



Guidelines for land and water management plans

Fitzroy basin
July 2005

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1.0 About these guidelines

This document sets out the requirements of the Department of Natural Resources and Water (NRW) to be addressed in the preparation of a Land and Water Management Plan (LWMP) for an irrigated enterprise in the Fitzroy River Basin.

These requirements stem from the Council of Australian Governments water reform agenda and the allocation of water under the Water Act 2000 to achieve the sustainable use of land and water resources.

The guidelines include desired outcomes for specific elements of a LWMP. These will be met where the management and use of land and water resources is consistent with contemporary good agricultural practices. Achievement of these outcomes will contribute to the targets set out in regional plans for natural resource management.

There are two other Fitzroy Basin specific documents that support these guidelines:

1. Fitzroy LWMP reference manual
2. Fitzroy LWMP information kits (one for each major Fitzroy sub-basin).

The combination of these three documents will assist Fitzroy irrigators to prepare their Land and Water Management Plans.



2.0 What is a LWMP?

The purpose of a LWMP is to guide and encourage sustainable use of irrigation land and water resources. A LWMP provides a landholder with the opportunity to plan and review an irrigation enterprise and identify hazards and risks associated with irrigation practices. It provides a practical management plan, which will demonstrate that water use practices are ecologically sustainable, both on and off farm. It is a way of measuring continuous improvement.

2.1 When is a LWMP required?

The *Water Act 2000* specifies that an approved LWMP is required before using water for irrigation purposes when:

- a new or additional water allocation or interim water allocation is obtained¹
- a Resource Operations Plan (ROP) specifies a LWMP is necessary for water licences
- an irrigator's land is identified in a Water Use Plan as land where a LWMP is required
- an irrigator intends to use a seasonal assignment of water as their only source of water on the same land in any two of three consecutive water years
- an irrigator intends to use on the same land both a seasonal assignment of water and water taken under a water allocation, or an interim water allocation, in any two of three consecutive water years, and water use will exceed the nominal allocation volume
- an irrigator moves some or all of their existing water allocation from one ROP zone to another ROP zone
- a development permit is required to construct works that capture tail water contaminated runoff.²

¹ LWMP requirement does not apply to water used for stock or domestic purposes, or for existing water entitlements obtained prior to the commencement of Section 73 of the *Water Act 2000*. This exemption also applies if prior existing water entitlements are converted to water allocations, or if they are purchased with land as an ongoing enterprise.

² Applies where a Water Resources Plan has declared specific types of works for taking contaminated agriculture runoff and tail water as assessable development.

All irrigators are encouraged to prepare a LWMP for their property. Irrigators who are not required to have an approved LWMP may use these guidelines to prepare a plan for their enterprise to improve water use efficiency or to address other resource management issues.

2.2 What land and water does a LWMP cover?

The LWMP is a requirement that attaches to the use of water for irrigation. Once water has a LWMP requirement, a LWMP must be prepared for the irrigation and associated development area on which it is to be used. This includes all land that is to be irrigated with the water that initiated the LWMP and all land on which associated infrastructure lies e.g. storages, sumps and delivery systems. If this water is mixed or used with other irrigation supplies through common associated infrastructure this would then include all land on which the total water supply is to be used.

2.3 What are the components of a LWMP?

A LWMP consists of a written report and a series of maps.

The written report must address the 'Information you need to provide' to satisfy the 'Desired outcomes' listed in section four (4) of these guidelines. The level of detail required will depend on the 'risk' associated with the use of the water for irrigation. The written report format should follow the same structured headings as the guidelines.

All LWMPs must provide mapping information consisting of a recent aerial photograph or satellite image base of the property and a series of other maps or overlays that provide the property information requested in the guidelines. This information can be presented as:

- Same scale clear transparent overlays that go over the base map, with information neatly recorded on them using waterproof / permanent fine point pens, or
- A number of photograph or satellite base maps with information neatly printed over the top of the image. If these are produced digitally on a computer it may be possible to combine some overlays onto one map provided the map does not become cluttered and difficult to interpret.

The mapping information must be provided at a scale(s) that allows meaningful presentation of both the whole property and the development/irrigation area.

To achieve this, two scales of map may be required:

- a whole property map, and
- a map of the development/irrigation area.

All maps need to be A3 size paper or larger. If you need help determining what scale map or presentation option is best, discuss the options with your regional LWMP officer at NRW.

Note: If the map of your whole property represents the irrigation area in sufficient detail, separate maps will not be necessary for the irrigation area. All maps can overlay the whole property map.



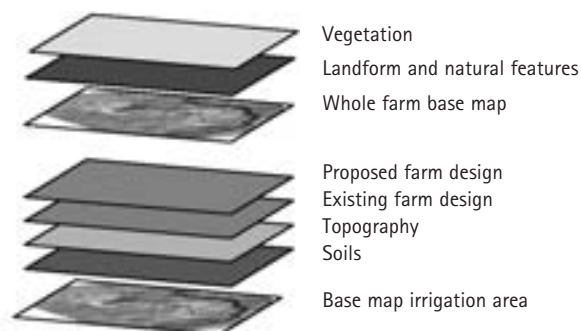
Map information should consist of:

Three whole property scale maps:

- a base map—airial photograph or satellite image
- landform and natural features map
- vegetation map.

Five irrigation development area scale maps:

- a base map—airial photograph or satellite image
- soils map
- topography map
- existing farm design map
- proposed farm design map.



3.0 Who is responsible for preparing a plan?

It is the landholder’s responsibility to prepare their LWMP. NRW is not responsible for preparing plans, but can provide information and materials to assist in their preparation. These are available by contacting your local NRW office.

Prepare the LWMP at the earliest opportunity to ensure that there are no delays in being able to use the water. Use your own expertise as well as consultants, industry organisations and other support services to ensure that your proposed irrigation development will meet the required obligations of a water entitlement holder.

Your local NRW office may have a list of consultants who can provide technical expertise in soils, water resources, topography, infrastructure design and imagery. The Department of Primary Industries and Fisheries, the Environmental Protection Agency and regional natural resource management bodies may also be able to provide information to assist with preparing a LWMP.

3.1 Will an industry Farm Management System (FMS) be considered?

Industry bodies are developing a range of programs and services aimed at assisting landholders with the development of property plans and management systems that support sustainable natural resource management. These are generically known as Farm Management System programs. Some existing programs include Cotton best management practices (BMP), Dairying Better 'n Better, Canegrowers FMS and the Growcom Steps Towards Effective Management Program. The *Water Act 2000* allows NRW to accept an FMS that is certified under an accredited FMS program³ as the equivalent of a LWMP.

If you have already adopted a farm management system, or prepared a property management plan or other plans and/or documents, contact NRW to see if they meet some or all of the requirements of a LWMP.

3.2 Can preparation of a LWMP be delayed?

Landholders with a genuine need to use their water entitlements before completing their LWMP can apply to NRW for a deferral (see reference manual). Deferrals up to 12 months may be granted depending on the level of 'risk' associated with the use of the water for irrigation.

³ The FMS program must be accredited by NRW as meeting LWMP requirements.

4.0 How to prepare your LWMP

This section sets out what information you need to provide in your plan.

4.1 Property information

This section asks for property location, ownership, contact details, evidence of relevant licences/approvals and gives an overview of property base map requirements.

4.1.1 Property description and ownership

<p>Information you need to provide</p> <ul style="list-style-type: none"> • Who owns the property • Contact details (mail address, phone, fax, email) • Who manages the property • Contact details (mail address, phone, fax, email) • Property name • Lot on Plan description from latest rates notice • Rural residential number and road name • Land tenure—leasehold or freehold. 	<p>Desired outcomes</p> <p>Ownership and contact details for the property are provided for future communication and reporting.</p>
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4.1.2 Permits, notices and existing approvals

<p>Information you need to provide</p> <p>Copies of relevant approvals or notices associated with the irrigation development e.g. flood plain approval, drainage diversion approval, riverine pump permit, approved works in a watercourse/ lake/ spring, vegetation clearing permit.</p>	<p>Desired outcomes</p> <p>Copies of notices and approvals, which may impact on the irrigation development or approval of the LWMP, have been provided.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.1.2</p>	

4.1.3 Base map

<p>Information you need to provide</p> <p>Whole property base map</p> <p>Recent aerial photography or satellite imagery covering your entire property, with the boundaries of both the property and irrigation development area marked.</p> <p>Irrigation and associated development area base map</p> <p>Recent aerial photography or satellite imagery showing a more detailed view of the irrigation development area, with the boundary marked.</p> <p><i>Note:</i> If the whole property base map presents the irrigation development area at a suitable scale then a separate irrigation area base map will not be necessary.</p>	<p>Desired outcomes</p> <p>Suitable base maps that cover both the whole property and irrigation development have been provided.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.1.3</p>	

4.2 Landscape considerations

In this section you are asked to identify landscape issues (e.g. salinity, riparian management) that impact on your enterprise, either from outside the property or from within. You are also asked to explain how any actions you take will support catchment or regional strategies.


4.2.1 Landform and natural features

<p>Information you need to provide</p> <p>A landform and natural features map or overlay with clearly marked ridges, gullies, watercourses, lakes, water holes, flood breakout, flood runners, re-entry points, springs and natural wetlands.</p>	<p>Desired outcomes</p> <p>The impact of drainage patterns and natural landform features on the irrigation development are determined.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.2.1</p>	


4.2.2 Flood risk and floodplain development impacts

<p>Information you need to provide</p> <p>If areas of your property flood, mark on your landform and natural features map or overlay:</p> <ul style="list-style-type: none"> • the maximum known flood boundary • flow depths and direction • any proposed or existing above-ground works e.g. levee banks, bund walls, embankments etc. <p>Also describe the flood frequency and your strategies to manage floodwater impacts.</p> <p>If located on the Nogoia floodplain, provide copies of written approval from the Emerald Shire Council for any above-ground works.</p> <p>If located on a floodplain elsewhere in the Fitzroy Basin, and proposing above-ground works:</p> <ul style="list-style-type: none"> • Provide an impact assessment for works on your property in relation to surrounding properties, stream bank stability and soil erosion. • Provide evidence of communication with neighbours and the local Shire Council. • Provide a copy of a letter of approval from the local Shire Council. 	<p>Desired outcomes</p> <p>Floodplain impacts associated with irrigation development are identified and avoided or minimised.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.2.3</p> <p>Fitzroy LWMP information kit for flood risk maps where available</p>	

4.2.3 Vegetation and riparian management

<p>Information you need to provide</p> <p>A vegetation map or overlay marking the extent of natural vegetation.</p> <p>Describe how the natural values of existing vegetation on your property will be protected or enhanced. Include any proposed vegetation management strategies to improve the connectivity of vegetation corridors with neighbouring properties.</p> <p>If located adjacent to a watercourse, describe how the irrigation development area, and its operation, will minimise impacts on the stability and function of the riparian zone. Where new development is to occur consider the impacts both upstream and downstream of the development.</p> <p>If planning to clear vegetation, provide evidence of vegetation clearing advice or approval from the Department of Natural Resources and Water and provide a copy of the latest Regional Ecosystems map covering the property.</p>	<p>Desired outcomes</p> <p>Irrigation development has minimal adverse impact on surrounding vegetation and riparian areas, and will not compromise the stability and function of watercourses.</p> 
<p>Guide to acceptable practices</p> <p>See Appendix 1, section 1.0: <i>Management of vegetation in and around watercourses</i></p> <p>Discuss with your local NRW Vegetation Management Officer if required.</p> <p>Fitzroy LWMP Reference Manual, section 4.2.2</p>	

4.2.4 Salinity risk and watertables

<p>Information you need to provide</p> <p>Shallow watertables</p> <p>Assess the risk of shallow or rising watertables. This will involve obtaining and assessing any existing groundwater information (e.g. watertable levels and water quality) from NRW, scheme operator or neighbouring landholders.</p> <p>If there is an identified shallow watertable (water less than 4 m from ground surface) or rising watertable issue, mark the approximate identified area on your landform and natural features map. Describe the possible contributing factors and their impacts.</p> <p>See section 4.5.5 concerning management practices to prevent or reduce watertable rises.</p> <p>Soil salinity</p> <p>If there are any visible signs of salinity in or around your property or any emerging salt problems, mark the identified areas on your landform and natural features map.</p> <p>Describe the possible contributing factors and the impacts.</p>	<p>Desired outcomes</p> <p>Salinity and shallow watertable issues are identified and avoided or minimised.</p> 
<p>Guide to acceptable practices</p> <p>See Appendix 1, section 2.0: <i>Suitability of soil types</i>; Section 3.0: <i>Quality of irrigation water</i>; Section 4.0: <i>Soil salt profile</i></p> <p>Fitzroy LWMP Reference Manual, section 4.2.4</p>	


4.3 Farm resources—land and water

This section covers the farm resources. It requires a series of maps, layers and descriptions of the land, water and vegetation resources.

4.3.1 Land—soils and topography

<p>Information you need to provide</p> <ul style="list-style-type: none"> • A soils map or overlay of the irrigated area showing soil types and boundaries. • Provide a soil profile description for each of the major soil types. • If the irrigation development is located in a coastal area and proposes disturbance (including de-watering) below 5.0 metres Australian Height Datum (AHD), an Acid Sulfate Soils (ASS) investigation and management plan will be required. In it you will need to outline your strategies to avoid and manage any impact. • A ground survey topographic map or overlay of the irrigated area showing survey grid and contours. 	<p>Desired outcomes</p> <p>The soils and slopes are suitable for irrigated cropping and pastures.</p> <p>Nil impact from the disturbance of Acid Sulfate Soils (ASS).</p>
<p>Guide to acceptable practices</p> <p>See Appendix 1, section 2.0: <i>Suitability of soil types</i></p> <p>Fitzroy LWMP Reference Manual, section 4.3.1</p> <p>See Fitzroy LWMP information kit, soil mapping, acid sulfate soils and topographic information</p>	

4.3.2 Water—sources, quantity and quality

<p>Information you need to provide</p> <p>A description of all water sources including:</p> <ol style="list-style-type: none"> 1. Surface and groundwater entitlements i.e. water allocations and water licences <ul style="list-style-type: none"> • proof of entitlement • nominal volume or volumetric limit, and long-term annual estimate • water allocation security objective (WASO) group. 2. Other sources including overland flow, treated sewerage or industrial discharge water. <ul style="list-style-type: none"> • estimate of long-term annual volume and supply rates. 3. For each irrigation water source provide test results for Electrical Conductivity (EC) <ul style="list-style-type: none"> • If using water with an EC greater than 1500 $\mu\text{S}/\text{cm}$ (micro-siemens per centimetre) provide a detailed chemical analysis and suitability assessment for irrigation. Consider water quality, soil types, proposed crops, irrigation method and climate. 4. If using treated sewerage or industrial discharge water provide a copy of any approval letters or permits, from the Environmental Protection Agency or Local Shire Council, which describes the quality of this water being provided to the property and any conditions relating to its use. 	<p>Desired outcomes</p> <p>Identification of the quantity and quality of all irrigation water sources.</p> <p>Quality of irrigation water will not degrade soils, contribute to salinity in groundwater or impact on adjacent riparian or natural riverine areas.</p> 
<p>Guide to acceptable practices</p> <p>See Appendix 1, section 3.0: Quality of irrigation water Fitzroy LWMP Reference Manual, section 4.3.2</p>	

4.4 Farm design and layout

This section covers farm infrastructure and its design. It seeks detailed information on irrigation infrastructure, field layout, land use and water reliability.

4.4.1 Existing crops and infrastructure

<p>Information you need to provide</p> <p>An existing farm design map covering the irrigation area. On it, show:</p> <ul style="list-style-type: none"> • The boundary of each field or block that is irrigated, the field name or number and area (ha). Describe the irrigation method/s and the crop type/s generally grown. • Any existing infrastructure including buildings, monitoring and irrigation bores, pumps, supply off-takes, irrigation storages (surge and gully dams, sumps, ring tanks and their name or number and storage volumes in megalitres (ML)) • The location of pipelines, channels, check or drop structures, inverted siphons, surface and sub-surface drains (open and buried), silt traps, power lines, main access tracks, and storage sites for pesticide, fertiliser and fuel. <p>A brief history of the irrigation development on the property.</p>	<p>Desired outcomes</p> <p>A map of existing irrigation development that shows current field layout and irrigation infrastructure.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.1</p>	

4.4.2 Proposed crops and infrastructure

<p>Information you need to provide</p> <p>A proposed farm design map for the irrigation area showing:</p> <ul style="list-style-type: none"> • As in 4.4.1 provide details on all proposed development. 	<p>Desired outcomes</p> <p>Proposed field layout and irrigation infrastructure is designed and located to avoid land or water degradation.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.2</p>	

4.4.3 Crop water requirement and reliability of supply

<p>Information you need to provide</p> <p>An estimate of the long-term total water requirement, which includes total crop water requirements plus all losses.</p> <p>If using unregulated supplies, provide an assessment of water availability and reliability in satisfying the total irrigation requirement.</p> <p>If using groundwater in conjunction with surface water, provide an indication of long-term reliability of supply for each bore. Provide copies of any pump/flow rate tests and the method by which the tests were conducted.</p>	<p>Desired outcomes</p> <p>The reliability of irrigation water and water supply infrastructure requirements have been determined.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.3</p>	

4.4.4 Suitability of irrigation system

<p>Information you need to provide</p> <p>Identify which irrigation systems are suitable for your soil types, topography, water quality and crop choice.</p> <p>Describe why you have chosen your current and proposed irrigation system over other methods.</p>	<p>Desired outcomes</p> <p>Current and proposed irrigation systems are designed and located for uniform water application and to minimise irrigation runoff.</p> <p>Suitable and efficient irrigation systems have been chosen.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.4</p> <p>See Appendix 1 section 5.0: <i>Suitability of irrigation development in parts of the landscape</i></p>	

4.4.5 Pumping, storage and distribution

<p>Information you need to provide</p> <p>Authorisation details (Development Permits) and the range of designed pumping duties (litres per second per metre of head) for each of your authorised supply pumps.</p> <p>For pumps that are located on or within a stream, describe how you will minimise any impact to the riparian zone caused by your pump installations and their associated access tracks.</p> <p>If proposing a new dam or ring tank, provide investigation, design and construction details including maximum storage capacity. Describe how construction will minimise the risk of failure, seepage and deep drainage losses, prevent by-wash erosion, and not cause adverse impacts to natural overland flows.</p> <p>If using earthen distribution channels, discuss how seepage losses will be minimised.</p> <p>Describe erosion protection around any channel structures e.g. bubblers, check structures and inverted syphons etc.</p>	<p>Desired outcomes</p> <p>Pump installations do not cause erosion or stream bank degradation.</p> <p>Storages, channels and pipelines have been designed and constructed to prevent seepage and deep drainage losses.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.5</p> <p>See Appendix 1, section 5.0: <i>Suitability of irrigation development in parts of the landscape</i></p>	

4.4.6 Irrigation design and erosion control

<p>Information you need to provide</p> <p>On your existing and/or proposed farm design map, mark your irrigation layout (i.e. head ditches, tail drains, furrow direction and grades). Describe how the design will minimise erosion and achieve uniform water application.</p> <p>On the same map/s mark existing and proposed sediment traps and buffers (i.e. detention basins, grass filters, artificial wetlands) and describe how they filter and capture sediment.</p>	<p>Desired outcomes</p> <p>Irrigation system and sediment buffer systems have been designed to minimise erosion and runoff.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.4.6</p> <p>See Appendix 1 section 6.0 for irrigation designs considered unsuitable</p>	

4.4.7 Drainage and stormwater run-off

<p>Information you need to provide</p> <p>Mark all surface and subsurface drainage works both inside and outside the irrigation area e.g. contour banks, drains and outfalls on your existing and/or proposed farm design map.</p> <p>Describe how your irrigation and drainage design will be managed to minimise, capture and recycle tail water.</p> <p>If using drip or micro spray systems, describe how agricultural effluent produced from system cleaning and back flushing procedures is captured and contained.</p> <p>For all irrigation methods, describe your stormwater management system, and the stormwater volume in mm or ML intended to be contained on-farm, or in a shared scheme with others. If proposing new or modified stormwater or tail water infrastructure (storages, sumps or drains), provide calculations of frequency and volume of run-off to be captured and explain why these are necessary.</p>	<p>Desired outcomes</p> <p>No tail water leaves the property.</p> <p>Drainage works, tail water and stormwater management systems are designed to be no larger than necessary to minimise the risk of potentially poor quality water leaving the farm.</p>
<p>Guide to acceptable practices</p> <p>See Appendix 1 section 7.0 for the minimum standard required Fitzroy LWMP Reference Manual, section 4.4.7</p>	

4.5 Farm management, monitoring and reporting

This section covers farm management issues that can impact on natural resources. It asks you to provide management and monitoring strategies, and some assurance that you are monitoring, keeping records and can report on conditions and trends.


4.5.1 Irrigation system performance

<p>Information you need to provide</p> <p>Describe how irrigation system performance will be monitored (volume supplied to farm; storage losses; delivery; application; and deep drainage losses).</p> <p>Provide details for, and describe how you will record:</p> <ul style="list-style-type: none"> • Field monitoring using tools to schedule water applications and ensure irrigation rates are matched to soil type and crop requirement. • Field assessment of water application uniformity. • Field assessment of on-farm storage losses resulting from deep drainage or seepage. • Opportunities to reconfigure layouts to improve performance. 	<p>Desired outcomes</p> <p>Irrigation system is operated so that water applied does not exceed what the crop requires or soil infiltration rates, and achieves an even distribution.</p> <p>Records are kept and reports are completed for the life of the approved plan.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.5.1</p>	

4.5.2 Soil and erosion management

<p>Information you need to provide</p> <p>Show that soil and erosion management practices are in line with the industry codes of practice or best management practice guidelines.</p> <p>Give details of:</p> <ul style="list-style-type: none"> • How in-field cropping practices (particularly crop rotation, soil compaction avoidance strategy, tillage and ground cover target levels) are used to maximise water infiltration and minimise erosion risk. • How sediment traps, drains and buffer systems are managed (including frequency of cleaning, slashing, de-silting and where silt is relocated). • If your long-term annual water supply reliability precludes an annual irrigated crop, describe how you will maintain ground cover levels to avoid land degradation potential when irrigation water is unavailable. 	<p>Desired outcomes</p> <p>Farm management practices minimise soil erosion.</p> <p>Records are kept and reports are completed for the life of the approved plan.</p>
<p>Guide to acceptable practices</p> <p>Fitzroy LWMP Reference Manual, section 4.5.2</p> <p>See Appendix, section 6.0: <i>Standard of infrastructure and its design</i></p>	

4.5.3 Farm run-off and water quality

<p>Information you need to provide</p> <p>Describe how possible pollutant discharge leaving the property or immediate sub-catchment will be minimised.</p> <p>Describe how you plan to manage and monitor:</p> <ul style="list-style-type: none"> • Irrigation tail water and stormwater systems (including storages). • The quality of water leaving your property or immediate sub-catchment (including turbidity, electrical conductivity, pH, nitrates, phosphates and pesticide levels). • The flushing and system cleaning procedures (end flush, back flush, frequency of flushing, typical volume discharged, and method of treatment or disposal) if using drip or micro spray systems. • Treated water (i.e. sewerage or industrial). Describe how the quality will be assessed, managed and monitored both on inflow and on discharge in a storm event. 	<p>Desired outcomes</p> <p>Irrigation tail water and stormwater run-off do not adversely affect water bodies or water resources on or off the property.</p> <p>The condition of water resources or water bodies is monitored and managed to ensure quality is not degraded.</p> <p>Records are kept and reports are completed for the life of the approved plan.</p>
	
<p>Guide to Acceptable Practices</p> <p>Fitzroy LWMP Reference Manual, section 4.5.3</p> <p>See Appendix 1 section 7: <i>Management of stormwater run-off from irrigated land</i></p>	

4.5.4 Pesticide, fertiliser and fuel management

<p>Information you need to provide</p> <p>Describe how the method of storage and handling of pesticides conforms to industry codes of practice or best management practice guidelines.</p> <p>Give details of:</p> <ul style="list-style-type: none"> • How agricultural chemicals are stored (storage location, security and bunding). • Where and how fuel and oil associated with any pumps are stored. • Where wash-down sites, refill points and disposal sites of used containers are located. 	<p>Desired outcomes</p> <p>Storage and use of agricultural chemicals does not contaminate surface water, groundwater or soil resources on or off site.</p> <p>Records are kept and reports are completed for the life of the approved plan.</p>
<p>Guide to Acceptable Practices</p> <p>Fitzroy LWMP Reference Manual, section 4.5.4</p>	

4.5.5 Salinity and watertables

<p>Information you need to provide</p> <p>Describe how you will avoid the potential for developing salinity and shallow watertables and how you will monitor this.</p>	<p>Desired outcomes</p> <p>Irrigation and farm management avoids the development of salinity and shallow watertable problems.</p> <p>A monitoring program is in place, records are kept and reports are completed for the life of the approved plan.</p>
<p>Guide to Acceptable Practices</p> <p>Fitzroy LWMP Reference Manual, section 4.5.5</p> <p>See Appendix 1 section 4.0: <i>Soil salt profile</i></p>	

5.0 How will your LWMP be assessed?

Two copies of your completed LWMP should be submitted, with an assessment application form (see reference manual) and the appropriate fee, to your local NRW office. If necessary, NRW will negotiate any changes with you before final assessment of the LWMP. Adoption of recommended industry best practice will be considered in the assessment process.

Once your LWMP is approved, a copy of the approved plan will be returned to you. Where changes in farm layout or farming practices are necessary as a result of the LWMP assessment, NRW will negotiate a reasonable implementation period so that your enterprise is not disadvantaged.

Landholders have an obligation to comply with the LWMP once it has been approved. The plan will be approved for a set period (maximum of 10 years). The approval may be for a lesser period, depending on the risk to land and water resources resulting from the use of the water. Before the approved period expires, you must apply to have the plan approved for a further period.

To support a renewal application, you will need to provide evidence that the existing plan and management practices are meeting the desired outcomes. This means you will need to monitor the performance of your farm practices over the term of the approved plan. During the life of the plan NRW has a responsibility to see that the LWMP is implemented and that outcomes are being achieved. This may be through property visits to conduct an audit to verify that strategies or actions identified in the plan are in place.

5.1 What if you vary your LWMP?

It is expected that farming practices will change over time as a result of changing technology, priorities, research and experience. As a result, landholders will make ongoing improvements that may modify their LWMP.

It is the responsibility of the landholder to advise NRW of any significant change to the LWMP. A significant change to the plan may require an approved amendment.

Examples of significant changes may include:

- A change in irrigation or cropping practice that leads to a significant change in irrigation management strategies
- A change in land use, irrigation method or irrigation infrastructure
- Using the water associated with a LWMP on new land or different land.

Contact your local NRW office before you make any change to your LWMP.

6.0 Other matters to consider

There can be other approvals and obligations required as part of an irrigation development.

These may include, but are not limited to:

- control of Declared Plants under the *Land Protection (Pest and Stock Route Management) Act 2002*
- development that may impact on state land.
- referable dams
- irrigation works in or adjacent to a declared fish habitat area.

NRW may require evidence that these and other approvals and obligations have been or are in the process of being addressed before approving your LWMP. Check with your local NRW office if any such approvals will delay the approval of your LWMP.

Irrespective of these approvals being obtained, landholders have a general environmental duty of care under the *Environmental Protection Act 1994* to conduct their activities in such a way that prevents environmental harm and maintains environmental values for air and water. Industry codes of practice and best management practice programs will help individuals comply with the Act.

6.1 Floodplain management

The placement of structures on the floodplain, such as storages, banks and channels, can alter natural flood flows, which may have adverse impacts on properties and landholders upstream and/or downstream. Landholders have always had a common law duty of care not to cause nuisance or harm to their neighbours through their actions and it is in the interests of all landholders to consider the consequences of any proposed activities.

The local NRW office can advise whether your property is covered by a plan that addresses floodplain management issues. This may include provisions under the *Water Act 2000* that deal with floodplain management issues, or a policy, local law or floodplain management plan prepared by local government. Primary producers must have regard for any relevant provisions when considering new developments, and obtain permits or similar authority for works as applicable.

Landholders proposing to construct significant works on their property where there are no floodplain management provisions should consider their common law obligations and assess the impact of those works on run-off volumes, concentrations and flow directions. Depending on the location of the property and the relative size of the works it may be necessary to undertake hydraulic modelling of flows. It is recommended that the advice of an appropriate consultant be sought first.

6.2 Native vegetation management

The *Vegetation Management Act 1999* regulates the clearing of native vegetation to prevent the loss of biodiversity, avoid land degradation, and maintain ecological processes. Landholders who wish to clear vegetation as part of a development should ask NRW if approval is required.

When making an application to clear vegetation, the landholder will have to prepare a Property Vegetation Management Plan (PVMP) and should prepare a single property plan to satisfy the requirements of both a PVMP and a LWMP. NRW can advise landholders on how this can be done.

As part of the property vegetation management plan, landholders are required to provide certain information, including:

- the location and extent of the proposed area to be cleared
- the purpose of the application
- details of the way the proposed clearing meets the performance requirements of the regional vegetation management code for the area
- any other information the applicant considers may assist in the assessment of the application.

Landholders should consult their local NRW Vegetation Management Officer for more information on preparing an application to clear vegetation.

6.3 Cultural heritage, environmental protection and biodiversity conservation

Individuals should comply with the provisions relating to cultural heritage under the *Aboriginal Cultural Heritage Act 2003* and the *Torres Strait Islander Cultural Heritage Act 2003*. All reasonable and practicable measures should be taken to ensure activities do not harm Aboriginal or Torres Strait Islander cultural heritage (the 'cultural heritage duty of care').

An individual's activities should be in accordance with:

- cultural heritage duty of care guidelines under the *Aboriginal Cultural Heritage Act 2003*
- any agreement with traditional owners
- any approved cultural heritage management plan under Part 7 of the Aboriginal or Torres Strait Islander cultural heritage legislation.

The Cultural Heritage Coordination Unit in NRW can assist you on these matters through its Cultural Heritage Database and Cultural Heritage Register. Your property details can be searched on this database and register.

The Environmental Protection Agency (EPA) has the responsibility to administer historic cultural heritage requirements. The EPA is also responsible for approvals, compliance and negotiated outcomes relating to rare and threatened flora and fauna. It can also provide information on impact assessment on environmentally sensitive places such as wetlands or endangered plant communities. Information should be provided to show that impacts of the LWMP development have been considered and discussed with the EPA.

Proposed developments must avoid adverse impacts in the following areas:

- Areas of national or international significance such as:
 - World Heritage areas
 - Ramsar listed wetlands
 - areas involving internationally protected migratory species or nationally threatened animal or plant species
 - ecological communities listed under the Environment Protection and Biodiversity Conservation Act 1999. One such threatened ecological community is Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregion located in the Fitzroy Basin.

- Areas of state significance such as protected areas, critical habitat or areas containing rare or threatened animal or plant species listed under the *Nature Conservation Act 1992*.
- Areas containing important wetlands or significant coastal dune systems as listed in:
 - the Directory of Important Wetlands (ANCA 1996)
 - regional coastal management plans prepared in accordance with the State Coastal Management Plan (Queensland's Coastal Policy 2001)
 - any other recognised plan.

7.0 Glossary

Development permit	An approval for a development as defined under the <i>Integrated Planning Act 1997</i> .
Irrigation	The application of water for the purpose of sustaining plant growth and/or enhancing primary production.
Irrigation requirement	The water that must be applied through the irrigation system to ensure the plant receives its full water requirement.
Seasonal water assignment	The assignment by the holder of a water entitlement (water allocation or water licence) to another person, for a water year, or part of the water year.
Sediment trap	An excavation, natural depression or small storage located in return drains or outfalls designed to collect suspended sediment.
Sump	Excavation, natural depression or storage designed to capture tail water or agricultural effluent run-off under gravity from cultivated land. This is often for later pumping into on-farm storages.
Surge dam	Large capacity, gravity-fed storage that captures overland flow water for later pumping into on-farm storages
Tail water	Applied water that exits the edge of an irrigated field.
Water allocation	An authority granted under section 121 or 122 of the <i>Water Act 2000</i> , issued under an approved Water Resource Operations Plan.
Water entitlement	A water allocation, interim water allocation or water licence.
Water licence	A licence granted under the <i>Water Act 2000</i> (chapter 2, part 6, division 2) that enables the taking and using of water or the interfering with the flow of water. The authority to construct works associated with the water licence is given under the <i>Integrated Planning Act 1997</i> .
Riparian vegetation	Vegetation within or bordering a river, stream or gully.

8.0 References

Codes of practice and best management practice manuals

- *Code of Practice for Agriculture*, Queensland Farmers' Federation, Brisbane, 1998.
- *FARMCARE—Code of Practice for Sustainable Fruit and Vegetable Production in Queensland*, Queensland Fruit and Vegetable Growers, Brisbane, 1998.
- *Best Management Practices Manual* Australian Cotton Industry September 2000.
- *WATERpak—A Guide for Irrigation Management in Cotton*, Cotton Research Development Corporation, 2004.

Land suitability

- *Guidelines for Agricultural Land Evaluation in Queensland*, Department of Primary Industries, Brisbane, 1990.
- *Planning Guidelines on the Identification of Good Quality Agricultural Land*, Department of Housing, Local Government and Planning and Department of Primary Industries, Brisbane, 1993.

Monitoring

- *Natural Resource Monitoring Guide*, NR&M, Brisbane 1999

Riparian zone management

- *Guidelines for Stabilising Stream Banks With Riparian Vegetation*, Cooperative Research Centre for Catchment Hydrology, 1999.
- *Guidelines for Riparian Filter Strips for Queensland Irrigators*, CSIRO Land and Water, 1999.

Salinity

- *Salinity Management Handbook*, NR&M, 1997.
- *Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines for Fresh and Marine Water Quality*, Environment Australia, Canberra, 2000.

Soil classification

- *Australian Soil and Land Survey Field Handbook*. McDonald R, Isbell R, Speight J, Walker J, & Hopkins M. 2nd edition, Inkata, Melbourne, 1990.

Soil maps and reports

- *Potential irrigation areas along the Comet River, below the proposed Comet Dam, and along the lower Nogoa River*, NR&M, 1997, DNRQ97081.
- *Agricultural land evaluation along the lower Dawson River*, NR&M, 1999, DNRQ9990107.
- *Land suitability for irrigated agriculture along the Fitzroy River*, NR&M, 2000, DNRQ00027.
- *Agricultural land evaluation of the Mackenzie River*, NR&M, 1998, DNRQ980055.
- *Agricultural land evaluation of key transects along the lower Nogoa River, below Emerald Irrigation Area*, NR&M, 1997, DNRQ97076.

Use of chemicals

- *Code of Practice for the Storage and Use of Chemicals at Rural Workplaces*, Department of Employment, Vocational Education, Training and Industrial Relations, Brisbane, 1994.

Water infrastructure and irrigation design

- *Farm Water Supplies Design Manual*, NR&M, Brisbane, 1984.
- *Design Guidelines—Whole Farm Planning for Irrigation*, Irrigation Association of Australia, 1991.

Appendix 1

Risk situations where development is not permitted, is unsuitable or a minimum standard is required

There are specific activities and situations within the Fitzroy Basin that are considered high risk.

These are included on the following pages:

1	management of vegetation in and around watercourses	page 23
2	suitability of soil types	page 24
3	quality of irrigation water	page 26
4	soil salt profile with high salinity rating	page 27
5	suitability of irrigation development in parts of the landscape	page 28
6	standard of infrastructure and its design	page 29
7	management of stormwater run-off from irrigated land	page 30

NRW will apply three criteria when assessing these identified risk situations:

Not permitted	Development is not permitted because existing codes or legislation prevent it.
Minimum standard required	NRW has set a minimum standard that you must meet for LWMP approval.
Unsuitable or high risk	Development is considered unsuitable or high risk. The onus is on the irrigator to demonstrate to NRW how the identified risk will be successfully managed.

Use the reference link at the top of each table to refer back to the relevant *Information you need to provide* section in section 4: *How to prepare your LWMP*.

1 Management of vegetation in and around watercourses

<p>Adequate vegetation corridors are in place to maintain biodiversity and ecological values and maintain stream bank stability. (Reference: 4.2.3 Vegetation and riparian management)</p>	
<p>Not permitted</p> <p>Regional vegetation codes do not allow clearing and development within the following distances of watercourses:</p> <p>Coastal streams (South-east coast bioregion and central Qld coast bioregion)</p> <p>Gullies 25 m either side of the high bank Creeks 25 m either side of the high bank Rivers 50 m either side of the high bank</p> <p>All other streams (Nogoa, Comet, Isaac, Mackenzie, Dawson, Upper Fitzroy catchments)</p> <p>Gullies 50 m either side of the high bank Creeks 100 m either side of the high bank Rivers 200 m either side of the high bank</p> <p>Gullies = Stream orders 1 & 2; Creeks = Stream orders 3 & 4; Rivers = Stream orders 5 & 6</p>	<p>Why</p> <p>For consistency with requirements of the <i>Vegetation Management Act 1999</i></p>
<p>Minimum standard required</p> <p>A minimum width of native vegetation is to be retained or reinstated in disturbed riparian areas.</p> <p>All streams</p> <p>The horizontal width of managed native vegetation extending from the top of the high bank away from the watercourse must be at least equal to:</p> <ul style="list-style-type: none"> • height from the bed of watercourse to top of high bank (metres) plus an additional five metres horizontally. 	<p>To maintain and/or improve biodiversity values as well as protect the stability of stream banks.</p>

2 Suitability of soil types

Only those soils that are suitable for irrigation should be developed. (Reference: 4.3.1 Land—soils and topography)	
Unsuitable or high risk	Why
The development of soils that have known inherent limitations or landscape position problems as follows:	
<p>Disturbance below the 5 m Australian Height Datum.</p> <p>Development that involves excavation, exposure or subsurface drainage without an Acid Sulfate Soils (ASS) investigation and management plan that complies with the Queensland ASS Technical Guidelines.</p>	Risks associated with exposure to Acid Sulfate Soils
<p>All catchments in the Fitzroy Basin</p> <p><i>Any irrigation method</i></p> <p>Thin surface texture contrast soils (less than 25 cm topsoil) with 'tough' clay surface and bleached sub-surface layer.</p> <p>Cracking clays with any of the following characteristics:</p> <ul style="list-style-type: none"> • a high number of melon-holes • a very coarsely structured soil surface • soil surface crusts • high sodium near soil surface. <p>Landscapes where salinisation is evident on lower slopes or adjacent lands.</p> <p><i>Flood irrigation method only</i></p> <p>Sandy surface texture contrast soils, where the sandy surface layer is less than 45 cm deep (Sodosols)</p> <p>Deep sandy and loamy soils (Kandosols or Tenosols)</p>	<p>Low plant available water, poor drainage</p> <p>Micro-relief, poor drainage, seed bed problems, sodicity</p> <p>Development will add to the problem</p> <p>Water application inefficiencies</p> <p>Deep drainage, water application inefficiencies</p>
<p>Lower Fitzroy River Catchment</p> <p>Refer to the Fitzroy Soils Report.</p> <p><i>Any irrigation method</i></p> <p>Sodic texture contrast soil (2ASO1) on alluvium and colluvium; black or grey cracking clay soils (1AVE4, 1AVE5) on recent alluvium.</p> <p>Deep uniform sands and loamy soils (1ATE2, 1ATE3); or black or brown cracking clay soil (1AVE6); or non-cracking clay soils (1AKA2, 1ADE2); or texture contrast soil (1ACH3), all located on the floodplain, close to stream channels and floodways.</p>	<p>Inherent salinity, poor drainage, sodicity</p> <p>Flood risk, except on elevated parts</p>

2 Suitability of soil types (continued)

Only those soils that are suitable for irrigation should be developed. (Reference: 4.3.1 Land—soils and topography)	
Unsuitable or high risk	Why
Soils that have known inherent limitations or landscape position problems.	
<p>Dawson River Catchment Refer to the Dawson Soils Report.</p> <p><i>Any irrigation method</i></p> <p>Black cracking clay soil (2VEa) on the active floodplain, and grey or black cracking clay soil (3VEa) on undulating plains and rises over old transported sediments.</p> <p>Texture contrast soils with sodic clay subsoils (4SOa, 4SOb) on undulating plains and rises, over sedimentary rocks.</p>	<p>Salinity, poor drainage and micro-relief, flood risk, sodicity, crusting</p> <p>Land slope, dispersive sodic subsoils</p>
<p>Mackenzie River Catchment Refer to the Mackenzie Soils Report.</p> <p><i>Any irrigation method</i></p> <p>Black self-mulching cracking clay soil (2VEe) on the active floodplain, and black self-mulching cracking clay soil (3VEx) on undulating plains and rises over old transported sediments.</p>	<p>Flood risk, poor micro-relief, poor drainage</p>
<p>Nogoa and Comet River Catchments Refer to the Nogoa and Comet Soils Reports.</p> <p><i>Any Irrigation Method</i></p> <p>Black self-mulching cracking clay soil (3VEx) on undulating plains and rises on old transported sediments; and brown or grey sodic texture contrast soil (4SOx) on undulating plains and rises over tertiary sedimentary rocks.</p>	<p>Sodicity, salinity, micro-relief, poor drainage, surface condition</p>

References:

Comet River Soil Report

McCarroll, SM (1997) Potential irrigation areas along the Comet River, below the proposed Comet Dam, and along the lower Nogoa River (NRW: Land Resources Bulletin Series DNRQ97081)

Dawson River Soil Report

McCarroll, SM (1999) Agricultural land evaluation along the lower Dawson River (NRW: Land Resources Bulletin Series DNRQ9990107)

Fitzroy River Soil Report

Forster, BA and Sugars, MA (2000) Land suitability for irrigated agriculture along the Fitzroy River (NRW: Land Resources Bulletin Series DNRQ00027)

Mackenzie River Soil Report

McCarroll, SM (1998) Agricultural Land Evaluation of the Mackenzie River (NRW: Land Resources Bulletin Series DNRQ980055)

Nogoa River Soil Report

McCarroll, SM (1997) Agricultural Land Evaluation of key transects along the lower Nogoa River, below the Emerald Irrigation Area (NRW: Land Resources Bulletin Series DNRQ97076)

3 Quality of irrigation water

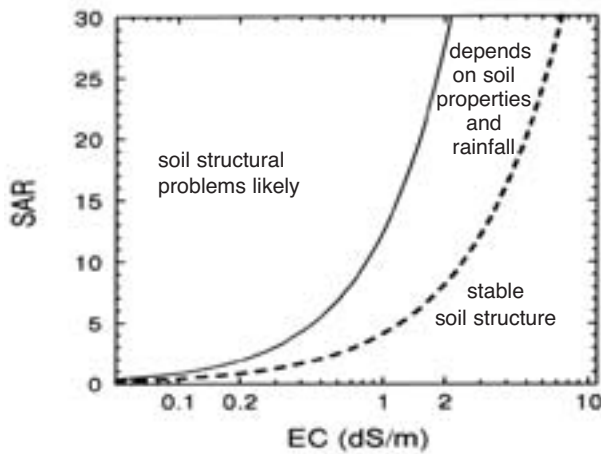
The assessment of water quality and its suitability for irrigation can be complex. Water suitability for irrigation cannot be assessed independently of soil properties, irrigation system, crop type, rainfall and management practices. The following criteria provide a general guide to what might be marginal water quality using two criteria—sodicity and salinity. Sodicity is the presence of a high proportion of sodium ions relative to calcium and magnesium ions. Salinity is the presence of soluble salts. In the Fitzroy Basin, these criteria are more likely to be a problem with water from groundwater sources.

(Reference: 4.3.2 Water sources—quantity and quality)

Unsuitable or high risk

Maintaining soil structural stability

Excess sodium will degrade the physical properties of soil by breaking down clay aggregates. The diagram below illustrates the relationship between the Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC) of irrigation water and its likely impact on soil structural stability. Water quality falling to the left of the solid curve is unsuitable.



Refer to the Fitzroy Reference Manual for information on how to calculate SAR from your water analysis report. Unit conversion: 1 dS/m = 1000 μ S/cm

Why

The use of poor quality irrigation water (sodic, saline or both) that may lead to soil structural degradation or an increased risk of salinisation.

Irrigation water—salinity

As a general guideline, the salinity level of irrigation water should not exceed: EC 1500 (μ S/cm)

May impact on the environment. If this water is used undiluted, sensitive crops and plant species will suffer. Potential for salt accumulation over time and subsequent plant toxicity. Need to assess soil type, drainage and irrigation management practice. Spray irrigation will be less suitable than other methods that apply water to the root zone—foliage of sensitive crops will burn.

4 Soil salt profile

The assessment of soil salinity is complex. It cannot be assessed independently of irrigation water quality, method of irrigation, management practices, choice of crop and rainfall. Salt in the root zone of the soil profile can be natural or induced. More often than not, it has been induced; a result of shallow watertables bringing salt closer to the soil surface through capillary rise. In these situations the cause of the shallow watertable problem needs to be addressed. Given adequate drainage, naturally occurring salt levels in the root zone can generally be reduced through irrigation that leaches the salt downwards. However, the shifting of this salt downwards may cause problems elsewhere on the property or landscape.

The following criteria provide a general guide to what might be considered a likely problem. If high levels of salt exist within the top two metres of the soil profile, the plan must outline management options that will maintain soil profile conditions suitable for agricultural activity, and prevent salt mobilisation contributing to salinity impacts elsewhere.

(Reference: 4.3.1 *Land—soils and topography*)

Unsuitable or high risk	Why
<p>Soils with an existing high salt accumulation somewhere within 2 m of the soil surface.</p> <p>Land visibly affected by salt:</p> <ul style="list-style-type: none"> • land showing a reduction or loss of non salt-tolerant plants • failed or reduced crop establishment or vigour bare areas • 'fluffy' structure-less surface soils • seasonally or permanently shallow watertable. <p>High soil salinity levels (EC1:5 soil water suspension) that exceed</p> <ul style="list-style-type: none"> • 1000µS/cm on medium to heavy clay soils (60% or more clay) • 800µS/cm on light clay soils (40–60% clay) • 400 µS/cm on sandy loams (10–20% clay) 	<p>High soil salt loads will limit or prevent plant growth</p>

5 Suitability of irrigation development in parts of the landscape

Some landscape positions and land slopes can preclude development of irrigation systems. (Reference: 4.3.1 Land – soils and topography; 4.4.4 Suitability of irrigation system)	
<p>Not permitted</p> <p>No ponded pasture development is permitted below the Highest Astronomical Tide level, in or adjacent to natural wetlands or in areas of high conservation value or fish habitat value.</p>	<p>Why</p> <p>For consistency with State Government Pondered Pasture Policy</p>
<p>Unsuitable or high risk</p> <p>Certain slopes are considered unsuitable for specific combinations of crop and irrigation method, irrespective of location within the catchment.</p>	
<p>Cotton, forage and grain crops</p> <p><i>Flood irrigation methods</i> (Siphons, lay flat and gated pipe) Land slope is less than 1 in 1500 (0.07%) Land slope is greater than 1 in 50 (2%)</p> <p><i>Spray irrigation methods</i> (Pivots, lateral moves and travelling guns) Land slope is greater than 1 in 30 (3%)</p> <p><i>Drip irrigation methods</i> (Permanent and temporary sub-surface drip) Land slope is greater than 1 in 50 (2%)</p>	<p>Waterlogging, drainage Erosion</p> <p>Erosion</p> <p>Erosion</p>
<p>Intensive small crops</p> <p><i>Spray and drip irrigation methods</i> (Hand shift, solid set, travelling gun, micro systems, and drip) Land slope is greater than 1 in 25 (4%)</p>	<p>Erosion</p>
<p>Perennial tree and vine crops</p> <p><i>Spray and drip irrigation methods</i> (Hand shift, solid set, travelling gun, micro systems, and drip) Land slope is greater than 1 in 15 (7%)</p>	<p>Erosion</p>

6 Standard of infrastructure and its design

<p>Certain design and construction standards should be adhered to, to reduce the risk of failure of irrigation works and decrease the risk of erosion.</p> <p>(Reference: 4.4.5 Pumping, storage and distribution; 4.4.6 Irrigation layout and erosion control; 4.4.4 Suitability of irrigation system)</p>	
<p>Unsuitable or high risk</p> <p>Flood irrigation—field design</p> <p>A direct drop of bare or cultivated soil from end of furrow into tail drain that is greater than 0.15–0.25 m. (Measured from end of furrow to floor of tail drain).</p> <p>Tail drains with flow velocities below 0.1 metres per second</p> <p>Tail drains with flow velocities greater than 0.45 metres per second</p> <p>Furrow cross-fall that exceeds 0.5%</p>	<p>Why</p> <p>Increased erosion</p> <p>Flow inadequate resulting in saltation.</p> <p>Increased erosion</p> <p>Furrow failure in large storm events</p>
<p>Storages</p> <p>Embankment batters that are 3:1 or steeper. (i.e. 1 m vertical rise for every 3 m horizontal)</p> <p>Embankment batters that are 4:1 or steeper for any part of the embankment located below flood level on a floodplain</p> <p>Embankment crests that are not 3 m wide or ($\sqrt{\text{height of the embankment} + 1}$) m wide, whichever is the larger width</p>	<p>Erosion</p> <p>Erosion and embankment failure</p> <p>Embankment failure</p>

7 Management of stormwater run-off from irrigated land

<p>Storm run-off from irrigated land or irrigated infrastructure, should be managed and directed away from susceptible water bodies, over vegetated land, and through a containment system. (Reference: 4.4.7 Drainage and stormwater runoff; 4.5.3 Farm run-off and water quality)</p>	
<p>Minimum standard required</p> <p>An effective stormwater management system for the combination of crop, soil type, and irrigation method.</p> <p>(Note: Any proposed new works must minimise the capture of water from non-irrigated areas and conform to the Code for Assessable Development for Operational Works for taking overland flow water).</p>	<p>Why</p>
<p>Broad-acre crops (cotton, grain or forage) on well structured cracking and non-cracking clays</p> <p><i>Flood irrigation</i></p> <ul style="list-style-type: none"> • Able to contain and recycle all tail water generated. • Able to contain 25 mm of stormwater run-off from irrigated land from a rainfall event, either in on-farm or shared group scheme. • Outfall areas well grassed. <p><i>Spray systems</i></p> <ul style="list-style-type: none"> • Able to contain 25 mm of stormwater run-off from irrigated land from a rainfall event, either in on-farm or shared group scheme. • Outfall areas well grassed. <p><i>Sub-surface drip systems</i></p> <ul style="list-style-type: none"> • Able to contain 25 mm of stormwater run-off from irrigated land from a rainfall event, either in on-farm or shared group scheme. • Outfall areas well grassed. • Discharge resulting from back flushing filtration system or the cleaning of drip lines (end flushing), is contained or disposed of in a manner that minimises environmental harm. 	<p>To control contaminated stormwater run-off so as to avoid pollution of water bodies.</p>
<p>Perennial tree and vine crops (citrus, tropical fruits, grapes)</p> <p><i>Spray and drip systems</i></p> <ul style="list-style-type: none"> • Able to contain 5 mm of stormwater run-off from irrigated land area from a rainfall event, either in on-farm or shared group scheme • Discharge resulting from back flushing filtration system or the cleaning of drip lines (end flushing), is contained or disposed of in a manner that minimises environmental harm • Inter rows and outfall areas well grassed 	<p>To control contaminated stormwater run-off so as to avoid pollution of water bodies.</p>
<p>Annual broad-acre crops and intensive crops on permeable soils (sandy loams to clay loams)</p> <p><i>Spray (lateral move, pivot, travelling gun, hand shift, solid set)</i></p> <ul style="list-style-type: none"> • Able to contain 10 mm of stormwater run-off from a rainfall event off irrigated land, either in on-farm or shared group scheme • Outfall areas well grassed 	<p>To control contaminated stormwater run-off so as to avoid pollution of water bodies.</p>

