

Central Plains Water Ltd

Farm Plan for Sustainable Irrigated Land Use

For (name of property) _____

Prepared by (name & position) _____

Person* directly responsible for implementing this plan _____

*(e.g. owner, manager, sharemilker, tenant; put name and position)

Date _____

FARM PLAN TEMPLATE

DRAFT

*This is a draft template for individual farm plans
that will be prepared by all water users in the Central Plains Scheme*

Purpose of plan

Each water user in the Central Plains Water Enhancement Scheme will prepare and implement a Farm Management Plan for Sustainable Irrigated Land Use to demonstrate how they are actively managing their use of natural resources in order to achieve high standards of environmental management and optimise production from irrigation.

The plan provides a risk management approach to environmental protection and enhancement on irrigated farms. The plan is designed so that it can be adapted for each farm business. Many of the requirements will have both economic and environmental benefits.

The plan is specific to irrigated agriculture and addresses related management issues. The areas of farm activity that need to be considered are:

- Irrigation management
- Soils management
- Nutrient management
- Collected animal effluent management
- Biodiversity & ecosystem management
- Waterway and riparian management
- Agrichemical management
- Energy management

Monitor/Review/Revise

The farm plans are dynamic in nature and will be changed and updated over time as information, technology and best practice change.

Audit and Compliance

Appropriate records must be kept and produced on request. See Appendix 11: Central Plains Water Audit and Compliance

Other Obligations

Preparation of and compliance with a Central Plains Water Ltd Farm Plan for Sustainable Irrigated Land Use will not exempt farmers from:

- their own industry quality assurance programmes, codes of practice etc.
- meeting specific regulatory/legal requirements (e.g. consent conditions for discharge of waste)

Industry Codes of Practice and Guidelines

Where industry standards and codes have been developed water users are expected to adopt these, unless due to local or scheme requirements CPWL adopts different standards.

Where applicable, water users will meet the requirements of:

- “Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use)” (NZFMRA, 2007) (Provides practical and specific guidance for safe, responsible and effective nutrient management)
- Standards New Zealand: NZS8409:2004 “Management of Agrichemicals”, which underpins the GROWSAFE[®] Training Programme for agrichemical users and suppliers.
- The Spreadmark Code of Practice for the Placement of Fertiliser in New Zealand
Spreadmark is a fertiliser spreading accreditation scheme that registers fertiliser-spreading companies with certified spreading machinery, trained operators and audited quality management systems.
- Environment Canterbury: “A guide to managing waterways on Canterbury farms”
- Irrigation NZ – Irrigation Code of Practice and Design Standards
- Irrigation NZ – Irrigation Evaluation Code of Practice
- “Dairying and Clean Streams Accord” (2003)

Appendices and References

The Appendices and References resource offers a wide range of information to assist water users. Of particular note are two resources available through Irrigation New Zealand www.irrigationnz.co.nz :

- The Irrigation Guide and Environmental Checklist for Irrigated Farmers – A guide to decision-making when going irrigating
- The New Zealand IRRIGATION MANUAL (developed by the Malvern Landcare Group) – A practical guide to profitable and sustainable irrigation

Summary of Key Environmental Concerns re Irrigated Agriculture and Best Management Practices to avoid or mitigate problems

Activity	Key environmental concerns/ Potential impacts	Examples of Best Management Practices
Irrigation management	Wasteful use of water e.g. <ul style="list-style-type: none"> • Irrigation during/after significant rainfall • Ponding of irrigation water • Inefficient application • Drainage to other properties 	Use Irrigation NZ code of practice for design Use Irrigation NZ evaluation code Schedule & apply water taking into account: crop type, soil type, rainfall etc
Soil management	<ul style="list-style-type: none"> • Soil compaction / pugging • Soil erosion • Soil health problems • Soil contamination 	Avoid stock pugging – use stand off pads or ‘sacrifice’ paddock Use shelter planting & reduced tillage to avoid wind erosion Avoid irrigation during or after heavy rainfall to minimise erosion Use only FertMark certified fertilisers to avoid soil contamination
Nutrient management	<ul style="list-style-type: none"> • Fertiliser getting into ground & surface waterways • Runoff and leaching of stock effluent from paddocks into waterways (including through tile drains) 	Follow the NZ industry protocols for fertiliser use Use soil test results to plan fertiliser needs Use Nutrient budgeting & nutrient management Manage fertiliser applications e.g. to avoid waterways, timing re crop needs, rainfall etc.
Collected animal effluent management	Contamination of ground & surface water during disposal of collected animal effluent (e.g. dairy shed or piggery waste)	Preparing an effluent disposal plan, including spillage management Including nutrients from effluent in nutrient budget and management
Riparian management	<ul style="list-style-type: none"> • Damage to stream banks. • Nutrient and faecal contamination of waterways • Sediment 	Stock management, including fencing to keep stock from waterways Crop management, including buffer zone around waterway. Stream bank planting
Biodiversity & Ecosystem management	<ul style="list-style-type: none"> • Loss of native plants and animals and their habitats; • Loss of ecosystem diversity • Soil health problems 	Protect existing habitats (e.g. wetlands) as an integral part of farm management Plantings (native & exotic) to support ecosystem diversity
Agrichemical management (including pesticides)	Contamination of ground or surface water	Follow NZ industry protocols for chemical use; ensure all staff are trained Store chemicals safely Apply chemicals to avoid contamination of surface water or into groundwater
Energy management	Wasteful use of energy <ul style="list-style-type: none"> • Electricity • Diesel • Petrol 	Design on-farm infrastructure for energy efficiency (INZ CoP) Driver education and awareness re machinery use Use reduced tillage where appropriate

Farm Plan for Sustainable Irrigated Land Use for Central Plains Water

I confirm that the information provided in this plan is correct:

Signature Date

Name Position (e.g. owner/manager)

Property name						
Owner name						
Postal address						
Phone no.		Mobile no.		Fax no.		
Email address						
Contact name (if different)				Position (e.g. manager, tenant)		
Postal address						
Phone No.		Mobile no.		Fax no.		
Email address						
Property area (ha)						
Effective area (ha)						
Area under irrigation (ha)	water				effluent	
Irrigation type	water				effluent	
Describe, if more than 1 type						
Enterprise type/s	Dairy	Dairy grazing	Sheep & beef	Deer	Cropping	Other (describe)

A. Irrigation Management

Our objective for best practice irrigation management is to use water efficiently, minimising runoff and drainage.

The problems that we will avoid, remedy or mitigate include wasteful use of water e.g.

- *irrigation during/after significant rainfall, or when heavy rain is forecast*
- *ponding of irrigation water*
- *inefficient application*
- *drainage to other properties*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Compliance with Canterbury Regional Council consent conditions for the Scheme (see Appendix 1)		
2. Design of Irrigation Infrastructure¹ 2.1 All new on-farm irrigation infrastructure to be designed by an Irrigation New Zealand (INZ) accredited designer to meet INZ design standards ² and any CPW design requirements (Appendix 2)		
3. Evaluation of Existing Irrigation Infrastructure 3.1 Existing irrigators to provide CPWL with an evaluation report prepared by an Irrigation NZ accredited evaluator according to the INZ Irrigation Evaluation Code of Practice ³ within 12 months ⁴ of receiving scheme water. The report must set out the system performance, and the timelines for upgrades, if required, to meet scheme requirements (Appendix 3). All upgrades to be completed as soon as practical but no later than 36 months after first receiving scheme water.		

We will use best practice irrigation management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
4. Apply correct amounts of water for plant growth requirements⁵ by 4.1 Knowing soil water-holding capacity & target soil water content 4.2 Knowing soil moisture levels ⁶ prior to irrigation 4.3 Considering climatic conditions ⁷ (e.g. ET and rainfall) 4.4 Monitoring crop / pasture to match water application		
5. Avoid regular ponding of irrigation water⁸ and drainage of irrigation water to adjacent properties or to groundwater⁹ 5.1 Any exceptions to be recorded and reasons noted		
6. Fix any problems that arise so that water is used efficiently 6.1 Show how problems have been dealt with or risk of recurrence minimised		

List future actions for irrigation management	Person responsible	Timeframe for completion	Completed (include date)
Design and evaluation			
Water (& effluent) application, including planning and scheduling			
Ponding and drainage matters			

B. Soils Management

Our objective for best practice soils management is to maintain or improve the physical & biological condition of our soil

The problems that we will avoid, remedy or mitigate include:

- *loss of topsoil by wind or water erosion*
- *movement of soil & contaminants into waterways*
- *damage to soil structure and health*
- *contamination of soil*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Minimise soil loss¹⁰ to waterways¹¹ 1.1 through compliance with CPWL requirements ¹² (Appendix 4)		
We will use best practice soil management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
2. Reduce the risk of wind erosion¹³ by 2.1 Using appropriate seedbed preparation 2.2 Avoiding creation of small aggregates 2.3 Minimising the length of time that soils are exposed during soil cultivation 2.4 Maintaining ground cover or soil moisture at times of high risk of wind erosion 2.5 Having a network of shelter to minimise effect of high winds 2.6 Other (describe)..		
3. Optimise soil structure and soil biological activity according to our land use practices by 3.1 Testing for soil compaction(e.g. by comparing hole dug by fence and in paddock) 3.2 Minimising compaction by stock <ul style="list-style-type: none"> ○ using safe areas for stock ○ using on-off grazing when wet ○ other (describe) 3.3 Minimising compaction by vehicles 3.4 Returning effluent to land 3.5 Conserving soil organic matter 3.6 Maintaining well-aerated soils 3.7 Other (describe)..		

4. Minimise risk of soil contamination from fertiliser and other inputs 4.1 Using fertilisers that are 'Fertmark' ¹⁴ compliant		
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Note: effects of land use activities on stream bank erosion are covered in 'Riparian Management' section.
Note: other related soil conservation matters are included in Biodiversity and Ecosystem Management' section.

List future actions for soil management	Person responsible	Timeframe for completion	Completed (include date)
To minimise soil loss to waterways			
To reduce the risk of wind erosion			
Optimise soil structure and soil biological activity			
Minimise risk of soil contamination			

C. Nutrient management

Our objective for nutrient management is to minimise nutrient losses to water while managing soil fertility to optimise pasture and crop productivity.

The problems that we will avoid, remedy or mitigate include:

- *N & P losses from fertiliser & stock into groundwater and surface water*
- *Runoff, leaching*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Compliance with Canterbury Regional Council's requirements for nutrient management (Appendix 5)		
2. Nutrient budget & management plan¹⁵ (Appendix 6) 2.1 To be prepared & implemented for the property 2.2 To be regularly reviewed ¹⁶ 2.3 Nutrient budget to account for all inputs, including brought in feed		
We will use best practice nutrient management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
3. Apply nutrients where and when needed by 3.1 Using nutrient budget and plan, including <ul style="list-style-type: none"> ○ Using results from soil tests (taken regularly, as appropriate to farming activity) ○ Using 'Spreadmark' accredited contractors or applying fertiliser to 'Spreadmark' standards ○ Using relevant best management practices from the 'Code of Practice for Nutrient Management' (NZFMRA 2007). 		

<p>4. Minimise nutrient losses to surface and ground water by</p> <p>4.1 Timing fertiliser and organic manure applications carefully to avoid saturated soil and heavy rainfall to minimise nutrient losses to water</p> <p>4.2 Using several smaller applications of fertiliser (especially N) during the growing season, rather than a single application</p> <p>4.3 Using new technologies that optimise N uptake for production & reduce leaching to water</p> <p>4.4 Working soil at times that minimise leaching to groundwater (Appendix 6)</p>		
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Note: Disposal of stock effluent is covered in Collected Animal Effluent Management Policy.

List future actions for nutrient management	Person responsible	Timeframe for completion	Completed (include date)
Compliance with Regional Council requirements			
Nutrient budget and management plan			
Application of nutrients			
Minimising nutrient losses			

D. Collected animal effluent management

Our objective for effluent management is to manage the effluent system to optimise the productive benefits of animal effluent while taking all practical steps to avoid contamination of ground and surface water.

The problems that we will avoid, remedy or mitigate include:

- *Contamination of groundwater and surface water from collected effluent*

We undertake to comply with CPWL’s specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Compliance with Canterbury Regional Council requirements relating to effluent management & disposal¹⁷ 1.1 All consent conditions to be met		
2. Effluent Management Plan (see example – Appendix 7) 2.1 Prepare, implement and regularly update		
3. Effluent application to land to be included in farm nutrient budget (See “C Nutrient Management”)		
We will use best practice collected animal effluent management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
4. Avoid contamination of groundwater and surface water by 4.1 Maintaining effluent irrigator and all associated equipment in good functioning order 4.2 Using only designated disposal area for effluent irrigation 4.3 Staff training 4.4 Ensuring that effluent disposal does not occur: o Within 20m of any surface waterway o Within 30 m of any bore or spring 4.5 Ensuring that runoff from stock races does not flow directly into waterways	(Very important to have an accurate effluent map and programme)	

5. Remedy or mitigate possible contamination situations by 5.1 Implementing specific procedures for dealing with spillage or ponding from any part of the disposal system 5.2 Ensuring that contingency plans to deal with for breakdown of disposal system are in place and understood by all staff	Any effluent spillage or ponding events to be recorded and reasons noted		
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List future actions for collected animal effluent management	Person responsible	Timeframe for completion	Completed (include date)
Compliance with consents etc.			
Effluent Plan			
Effluent management included in Nutrient Budget & Plan			
To avoid or remedy contamination of water			

Note that consents that may be required for collected effluent (e.g. dairy shed effluent) are the responsibility of the individual property owner. This section focuses on effects that may arise or be exacerbated by irrigation.

E. Waterway¹⁸ & Riparian management

Our objective is to protect the waterways on our farm.

The problems that we will avoid, remedy or mitigate include:

- *Stock damage to banks, causing sedimentation*
- *Contamination of water by stock or agrichemicals*
- *Soil loss causing sedimentation of waterways*
- *Poor water quality and stream life*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Compliance with Selwyn District and Canterbury Regional Council requirements. (Appendix 8)		
2. Riparian management to meet CPWL requirements for all permanent rivers & streams (Appendix 8) 2.1 Exclude all cattle, pigs and deer from waterways 2.2 Leave a buffer of uncultivated vegetation beside streams to filter any runoff. This will be an appropriate distance from the stream bank depending on soil type etc. [ECAN has guidelines ¹⁹]		
We will use best practice waterway and riparian management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
3. Minimise stock damage to banks and waterways by 3.1 Careful management of any stock in riparian areas (e.g. for weed control)		
4. Minimise soil loss and contamination of waterways by 4.1 Using a wide riparian buffer at low points which are more prone to potential runoff from paddocks to provide filter. 4.2 Having field drains discharge into a riparian strip, rather than a waterway. 4.3 Applying fertiliser or other chemicals so they don't go directly into any waterway.		

4.4 Reducing runoff with careful strip grazing 4.5 Careful management and maintenance of farm drains and races 4.6 Other methods (describe)		
5. Enhance water quality and stream life by 5.1 Planting suitable species of trees and shrubs on waterway margins (Appendix 8) [ECAN has guidelines ²⁰]		

List future actions for waterway and riparian management	Person responsible	Timeframe for completion	Completed (include date)
Compliance etc.			
Stock exclusion and/or management			
To avoid or remedy soil loss or other contamination of waterways			
To enhance water quality and stream life			
Drain and race management			

F. Biodiversity and ecosystem management

Our objective is to include biodiversity and ecosystem management as an integral part of our farm management

The problems that we will avoid, remedy or mitigate include:

- *Loss of native plants and native animals and their habitats;*
- *Loss of ecosystem diversity*
- *Soil health problems*
- *Loss of habitat for pollinators, beneficial birds, insects etc*
- *Loss of shelter for stock, crops and soil conservation*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Adopting CPWL requirements for biodiversity enhancement (Appendix 8)		
We will use best practice biodiversity and ecosystem management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
2. Minimise loss of native plants and animals and their habitats by 2.1 Identifying important species or habitats etc 2.2 Protecting native biodiversity through sympathetic management		
3. Manage shelter and habitat by 3.1 Planting suitable perennial plants to provide shelter and habitat for pollinators, beneficial birds, insects etc, especially where shelter belts, hedges, trees etc are removed as part of irrigation development ²¹		
4. Ensure soils are kept healthy by 4.1 Monitoring physical, biological and nutrient properties of soil 4.2 Applying appropriate management	This may be covered by B – Soils Management	

Note: Having healthy waterways is covered in Waterway and Riparian Management

List future actions for biodiversity and ecosystem management	Person responsible	Timeframe for completion	Completed (include date)
Compliance etc.			
To maintain native plants, animals and habitats			
To manage shelter and habitat etc.			
To ensure that soils are healthy			

G. Agrichemical management

Our agrichemical management objective is to ensure that our chemical storage and use does not cause adverse environmental effects.

The problems that we will avoid, remedy or mitigate include:

- *Contamination of ground or surface water*

We undertake to comply with CPWL's specific requirements	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
1. Compliance with all regulatory conditions for chemical storage & use, including Canterbury Regional Council, HAZNO etc (Appendix 9)		
We will use best practice agrichemical management for our land and farm activities in order to	Planning - state policies and actions Describe what / how / when, & what records you will keep or how you will show your achievements	Farmer Review Say what you have actually done. If different from plan, then explain why changes have been made.
2. Minimise use of agrichemicals by 2.1 Using insecticides and pesticides strategically for maximum effect; & seeking appropriate professional advice		
3. Manage use of agrichemicals by 3.1 Following manufacturers' recommendations for use and storage of agrichemicals 3.2 Using Growsafe certified operators, and following the Growsafe Code of Practice (Appendix 10)		

List future actions for waterway and riparian management	Person responsible	Timeframe for completion	Completed (include date)
Compliance etc. (E.g. with HAZNO, Growsafe, Regional Council)			
Agrichemical use and management			

APPENDICES

1. Summary of RMA consent conditions for the Scheme that affect on-farm activities
2. Requirements for on-farm irrigation system design
3. Requirements for evaluation of existing irrigation systems
4. Requirements to minimise soil loss
5. Summary of Canterbury Regional Council requirements for nutrient management
6. Requirements to minimise nutrient losses (includes nutrient budget and management plan)
7. Draft effluent management plan
8. Requirements for waterway, riparian and biodiversity management
9. Chemical Storage and Use (Environment Canterbury information sheet 22)
10. Summary of Growsafe programme
11. Central Plains Water Audit and Compliance requirements
12. Further reading and references

Note that these Appendices need to be consistent with the CPW ‘Sustainability Protocol’.

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- ¹ Recent technical reports (refs) have identified that well-designed on-farm irrigation infrastructure is the key to achieving application efficiency of 80% or greater and minimising adverse effects such as runoff & ponding.
- ² INZ Design standards describe the minimum acceptable design practices. NZQA recognised unit standards set the benchmark for a Certified Irrigation Design
- ³ INZ CoP for Evaluation describes acceptable practices. NZQA recognised unit standards set the benchmark for a Certified Irrigation Evaluator
- ⁴ Existing irrigators should be allowed one season before providing a completed evaluation report, as they may need to modify their systems for relocated off-takes, different pressures etc. A further period is allowed to implement required changes
- ⁵ System must be designed to match appropriate soil-crop conditions. Application depths managed through soil moisture and crop monitoring.
- ⁶ Table 19 INZ CoP gives summary of soil moisture measurement methods. NZ Irrigation Manual provides details.
- ⁷ CPW will provide access to data (ET etc). Several initiatives are under way to develop computer software suitable for farmer use, that can analyse data and provide scheduling information (daily & seasonal) (e.g. SFF Project 03/096, Optimised Pasture Systems for Irrigated Farms in Canterbury; Wheat, Potato and Irrigation Calculators (being developed by Crop & Food Research, Ag Research and Dairy Insight), Lincoln Ventures (Peter Brown). Less sophisticated methods will be suitable for small blocks with straightforward water demands
- ⁸ Design criteria should ensure that application rate does not generally exceed infiltration rate. (Design standard) Note that soil infiltration rates can vary with wetness of soil and can change after irrigation development.
- ⁹ Irrigation during or after significant rain can be avoided if users know that water can be ordered/delivered when they require. Good application uniformity (to design standards) reduces problems.
- ¹⁰ Minimising soil loss to waterways reduces sediment, nutrient and microbiological contamination of the water body.
- ¹¹ Note that this section refers only to waterways on or directly affected by the property that the plan applies to.
- ¹² Good design and management of irrigation are key to avoiding runoff. Irrigation NZ design code of practice identifies standards that reduce risks of run off from irrigation water. Water budgeting and regularly available water reduce the need to apply water when soil moisture levels are close to field capacity.
- ¹³ Well-managed irrigated crops and pastures have a low wind erosion risk c.f. dryland. Irrigated land uses have reduced risk of topsoil loss by wind (c.f. dryland) because irrigated soil is moist and ground cover by plants is maintained at higher levels.
- ¹⁴ Fertmark is an independently assessed fertiliser quality assurance programme that is supported by the major fertiliser companies. 'Fertmark' fertilisers have ongoing, independent and vigorous auditing. Most fertiliser sold in NZ (>90%?) is 'Fertmark' approved (Kevin Geddes pers. com.)
- ¹⁵ Nutrient leaching is not easily measured by individual water users, so emphasis is on best management practices for fertiliser application, grazing etc, to avoid problems, rather than require remedial actions.
- ¹⁶ Fonterra require a review of plan/budget every 3 years (June 2007), but this is expected soon to be required every second year.
- ¹⁷ Meeting regulations for effluent disposal are the responsibility of the landholder. However, where disposal is to land on an irrigated farm, the effects of the effluent disposal must be taken into account in managing irrigation applications.
- ¹⁸ Note that this section refers only to waterways on or directly affected by the property that the plan applies to.
- ¹⁹ "Guide to managing waterways on Canterbury farms" & companion guide "Lowland Plains, Streams and Drains"
- ²⁰ "Guide to managing waterways on Canterbury farms" & companion guide "Lowland Plains, Streams and Drains"
- ²¹ Achieving good irrigation design for efficient water use may require existing shelter etc. to be removed. With water, new plantings will grow more readily, and a greater range of species will thrive. Shelter and other plantings need to fit with the particular farm enterprise e.g. requirements on arable farms may be different to those for farms with livestock.

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Appendix 1

Summary of RMA consent conditions that affect on farm activities

Appendix 2

Design of on-farm irrigation systems

New infrastructure must be designed by a Certified Irrigation Designerⁱ who is accreditedⁱⁱ to design for CPWL. Irrigation systems must meet INZ design standards and any CPW design requirements. The Irrigation New Zealand Code of Practice and Design standards are available from Irrigation New Zealand (INZ) (www.irrigationnz.co.nz).

The designer must comply with the Irrigation New Zealand Code of Practice for:

- Planning;
- Design;
- Quoting and Supply;
- Installation & Commissioning;
- Operations.

The designer must:

- Explicitly state what key performance indicator (KPI) values will be achieved by the design, if correctly installed;
- Give sufficient details on what to measure and where, throughout the irrigation system, for the purchaser or a third party to verify that the system is achieving the KPI values;
- Provide a design summary report with KPIs (e.g. Table 21 INZ CoP);
- On commissioning, provide an operating manual that specifies:
 - The correct way to operate all equipment and installations;

ⁱ INZ Design standards describe the minimum acceptable design practices. NZQA recognised unit standards set the benchmark for a Certified Irrigation Designer

ⁱⁱ The process for this will need to be defined e.g. it could include a third party audit of some designs

- Scheduling methods and crop water requirements;
- How the system should work and its optimal operating range;
- Protocols for operating the system safely;
- How the system handles natural extreme events such as floods and storms;
- How the system's operation will be monitored;
- How environmental impacts, such as drainage, will be monitored; and
- Emergency procedures.

The incorporation of both water use measurement and soil moisture measurement should be planned for and included in the designⁱⁱⁱ.

CPWL irrigation management requirements:

- All users must target an 80% application efficiency. CPWL reserves the right to cap the annual volume supplied to an irrigated area to the amount that would achieve 80% efficiency;
- A water user cannot obtain rights to additional scheme water, either by acquiring shares, or by lease or other arrangement, until that user achieves 80% or better application efficiency with respect to their existing irrigation;
- Water users must avoid ponding or runoff of irrigation water. Breaches will be considered as non-compliance with water users agreement, and will incur penalties (see Appendix 11).
- Systems must be designed for the scheme's peak supply (0.6 l/s/ha) (this is equivalent to 4 mm per day at 80% application efficiency);
- Annual volume – determined by share allocation;

References:

The Irrigation Guide – in particular Section 8: How much water to apply and how often
NZ Irrigation Manual

Accredited Designers

ⁱⁱⁱ Measuring water use and soil moisture can make significant savings in both water use and energy use, particularly on systems with more than adequate capacity, as it is very easy to over water under most conditions.

A list of accredited designers can be found at[not available at this time].

Appendix 3

Requirements for evaluation of on-farm irrigation systems

Existing on-farm irrigation systems must be evaluated by an Irrigation New Zealand (INZ) accredited evaluator^{iv} according to the INZ “Irrigation Evaluation Code of Practice” The Code of Practice is available at <http://www.pagebloomer.co.nz/EvaluationProject.html#Code> . CPW will require existing systems to be upgraded, if necessary, to meet the water use efficiency and environmental performance standards required of new systems.

An ‘Irrigation Evaluation’ carried out under the Irrigation New Zealand Code of Practice assesses and reports on the existing system and current management practices. It should consist of:

- A visual inspection plus a uniformity test on the system to determine the water application efficiency over the site
- A seasonal irrigation efficiency estimation
- Assessment of pump, pipe and filter performance including energy use
- Analysis and reporting of the results, with comparison to INZ design standards
- Recommendations for improvement, if necessary

The report should provide the information required by CPW on key performance indicators of water use efficiency and established performance benchmarks, as well as recommendations for improvements to the system, if the system does not meet required performance.

CPW does not require reporting of indicators relating to the business performance e.g. labour, capital, productivity, returns etc.

Indicators selected for this Code relate to estimates of efficiency across an irrigated growing season or year. They provide information relating to economic or environmental implications of inefficient irrigation systems or management.

^{iv} National Certificate in Irrigation Evaluation (NZQA) through Agricultural Industry ITO

Key performance indicators

Key performance indicators used in the Irrigation Evaluation are presented in the Code of Practice for Irrigation Design (2007). They include:

Water Use Efficiency

Crop irrigation demand
Management allowable deficit
Return interval
Application uniformity
Application rate
Application depth
Adequacy of irrigation
Application efficiency
Distribution efficiency
Headwork efficiency
Supply reliability
System capacity

Other Efficiency Indicators

Energy
Labour
Capital
Capital cost
Operating cost
Productivity
Returns
Environment
Average system efficiency
Drainage
Runoff

The evaluation is only the start of the process towards irrigation “best practice”. It is important that managers use the generated information to continuously improve the irrigation system and practice.

Accredited Evaluators

A list of accredited evaluators can be found at[not available at this time].

Appendix 4 Soils Management

Avoiding soil and contaminant loss to waterways

Design requirements

High-volume sprinkler irrigation impacting on the soil particles can cause either movement of the particles or the breakdown of the soil into smaller particles. Designers must ensure that the design minimises problems with soil breakdown and movement by:

- Identifying potential problems with stream impact energy;
- Selecting an irrigation system type to minimise or eliminate problems with stream impact; and
- If there is a potential problem, make it known to the purchaser of the irrigation system.

Spray irrigation system should apply water at a rate that does not cause surface runoff or excessive ponding on the soil surface during irrigation or after irrigation has ceased.

Management Requirements

Spray irrigation system must be operated so that they apply water at rates that do not cause surface runoff or excessive ponding on the soil surface during irrigation or after irrigation has ceased.

Riparian buffers

To minimise soil (and contaminant) loss in the event of heavy rainfall on land with high soil moisture levels suitable riparian buffers must be provided adjacent to rivers and streams. See Appendix 8 for guidelines on riparian buffers.

Appendix 5

Summary of Canterbury Regional Council requirements for nutrient management

To come [current requirements likely to change when NRRP is finalised]

Appendix 6

Requirements for minimising nutrient losses

(includes requirements for nutrient budgets and nutrient management plans)

Potential risks

- Contamination of ground water
- Contamination of surface water

Minimising Nitrate Leaching

- Apply irrigation at optimum rates & times
 - Soil moisture measurement, scheduling. (Note that irrigation calculator and scheduling tools currently in prototype are likely to be available for general use by 2009)
- Match N fertiliser application to meet plant demand
 - Amount, rate and timing
- Use nutrient budgets and models to guide N inputs
 - (e.g. OVERSEER ®)
- Use new nitrification inhibitor technology to improve the soil N cycle efficiency and reduce nitrate leaching losses

Nutrient Management Plan

[More work to do here. The recently released “Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use)” (NZFMRA, 2007) will provide the ‘industry standard’. It has a template for preparing a nutrient management plan etc. Consideration needs to be given as to whether all

irrigated land use would require this, or whether it is a guide. Also, whether all nutrient management plans should be prepared or reviewed by a suitably qualified person (except for small block holders)]

A nutrient budget and management plan that is appropriate to the land uses must be prepared.

The budget, plan and records of fertiliser and effluent application must be made available to CPW, on request.

A nutrient budget must compare inputs and outputs to establish changes in soil nutrient levels.

Inputs to be considered include nutrients:

- in mineral fertilisers
- in organic fertiliser, soil amendments, feedlot waste, other imported manures or by-products
- in dairy and pig effluent
- in purchased feed (such as grain, hay, silage, brewer's grain, palm kernel extract, other feeds)
- contained in stock returns from stock grazing regularly on the land
- released from soil fixation sites or mineralised from organic matter
- in irrigation water and rainfall
- in clover/lucerne nitrogen fixation

Nutrient outputs and losses that should be included occur in:

- produce leaving the block (such as fruit, vegetables, grain, hay, silage, milk, meat, wool, timber)
- nutrient leaching below the root zone
- losses in run-off, including nutrients associated with eroded soil particles
- loss through soil fixation (P, K) or immobilisation (N, S)
- loss to the atmosphere from volatilisation and denitrification
- transfer in dung or urine to stock camps, yards or laneways.

(based on “Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use)” (NZFMRA, 2007, which provides practical and specific guidance for safe, responsible and effective nutrient management)

Appendix 7
Example of an Effluent Management Plan

Blackrock Dairy Farm Ltd.

Dairy Shed Effluent Management Plan

Revision No. - 1

Revision Date - 28th August 2006

Resource Consent Number - CRC xxxxxx

Circulation

- Farm Owner - *name, address, phone*
- Sharemilkers - *name, address, phone*
- Farm Staff - *Name*
- *Name*
- Environment Canterbury - South Canterbury Compliance Officer, Timaru, Tel 03-684-0500 (Pollution Hotline - 03-688-3320)

Spillage Procedure

In the event of a spillage of effluent from any part of the disposal system, the sharemilker will notify Environment Canterbury (Compliance and Enforcement Manager) within 24 hours of the spillage occurring, and shall provide the following information: -

- The date, time, location and estimated volume of the spillage.
- The cause of the spillage.
- Details of the steps taken to control the remedy the effects of the spill on the receiving environment.
- The measures undertaken to prevent a reoccurrence.

SYSTEM COMPONENT	DESCRIPTION	PERIODICAL MAINTENANCE	ANNUAL MAINTENANCE	BREAKDOWN CONTINGENCY	OTHER
Stone Trap/Sand Wedge	<ul style="list-style-type: none"> - Concrete wedge - Drive-in access for tractor & FEL. 	<ul style="list-style-type: none"> - Weekly - clean out solids (more often in wet and muddy conditions). - Heap solids materials to dry for later spreading onto non-effluent irrigated paddocks. - Check for cracks in the concrete walls and floor. - Check inlet and outlet pipes are clear of blockages. 	Check for cracks in the concrete walls and floor.		<ul style="list-style-type: none"> - Reduce risk of blockages by cleaning grates in milking shed, dairy and yard and preventing rubbish materials entering the drains.
Effluent Holding Tank	<ul style="list-style-type: none"> - 30,000 litre concrete storage tank. - Located adjacent to the stone trap. - Connected to the stone trap by a large diameter pipe. 	<ul style="list-style-type: none"> - Once per year, or as necessary, remove solid waste from bottom of tank using contractor. 	<ul style="list-style-type: none"> - Once per year or as necessary remove solid waste from bottom of tank using Contractor. - Solid waste spread on non-effluent paddocks. 		Septic Tank cleaner is ?????

<p>Effluent Pump, Motor and Controls</p>	<ul style="list-style-type: none"> - Gillies recirculating effluent pump and electric motor unit. - Pump and motor mounted on a pontoon in the storage tank. - Motor is switched by an automated mechanical switch activated by the travel of the pontoon. - pump outlet connects to alkathene distribution pipe. 	<p>Weekly</p> <ul style="list-style-type: none"> - Grease pump & motor. - Check pontoon position and flotation. - Check that mechanical switchgear is operating efficiently. - When motor/pump operating note any unusual motor noise. 	<p>Annually - lift pump and motor and have it serviced by a qualified repairer.</p>	<p>In the event of breakdown of either the pump or motor: -</p> <ul style="list-style-type: none"> - Limit quantity of effluent produced by reducing yard wash. - Contact repairer to assess problem. - Complete repairs or if repairs delayed, install a loan pump unit until repairs are completed. - Alternatively have a septic tank cleaner empty storage tank between milkings and spread effluent on disposal area. 	<p>Pump Repairer is: ????</p> <p>Electrician is ????</p>
<p>Pipelines</p>	<ul style="list-style-type: none"> - Above ground large diameter alkathene pipelines carry effluent to irrigator on disposal area. - Pipe sections are connected with camlock joiners. 	<ul style="list-style-type: none"> - Ensure pipelines are laid along fence lines and under cow lanes to avoid being run over by vehicles. - Weekly check for leaks in pipes and joiners. - If blockages occur break camlock joiners to identify blocked section. 	<p>- Assess state of pipelines, replacing any weak or damaged sections.</p>	<p>- Where blockage is difficult to clear, replace blocked section or move irrigator closer to the pump to avoid blockage.</p>	<ul style="list-style-type: none"> - Alkathene pipe diameter is 62mm OD. - Irrigator drag hose is 50mm OD.

Effluent Irrigator	<ul style="list-style-type: none"> - "Plucks" rotary boom travelling irrigator. - 	<p>Weekly</p> <ul style="list-style-type: none"> - Grease irrigator. - Check tyre pressures. - Check for excessive wear or breakages. - Check the winch rope is not frayed. 			<ul style="list-style-type: none"> - The irrigator is only to be operated in the disposal zone, which comprises paddocks #4, 11, 12, 13, 14, 15, and 16. - Irrigator to be operated on maximum speed setting at all times. - Imperative that "ponding" of effluent does not occur. - not to be operated within 20m of any surface water body, and 30 metres of any bore or spring. - runoff to any waterbody is to be avoided. <p>Prosecution for polluting a waterway could result.</p>
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Appendix 8

Waterway, riparian and biodiversity management

This appendix to include Environment Canterbury ‘Guide to managing waterways on Canterbury farms’ & companion guide “Lowland Plains, Streams and Drains”.

This appendix to include Canterbury Regional Council and Selwyn District Council requirements e.g. Selwyn District Plan rules re new or expanded dairy farms.

CPWL requires that:

- Cattle, pigs and deer are excluded from waterways. Other stock to be excluded from waterways, if necessary;
- Sheep grazing that is well-controlled with low stocking rates is acceptable, especially as an option to manage long grass and weeds in riparian areas;
- A buffer of uncultivated vegetation must be left beside streams to filter any runoff. This will be an appropriate distance from the stream bank depending on soil type etc., according to the ECAN guidelines;
- A wider buffer is provided at low points which are more prone to potential runoff from paddocks to provide filter;
- Farm drains and races are managed according to Environment Canterbury guidelines;
- Help manage waterways with plantings of suitable trees and shrubs on waterway margins, choosing species according to Environment Canterbury guidelines.

Recognition of the ‘Biodiversity Strategy for the Canterbury Region’ ? [This to be confirmed when the strategy is complete and can be reviewed.]

Appendix 9

Chemical Storage and Use

Environment Canterbury information sheet 22

Appendix 10

Summary of Growsafe programme

Appendix 11

Compliance and Enforcement

[To come from the CPWL “Sustainability Protocol”]

Appendix 12

Glossary, further reading and references

Definition

Waterway

Waterways include both permanent and seasonally wet rivers, streams, creeks, drains and wetlands. Wetlands include bogs, gully bottoms, swamps and seepage areas that contain or channel water at least some of the time. [from Environmental Canterbury “Guide to managing waterways on Canterbury farms”]