Farm Environmental Management Plan: Maryburn Station (Classic Properties Ltd)

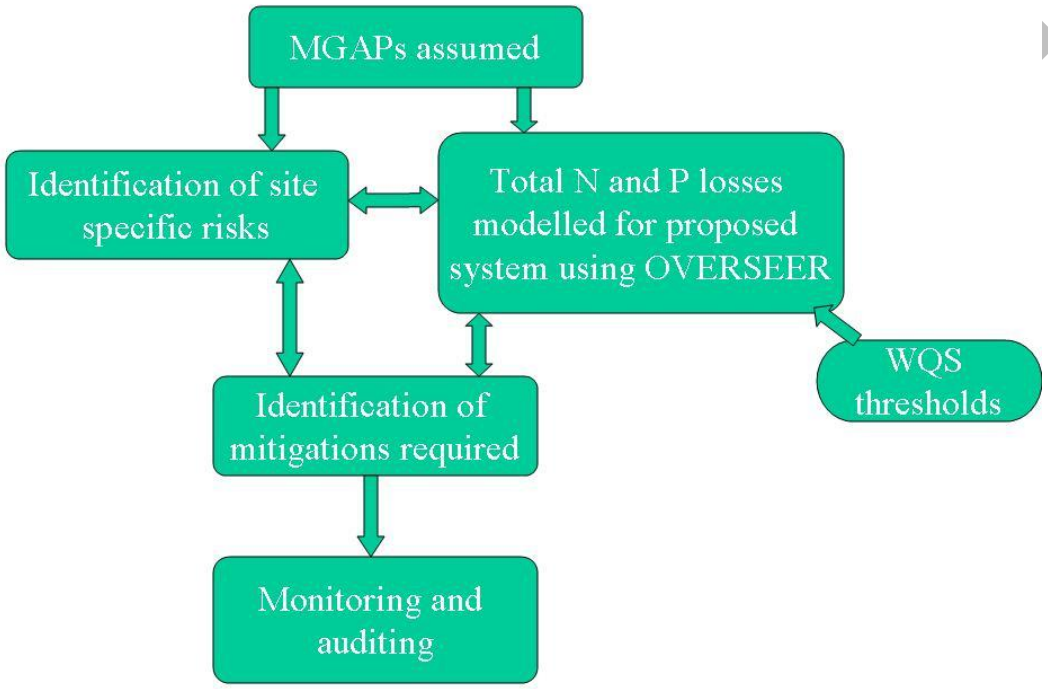
1. Introduction

The Water Quality Study ('WQS') funded by Mackenzie Water Research Limited ('MWRL'), found that the additional irrigation proposed in the catchment could take place without significant adverse effects on the environment providing that nutrient reduction occurred on the farms.

The process that was advocated for ensuring this on-farm nutrient reduction was through Farm Environmental Management Planning. A clear process for building a Farm Environmental Management Plan (FEMP) was laid out in the Water Quality Study and has been followed here. An overview schematic of the process of building a FEMP is shown in Figure 1.

The responsibility of the implementation, monitoring and auditing of the plan lies with the **farmer**.

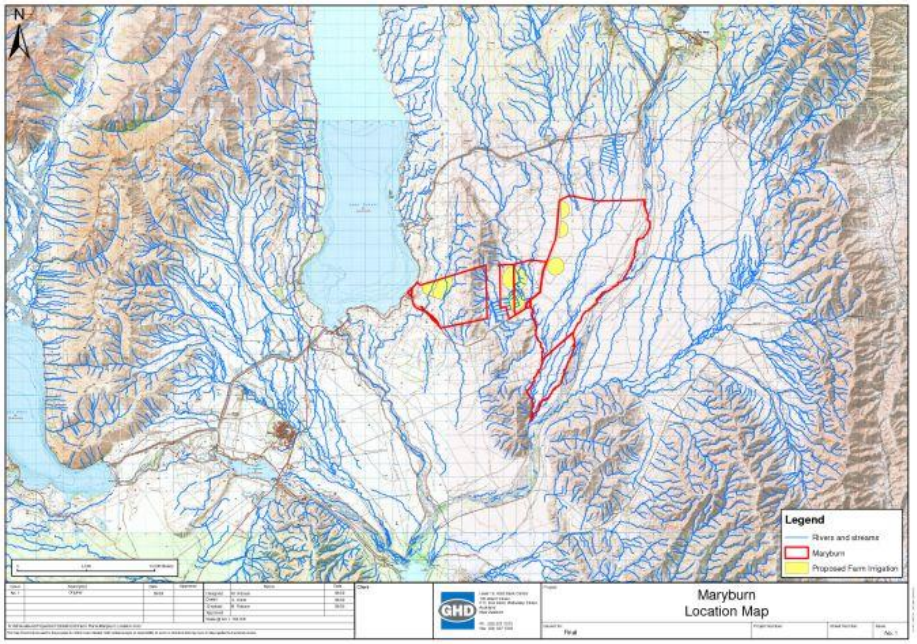
Figure 1: Overview schematic of the process to build a Farm Environmental Management Plan



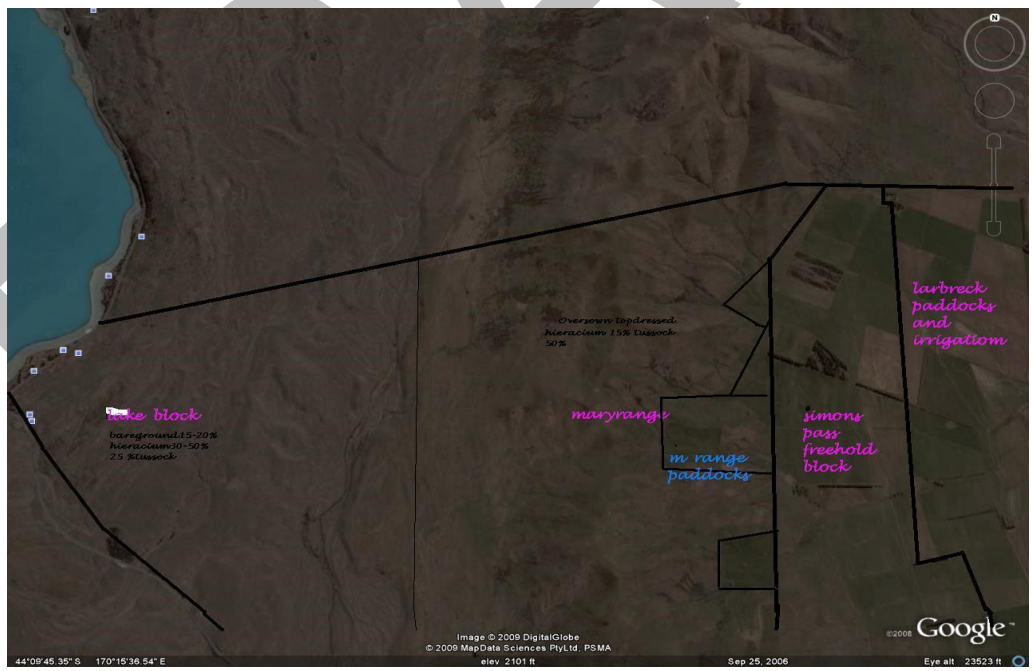
MGAP – Mandatory good agricultural practices

2. Farm Description

2.1 General farm description



Location Plan



Aerial View of Maryburn Station

The property is situated on State Highway 8, some 30 kilometres south of Tekapo. It extends from Lake Pukaki in the west, to the Tekapo River in the east, with the main portion of the property being between the State Highway and the Tekapo River.

Maryburn Station is 9,000 hectares of which 650 are freehold and the remainder is leasehold. Maryburn Station is also in the Tenure Review process. Most of the property is flat but 1,000 ha is steep hill. 4,500 ha are in a very fragile state being mostly bare ground, hieracium and plenty of rabbits. The only living native tussock in a good state is where there has been a history of fertiliser applied. Much of the native tussock has only disappeared in the last 10 years due to very dry years, rabbits and hieracium.

At present there is 170 ha of border dyke irrigation but because of a very high minimum flow placed on the Maryburn stream in 2002 this irrigation has become very limited with a lot of the pasture in a poor state due to lack of water. This irrigation was the engine of the whole property and it has had a huge impact on Maryburn financially, socially and environmentally.

Current Stock Numbers

- Ewes 5,000
- Hoggets 2,100
- Wethers 750
- Rams 100
- Cows 180
- Heifers 50
- Bulls 7

Table 1. Cover utilisation by season and stock class for current system

	Cover utilisation by season and stock class - CURRENT			
Class of stock	**Spring**	**Summer**	**Autumn**	**Winter**
Ewes	Hill and flats irrigation paddocks ryecorn	Swamp Hill flats paddocks ryecorn	Swamp hill paddocks irrigation ryecorn	Irrigation and paddocks
Hoggets	hill	hill	Ryecorn irrigation and paddocks	Ryecorn irrigation and paddocks
Breeding cows	swamp	swamp	Hill ryecorn	hill
Wethers	Flats native	Flats native	Flats native	Flats native
Heifers	swamp	swamp	paddocks and irrigation	Paddocks, Irrigation ,Hill

2.2 Proposed farming system

Stock Numbers- same as the current system, but the irrigation will carry most of the fattening and young stock.

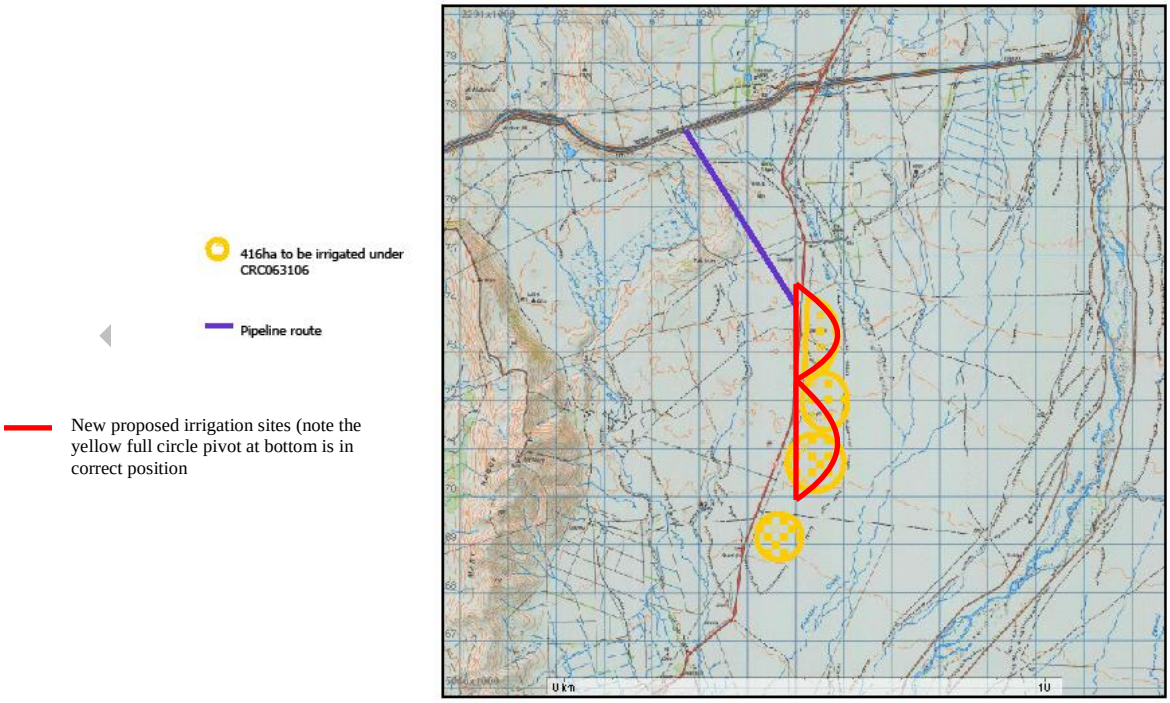
Proposed Stock Numbers

- Ewes 7,500
- Hoggets 5,500
- Wethers 1,000
- Cows 500

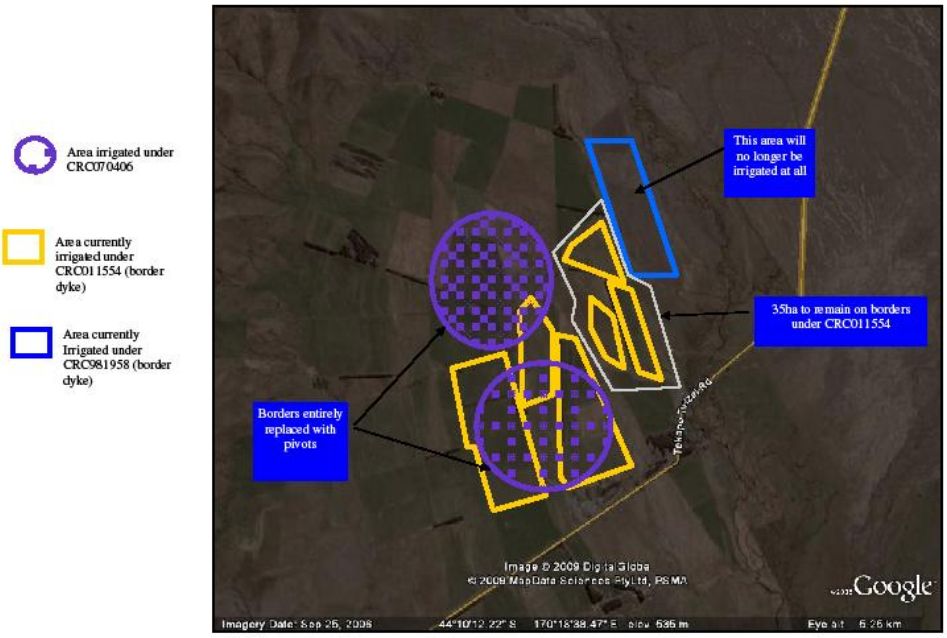
- R2's 250
- R1's 250
- Rams 120
- Bulls 12

Table 2. Cover utilisation by season and stock class for proposed system

	Cover utilisation by season and stock class - PROPOSED			
Class of stock	**Spring**	**Summer**	**Autumn**	**Winter**
e.g. Ewes	Set stocked			Set
e.g. Hoggets	Grass flats	Grass flats	Oversewn hill	Oversewn hill
e.g. Breeding cows	Grass flats	Native	Native	Native
Wethers		Grass flats	Grass flats	Ryecorn



Proposed Irrigation Map one



Proposed Irrigation Map Two showing Current Irrigation as well

2.3 Soils

Where the proposed irrigation is going the soils are a mix of Simon and Glenrock silt loams and Holbrook and Pukaki soils.

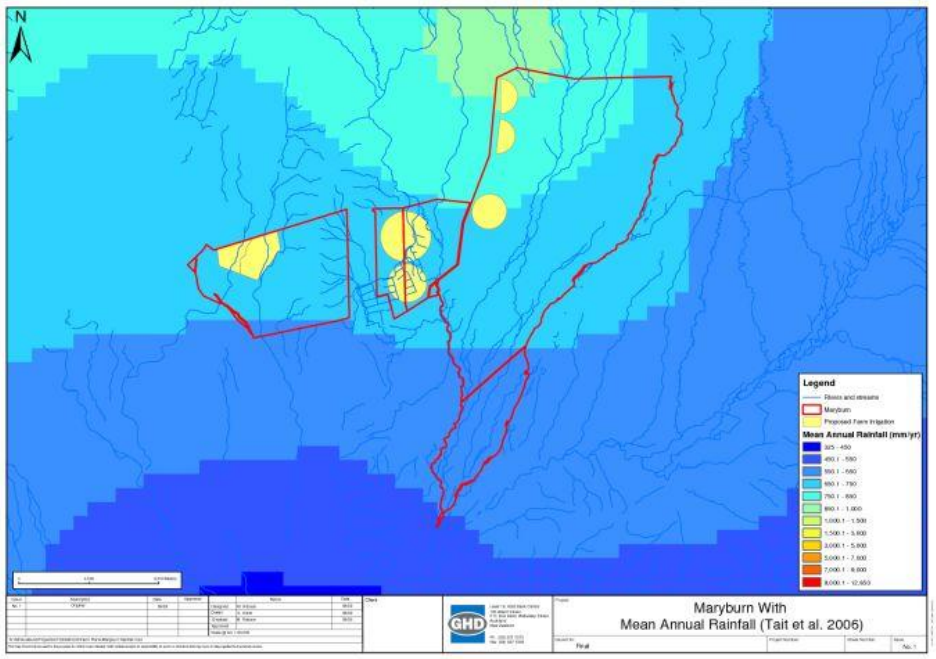
The rest of the property has Meyer and Tekapo soils on the hill, and Sawdons, Edwards and Mackenzie soils on the flats.

2.4 Topography

The topography is mostly flat, with 1,000ha in steep hill country.

2.5 Climate

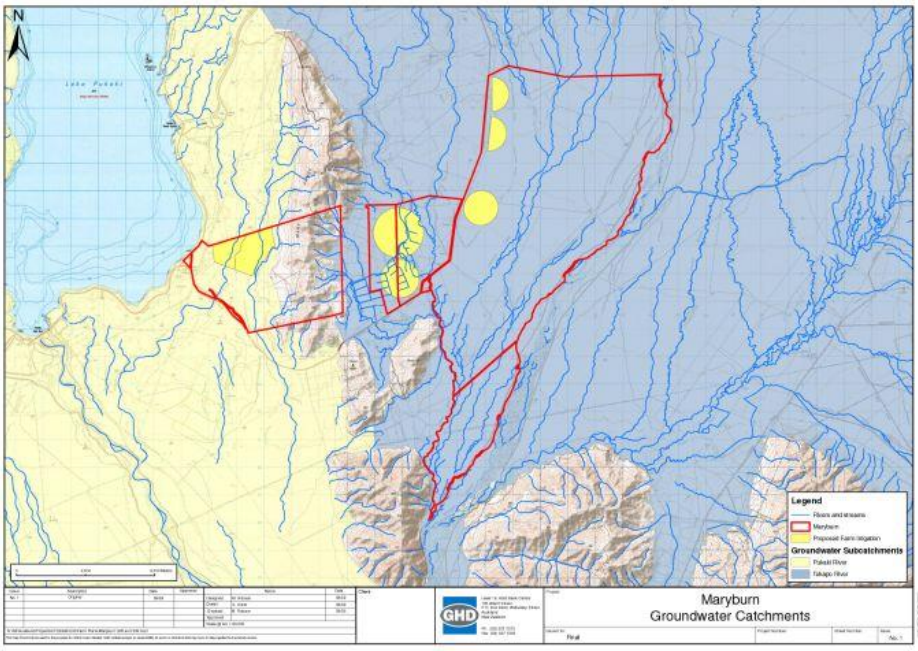
On average 500mm rainfall. Winter can last for 150 days, being long and cold. Snow can cover the whole property for up to 4 weeks at a time.



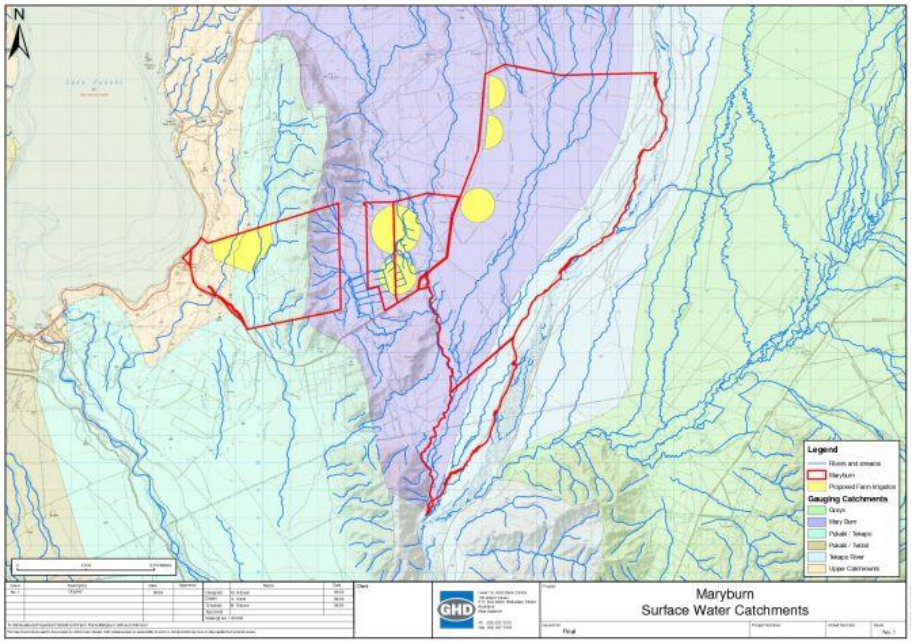
Rainfall Map

3. Environmental Context

The environmental context of the farm is a reference both to local and wider receiving environments.



Groundwater Catchment



Surface Water Catchment

3.1 Water Quality Study receiving environments and mitigation requirements

Maryburn Station, according to the WQS, lies in the Tekapo groundwater catchment and the Maryburn, Tekapo and Northern Lake surface water catchments, as shown on the maps above.

The following table shows the calculated nutrient mitigation requirement of the receiving environments determined in the WQS and the resulting thresholds for N and P for Maryburn Station.

Maryburn Stream Mitigation required kg/ha irrigated land (primary)	Tekapo Stream Mitigation (secondary)
N 1.50 P -0.60	N 0.40 P 0.40

For this farm, the Maryburn Surface Water mitigation requirements are the most stringent. These mitigation requirements cap Maryburn Station's nutrient discharges at 30,077 kg N per annum and 517 kg P per annum.

3.2 Local receiving environments

The proposed irrigation area is approximately 680 metres west of Maryburn Stream.

There are many small creeks and water races within the proposed irrigation area as well.

The Maryburn supports populations of brown trout, as well as long finned eel, alpine galaxiid, Canterbury galaxiid, koaro, common and upland bully and freshwater mussels.

It has many wetland areas within it, and the black stilt, grey duck, bittern and terns are known to nest there.

4. Farm Environmental Management Plan development

4.1 Stage 1 – Mandatory good agricultural practices

The table below shows the mandatory good agricultural practices that will be adopted. These include the base assumptions of OVERSEER and therefore help validate the use of the model on the farm.

Table 3. Mandatory good agricultural practices

Mandatory good agricultural practices	What these practices mean on farm
Fertilisers applied according to code of practice for fertiliser use	The fertiliser users' code of practice aims to ensure that where fertilisers are used that they are used safely, responsibly and effectively and in a way that avoids, remedies or mitigates any adverse environmental effects. The code of practice includes guidance on fertiliser use, application, storage, transport, handling and disposal.
Use a fertiliser recommendation system (nutrient budget) and account for all sources of nutrients including applied effluents and soil reservoirs accounted for	Planning fertiliser applications to all crops, determining crop requirement and accounting for soil nutrients and organic nutrient supplies, all reduce the risks of applying excessive fertiliser above the crop requirement. This maximises the economic return from the use of fertilisers and reduces the risk of causing nutrient pollution of the environment Accounting for all sources of nutrients including imported sources and soil reservoirs is an important management measure in all farming systems and become especially important on farms where manure is produced and applied to the land. The re-application of organic manures to land is often thought of as a disposal of a waste product, and the available nutrients within the organic manures are not accounted for. The use of an integrated nutrient budgeting tool such as OVERSEER automatically accounts for nutrients supplied in organic manures.
Fertiliser application applied evenly	The even application of fertiliser is an assumption of the OVERSEER model as included in the fertiliser code of practice. Fertiliser spreaders should be tested and calibrated in-house at least annually and every 5 years by an independent auditor.
Irrigation and effluent applied evenly	The even application of water and or effluent is an assumption of the OVERSEER model. Irrigators should be tested and calibrated in-house at least annually and then every 5 years in accordance with the code of practice for irrigation evaluation by a qualified irrigation auditor.
Crop, cultivation, nutrient inputs and yield records kept per farm management unit	Maintaining good crop input records is important for: • The calculation of cumulative annual organic fertiliser applications and also their contribution to long term nutrient supply; • The prediction of realistic crop yields that are used to determine crop requirements;

	• Providing accurate inputs to the OVERSEER nutrient budgeting model that is being used here as a proxy for measuring diffuse nutrient losses.
Good design of irrigation systems	Design will match soil properties and low application amounts on shallower soil to prevent summer drainage.
Robust irrigation scheduling	Good irrigation scheduling to prevent summer drainage.
Supplement and feeding out management	To be addressed in the Farm Environmental Risk Assessment.
Winter grazing management	To be addressed in the Farm Environmental Risk Assessment.

4.2 Stage 2 – OVERSEER and meeting WQS mitigation requirements

The WQS thresholds set for Maryburn Station, using the most stringent nutrient mitigation requirement, are 30,077 kg N/year and 517 kg P/year. Table 4 below shows the output from OVERSEER for the modelled proposed farming system at Maryburn Station. The results illustrate that the proposed farm system losses as modelled by OVERSEER are within the thresholds set out by the WQS. Management or mitigation strategies that have been used to meet this threshold are detailed in Section 5.

Table 4. Water Quality Study mitigation requirements for Maryburn Station

	Nitrogen Threshold (kg/farm)	Phosphorous Threshold (kg/farm)
MWRL Water Quality Study Property Thresholds	30,077	517
OVERSEER® outputs	24,086	153

4.3 Stage 3 – Identification and mitigation of site specific environmental risks

4.3.1 Farm Environmental Risk Assessment (FERA)

4.3.1 All regularly used tracks (twice daily) are culverted or bridged. Tracks that do cross through any streams are not used often.

4.3.2 There is no chance of direct runoff form tracks entering a stream, as there are no streams located close to tracks.

4.3.3 The most constantly used stock tracks (for moving) are culverted where possible.

4.3.4 Property does have silage pits; these pits are located in an area that is a long way from any streams.

4.3.5 Stock are not restricted from entering any waterways and have free access for stock water throughout the Maryburn Stream.

4.3.6 During winter months cattle generally are located in the area where the Maryburn Stream flows through the property, this is a large area, and it is my understanding that there may be between 100 and 250 cattle having access to around 3500 hectares during this period. There may also be 3000 ewes over this area as well.

4.3.7 During the winter month's sheep (5000 ewes and around 2500 hoggets) are all wintered (from May to October) in the area where the proposed pivot/pivots are going. These sheep are fed silage (fine chop) over this period (see map of location of pivots).

4.3.8 The yards are located a reasonable distance from any permanent waterways, water is not often used in the yards, and the property has not dipped in around fifteen years.

4.3.9 There is the Maryburn Stream, and Irishman Creak which are both areas of interest on the property. The Maryburn stream is not fenced off and stock have constant access to this. The Irishman creak is also not fenced in the lower reaches, but this creak goes underground above this point, in the upper reaches the creak is fenced to some degree restricting animal access.

4.3.10 There is also the Mouse-tail Plant (*Myosurus Minimus*) found on the property, this has only been found in the PNA zone located within the property, this area is fenced to some degree.

4.3.11 Contractors are employed to do any spraying on the property.

4.3.12 Border dyke irrigation is currently used on the property, but the majority will be upgraded to a centre pivot. There is no wipeoff losses from the border dyke system, as the water is caught by paddocks below, this happens rarely as there is not a large amount of water used. If there is any wipeoff it is not discharged to a waterway as the waterways are a long distance below/downstream of the border dyke area.

4.3.13 Along the Maryburn stream there are areas of relatively bad stock induced erosion (approximately 50 meters, see photos); this according to the applicant is from sheep. There were at the time of the visit around 50 cattle in this vicinity as well.

4.3.14 Pivots will be ring fenced.

4.3.15 Preferably/ almost all the time, direct drilling is used instead of inversion tillage. This may be used on occasion to break in previously unused soils.

4.3.16 Over the winter period the soils are left somewhat bare, as they have been sprayed out.

4.3.17 If there are any winter crops in place, these areas will often be re-drilled and planted in the spring, this is usually in Rye corn.

4.3.18 The property tends to do its 'grazing' in June and September, and nothing in July and August as it can be too wet. During July and August the stock are fed silage.

4.3.19 There are no compacted soils on the property, including the areas of border dykes.

4.3.20 Pest control measures in place currently are; Pindone poisoning for rabbits, 1080 poisoning if rabbits get bad, broom, gorse, and briar spraying, and wilding pine control. There is also a relatively large night shooting operation on the property, this is undertaken by contractors. The property has also got rabbit netting around portions of the boundary.

4.3.21 Fertilisers used are; 250kg of Lucerne mix per hectare, every second year. 250kg of sulphur super 30 and up to 150kg of urea is applied to grass areas every second year. Areas of Rye corn may receive up to 200kg per hectare per annum.

4.3.22 The bases of the pivots will not be located along the road but as far as possible from the road to minimise any visual impacts.

4.4 General issues on extensive high country farming systems

In extensive high country farming systems there are a number of issues that on more intensive farming systems would be assessed as being a risk to water quality but on extensive high country farming systems they have not been defined as a risk due to the extensive nature of the farming systems and the lower stocking rate per hectare. Some of these general issues have been identified below:

1. There will be areas within the farming system where tracks will cross waterways; these are tracks that are used irregularly, in extensive areas of the farm.

2. There are also areas within a high country farming system where stock will have unrestricted access to streams for crossings and stock water. This is an essential access for stock movement and stock water. On most farms there are a number of small creeks/streams that flow within the hill country and it would be logistically impossible to place stock crossings on all of these. There is also the need for stock to move across streams/creeks within a block (paddock) for grazing access. A reticulated water system would be unsustainable in the hill country as troughs would freeze solid in the winter months, preventing access to fresh drinking water.

3. Swamps/heavy grounds are an integral area in a high country farming system; they provide a water source and good grazing for stock in dry years. In undertaking the FERA it has been identified that all swamps/heavy ground need to be monitored to ensure that bank erosion, compaction and pugging does not occur.

4. Wind erosion is a significant issue in the upper Waitaki Catchment. The sparse vegetation on large areas of land in the Mackenzie Basin gives little protection to the shallow, friable soils which continue to be eroded by frost heave and westerly winds. A mean soil loss of 0.22 mm/year or 2.2 tonnes of soil lost per hectare across a number of sites within the Mackenzie Basin has been reported. While it cannot be assumed from this information that erosion rates will continue at this level in the future, the results do confirm a strong relationship between the percentage of vegetation cover and erosion risk. The problem of bare ground and exposure to wind erosion has been compounded since the early 1990s by the rapid spread of hieracium particularly on the poorest soils. One of the most significant impacts of further irrigation in this area would be a reduction in the amount of bare ground and corresponding reduction in wind erosion risk. (*Environmental, Economic and social impacts of irrigation in the Mackenzie Basin. Ministry for the Environment, February 2005.)*

5. Monitoring and identification of any problems arising for the above three issues has been included in Table 8.

5. Farm Environmental Management Plan for Maryburn Station

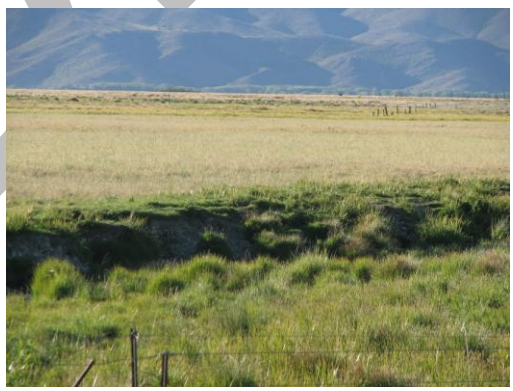
5.1 Mitigation measures and management options adopted on Maryburn Station

The table below shows the all the mitigation and management tools that are proposed to be undertaken on Maryburn Station. Measures indicated as **FEMP stage 1 are those identified as Mandatory Good Agricultural Practice**, **measures identified as FEMP stage 2 are those changes that have been modelled in OVERSEER to meet the WQS mitigation requirement (if required)**, and those indicated as **FEMP stage 3 are mitigation measures chosen to ameliorate site specific environmental risks on the farm.** Table 7 indicates in brief how the measures are to be monitored and audited.

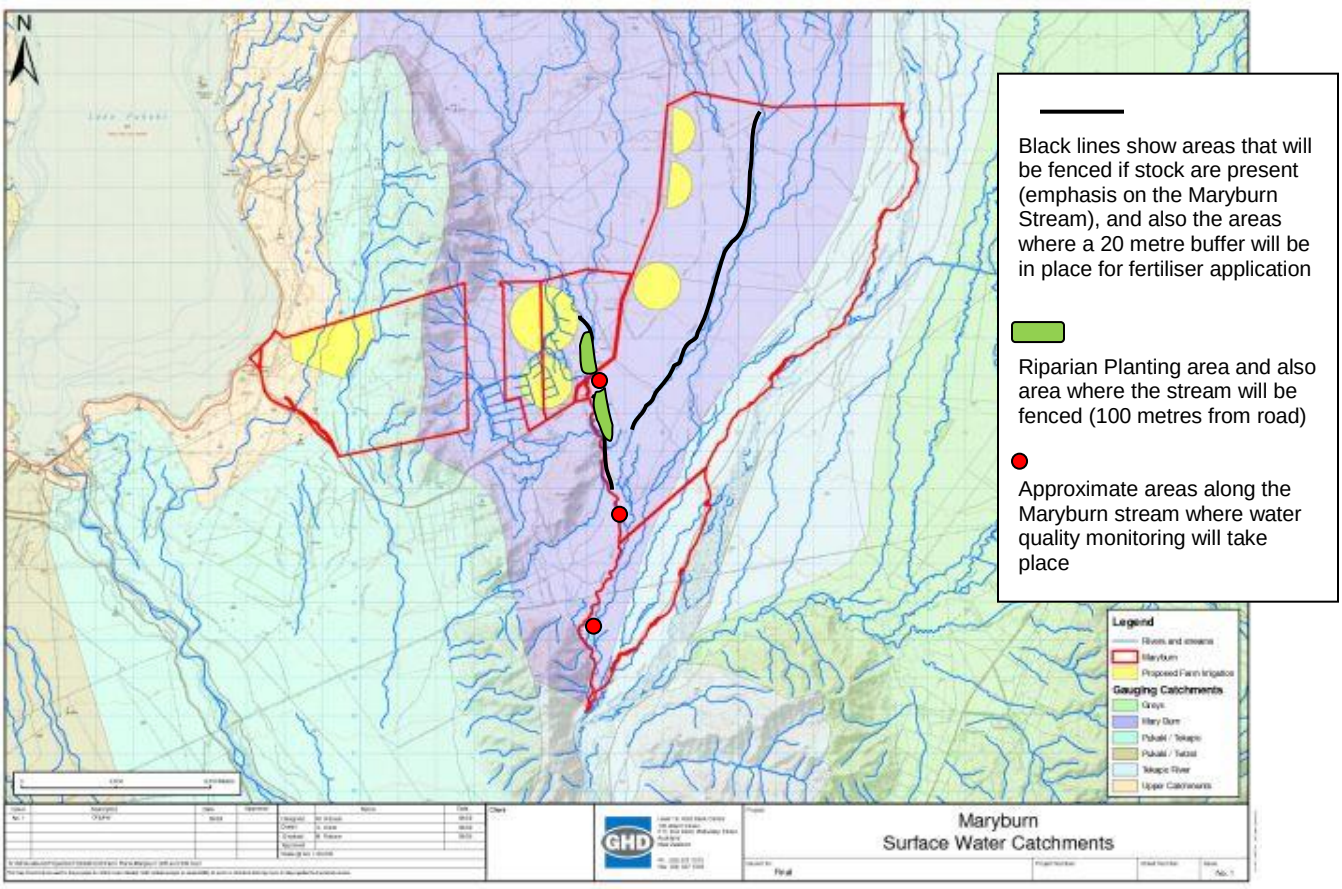
Table 5. Table of mitigation options, monitoring and auditing for Maryburn Station

FEMP stage	Measure	Monitoring	Auditing
1	Fertilisers applied according to code of practice for fertiliser use		Self certification
1	Accounting for all sources of nutrients including applied effluents and soil reservoirs	Soil and effluent testing and cumulative effluent inputs per management unit	Reconciliation of fertiliser, effluent and soil records with nutrient budget for example blocks. Submission of examples soil and effluent tests
1	Even fertiliser application	Calibrate and optimise fertiliser spreaders annually and every 5 years by an external auditor	Submission of testing and calibration
1	Even irrigation and effluent application	Calibrate and optimise irrigators annually in house and every 5 years by an external auditor	Submission of testing and calibration
1	Record crop, cultivation, nutrient inputs and yields per farm management unit	Upkeep of records	Submission of example block records
1	Good design of irrigation systems	Design of irrigation system by a certified professional	Irrigation system audited by a certified auditor every 5 years
1	Robust irrigation scheduling	Calculation of annual % effective water use	Submission of annual % effective water use
2	N fertiliser applications split to under 50 kg N/application	Field records	Signed field records
2	No P fertiliser within three weeks of irrigation	Field records	Signed field records
2	Olsen P of below 30 maintained	Regular soil testing (every 3 years)	Submission of soil tests
3	Fence off the first 100 metres of the Maryburn Stream where it is evident that stock have been causing erosion, this fence may be temporary, and only put up when there are stock located in the area.	Photos	Annual auditing visit.
3	Minimise stock access and grazing in the Maryburn Stream, and Irishman	Photos, and an annual	Compaction survey and photos in the

FEMP stage	Measure	Monitoring	Auditing
	Creek during the winter months of June, July and August, (a temporary fence would be adequate)	compaction survey	audit report
3	Redevelopment of existing irrigation to spray	Photos and location map	Annual audit report until conversion completed
3	20 metre layback from any water way when applying fertliser by land based application e.g. bulk spreader	Field Records	Annual audit report
3	Development of a Riparian margin of a minimum of 5m width along the most affected areas of the Maryburn Stream (the 100 metres that will be fenced)	Water Quality monitoring	Photos in the audit report annually to monitor progress
3	Water quality monitoring of the Maryburn stream before it enters the property and as its exits the property	Monitored quarterly in the first week of the month	Annual audit report and visits.
3	The Pivot bases will not be located parallel to the road, the bases will be located as far away from the road as possible to minimise any visual impact.	Photos of base location and GPS positioning of the base location provided in the first annual report	Annual audit report.



Photos showing the worst area of erosion that is stock induced, this area extends for approximately 100 metres



5.2 Monitoring and Auditing

5.2.1 Baseline monitoring

Baseline monitoring is already underway on Maryburn Station.

Maryburn stream is part of ECAN monitoring for the past 5years.

Table 6. Baseline monitoring on Maryburn Station

		Location	Frequency	Measured parameters to include
Soil	Soil nutrient testing	All blocks in rotation	1 in 3 years	Standard suite of soil nutrients
Water	Maryburn stream (carried out by ECan)	HIGHWAY BRIDGE	YEARLY	Total Nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids.
Water	Groundwater quality (carried out by Maryburn Station)	HOUSE WELL	2-5 YEARLY	Nitrate nitrogen and dissolved reactive phosphorous

		Location	Frequency	Measured parameters to include
Pasture	Ground cover and species	All blocks	As required	% Ground cover, species

5.2.2 On-going monitoring

On-going monitoring and auditing of FEMP are as important as the plan itself.

Table 6 above shows the current monitoring undertaken on Maryburn and Table 7 below shows proposed monitoring plan, frequency, location for the monitoring and parameters for the monitoring along with the triggers and contingency plans if the triggers are exceeded.

Table 7. Example monitoring plan for Maryburn Station showing location, frequency and parameters for monitoring

		Location	Frequency	Measured parameters to include	Triggers	Contingency plan if triggers are exceeded
Soil	To include: Soil nutrient testing	All blocks in rotation	1 in 3 years for soil nutrient status	Standard suite of soil nutrients	Olsen P >30	Reduce or stop the application of P fertiliser to the area and monitor
Soil	Soil compaction testing	All blocks in rotation	Annually for soil compaction testing.	Soil compaction	Compaction, surface capping	Remove compaction with the appropriate tool
Runoff	Wet weather survey	All blocks and tracks	Annually	Runoff	Runoff occurring	Introduce runoff removal infrastructure where appropriate.
Water	Surface water quality	Maryburn Stream.	Annually	Total Nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, E Coli and suspended solids.	No significant decrease in water quality	If comparative surface water analysis indicates a decrease in surface water quality then the particular contaminant should be identified while a full root cause analysis is undertaken
Water	Groundwater quality	Maryburn house well	2 – 5 yearly	Total Nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, E Coli and suspended solids.	No significant decrease in water quality	If comparative surface water analysis indicates a decrease in surface water quality then the particular contaminant should be identified while a full root cause analysis is undertaken
Water	Irrigation application		Annually in house and 1 in 5 years by an independent	Application uniformity	>80 %	Optimisation of the irrigator performance will be performed at the time of testing
Fertiliser	Fertiliser application		Annually in house and 1 in 5 years by an independent	Application uniformity	>80 %	Optimisation of the spreader performance will be performed at the time of testing

		Location	Frequency	Measured parameters to include	Triggers	Contingency plan if triggers are exceeded
Weed and pest pressures	Weed and pest populations	Relevant blocks	Annually	% or magnitude of infestation	ECAN monitor and communicate if their triggers have been exceeded	Legislative compliance with notice of direction issued by ECAN

Where triggers are exceeded, the immediate contingency plans in Table 9 should be implemented while a 'root cause' analysis is carried out. Any further mitigation measures to be adopted as a result of monitoring should be added to Tables 7, 9 and 10.

1) Is the current mitigation option implemented correctly?

No – Implement and monitor

Yes – to 2)

2) Has anything changed in the farm system?

Yes – remodel and monitor

No – to 3)

3) Have there been abnormal conditions at the time of trigger breach?

Yes – continue monitoring to see if trigger breach continues

No – Seek advice if suitably qualified person to investigate root cause and suggest appropriate mitigation.

If emergency conditions occur that risk a pollution event, such as a catastrophic failure of the irrigation system that is resulting in overland flow to a watercourse, seek immediate guidance from you regional council:

Environment Canterbury 0800 76 55 88

5.2.3 Auditing

The auditing process allows both the farm operator to illustrate, and other interested parties to have confidence that the management practices and mitigations planned for the farm are being implemented. In addition, the audit shows that there is a mechanism for the adaptive management of the property should the chosen mitigation or management not perform to expectations.

An annual audit is proposed, and requires both external and in-house input. The annual audit should be completed and submitted to ECan by end of July each year.

Table 8 below shows an example of an annual audit report for Maryburn Station.

Table 8. Table showing proposed contents of an annual audit report for Maryburn Station

Mitigation Measure	Audit Measures	Action in case of non compliance
	Annual audit of OVERSEER nutrient budget and report based on previous 3 years.	Should the OVERSEER report show losses exceeding the threshold, further mitigations should be adopted to effect a

	Submission of compliance with thresholds	reduction in nutrient loss to below thresholds.
	Submission and brief interpretation of water quality analysis	Where triggers have been exceeded, immediate contingency plans should have been carried out and a root cause analysis conducted. The results of which should be presented here.
	Submission and brief of annual wet weather survey	Any remedial actions proposed after the annual survey should be undertaken.
	Submission and brief of annual tracks that cross waterways survey	Any remedial actions proposed after the annual survey should be undertaken
	Submission and brief of annual compaction survey of the irrigation area	Any remedial actions proposed after the annual survey should be undertaken
	Annual pest and weed survey undertaken by Ecan should be submitted	Legislative compliance
Even irrigation application	Calibrate and optimise irrigators annually in house and every 5 years by an external auditor	Submission of testing and calibration
Record crop, cultivation, nutrient inputs and yields per farm management unit	Verification of records	If records have not been produced then this should be rectified for next audit
Good design of irrigation systems by a certified professional and audited every 5 years	Irrigation system audited by a certified auditor every 5 years and any changes recommended should be implemented	If changes recommended not implemented then this should be rectified by next audit
Robust irrigation scheduling	Verification of records	If records not received then this should be rectified by next audit
No June/July application of fertiliser on the irrigated area	Field records	If records not received this should be rectified for next audit.
N fertiliser applications split to under 50 kg N/application	Field records	If records not received this should be rectified for next audit
No P fertiliser within three weeks of irrigation	Field records	If records not received this should be rectified for next audit
Olsen P of below 30 maintained	Submission and brief interpretation of soil test results	Where triggers have been exceeded, immediate contingency plans should have been carried out and a root cause analysis conducted. The results of which should be presented here.
Fence off the first 100 metres of the Maryburn Stream where it is evident that stock have been causing erosion, this fence may be temporary, and only put up when there are stock located in the area.	Check fenced areas are present and where they have indicated they will be. Photos	Areas of fencing damage should be repaired.
Minimise stock access and grazing in the Maryburn Stream, and Irishman Creek during the winter months of June, July and August, (a temporary fence would be adequate)	Check fenced areas are present and where they have indicated they will be. Photos	Areas of fencing damage should be repaired.
Redevelopment of existing irrigation to spray	Photos and location map	Ensure conversion is completed within specified timeframe

20 metre layback from any water way when applying fertliser by land based application e.g. bulk spreader	Field records and maps	If maps not received with annual audit this should be rectified by the next audit.
Development of a Riparian margin of a minimum of 5m width along the most affected areas of the Maryburn Stream (the 100 metres that will be fenced)	Water Quality monitoring of Maryburn, photos. Check riparian vegetation is present and where it has been indicated it will be. Location Map.	Areas of riparian vegetation failure or damage should be replaced prior to the next audit
The Pivot bases will not be located parallel to the road, the bases will be located as far away from the road as possible to minimise any visual impact.	Photos of base location and GPS positioning of the base location provided in the first annual report	Plans should be inspected prior to construction to ensure they are located where specified

6. Summary

This FEMP has been written to serve two purposes; to ensure the existing farm system can meet the nutrient mitigation requirements set out by the MWRL Water Quality Study, and to set out the process for identification of farm specific environmental risks that arise from the inherent characteristics of the farm and from the existing farm system and its management.

The WQS thresholds and modelled outputs from OVERSEER detailed in Section 4.2 illustrate that this proposed system meets the WQS thresholds identified.

A full on-farm risk assessment was completed in December 2009 with a commitment to address the risks identified. Section 4.3 sets out the risks identified for this property and those issues common to all high country farming systems, along with existing mitigation measures.

The mitigation and management measures detailed in Table 5 set out the measures that have been adopted to mitigate and manage the risks that were identified in the risk assessment along with mandatory good agricultural practices and those measures that have been modelled in OVERSEER.

Baseline monitoring and any additional monitoring proposed for this property are identified and set out in Section 5.2, Tables 6 and 7 allows the performance of the measures chosen to be monitored and where they are performing sub-optimally, these can be addressed through the root cause analysis process.

The auditing of this plan, addressed in Section 5.2.3, Table 8 ensures that the relevant mitigation measures outlined in Table 5 are audited annually either internally or externally and communicated to ECAN by the end of July each year.