off**
Goth Ewe flock (plus progeny)	36	Permanently	Lambs sold as Rare Breeds
Wiltshire ewe flock (plus progeny)	175	Permanently	Lambs as finished, or sold store
Rams	10 (3 Goth)	Permanently	
Angus Breeding cows	17	Permanently	Most heifers sold at weaning
R1 Angus Heifers	3	At year start	Replacements
R1 Angus Steers	9	At year start	Most sold to store in autumn
R2 Bulls	2	At year start	Retained as bulls
Supps	**Amount**	**Area**	**Fed**
Baleage	35 bales		Cows late winter
Baleage	35 bales	Bought in	Cows late winter

4.3. The southern part has been leased out as a run off block for local dairy farmers Garth Fraser & Mel Fraser-Harris. This supports the following:

Table 4: Fraser-Harris partnership farm activities

Class	**Number**	**On**	**Off**
Dried off Friesian dairy cows	300	1 June	July-Sept as calve
R1 Friesian Heifers	90	Mid Nov (weaned)	Remain on
R2 Friesian Heifers	90	Year Start Mated October	Immediately pre-calve
R2 Jersey Bulls	3	Oct (to mate heifers)	Mid January
R1 Steers	22	Mid Nov (weaned)	Remain on
R2 Steers	22	Year Start	Autumn when finished
Supps	**Amount**	**Area**	**Fed**
Silage	150t DM	28ha currently	Dairy graze mid-winter, some exported as needed

4.4. The three soils on this property are all volcanic:

- Otanewainuku steepland soils (Otanw_1a.1) – originating from the Okataina and Taupo volcanic eruptions. They are sandy to gravelly allophanic soils with varying degrees of weathering and fertility. Soil texture is loam and they are extensively present in the district. These soils cover the slopes above 20 degrees on this property.

- Te Rere Shallow Soils (Taup_18a.1) - Soil profile has a black sandy loam friable topsoils overlying dark yellowish-brown friable sandy loam. They are fertile pumice soils which will support horticulture and dairying. These soils cover the flat to rolling country on this property, much of which is mowable
- Te Rere Soils (Taup_9a.1) – Very similar soil profile to the Te Rere Shallow soils with slightly less clay in the topsoil and a slightly higher Profile Available Water.

4.5. There are soil tests available for the area north of the creek but there is a concern over the reliability of these. The Broughs intend to re-test in February and ensure that correct protocols are followed when the samples are collected. Olsen P is only 12 on the Cattle Country and 7 on the Sheep only. These numbers have been carried over onto the block south of the creek, in the absence of any other soil tests. These can be updated once new results are available.

5. FARM MAPPING

5.1. The total farm area is 135ha, as mapped by BOPRC. Of this the pastoral area is 120.7ha:

- 42.8ha on the northern side of the creek farmed by the Dick & Gaylene Brough;
- 77.9ha on the southern side of the creek, leased and farmed by Garth Fraser & Mel Fraser-Harris, since I July, 2017.

5.2. The property has been divided up by contour, use and soil type to provide land management units. Retired areas were identified, along with those planned for retirement. Critical Source Areas (CSA) were also marked on the map to provide reference points for their location and mitigation.

5.3. All of the tree blocks, excepting some of the historical soil conservation plantings, are excluded from grazing by cattle, and most are permanently fenced from all stock.

5.4. From the maps created on farm, Bay of Plenty Regional Council has provided GIS layers back to the Broughs, with the boundaries, soil types, average slope and GPS co-ordinates for each block. This data has been used to populate the OVERSEER® file created for this property

5.5. The farm has been mapped as two distinct activities, reflecting the way it is currently run and the fact that the southern block is the more productive part of the farm.

5.6. The farm map, identifying the mapped blocks is in Figure 1 overleaf:

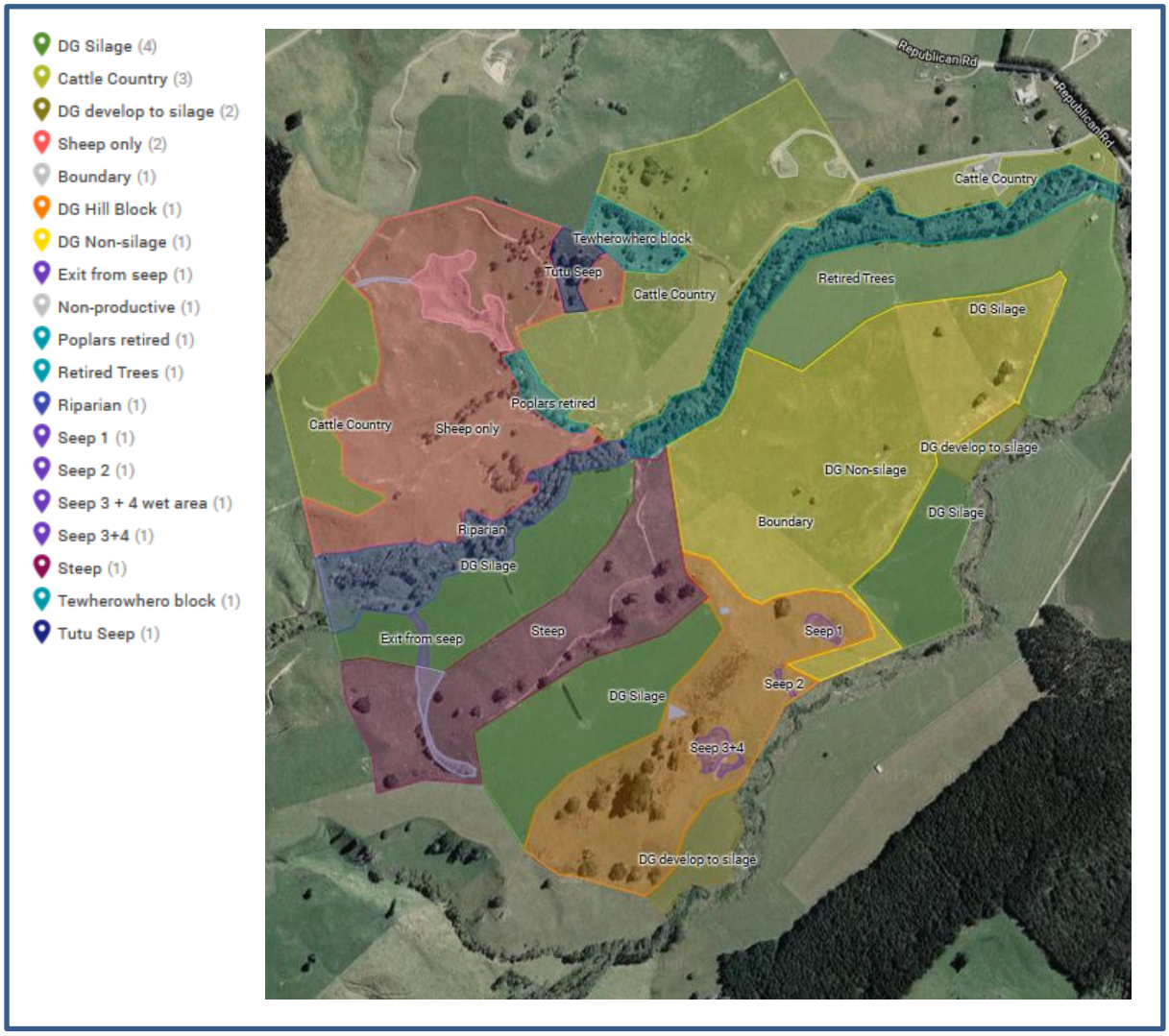

Figure 1: Block Map of 238 Republican Road, Rerewhakaaitu

5.7. The map of Critical Source Areas (CSA), discussed in section 9, is in Figure 2, overleaf:

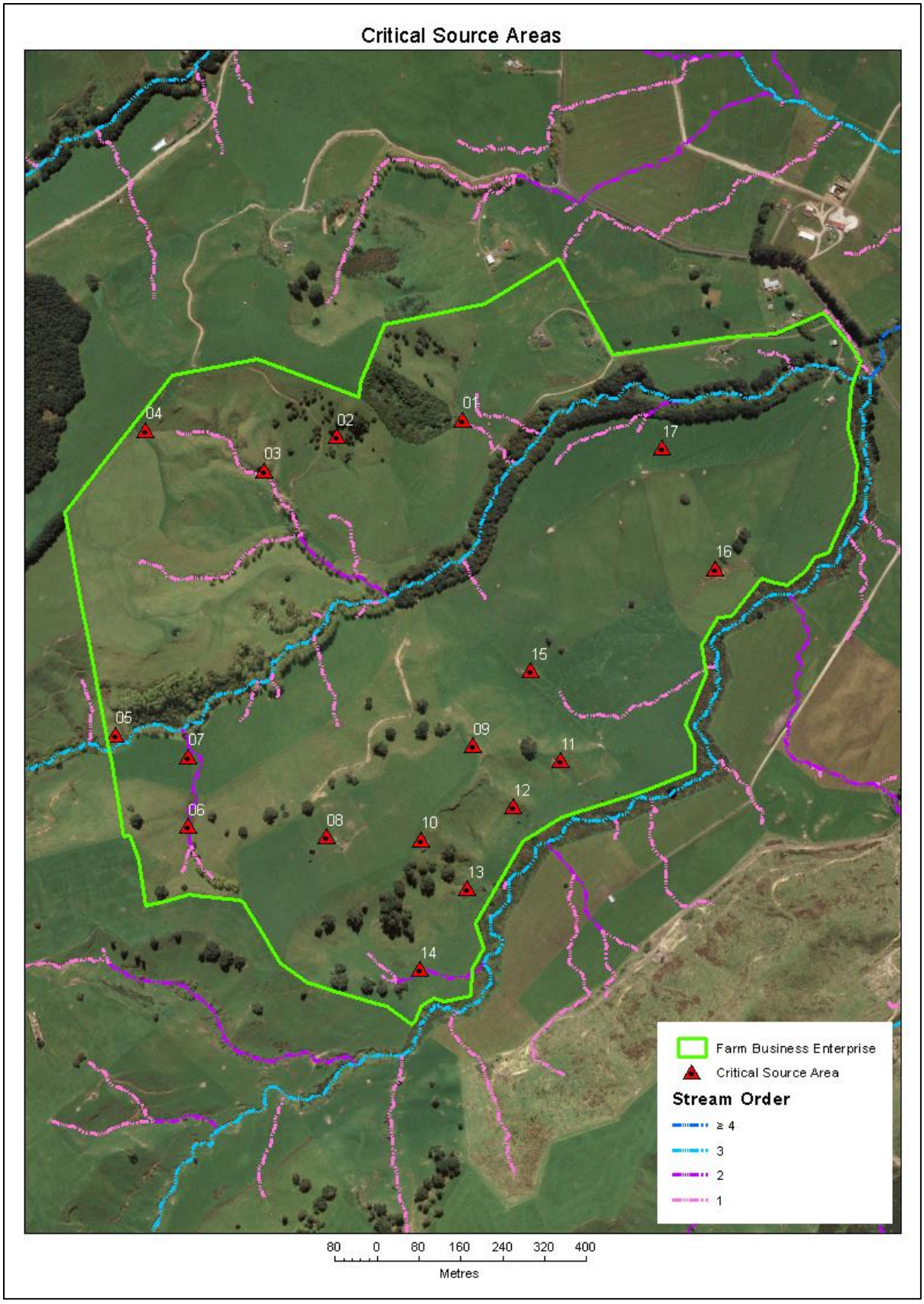

Figure 2: Map of CSAs for 238 Republican Road, Rerewhakaaitu

6. BROUGH PRODUCTION GOALS

6.1. The Broughs, farming the north side of the creek, are running an extensive sheep and cattle breeding operation, with low numbers of stock. The small mob of Angus cattle are run on the easier part of the farm and low-input Wiltshire sheep, which naturally shed their wool, are the main breed on the rest of the farm. There is also a flock of Goths, an official Rare Breed of sheep from Stewart Island, but the Broughs are looking to sell these to further simplify their system.

6.2. Fertiliser in the 2017-18 year is a 'Back to the Future' blend with 59 kg P/ha and 1 kg N/ha. This is the only fertiliser applied to this block. Total inputs for the year are N-P-K-S of 1-59-0-1. In addition the silage area has 3t total of 15% Potash Sulphur Super applied post harvesting

6.3. Lime is applied bi-annually, approximately 30t is applied across the whole block – equivalent to one truck and trailer.

6.4. Very few supplements are made on farm (approximately 35 bales of 10 equivalent baleage per year) and a very small quantity of maize grain bought in for the ewes over late winter. There are no plans to crop on this part of the property and current pastures are in relatively good heart on the easier country. The steeper, sheep country has a mixture of older grass which form a mat, protecting the hills from drying out and eroding, as long as pasture covers are not grazed too low.

6.5. They have a strong focus on conservation and making the whole property sustainable for the future. Obtaining a fencer to carry out the retirement works is the limiting factor rather than a financial or production issue.

6.6. They are not looking to intensify their operation, they are enjoying a relatively low inputs system that allows them to be semi-retired and remain on the property.

6.7. Should the Broughs decide they no longer wish to actively farm the area north of the creek, there would be interest in the district, probably from dairy farmers, to lease the land as support for their operation. Care would need to be taken to ensure the good work done in protecting the steeper country with sheep only management is not compromised.

7. FRASER-HARRIS PRODUCTION GOALS

7.1. The Frasers have only leased the southern portion of the farm since 1 June 2017 but have a very similar ethos to the Broughs and are keen to support a programme of land retirement where it is not suitable for pastoral activities. They are very amenable to temporary electric fencing to restrict stock access to areas earmarked for retirement.

7.2. They are setting up for a full year, but when they took over on 1 June, there were very low covers left by the previous lessee, so the system modelled is for a fully operational year, probably 2018-19. The purpose of the lease is to be able to run 80 R1 heifers and 80 R2 heifers to provide replacements for their dairy platform. They will also run around 200 dried off dairy cows from early June through July, taking cows home as they reach calving date. In addition, they plan to run 22 R1 steers and R2 steers, retained from their dairy calves, to utilise grass grown on the block and provide a further income stream.

7.3. Fertiliser across the whole farm is focussed on phosphate and lime, to improve the block's productivity. Across the whole block, 100t of Lime was applied at in Spring 2017 and there are spring and autumn applications of Serpentine Super and N-rich Urea providing 26kg P/ha and 21kg N/ha each time. An additional dressing of Serpentine Super in July, at takeover, provided a further 9kg P/ha. Sulphur is also

being addressed with Sulphur Gain Pure, applied in the spring providing 28kg S/ha. In addition, the mowable area will receive 18kg N as SustaiN Ammo 36N in December. To summarize total inputs for the year are identifed in Table 5.

Table 5: Fert inputs for leased block in 2017-18

Month	Fert	Rate (kg/ha)	Nutrients (N-P-K-S)	Block
July	Serpentine Super	128	0-9-0-11	Whole block
September	Sulphur gain pure	31	0-0-0-28	Whole block
September	Serpentine Super	385	0-26-0-32	Whole block
September	N-rich Urea	46	21-0-0-0	Whole block
December	SustaiN Ammo 30N		18-0-0-4	Silage country
April	Sulphur gain pure	31	0-0-0-28	Whole block
April	Serpentine Super	385	0-26-0-32	Whole block

7.4. They hope to make up to 150t DM silage each year and to feed this out on the property, but occasionally in drought years, they make take some home to support the milking herd. Currently there is 27.6ha of mowable country.

7.5. There is potential for the silage area to be increased (2.5ha of DG Develop to silage). This is in two parts, one area is at the eastern end of the property and requires some contouring to enable easy mowing, but the paddock is already relatively fertile. At the western end, there is an area of flats at the base of the DG Hill Block that is very uneven and in places wet. With careful drainage, appropriate cultivation and re-grassing (probably after a summer crop), there is the possibility increase the production significantly on this block. Within the 'non-silage' block, there is also up to 10ha which may be able to be mown for silage in the better areas.

7.6. Summer cropping may be considered in future years to provide some protection against summer drought. This will also be used to assist in improving the contour of some of the non-mowable country to allow it to be brought into the silage harvesting round.

8. ADDITIONAL CONSIDERATIONS

8.1. There are two beehive sites on the property, owned and managed by Arataki Honey, these provide a small additional income to the Broughs. Careful consideration needs to be given to any spraying operations within the vicinity of the hives and clarification should be sought from Arataki Honey if there is any uncertainty around possible impacts on the bees

8.2. There are several plantings of nut and fruit trees, in a 'chicken orchard' close to the house and on the edge of the fenced off trees on the north side of the main creek.

8.3. The main creek contains at least one breed of native fish, a fact which the Broughs are very proud and protective of

8.4. The retired stand of Tewherowhero trees to the west of the house, and subsequent replanting with natives and watering in the first summers has created a great legacy on the property.

8.5. There is a pair of Totara trees planted up the house entrance by the right hand turn up to the house. These trees are planted over Finley and Charlie's placentas (grandsons) and must be retained.

9. NUTRIENT MODELLING AND LOSSES

9.1. Modelling for OVERSEER® was carried out for the planned 2017-18 year, using recent stock sales and lambing/calving data where appropriate. With a change in lease on the southern creek block, there was no actual data available for the 2016-17 year. Data is relatively accurate but not auditable.

- The owners' data was an amalgamation of full year data from 2016-17 and actual data from 2017, year to date. There is very little variation from year to year on the sheep and beef unit, with the exception of the planned sale of the Goth flock.
- The lessees identified their planned full year system and fertiliser inputs and supplementary feed harvests to date were modelled, with the rest of the year being budgetted. Outputs from the OVERSEER® file align with expected values for the district.

9.2. Nitrogen losses to water of 18kg N/ha/yr across the whole farm, a total of 3,008kg or 22kg N/ha/yr, which is reasonable for a drystock operation and give some room for flexibility. The OVERSEER® output information is below in Table 6.

Table 6: OVERSEER® Nitrogen outputs

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
Cattle country	693	31	4.9	97	1
Sheep only	238	12	N/A	55	1
Retired Trees	25	3	N/A		
Riparian	14	3	N/A		
DG Silage	604	29	4.6	44	60
DG Silage Plateau	144	21	3.3	9	60
DG Non-silage	747	33	5.3	96	42
DG Hill Block	230	17	N/A	70	42
DG Develop to silage	72	29	4.6	31	42
DG Steep	183	16	N/A	64	42
Other sources	59				
Whole farm	3,008	22			
Less N removed in wetland	0				
Farm output	3,008	22			

- Apportioning the effective losses to the two sides of the creek gives 21.8kg N/ha/yr on the 42.8ha effective north of the creek and 25.4kg N/ha/yr on the 77.9ha effective on the south side of the creek.
- There is low nitrogen fertiliser usage, maximum 60kg N/ha on the silage blocks south of the creek. If more nitrogenous fertiliser is to be applied it should not be in the months May, June or July, to avoid the risk of climatic and plant conditions not being suitable for uptake. This can result in an excessive loss of nitrogen to the ground water, which is modelled by OVERSEER®.

9.3. Phosphorous losses are very low at 0.7kg P/ha/yr across the whole farm, a total of 88kg (see Table 7, below). Phosphorous loss categories are low to medium for soil due to the currently low measurements for Olsen P. However, fertiliser losses are extreme on the Cattle country block due to the high levels of phosphate in the fertiliser purchased from 'Back to the Future' (12.6%). This has been applied since the last soil test, so it should have an impact on Olsen P levels when soil tests are next re-done.

Table 7: OVERSEER® Phosphorouse outputs

Block name	Total P lost	P lost to water	P loss categories		
	kg P/yr	kg P/ha/yr	Soil	Fertiliser	Effluent
Cattle country	42	1.8	Medium	Extreme **	N/A
Sheep only	8	0.4	Low	Medium **	N/A
Retired Trees	1	0.1	N/A	N/A	N/A
Riparian	0	0.1	N/A	N/A	N/A
DG Silage	10	0.5	Low	Medium	N/A
DG Silage Plateau	3	0.5	Low	Medium	N/A
DG Non-silage	6	0.3	Low	Medium	N/A
DG Hill Block	4	0.3	Low	Medium	N/A
DG Develop to silage	1	0.5	Low	Medium	N/A
DG Steep	4	0.3	Low	Medium	N/A
Other sources	10				
Whole farm	88	0.7			

- A further set of soil tests is required for the whole property, after which time phosphate requirements can be more accurately modelled. In the interim any further applications of phosphate fertiliser should be in the months of September to April inclusive and avoid heavy rainfall events, to prevent loss in overland flow events.

9.4. OVERSEER® doesn't accurately model phosphate losses and consideration of best management practices to prevent losses to the environment of phosphate, sediment and e-coli are currently used as a measure of risk. This property has cattle excluded from the major waterway and sheep have limited access. With reticulated water in place, they are unlikely to seek water from the small un-fenced stretch of retirement. There are few risky activities on the block with no effluent being managed and captured and plans underway to retire the seeps on the south-western corner of the property will reduce the most major risk of e-coli loss to waterways.

9.5. Stocking rate across the whole farm is 11.4 RSU/ha on the effective area, being 22% sheep and 78% cattle. The proportion being heavily in favour of cattle due to the dairy grazing operation south of the creek.

10. FARM STRENGTHS AND WEAKNESSES`

10.1. Below are tabulated the strengths and weaknesses for this property by block

Table 8: Strengths and Weaknesses for 238 Republican Road, Rerewhakaaitu

	Description	Strength	Weakness
Landscape			
Natural Seeps	Springs coming directly out of the steeper parts of the farm, some potable, some not. Usually flowing all year and with some form of wetland or stream at their base	Water is tapped off and gravity piped to the woolshed, then pumped around the property Most are good quality stock water Biodiversity and habitat when stock excluded, easy to establish new plantings with good soil moisture	Prone to erosion and damage from stock if not retired One is highly unpalatable to stock and not suitable for tapping
Bush Remnants	Mainly scattered but some already protected, others planned	When fenced off and supplementary planted they provide great habitat Aesthetically pleasing Potential to eco-source seeds (Tewherowhero and Ti Kouka) for re-stocking programmes	If left in paddock, Tewherowhero especially is prone to stock damage and will die back Weed control when stock excluded and replanted
Waterways	Significant	When fenced off, provide good shelter for stock due to the mature plantings they contain Biodiversity - native fish found in the farm's creek	Keeping fences stock proof Weed control trees falling over fences as they reach full maturity
Tracks	One formed track through 'Cattle Country', 'Steep' and 'Sheep only' blocks	Access for vehicles through steeper parts of the farm Easy walking for cattle to access non-contiguous blocks Created with good 'cut-offs' and culverts to minimise water damage	Tracks require regular maintenance Slippery when wet, no metal applied to tracks.

LMU			
Cattle Country **(22.6ha)**	Easier rolling country, suitable for cattle and sheep, north side of creek	Free draining soils, resistant to pugging Good contour Mostly sheltered from southerly with mature plantings Ability to make supplementary feed Mixture of pasture species No significant wetter areas Good access to cattle yards and load out	Low Olsen P, could be restricting production Non-contiguous blocks High nutrient leaching due to free-draining soils Limited access for machinery Western most block has a significant Californian thistle issue, spraying to manage
Summer Cattle **(19.6ha)**	Steeper country with some erosion risks, suitable for sheep, north side of creek	Contour provides good shelter Steepest and wettest parts already stock excluded or planned Seeps provide the water for the property Mixed older pasture species has dense cover, holds on well in summer and protects the steeper faces from drying out Sheep don't get into the un-fenced creek area where the fence has fallen into disrepair Relatively contiguous block and easy access to woolshed, yard and load out	Steeper and broken contour, no opportunity to renovate pasture Low stocking capacity Not suitable for cattle over 24mths of age Seeps which often need mitigating or stock excluding Avoid over-grazing to maintain pasture sward and prevent sheet erosion
Tewherowhero Block **(1.7ha)**	Retired native block with remnant bush, including Tewherowhero trees and replanted natives	Provides protection for the seep supplying water to the farm Aesthetically pleasing Supporting lots of birdlife (Tuis, Bellbirds, Grey Warblers, Shining Cuckoos, Waxeyes)	Weed control Maintaining perimeter fence

Riparian & Retired Trees **(11.5ha)**	Area along creek edge, stock excluded or restricted, all fenced in trees	Stream is well protected, crystal clear and home to native fish Aesthetically pleasing Some regeneration of historical bush species occurring, plus still some tree ferns and Ti kouka trees	Weed control under trees Fence maintenance, as the fence is many decades old Occasional stock access into stream, hard to get out
DG Silage **(27.6ha)**	Good mowable country, south side of creek	Flat to rolling contour, generally free draining soils, resistant to pugging Fertile, good producing pasture, areas of compaction (fragipan) retain moisture better than pumice would normally and allow pasture to hold on in drier weather Good clover and herbage content Suitable for mowing Able to be cropped or pasture renewal carried out High stocking capacity 6.8ha is on elevated ignimbrite plateau allows access to top of DG Hill Block to improving pasture utilisation	No cattle yards on south side of creek Compaction in some areas of flats, potential barrier to cultivation, difficult to dig posts in Managing high seasonal grass growth 6.8ha is on elevated ignimbrite plateau and disjointed from rest of block (no southerly protection) but allows access to top of DG Hill Block to improving pasture utilisation
DG Develop to silage **(2.5ha)**	Reasonable contour with some issues around drainage or uneven ground	Good overall contour Potential for improvement in productivity Will increase harvestable area Potential to summer crop to carry out renovation and provide some protection against summer dry	Cost of renovation work to get blocks mowable Maintaining integrity of ephemeral flow paths Some drainage may be required

DG Hill Block **(12.2ha)**	Sides of ignimbrite plateau, steeper faces and some scattered natives	Country for younger stock to allow more productive areas to be shut up for silage or autumn saved pasture Some shelter in the varying contour	Not suitable for older animals Lower stocking capacity Not suitable for cattle over 24mths of age Currently no reticulated water Significant seeps which require work Tops adjoining silage area on top of ignimbrite plateau are difficult to get well grazed Very wet areas in patches along lower lying areas where it joins the boundary creek Broom is an issue - control being carried out and will have to continue
DG Steep **(11.7ha)**	North facing slope of the ignimbrite escarpment, very steep	Shelter from southerly for younger stock Provides access to elevated ignimbrite plateau	Not suitable for cattle over 24mths of age Low stocking capacity Avoid over-grazing to maintain pasture sward and prevent sheet erosion Broom is an issue - control being carried out and will have to continue

Appendix 1

11. FARM ENVIRONMENT PLAN UPDATES

11.1. This Farm Environment Plan should be updated at least every three years and progress noted on page 3 in the interim.

11.2. If there are any major changes to the farm system it would be advisable to have the OVERSEER® budget updated as well.

PERRIN AG CONSULTANTS LTD

Rachael Mitchell, CNMA

Peer Review

OVERSEER® files: Leighton Parker

Report: Lee Matheson

Appendix 1

Photos of Critical Source Areas

Image 1: CSA 1, novaflowed seep exit, re-contoured and re-grassed

Image 2: CSA 2, 'Tutu Seep' to be retired and replanted