Farm Environmental Management Plan: Willowburn Station

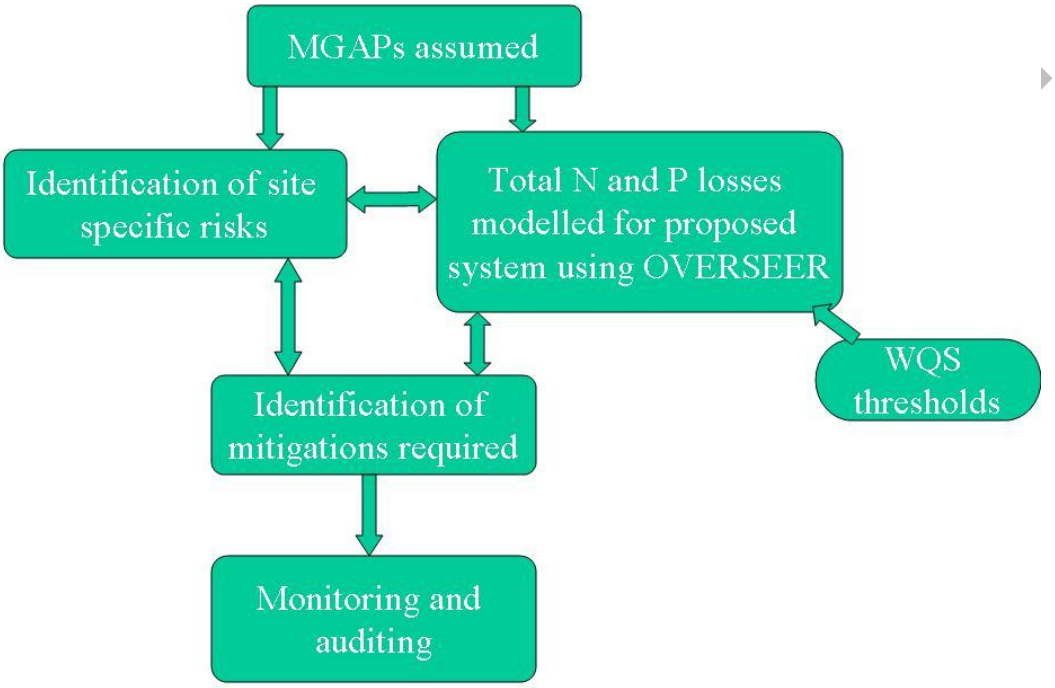
1. Introduction

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 Planing. 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

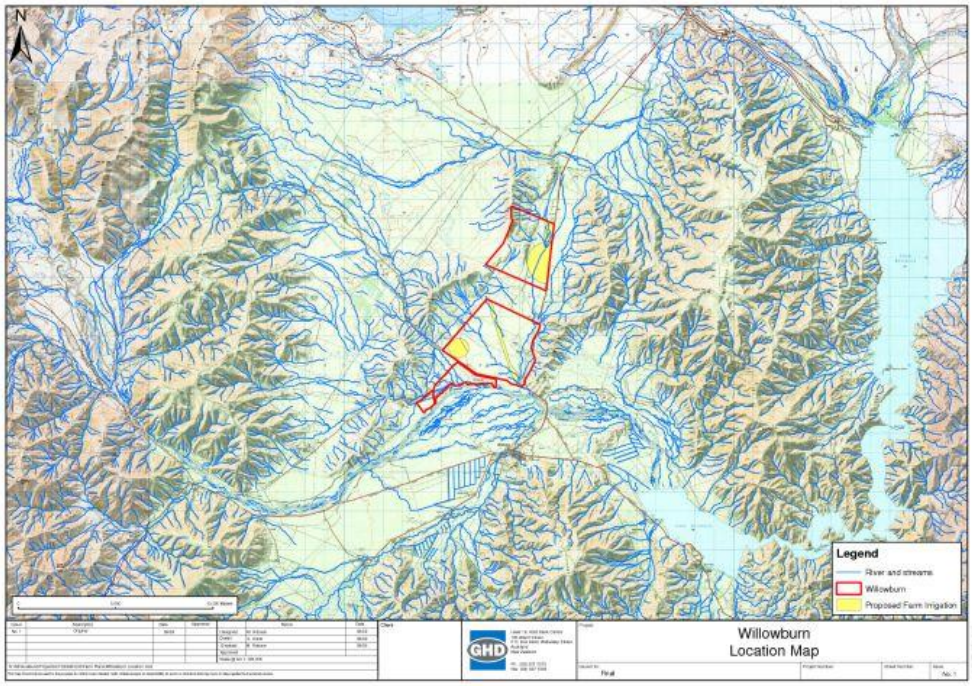
Willowburn Station is a 2,200ha property located adjacent to SH79, between Twizel and Omarama. The farm produces fat lambs, beef cattle, store weaner deer/velvet and grazes dairy dry stock.

The farm is effectively split into two blocks both bisected by the Wairepo water race and Willowburn Stream.

82 hectares is used to grow crops and/or small seeds.

168 hectres is irrigated using a centre pivot with water supplied from the Benmore Irrigation Scheme and this is situated on the top block adjacent to SH8,

35 hectares is currently irrigated out of the Wairepo system using k-line irrigation to grow pasture.



Location Plan

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	Oversown flats set stocked all year			
Hoggets	Oversown hill set stocked from weaning			
Whethers	Oversown hill set stocked from weaning			
Deer hinds and stags	Set stocked on oversown hill block			Oversown flats
Weaned deer	Rotated around oversown flats until 18 months of age			

Breeding cows	Set stocked over entire property	
Dairy Grazing	Rotated around pivot	Feed supplements on native hill
Crop	After half of centre pivot used to fatten stock, it is used for small seed and cereal crops	

2.2 Proposed farming system

There are no changes to the farm system proposed.

2.3 Soils

The soils on Willowburn Station are light to medium silt, with water holding capacity of 40mm to 75mm.

2.4 Topography

Willowburn Station is 80% rolling flats to very steep, with the Willowburn Swamp in the SE corner.

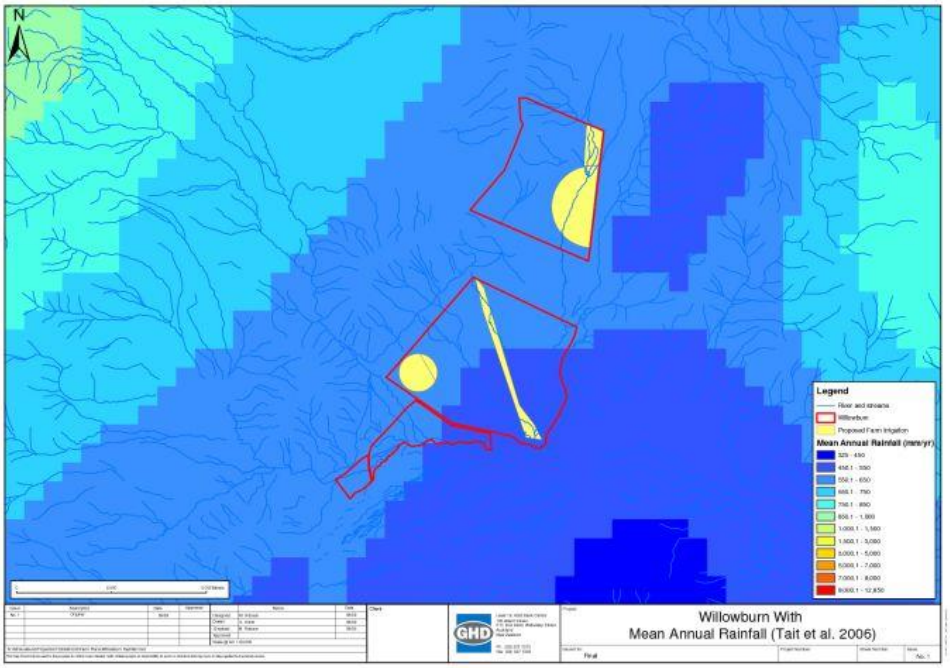
Topography of Willowburn Station

2.5 Climate

Annual rainfall ranges from 583mm at the Top Block to 550mm at the Bottom Block. Summers are very dry.

Snow occurs most winters of depths between 100mm and 500mm.

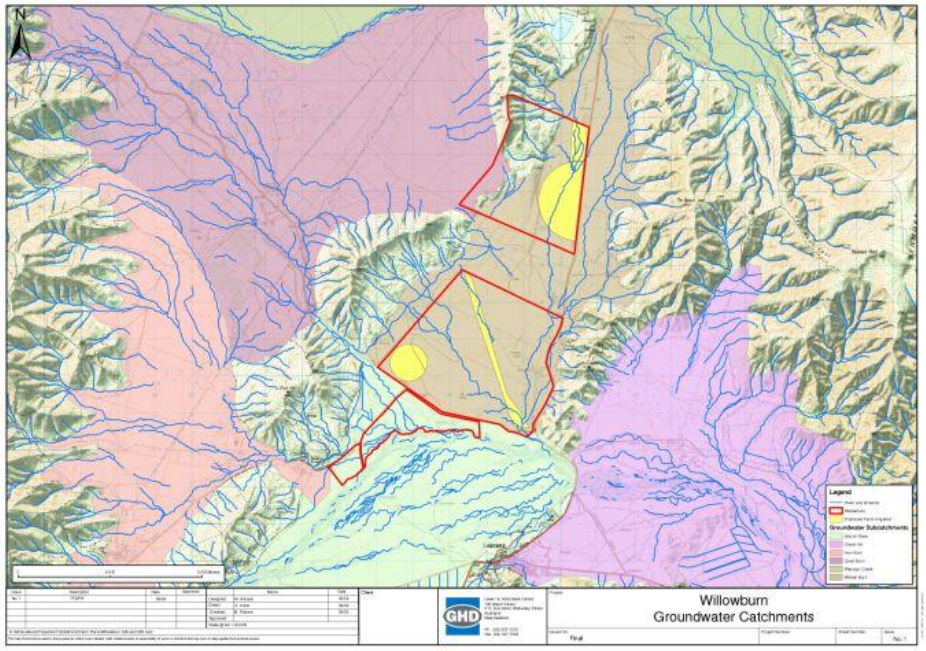
Temperatures range from -15 degrees to 40 degrees.



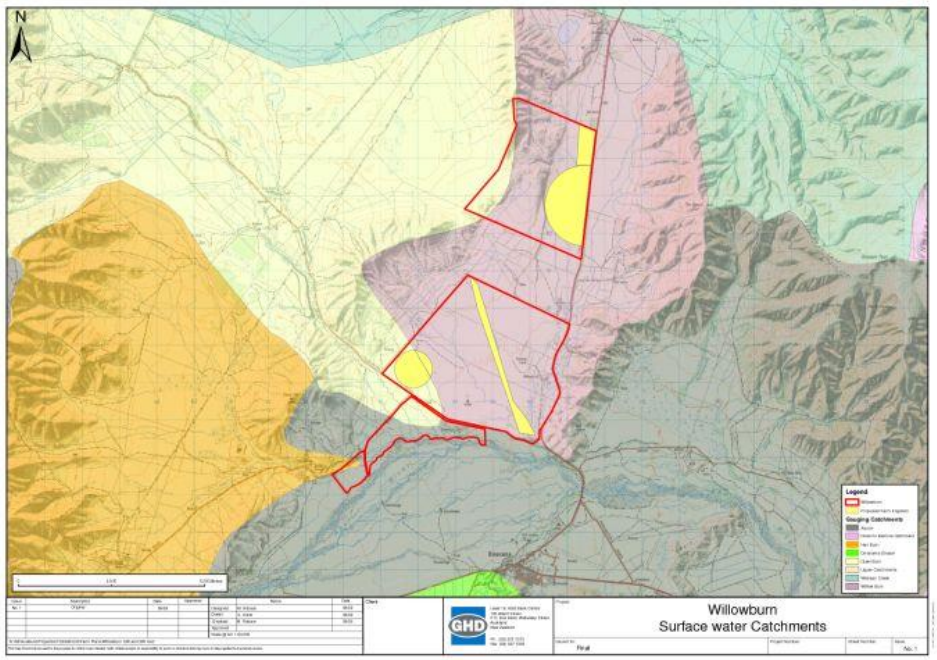
Rainfall Map

3. Environmental Context

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



Groundwater Receiving Environment



Surface Water Receiving Environment

3.1 Water Quality Study receiving environments and mitigation requirements

Willowburn, according to the WQS, lies in the Willowburn groundwater catchment, and the Willowburn "Ahuriri Arm" and Ahuriri surface water catchments.

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 The Glens. Please note that no groundwater mitigation is required.

Ahuriri Arm Mitigation required kg/ha irrigated land	Willowburn Stream Mitigation required kg/ha irrigated land	Ahuriri Stream Mitigation required kg/ha irrigated land
N -10.70 P -1.10	N -0.70 P -0.10	N 1.10 P -0.90

For this farm, the Ahuriri Arm mitigation requirements are the most stringent. These mitigation requirements cap Willowburn nutrient discharges at 6,584 kg N per annum and 156 kg P per annum.

3.2 Local receiving environments

The Quailburn Catchment is located approximately 15km North-west of Omarama and drains the Diadem and Ohau Range. It has a catchment area above the minimum flow site of 82km^2 which is located at the Henburn Rd. The altitude of the upper catchment ranges from 500m to 1900m above MSL.

Several tributaries, including the East Diadem and Serpentine Stream, feed into the Quailburn upstream of the gorge, then into the Ahuriri River. Flows at the minimum flow site are usually continuous, however below the site is often dry, with surface flows often not continuous to the Ahuriri River.

The Quailburn provides a limited fishery for spawning and rearing habitat of rainbow and brown trout.

Willowburn Stream also passes through the property,

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 2. 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 Willowburn Station, using the most stringent nutrient mitigation requirement, are 6,584 kg N/year and 156 kg P/year. Table 4 below shows the output from OVERSEER for the modelled proposed farming system at Willowburn. 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 3: Total N and P losses modelled by OVERSEER for the proposed farming system on Willowburn Station and WQS thresholds

	Nitrogen Threshold (kg/farm)	Phosphorous Threshold (kg/farm)
MWRL Water Quality Study Property Thresholds	6,584	156
OVERSEER® outputs	5,663	77

Note: The Nitrogen kg/farm outputs above from Overseer includes 1451kg/farm removed in wetland/swamp

Stage 3 – Identification and mitigation of site specific environmental risks

4.3 Farm Environmental Risk Assessment (FERA)

4.3.1 The main tracks on the property are culverted in most areas where they cross streams (see photos below section 5).

4.3.2 There is a small possibility of having runoff from this track during wet times entering the stream.

4.3.3 The Willowburn swamp is located within the property and this is not fenced off, and at times there may be as many as 160 cattle and 700 ewes in this area, which is 530 hectares

4.3.4 Throughout the 'heavier' land near the Willowburn swamp (on the Homestead block) the stock have access to the Willowburn stream/river. This is not fenced off and in areas there are stock crossings where the stock tend to be concentrated, these crossings are not culverted and in certain areas there is relatively bad stock induced erosion. The applicant realises the possibility of having to culvert these crossings (see photos below section 5 of eroded areas due to stock).

4.3.5 On the dear block the streams are unfenced allowing access to the waterway. There are around 170 hinds, 89 stags, and 40 yearlings in this block of 150 hectares, there are also a handful (50) steers on this block.

4.3.6 Stock only shifted through these crossings about 4 or 5 times per year.

4.3.7 The sheep and cattle yards are located a distance away from any permanent waterways, and if dip or foot rot is being used it is contained within the yards and is reused in the future.

4.3.8 If there is any spraying to be done contractors are used.

4.3.9 No border dyke irrigation, all K-line and centre pivot. Centre pivot is ring fenced and fully troughed; if another centre pivot is put on it would also be ring fenced and troughed.

4.3.10 Direct drilling is the preferred method used, but at times fallowing is needed to break in new soils.

4.3.11 Over the winter the soils are left with as much pasture as possible. In areas where stock may be held over the winter, the goal is to re-drill coming out of the winter to uptake nutrients and to flatten area to some degree.

4.3.12 In the winter grazing areas there is no chance of runoff into any waterways as they are located a great distance from the grazing area.

4.3.13 No compacted soils within the property.

4.3.14 Pest control measures in place are; spot spraying for gorse, broom and briar. Helicopter used at times for spraying large areas of briar and Nodding thistles (*Carduus nutan*). Night shooting for rabbits, Pindone poisoning, and rabbit fencing around boundary.

4.3.15 Fertilisers used are; Sulphur super 30 and Phosphate. There are two blocks that receive fertiliser and these alternate every year. One block is 810 hectares and receives 70 tonne of half mix super sulphate and phosphate; the other block is 1200 hectares and receives 90 tonne. It alternates every second year between blocks. Under the irrigated area, 400 hectares there are similar quantities of fertilisers used.

4.3.16 Where there are streams running through the property (in areas that receive fertiliser) these streams are avoided as much as possible, but in some instances they may receive small amounts of fertiliser.

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 a 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 Willowburn Station

5.1 Mitigation measures and management options adopted on Willowburn Station

The table below shows the all the mitigation and management tools that are proposed to be undertaken on Willowburn 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 4 indicates in brief how the measures are to be monitored and audited.

Table 4. Table of mitigation options, monitoring and auditing for Station Willowburn 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	No winter application of fertiliser	Field records	Signed field records
2	Use of a nitrate inhibitor	Supply records	Signed supply 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
2	Upkeep of Willowburn Swamp at 40ha	GPS extent of swamp Initially, then monitor.	Site visit to verify

FEMP stage	Measure	Monitoring	Auditing
3	Fence off the wettest area of the Willowburn swamp to stop stock access; this could be done with a two or three wire waratah fence. The area is approximately 40 hectares.	Surface water testing of Willowburn as it enters and exits the property	Annual auditing visit.
3	Restrict stock access to the Willowburn during the winter months of June, July and August	Annual compaction and erosion survey	Annual auditing visit and report
3	Place culverts at selected areas along the Willowburn Stream for stock movement	Photos	Annual auditing visit
3	Fence off the areas that have already been pugged up and eroded badly (as seen in the photo) along the Willowburn	Photos	Annual auditing visit
3	20 metre layback from any water way when applying fertliser by land based application e.g. bulk spreader	Field records	Annual auditing visit and report
3	Create a sufficient track in the areas around the Willowburn Stream to allow for the shifting of stock with out them accessing the stream readily.	Photos	Annual auditing visit
3	Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin in location described in below map	Water quality monitoring continued quarterly, and photos in the audit report	Annual audit report and visit
3	Fence off the streams that run through the dear block, but keep drinking bays	Monitor the quality of the water, photos	Annual auditing visit
3	Maintain a 20 metre buffer zone from waterways while irrigating	Photos	Annual auditing visit

Part of stream within the dear block that needs to be fenced off, note the culvert and also the evident erosion

Evidence of erosion, this area should be fenced and culverted to restrict stock access as much as possible

Evidence for culverts over the main vehicle track crossing the Willowburn

Another area of the Willowburn that has been badly eroded, again this will be fenced and culverted

Evidence for cloudy silt laden waters due to cattle in the stream

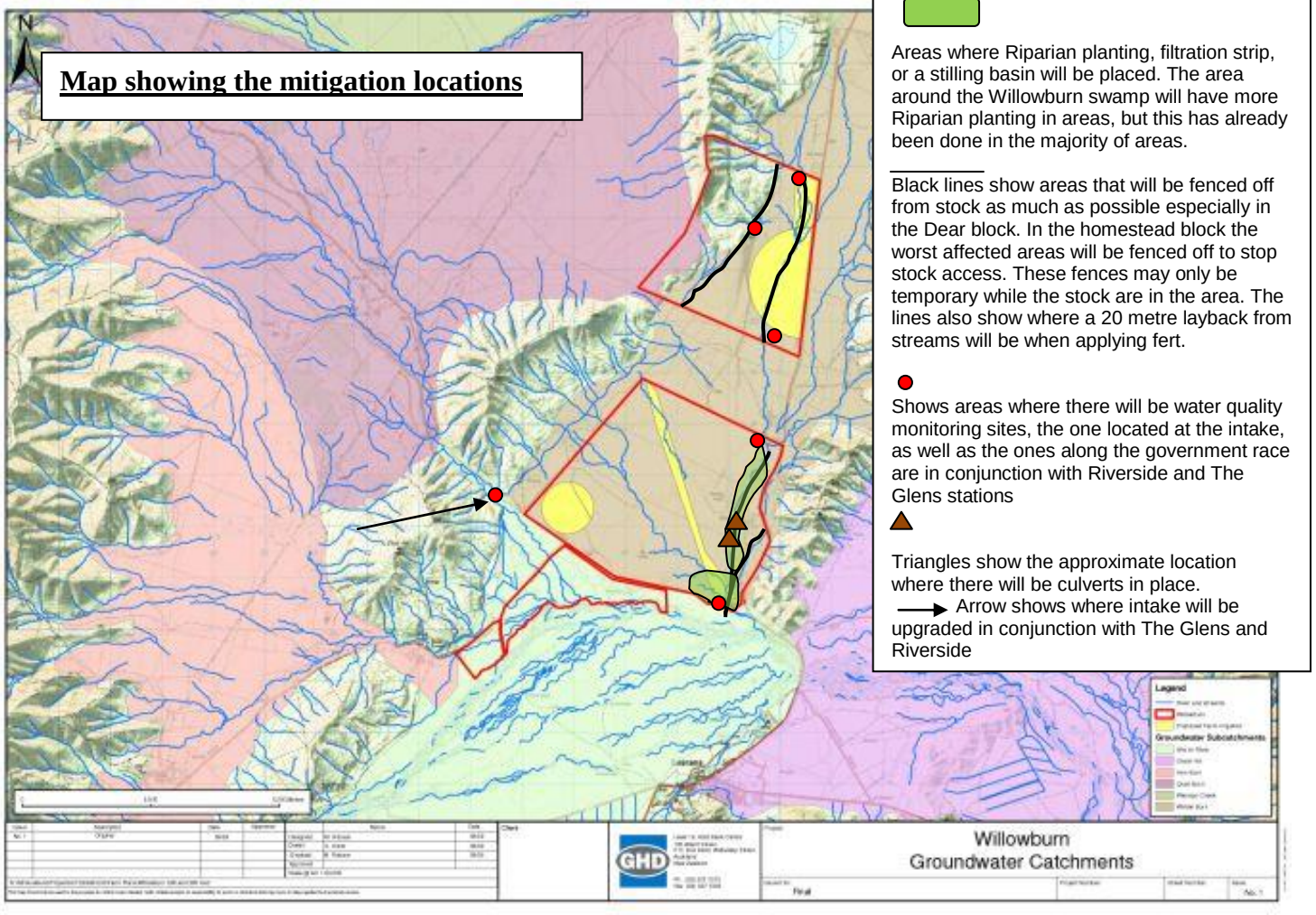


Table 5. Baseline monitoring on Station Willowburn Station

		Location	Frequency	Measured parameters to include
Soil	Soil nutrient testing	All irrigation paddocks and intensive areas in rotation	1 in 2 years	Standard suite of soil nutrients
Pasture	Ground cover and species	All blocks	As needed	% Ground cover, species
Water	Groundwater quality in Domestic bore (carried out By ECan)		Annually	Nitrate Nitrogen, dissolved reactive phosphorous, E.coli and electrical conductivity.
Water	Surface water quality Wairepo Race (done By ECan)		Quarterly	Nitrate Nitrogen, dissolved reactive phosphorous, dissolved oxygen, turbidity, temperature, E.coli and electrical conductivity.
Water	Surface water quality Willowburn		Quarterly	Nitrate Nitrogen, dissolved reactive phosphorous, dissolved oxygen, turbidity, temperature, E.coli and electrical conductivity.

5.1.2 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 Willowburn 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 6. Example monitoring plan for Willowburn 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 irrigation paddocks and intensive areas 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 irrigation blocks in rotation	Annually for soil compaction testing.	Soil compaction	Compaction, surface capping	Remove compaction with the appropriate tool
Soil	Visual assessment	Willowburn swamp	Annually	Soil compaction, pugging and bank erosion	Any visual evidence of extensive pugging, bank erosion or compaction if grazed	Exclude stock from the affected area until remedial action can be taken
Runoff	Wet weather survey	All blocks and tracks	Annually	Runoff	Runoff occurring	Introduce runoff removal infrastructure where appropriate.

		Location	Frequency	Measured parameters to include	Triggers	Contingency plan if triggers are exceeded
Water	Surface water quality	1. Wairepo Race (done By ECan) 2. Willowburn 3. Above the Government race intake on the Quailburn Stream in conjunction with Quailburn Downs	Quarterly to be consistent with ECAN for the first 5 years and then reviewed	Total Nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, 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	Groundwater quality in Domestic bore (carried out By ECan)	Quarterly to be consistent with ECAN for the first 5 years and then reviewed	Nitrate Nitrogen, dissolved reactive phosphorous, E.coli and electrical conductivity.	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 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

5.1.3 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 7 below shows an example of an annual audit report for Willowburn.

Table 7. Table showing proposed contents of an annual audit report for Willowburn Station

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	Verification of records	If records have not been produced then

yields per farm management unit		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 wettest area of the Willowburn swamp to stop stock access; this could be done with a two or three wire waratah fence. The area is approximately 40 hectares.	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
Restrict stock access to the Willowburn during the winter months of June, July and August	Field records	If field records not received with annual audit this should be rectified by the next audit.
Place culverts at selected areas along the Willowburn Stream for stock movement	Photo once installed	Timeline for completion required, if not completed prior to indicated timeframe then should be rectified by next audit
Fence off the areas that have already been pugged up and eroded badly (as seen in the photo) along the Willowburn	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
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.
Create a sufficient track in the areas around the Willowburn Stream to allow for the shifting of stock with out them accessing the stream readily.	Check track is located as described. Photos	Timeline for completion required, if not completed prior to indicated timeframe then should be rectified by next audit
Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin in location described in below map	Water quality monitoring continued quarterly, and 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
Fence off the streams that run through the dear block, but keep drinking bays	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
Maintain a 5-11metre setback from permanent flowing waterways while irrigating	Check setback area is present. Photos	Areas of less than 5m setback should be extended to ensure the minimum is 5m.

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 4 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 5 and 6 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 6 ensures that the relevant mitigation measures outlined in Table 7 are audited annually either internally or externally and communicated to ECAN by the end of July each year.