Farm Environmental Management Plan: Aviemore and Otematata Stations

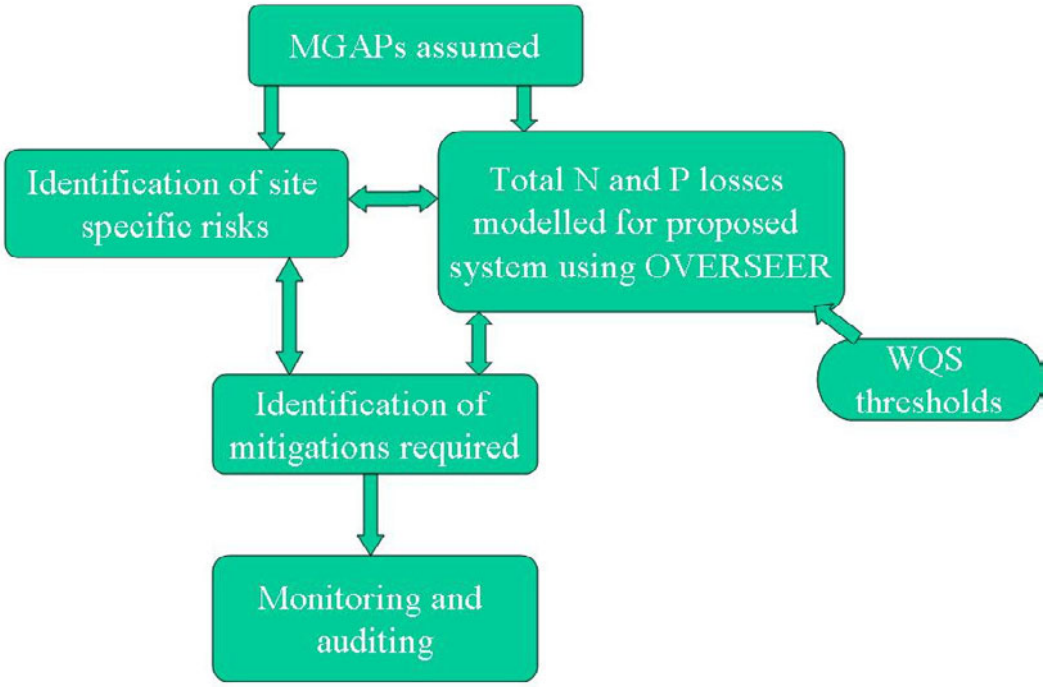
1. Introduction

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



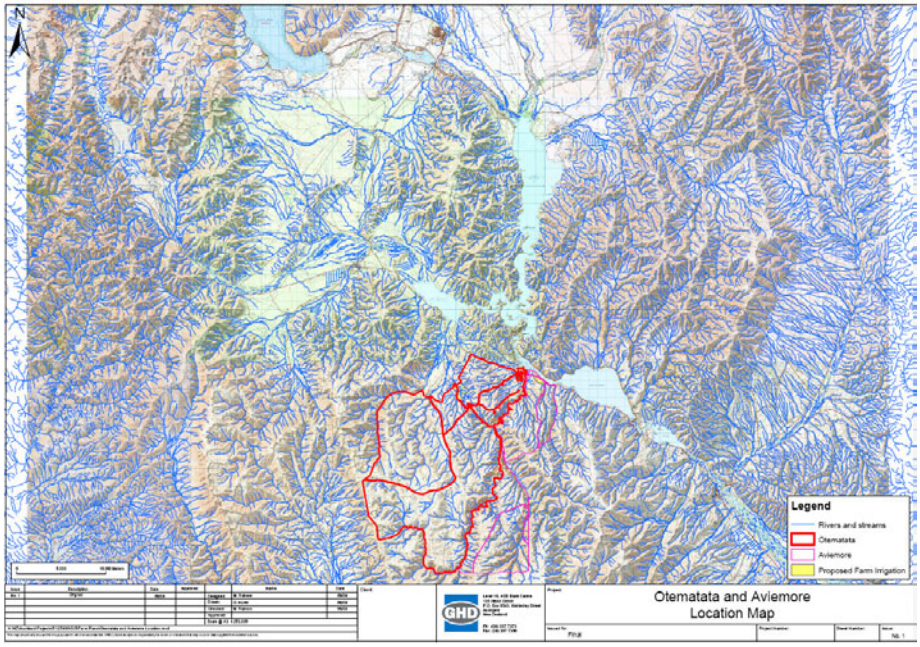
MGAP – Mandatory good agricultural practices

2. Farm Description

2.1 General farm description

Otematata Station is farmed in conjunction with Aviemore Station (which have water permit applications subject to this hearing) Awakino Downs and Little Awakino Station. The latter two areas have been used to grow out the young stock and as the hogget wintering blocks. What this means is that the property farmed by the applications extends from the shores of Lake Aviemore and Lake Waitaki to the Round Hills to the south.

To date the farm has been farmed using a very traditional method of farming within the high county. This involves having extensive areas available for stock grazing. In general the ewes are placed on the easier better country with weathers placed on the higher undeveloped country during the summer. Prior to winter all stock are brought off the higher country and wintered on the lower country. It is the lower countries stock carrying capacity that determines the numbers of stock able to be farmed on these properties. This also means that the farming system currently used by the applicant has a heavy reliance on being able to use land at the higher altitudes, which the applicant acknowledges that other uses for this land exist, such as recreation and conservation.

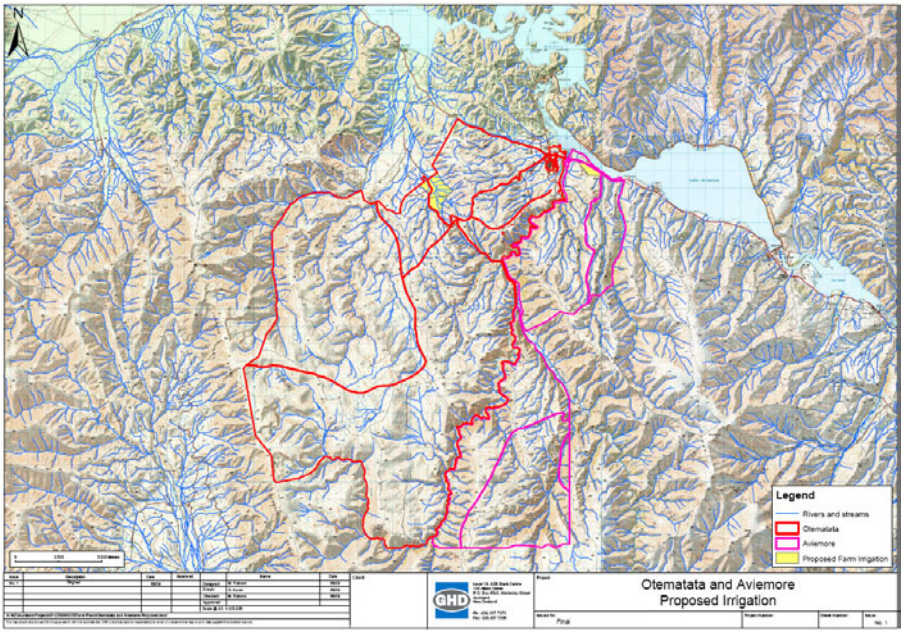


Map A: Location map for Otematata and Aviemore Stations

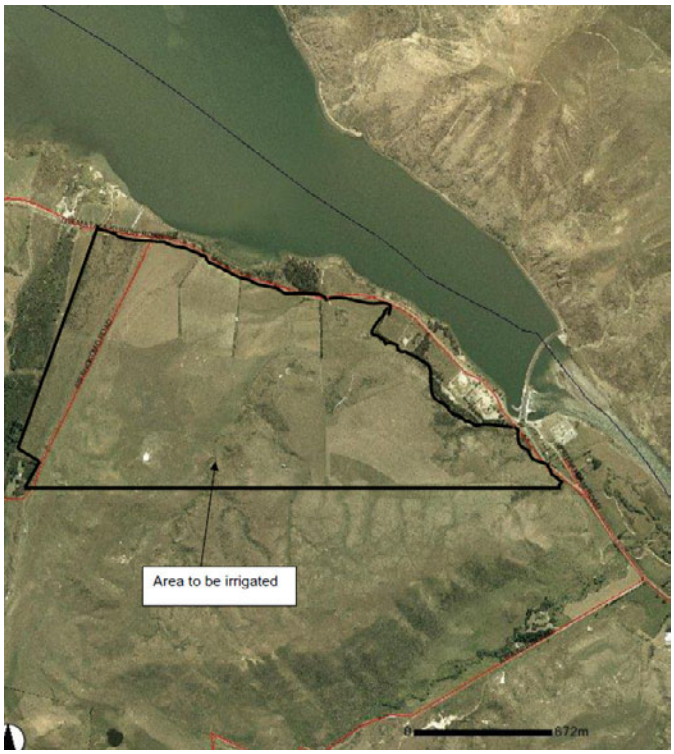
Table 1. Cover utilisation by season and stock class for current system

	Cover utilisation by season and stock class - CURRENT			
Class of stock	**Spring**	**Summer**	**Autumn**	**Winter**
Ewes	Grass flats	Oversewn hill	Native	Oversewn hill
Hoggets	Grass flats	Grass flats	Oversewn hill	Oversewn hill
Breeding cows	Grass flats	Native	Native	Native
R1 Steers	Grass flats	Grass flats	Grass flats	Ryecorn

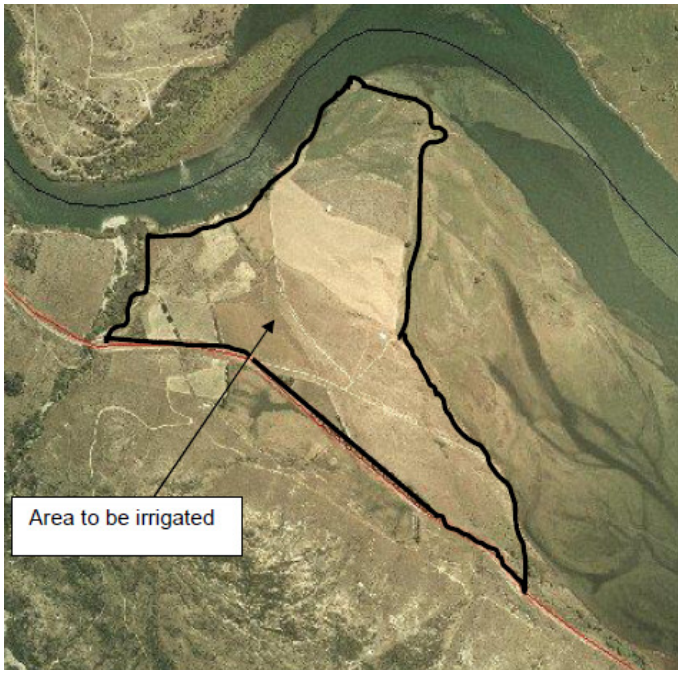
2.2 Proposed farming system



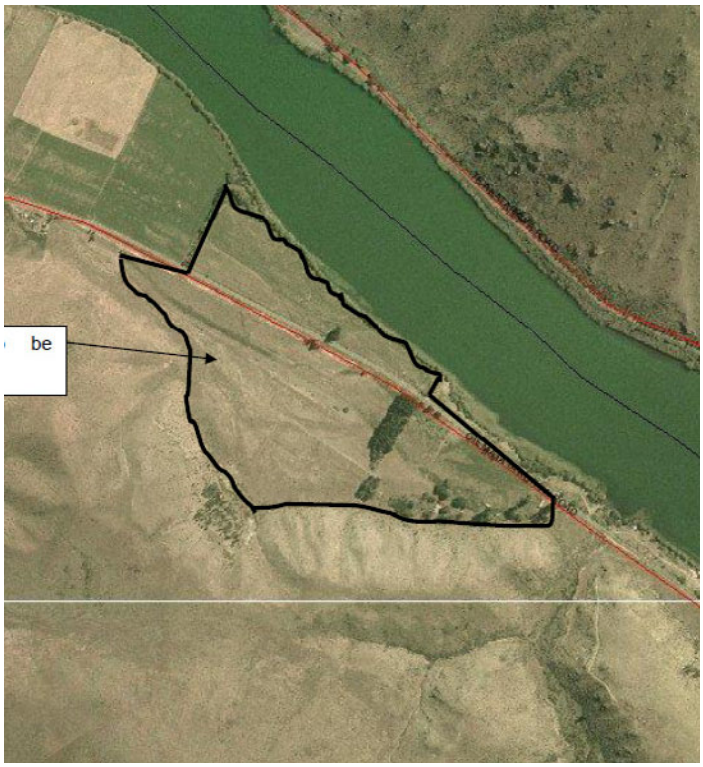
Map B: Proposed irrigation development – Otematata and Aviemore Stations



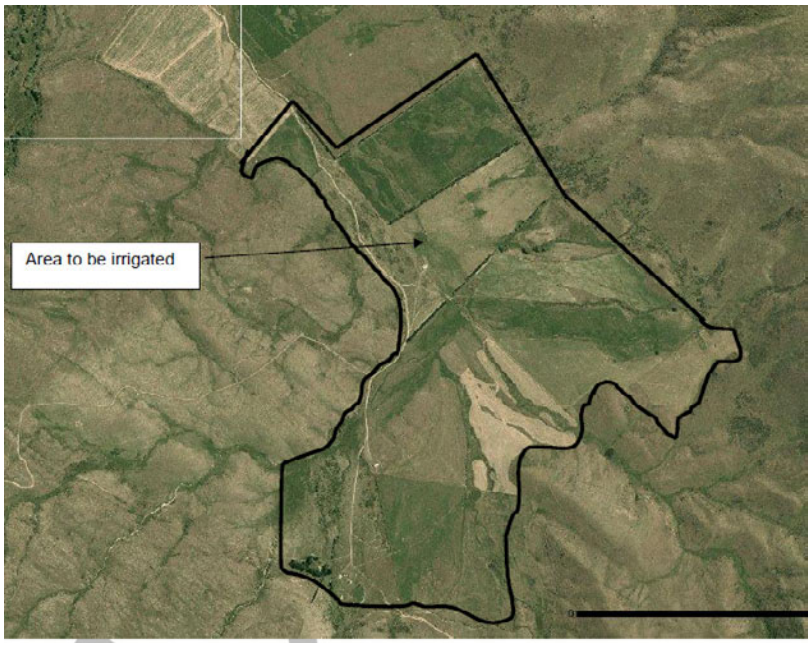
Map C: Area to be irrigated on Aviemore Station from Lake Waitaki



Map D: Area to be irrigated on Otematata Station from Lake Waitaki



Map E Specific area to be irrigated on Aviemore Station from Lake Aviemore



Map F: Specific area to be irrigated on Otematata Station from Glen Bouie Stream

Allowing the areas to be irrigated will allow for a greater level of flexibility within the applicant's existing farming operation. This flexibility will enable the applicant to have a level of confidence that they will be able to produce a high quality product. The greatest value is in the fact that the irrigation addresses, in part, some of the current limiting factors which are:

- High variably in seasons. This variably leads to significant risks when taking on contracts (i.e. to grow lambs to a specific weight/condition etc) as the quality of the end product can be compromised.
- Further the variability in seasons can also have a significant impact upon the economic viability of the farm. In particular if as a result of drought conditions, stock (both lambs, replacement stock and in particularly bad drought conditions breeding stock) have to be sold. If the latter occurs, it can take many years for the farm to recover and be back to pre drought stocking rates.
- There is also a high variability in the quality and quantity of crops (such as oats and hay) grown specifically for winter-feed. Allowing irrigation will enable the application to have a grater level of flexibility in the types of crops grown for winter feed, in particular Lucerne could be grown.
- To make sufficient winter feed large areas of un-irrigated land is required due to low growth rates of pasture. The larger the area needed, the higher the cost is of ensuring that sufficient winter feed is available.
- If insufficient winter-feed can be made on-site, then additional winter feed needs to be brought in. Transporting such feed into the basin is a significant cost to the applicant.

Allowing irrigation will have significant benefits for the applicant in terms of increase in reliably being able to provide a high quality product, financial rewards as a result of producing a high quality product, increased flexibility in the farming operation and significant benefits in terms of animal husbandry. It should be noted that allowing irrigation will not significantly change the farming system; rather it will strengthen the existing operation.

The value of irrigation for the applicant is being able to have consistently high quality feed. This is critical to the farming operation. This is because the quality of the feed able to be produced on-site sets the platform for the whole years, and potently following year's production. Enabling the applicant to finish lambs, to lamb 2tooths on the property, which to date has been very difficult, increase pregnancy and calving rates of cattle along with diversifying into other high value crops such as viticulture, gives higher

financial rewards with minimal costs when compared to having to sell stock from the property, usually at lower returns

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**
Ewes	Grass flats	Oversewn hill	Native	Oversewn hill
Hoggets	Grass flats	Grass flats	Oversewn hill	Oversewn hill
Breeding cows	Grass flats	Native	Native	Native
R1 Steers	Grass flats	Grass flats	Grass flats	Ryecorn

2.3 Soils

Light to medium depth of top soil on hills, some stone with a mixture of soil types on both undeveloped and developed flat land.

2.4 Topography

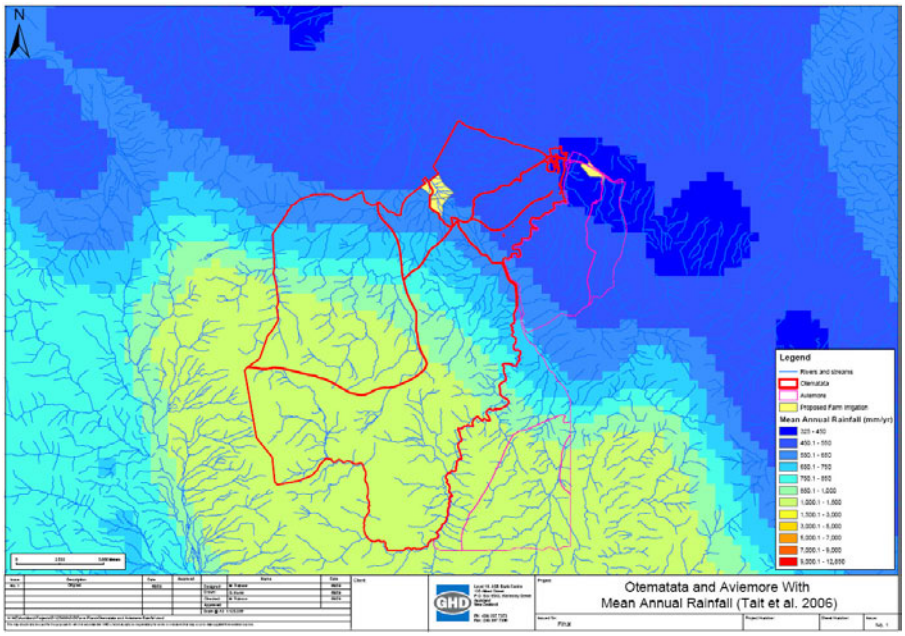
The topography of the farm can be described as a mixture of rolling to steep hill country. There are some limited river flats which adjoin Lakes Aviemore and Waitaki.

Photo A - Topography of Otematata Station

Photo B – Remains of river flats (Lake Waitaki)

2.5 Climate

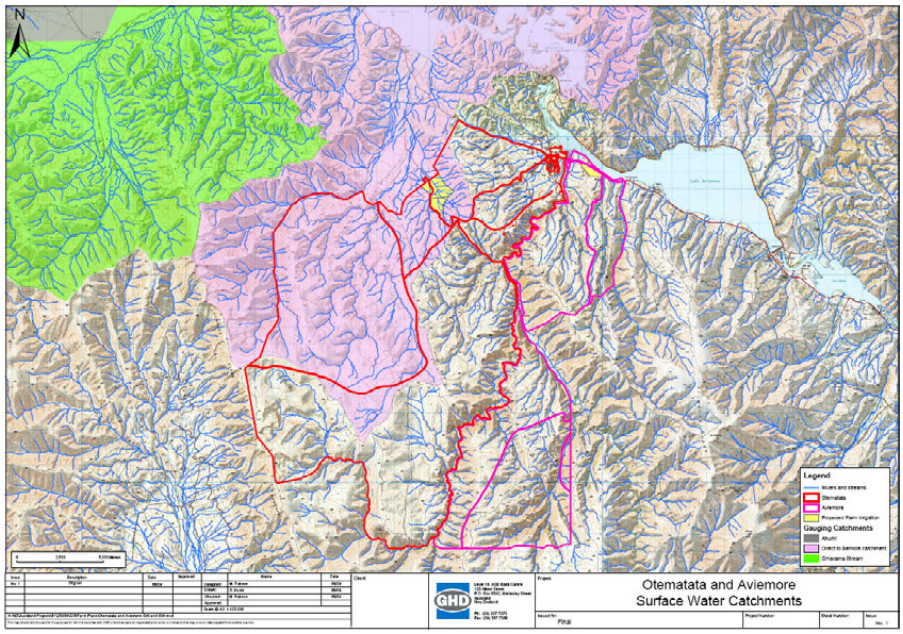
Winter cold (heavy snow falls common) and summer dry with high evaporation levels. North-westerly weather aspect with unreliable rainfall, especially October to March.



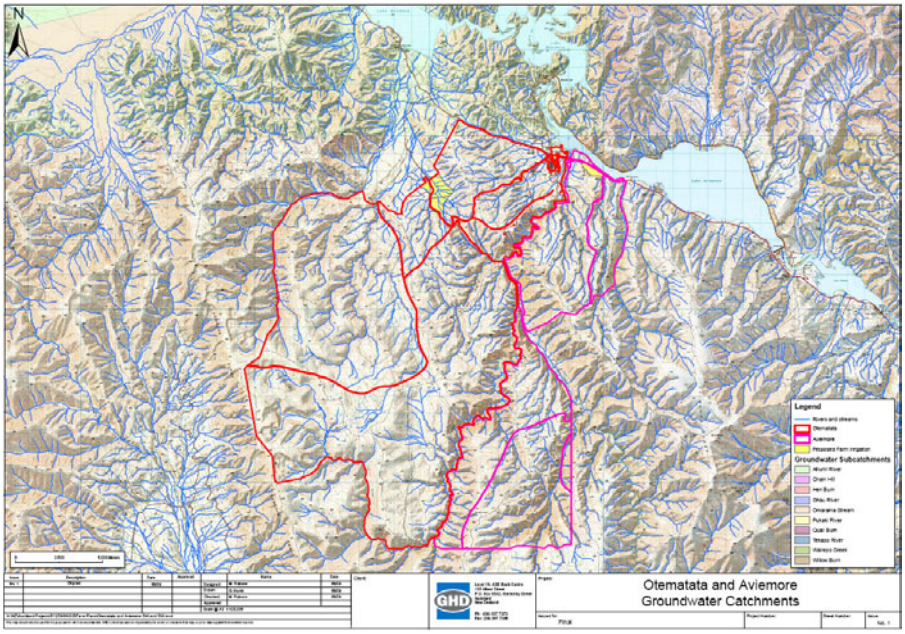
Map G: Mean annual rainfall – Otematata and Aviemore Stations

3. Environmental Context

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



Map F: Surface water receiving environment



Map H: Groundwater receiving environment

3.1 Water Quality Study receiving environments and mitigation requirements

Otematata and Aviemore Stations, according to the WQS, lies in the Lake Benmore, Lake Aviemore and Lake Waitaki surface water catchments. These maps are shown above

Table 3 shows the calculated nutrient mitigation requirement of the receiving environments determined in the WQS and the resulting thresholds for N and P for Otematata and Aviemore Stations.

For this farm, the Lake Benmore mitigation requirements are the most stringent. These mitigation requirements cap Otematata and Aviemore Stations' combined nutrient discharges at 97,622 kg N per annum and 2,206 kg P per annum.

3.2 Local receiving environments

Describe the local receiving environments for the farm. These should also be shown on the receiving environment map referred to above.

Table 3: Water Quality Study mitigation requirements for Otematata and Aviemore Station

	Stream mitigation required for periphyton kg/ha irrigated land	Secondary Stream mitigation required for periphyton kg/ha irrigated land	Stream mitigation required for ANZECC kg/ha irrigated land	Secondary Stream mitigation required for ANZECC kg/ha irrigated land	GWR mitigation required kg/ha irrigated land	Lake Mitigation required kg/ha irrigated land
N	0	0	0	0	0	10.7
P	0	0	0	0	0	1.1

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 4 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 Otematata and Aviemore Stations, using the most stringent nutrient mitigation requirement, are 97,622kg N/year and 2,206 kg P/year. The table below shows the output from OVERSEER for the modelled proposed farming system at Otematata and Aviemore Stations. 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 5. Total N and P losses modelled by OVERSEER for the proposed farming system on Otematata and Aviemore Stations and WQS thresholds

	OVERSEER modelling outputs kg/year	**WQS threshold kg/year**
Total N leaching/runoff	81,239	97,622
Total P leaching/runoff	793	2,206

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

4.3 Farm Environmental Risk Assessment (FERA)

4.3.1 All the regularly used tracks on the farm are culverted or bridged, and the streams that do get crossed, get crossed very rarely.

4.3.2 The tracks that get used for stock moving are all tracked and the stock are restricted to this where possible.

4.3.3 There is no evidence of any direct runoff from any of the tracks entering a waterway.

4.3.4 Silage pits are not used, but silage buns are used. During the time of my visit (2nd December) there were no buns located near a watercourse, but I was made aware that one bun may be located close (100 metres) to a waterway, this will not have any adverse on the watercourse as the runoff experienced would be minimal.

4.3.5 Stock are not restricted from entering water courses and these are often used for stock water (including Lake Aviemore and Lake Waitaki), the Otematata River is largely fenced off, as is the Parsons Rock stream.

4.3.6 Water is used in the yards and most of the yards are located a long distance from any streams, dipping has not been done in the last 10 years, but if fly strike gets bad again it will be used. There is one set of yards that is located around 30 metres from the diversion stream from the Glen Bouie Creak. These yards are not often used (around once a year), and if dipping is taking place it is electric eye dipping so the runoff from this is minimal.

4.3.7 There are around 10 PNA areas over the property, none of these are near any low land or irrigated land, with most being up on the "tops".

4.3.8 The majority of the wetland areas are at high altitude (1500 metres up); there are also three larger streams/rivers on the property, these being the Otamatapaio, Otematata, and Parsons Rock Stream. The Otamatapaio River does not have large numbers of stock located in close proximity, these stock can access the river for water if need be, the Otematata river is fenced to some degree with stock having access for water in areas, the Parsons Rock Stream is only small and stock are allowed to access this for water.

4.3.9 The applicant already has a small natural buffer in place along Lake Aviemore and Waitaki, this is around 5-10 metres wide, and the applicant acknowledges the fact that this buffer will be made larger.

4.3.10 If any areas are being sprayed out contractors are brought in to do the job.

4.3.11 There is border dyke irrigation on the property (15 Hectares), close to Lake Waitaki; it is my understanding that there is no runoff from these border dykes (see photos where there is freshly mown grass). These border dykes are likely to change to spray irrigation in the future (guns).

4.3.12 Direct drilling is used most often, and turning the soils over is avoided as much as possible, but on occasions when land needs to be broken in it is turned over (ploughed).

4.3.13 Soils are not left bare over the winter period, some soils have winter crops planted in them, and this is not done on a large scale.

4.3.14 Most stock are set on the hill block, with the exception of the steers, which are on the ryecorn. After the paddock has been in ryecorn (depending where on the property this is) it will either return to permanent pasture or lucerne.

4.3.15 There is no problem with compacted or consolidated soils on the property, including under the border dykes.

4.3.16 Pest control measures in place are; night shooters are brought in for rabbits, trapping for rabbits, stoats, ferrets, and for weeds such as gorse and broom the patches are spot sprayed. Wilding pines are also targeted by contractors some years as well.

4.3.17 Fertilisers used are; 300 tonne of Maxi sulphur super is used on the hill country, and over the flats (approximately 15000-20000 hectares); lucerne mix is used on the lucerne on occasion when it has been grazed hard or cut for silage. 10 tonne of crop 20 is used every year for the regrassing areas.

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 Otematata and Aviemore Stations

5.1 Mitigation measures and management options adopted on Otematata and Aviemore Stations

The table below shows the all the mitigation and management tools that are proposed to be undertaken on Otematata and Aviemore Stations. 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 6 indicates in brief how the measures are to be monitored and audited.

Table 6. Table of mitigation options, monitoring and auditing for Otematata and Aviemore Stations

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	**e.g.** No winter application of fertiliser	Field records	Signed field records
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	Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin as detailed in the map below	Water quality monitoring continued quarterly, and photos in the audit report	Annual audit report and visit
3	Maintain a 5-11 metre irrigation setback from any waterways	Photos	Annual auditing visits

FEMP stage	Measure	Monitoring	Auditing
3	20 metre layback from any water way when applying fertliser by land based application e.g. bulk spreader	Field Records	Annual auditing report
3	Plant a buffer zone along the boundaries of the Lakes Aviemore and Waitaki.	Photos	Annual Auditing visit to view the progress
3	Fence along the waterways as best as possible. This includes the Lakes. These may be fenced with an adequate 2 wire waratah fence. Drinking bays may be made along this fence, and the fence only has to be erected during times that stock are in the area. In the case of the Otamatata River stock numbers should be kept relatively low as fencing this could be difficult	Photos and location maps of the fences	Annual auditing visits
3	Footrot and dip must be contained within the yards and allowed to evaporate, also a small filter strip planted alongside the small stream that flows near the yards.	Photos and water quality monitoring of this stream	Annual auditing visits and report

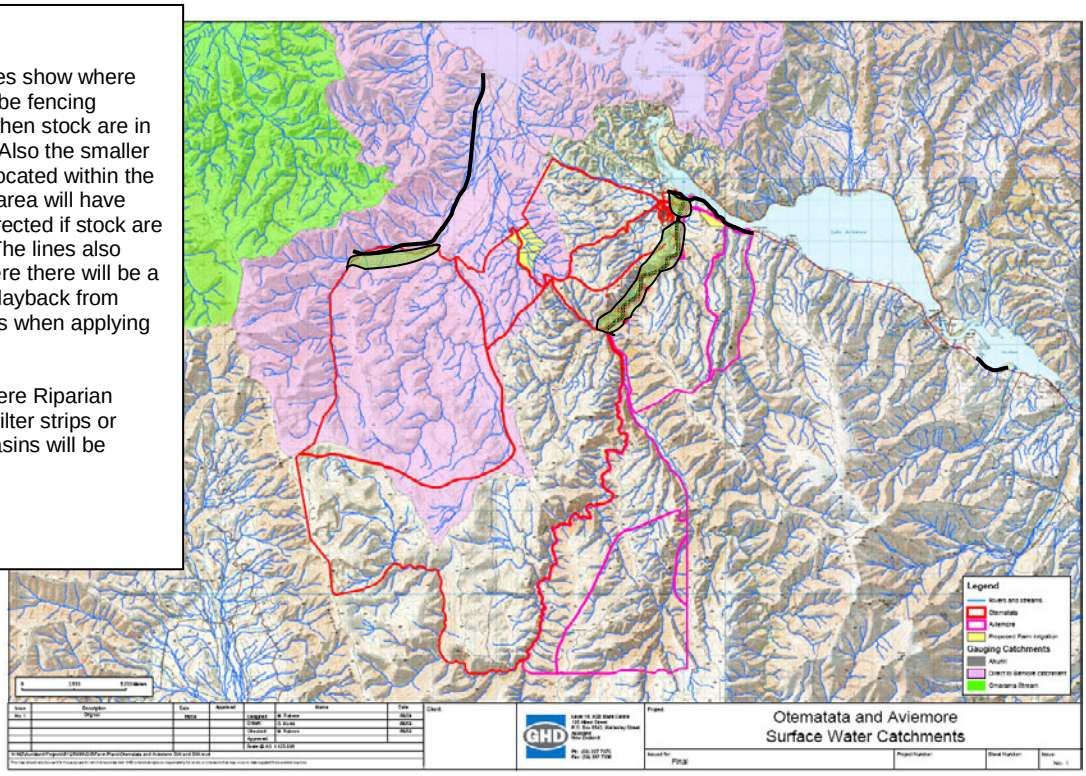
Photos one and two are looking down on areas that will be fenced along the Lakes

Culverts already in place across a main track

The stream that is located close to the sheep yards that will have a filtration strip planted

Black Lines show where there will be fencing erected when stock are in the area. Also the smaller streams located within the irrigation area will have fencing erected if stock are in them. The lines also show where there will be a 20 metre layback from waterways when applying fert.

Areas where Riparian planting, filter strips or Stilling Basins will be located



5.2 Monitoring and Auditing

5.2.1 Baseline monitoring

Baseline monitoring is already underway on Otematata and Aviemore Stations.

Table 7. Baseline monitoring on Otematata and Aviemore Stations

		Location	Frequency	Measured parameters to include
Soil	Soil nutrient testing	All irrigation paddocks and intensive areas in rotation	1 in 3 years	Standard suite of soil nutrients, pH C, N and organic matter
Pasture	Ground cover and species	All blocks	Annually	% Ground cover, species
Weed and pest		Whole farm	Annually	Done as part of an annual survey from ECan

5.2.2 On-going monitoring

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

Table 7 above shows the current monitoring undertaken on Otematata and Aviemore and Table 8 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 8. Example monitoring plan for Otematata and Aviemore Stations 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 irrigation paddocks and intensive areas in rotation	1 in 3 years for soil nutrient status	Standard suite of soil nutrients, pH C, N and organic matter	Olsen P >30	Reduce or stop the application of P fertiliser to the area and monitor
Soil	Soil compaction testing	All irrigation 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	Annually	Runoff	Runoff occurring	Introduce runoff removal infrastructure where appropriate.
Water	Surface water quality	As per consent conditions	As per consent conditions	As per consent conditions	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	Irrigation area	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
Tracks that cross waterways	Visual assessment of bank/track erosion	All tracks that cross creek/stream within extensively farmed areas	Annually	Visual assessment of bank/stream erosion caused by vehicle crossing or stock	Any sign of extensive visual erosion	Restrict vehicle and stock access until an assessment of the damage and cause can be made
Fertiliser	Fertiliser application	All Farm	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
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 8 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, 8 and 9.

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 9 below shows an example of an annual audit report for Otematata and Aviemore Stations.

Table 9. Table showing proposed contents of an annual audit report for Otematata and Aviemore Stations

Mitigation Measure	Audit Measures	Action in case of non compliance
	Annual audit of OVERSEER nutrient budget and report based on previous 3 years. Submission of compliance with thresholds	Should the OVERSEER report show losses exceeding the threshold, further mitigations should be adopted to effect a 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.
Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin as detailed in the map in section 5.1	Water quality monitoring continued quarterly, and photos in the audit report	Areas of riparian vegetation failure or damage should be replaced prior to the next audit. Settling ponds should be constructed and in use before next audit
Maintain a 5-11 metre irrigation setback from any waterways	Check setback area is present. Photos	Areas of less than 5m setback should be extended to ensure the minimum is 5m.
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.
Plant a buffer zone along the boundaries of the Lakes Aviemore and Waitaki.	Photos	Areas of riparian vegetation failure or damage should be replaced prior to the next audit.
Fence along the waterways as best as possible. This includes the Lakes. These may be fenced with an adequate 2 wire waratah fence. Drinking bays may be made along this fence, and the fence only has to be erected during times that stock are in the area. In the case of the Otamatata River stock numbers should be kept relatively low as fencing this could be difficult	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
Footrot and dip must be contained within the yards and allowed to evaporate, also a small filter strip planted alongside the small stream that flows near the yards.	Photos	Areas of riparian vegetation failure or damage should be replaced prior to the next audit.

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 6 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 7 and 8 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 9 ensures that the relevant mitigation measures outlined in Table 6 are audited annually either internally or externally and communicated to ECAN by the end of July each year.