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Environmental Assessment

Rangers Valley Feedlot DA Modification

Report Number 24072.87581

Prepared for

Rangers Valley Cattle Station

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This document provides information to address the intent of Project Number 24072 as agreed to by Rangers Valley Cattle Station.

Executive Summary

Background

Rangers Valley is an existing feedlot north of Glen Innes on the New England Tablelands, New South Wales.

The Rangers Valley Feedlot was the subject of a Development Application (DA) in August 2002. This was supported by an Environmental Impact Assessment (EIS), and received approval (in 6 stages over a 5-10 year horizon) to grow from 24,000 head to 50,000 head. The Development Application was approved in 2003.

Since 2002 Australian agribusinesses such as Rangers Valley have encountered the Global Financial Crisis (GFC) and exchange rates over parity ($1AUD > $1USD). These significant financial constraints have substantially slowed the development of the site.

Of the forecasted stages, the feedlot has grown to stage 1 and then stage 2. Rangers Valley is currently a 30,000 head feedlot, and has had an upgrade of the feed mill, including minor works to support these stages.

In the last 15 years substantial changes have occurred in feedlot production technologies, feedlot environmental management and the business operations of the Rangers Valley property. Fifteen years of environmental monitoring data and performance has been gathered for the site.

Rangers Valley needs to refocus its forward development to take into account these changes and its business position.

Objectives

The amendment of the development site does not seek to change the approved capacity of 50,000 head, nor does it seek to modify substantially the footprint or the general operations that are detailed in the original application.

The development modification seeks to:

(i) Make minor configuration changes to the layout and staging of the pens proposed for the remaining, forward stages;

(ii) Add a manure wet weather storage area (within the existing footprint);

(iii) Increase the traffic movement hours;

(iv) Alter both the Effluent and Manure Utilisation Areas; and,

(v) Modify the environmental monitoring to deliver better alignment with feedlot and farm operations and environmental management.

The pen reconfiguration is as follows:

- Relocation of the proposed northern most pens to the north western side of the feedlot to allow the existing centre pivot irrigation area located immediately to the north of the existing pens to be maintained;
- Pens on the south west quadrant of the feedlot that currently run east-west are to be upgraded to run north-south to improve drainage;
- Removal of the proposed sediment basin and holding pond in the NW and consolidation of the NW and SW catchments and use of one set of basins and holding ponds for the revised "western catchment";
- Minor repositioning of some of the proposed pens in other areas to allow for sedimentation and wastewater ponds to remain undisturbed.

Summary of Results

This Statement of Environmental Effects focusses on:

- (i) Supply of plans for the reconfigured pens;
- (ii) A revised hydrological assessment to reassess the changes in the catchments that result from the reconfiguration;
- (iii) A waste management assessment to assess the changes in manure applications; and,
- (iv) A revised environmental monitoring program.

All other areas of assessment, as detailed in the original EIS have been reviewed, and are considered to remain relevant and applicable.

Therefore, please refer to the EIS for detail on socio economic, noise, dust, odour, traffic, flora and fauna, archaeological, manure re-use and mass rebalance, holding pond performance, availability of land suitable for wastewater irrigation, surface water restrictions, water supply security, and groundwater vulnerability. Minor deviations identified during the review process have been documented and addressed within this Environmental Assessment.

The revised Hydrological Assessment used the FSIM model (Lott, 1998) to simulate the hydrological performance of the (revised) Rangers Valley feedlot catchment including the holding pond and effluent utilisation area. Updated average climatic data was used for this model, incorporating a decrease of rainfall by 10 mm per year and an increase in evaporation of 174 mm. The new modelling resulted in the following improvements:

- The controlled drainage area (CDA) has been reduced by 315,058 $m^{2;}$
- There is a net reduction in land use areas and footprint.

As a result, the Hydrological Assessment concluded that:

- The active areas of the Rangers Valley Feedlot are above any historical flood level;
- The existing and proposed sedimentation systems and holding ponds are adequately sized such that will result in less than 1 spill per 20 years;
- Drain structures and terminal pond have been appropriately sized;
- The waste utilisation areas have adequate capacity for sustainable waste disposal.

Conclusions and Recommendations

It is concluded that the changes to the development do not increase any impact and in fact the changes provide a net improvement to the original proposal for the 50,000 SCU feedlot.

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1. Introduction

1.1 Background

This Statement of Environmental Effects (SEE) is to support a proposed modification to the Development Approval (DA-261-8-2002-i) for the Rangers Valley Feedlot.

The modification of the development has occurred due to:

(a) Changes to the business environment and the program for the development;

(b) Changes in business needs for the facility;

(c) Improvements in feedlot design and management, and development of the greater Rangers Valley property; and,

(d) Improvement in management of the facility and changes in operations that affords changes in the monitoring requirements of the EPL.

1.2 Description of Modifications to the Development

The development modification seeks to:

(i) Reconfigure the layout and staging of the pens proposed for the remaining, forward stages;

(ii) Add a manure wet weather storage area (within the existing footprint);

(iii) Add paddocks to the manure utilisation operations;

(iv) Modify the environmental monitoring to deliver better alignment with feedlot and farm operations and environmental management.

The revised pen layout design aims to meet best practice for drainage and facilitate operations on the site. The revised design is based on:

- Relocation of the proposed northern most pens to the north-western side of the feedlot to allow the existing centre pivot irrigation area located immediately to the north of the existing pens to be maintained;
- Pens on the south west quadrant of the feedlot that currently run east-west are to be upgraded to run north-south to improve drainage;
- Removal of the proposed sediment basin and holding pond in the NW and consolidation of the NW and SW catchments and use of one set of basins and holding ponds for the revised "western catchment";
- Minor repositioning of some of the proposed pens in other areas allow for sedimentation and wastewater ponds to remain undisturbed.

The development of the Rangers Valley property has steadily progressed over the last 15 years. Rangers Valley wish to add paddocks to the approved manure utilisation areas, and also remove some paddocks that are less useful.

The modification also proposes changes to the monitoring requirements on the site to gain consistency between the EPL and approval and to allow waste management practices to be undertaken in accordance with best management practices.

1.3 Requirements for Consultant Competency

EnviroAg has prepared this SEE to meet the planning requirements as identified in consultation with the Department of Planning and Environment (DPE) for the modification of Development Approval [DA-261-8-2002-i]. This includes an environmental assessment generally in accordance with the Environmental Planning and Assessment Act 1979 (EP&A Act), and in accordance with relevant government agency requirements.

EnviroAg is a multidisciplinary firm of environmental consultants with experience and qualifications as described in *Schedule B9 Guideline on Competencies & Acceptance of Environmental Auditors and Related Professionals* (NEPC, 2011b). Additional details of consultant competency can be provided if requested.

This SEE has been prepared by qualified and suitably experienced personnel as listed below:

- Dr Simon Lott, Director;
- Mr Peter Pearson, Environmental Scientist;
- Ms Sarah Grady, Senior Environmental Scientist;
- Mr Rowan Morrison, Environmental Scientist;
- Mr Hamish Cato, Environmental Scientist.

2. Amendment to Development Approval Process

2.1 Approval Process

EnviroAg Australia met with the Department of Planning and Environment on 21/10/16. In attendance were:

Dr Simon Lott (EnviroAg/Rangers Valley);
Ms Pamela Morales (Department of Planning and Environment);
Ms Joanna Bakopanos (Department of Planning and Environment); and,
Ms Sarah Grady (EnviroAg/minute taker).

During the meeting, it was confirmed that the DPE continues to accept modifications to applications previously approved under Part3A of the EP&A Act, of which Rangers Valley DA was originally approved.

Under Part 5 of the EP&A Act, an environmental assessment is required in the form of an Environmental Impact Statement. Given that this is a modification process and that there are no changes to the overall footprint and stocking density and hydrological improvements have been made (which will have a net benefit to the environment), an SEE is considered appropriate as an environmental assessment.

As agreed at the meeting, a briefing note was provided to DPE for circulation to relevant government agencies seeking their requirements for the planning and assessment process. The briefing note contained a risk assessment, which was prepared in accordance with ISO3001, and detail on the modification proposal. A summary of the agencies notified and their responses can be seen in Table 1.

Table 1 Summary of agencies notified of the DA modification

Agency	Response
Department of Planning and Environment	See section 2.1.
Department of Primary Industries - Agriculture	Provided comment (See Appendix D)
Department of Primary Industries – Water	DPI Water will await submission to DPE before providing comment on the proposal.
Environmental Protection Agency	*No response*
Glen Innes Shire Council	*No response*

This SEE has been prepared specifically to meet the above requirements and demonstrate the net benefits to the environment associated with the proposed modification.

2.2 Comparison Between Existing EIS and Approval and This Development Modification (SEE)

Table 2 below outlines a comparison between the existing 2002 EIS for Rangers Valley, and the proposed development modifications, using the subheadings of sections B (Environmental Impact Assessment) from the 2002 EIS.

Table 2 Sections of the existing EIS and associated notation

Section	Notation
4.0 Planning and Environmental Background	**N/A**
Development Approval Process	N/A
Approvals, Licences and Permits	N/A
Assessment of Development	N/A
5.0 Justification and Alternatives to the Proposal	**N/A**
Project Justification	N/A
Alternatives	N/A
Assessment of Development	N/A
6.0 Environmental Assessment	
Feedlot Description	N/A
Site Geography	N/A
Climate	Additional climate data.
Regional Geology	*No change*
Soils	*No change*
Feed Commodity Consumption and Preparation	New feedmill included in Stage 2 completed.
Characterisation of Feedlot Waste	Ongoing monitoring reported in AEMR.
Noise	*No change*
Air Quality	*No change*
Flora and Fauna	*No change*
Archaeological	*No change*
Traffic	*No change*
Hazardous Chemicals	*No change*
Insects and Vermin	*No change*
7.0 Animal Welfare	
Animal Care Statement	*No change. Change in NFAS.*
8.0 Sustainable Waste Reuse	
Introduction	N/A
The Soil-Plant System	N/A
Nutrient Loading Rates	Changed with changes in utilisation areas.
Defining the Mass Balance Using Data from Rangers Valley	Changed with changes in utilisation areas.
9.0 Environmental Management Plan	See section 6 of this document.
Management plan	*No change*
Farm management	Changes in maps of areas used for waste utilisation.
Odour	*No change (Stocking rates to be maintained)*
Dust	Reduction due to reduced footprint and improved practices.

Fly Control	*No change*
Vermin Control	*No change*
Noise	*No change*
Carcass Disposal	*No change*
Chemical Storage and Usage	*No change*
Environmental Monitoring	Seeking changes to conditions to align with EPA licence no 3864. (See section 6.3 of this document.)
10.0 Social and Economic Issues	See section 7 of this document.
Capital Investment	N/A
Continuing Employment	N/A
Regional Employment	N/A
11.0 Ecological Sustainable Development	*No change*
12.0 Conclusions	See section 9 of this document.

3. Risk Assessment

3.1 Risk Assessment

A risk assessment was conducted for Rangers Valley with specific reference to the proposed changes. The results of this assessment are presented in Appendix A.

Table 3 summarises the risk assessment based on the highest, most conservative, risk rating (before management measures) for each issue and the revised risk score once mitigation measures are implemented.

Table 3 Summary of assessment (Red = High; Yellow = Medium; Green = Low)

Issue No.	Issue	Risk / Prioritisation Score	Revised risk score after management
1	Liquid waste management	12	8
2	Solid waste management	15	8
3	Water quality & catchment protection	12	8
4	Air Quality (including dust)	15	8
5	Odour	10	8
6	Noise	10	8
7	Economic and social effects	12	9
8	Land capability and soil resources	12	6
9	Pest & insect control	10	8
10	Weed management	12	6
11	Cumulative impacts	10	5
12	Traffic & road impacts	10	8
13	Flora & fauna	6	6
14	Hazardous chemicals	9	6
15	Community amenity	12	8
16	Animal welfare	6	6
17	Heritage	2	2

Based on Table 3 above the key risk items are:

- Solid waste management and air quality with a risk score of 15 (Medium);
- Liquid waste management, water quality & catchment protection, land capability and soil resources, weed management and community amenity with a risk score of 12 (Medium);
- Odour, noise, pest & insect control, cumulative impacts, and traffic & roads impacts with a risk score of 10 (Medium);
- (Economic and social effects are considered as a consequential impact associated with the management of primary risk factors such as odour etc.).

It was concluded from the risk assessment that the key risk in relation to the proposed development modification in respect to the hydrology.

Odour was also raised as a concern in the initial meeting with the Department of Planning and Environment, however, it is not being investigated further in this Statement of Environmental Effects for the following reasons:

- odour modelling is expensive and was already covered extensively in the original EIS (2002);
- the stocking rate is not being changed from that outlined in the original EIS (2002);

- the proposed modifications only impact on the footprint of the site, and therefore the sites hydrology.

3.2 Mitigation

As identified by the risk assessment, the key risks for the proposed development changes are in relation to site hydrology. Table 4 below summarises the management measures proposed to mitigate the key risks in relation to the proposed modifications.

Table 4 Summary of mitigation measures associated with the key risks identified due to the proposed development modifications

Activity/Aspect/Hazard	Management/Mitigation Measure
Earthworks and construction of infrastructure causing dust.	Water will be applied to the ground prior to clearance.
Collecting wastewater in the wastewater pond causing odour.	Wastewater pond has pump infrastructure that is able to transfer water to secondary ponds or irrigation areas if odours are produced and the pond needs to be cleaned. Lime can be added to wastewater to reduce odours and make it inhabitable for mosquito breeding.
Surface runoff/spills of effluent to surface water causing contamination	Wastewater holding ponds are adequate in size and are able to be dewatered quickly to irrigation area should they become too full. Facilities are located above the 1 in 100 year flooding levels. Controlled drainage areas designed to capture contaminated runoff for treatment prior to use onsite. Surface Water monitoring will be undertaken in accordance with EPL 3864.
Leaching of effluent to groundwater causing contamination.	Dams are lined with compacted clay or HDPE and then covered with sand. The irrigation areas will be closely monitored to ensure it is not irrigated while saturated. Irrigation areas will be planted with species that have high nutrient uptake rates. Groundwater monitoring will be undertaken in accordance with EPL 3864.
Improper/irregular pen cleaning causing an increase in weeds, pests and vermin.	Enact weed and pest management plans. Staff trained on proper cleaning practices. Pen maintenance routines and registers kept. Effluent waste captured in sediment drains and treatment ponds. Monitoring program as per EPL 3864
Improper/irregular pen cleaning causing disease/ health issues.	Staff trained on proper cleaning practices. Pen maintenance routines and registers kept. Livestock isolation and hospital pens for disease. Enact Pest and Weed Management Plans. Enact Waste Management Plan.
Improper/irregular pen cleaning causing odour.	Pens are maintained at a (dry) manure depth of 50mm or less and cleaned at minimum every 13 weeks. Enact Odour Management Plan.
Surface runoff/spills of effluent to surface water causing contamination.	Bunding of chemical, compost manure pad and pens will prevent nutrient runoff. Monitoring of surface water as required by EPL 3864 *Redesign and upgrade of old pens moving towards "Class 1" improves the drainage of pens in Controlled drainage area and improves drainage to holding ponds.*

Leaching of effluent to groundwater causing contamination.	Pens, compost manure pad, wastewater ponds and drainage areas are lined with compacted clay to reduce leaching into the groundwater system. The irrigation block will be closely monitored to ensure it is not irrigated while saturated. Irrigation block will be planted with species that have high nutrient uptake rates. Monitoring of groundwater will be undertaken in accordance with EPL 3864. *Redesign and upgrade of old pens moving towards "Class 1" improves the drainage of pens in Controlled drainage area and improves drainage to holding ponds.*
Collecting and stockpiling manure for compost causing odour and dust.	Compost pile must be turned regularly. Compost manure pad will be monitored for fires, pests and vermin. Wind conditions will be monitored prior to compost turning and pen cleaning to reduce offsite impacts. Compost, pens and internal roads will be watered to reduce dust *Improved waste management practices as per the National Feedlot Guidelines 2012.* *Monitoring as per EPL 3864*
Collecting and stockpiling manure for compost causing spontaneous combustion and fire.	Monitoring of compost moisture and temperature levels to reduce odour and dust. Application of water to compost heap if moisture levels are low. Compost manure pad will be monitored for fires, pests and vermin. *Separation of composted Manure from hay sheds and other infrastructure.* *Slashed fire break around manure composting pad.*
Turning compost causing odour and dust.	Compost moisture and temperature levels are monitored and kept at optimal levels to reduce dust and odour. Compost manure pad will be watered when moisture levels are low to reduce dust and maintain optimal composting conditions. Wind conditions will be monitored and turning will not be carried out when windy
Application of compost to irrigation area causing noise.	All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions. Trucks and machinery will not be left idling when not in use. Consistent with farming operations in the area.
Application of compost to irrigation area causing soil and water contamination.	Soil and water monitoring and testing will be carried out under the Environmental Protection Licence 3864 to ensure that pasture is removing nutrients from soil and nutrients are no leaching onto waterways. Application rates of manure and fertiliser based on sample results and nutrient budgets

3.3 Scope of the Assessment

The scope of the assessment includes the following:

- Application to Modify a Development Consent (NSW Government – Planning & Environment;
- Statement of Environmental Effects; and,
- A revised Hydrological Assessment (including updated climatic data).

4. Site Information

4.1 Site Identification

Relevant site details are presented in Table 5.

Table 5 Site details

Real Property Description:	Parish of Fladbury, County of Gough Lot 14, 15, 21, 24, 26, 27, 28, 30, 88, 89 of DP753278 Lot 2 of DP859230 Lot 25 of DP659977 Parish of Rangers Valley, County of Gough Lot A, B, C, D, E of DP1870 Lot H of DP32737 Lot I of DP215201 Lot 3, 17, 18, 20, 22, 23, 24, 25, 31, 43, 44, 47, 48, 50, 53, 73, 74, 83, 84 of DP753303 Pt Lot 1, 2, 7, 8, 9, 10, 14, 15, 16, 19, 32, 42, 45, 49, 52, 72, 75, 85, 86, 99, 126 of DP753303 Parish of Wellington Vale, County of Gough Lot 221, 222, 223, 224, of DP753323 Parish of Louis, County of Gough Lot 6, 7, 8, 9, 19, 21, 22, 23, 24, 25, 26, 32, 40, 120, 131, of DP753291 Pt Lot 45 of DP753291
ANZLIC Address:	Rangers Valley New England Valley NSW
Local Government Authority:	Glen Innes Council
Location Centroid (GDA 94):	6733092 m S; 377733 m E Zone 56 J
Area:	3991 ha

4.2 Property Description

A site location map is provided in Figure 1.

Figure 2 (original design) and Figure 3 (proposed design) show how the proposed modification will change the layout of the feedlot's facilities, while Figure 4 shows the current layout of the feedlot.

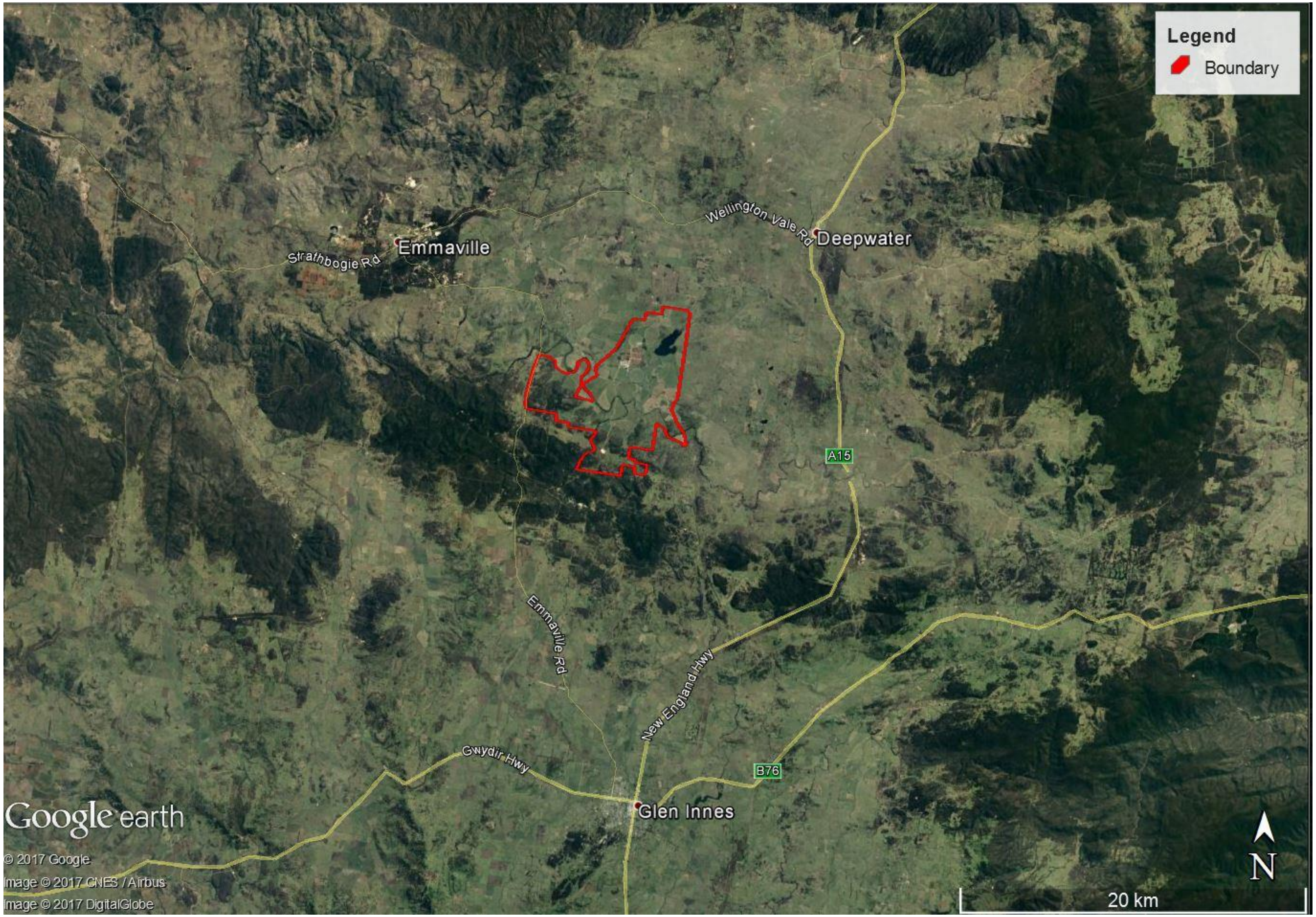

Figure 1 Site location map

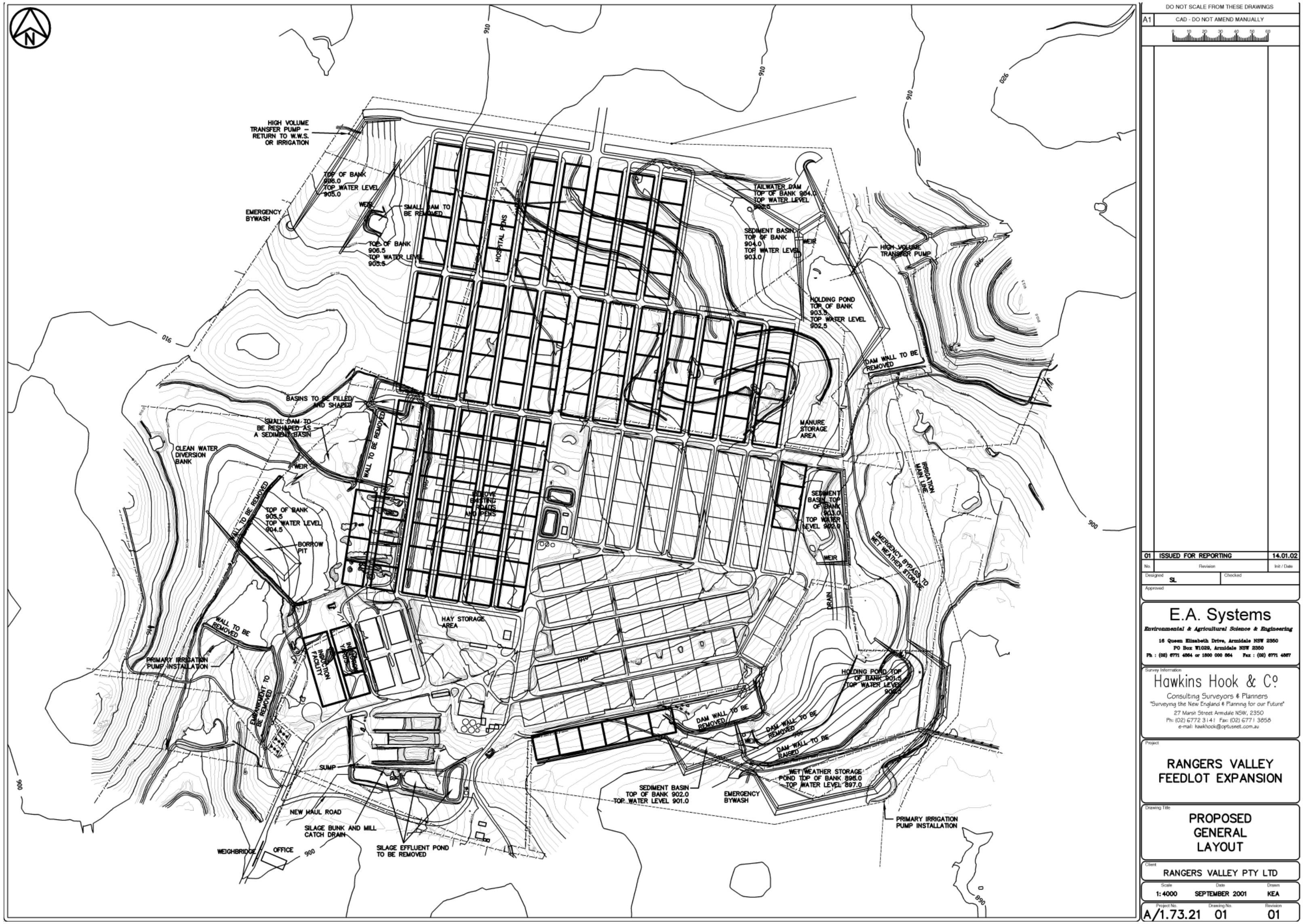

Figure 2 Rangers Valley - Original (2002) Development Design (50,000SCU)

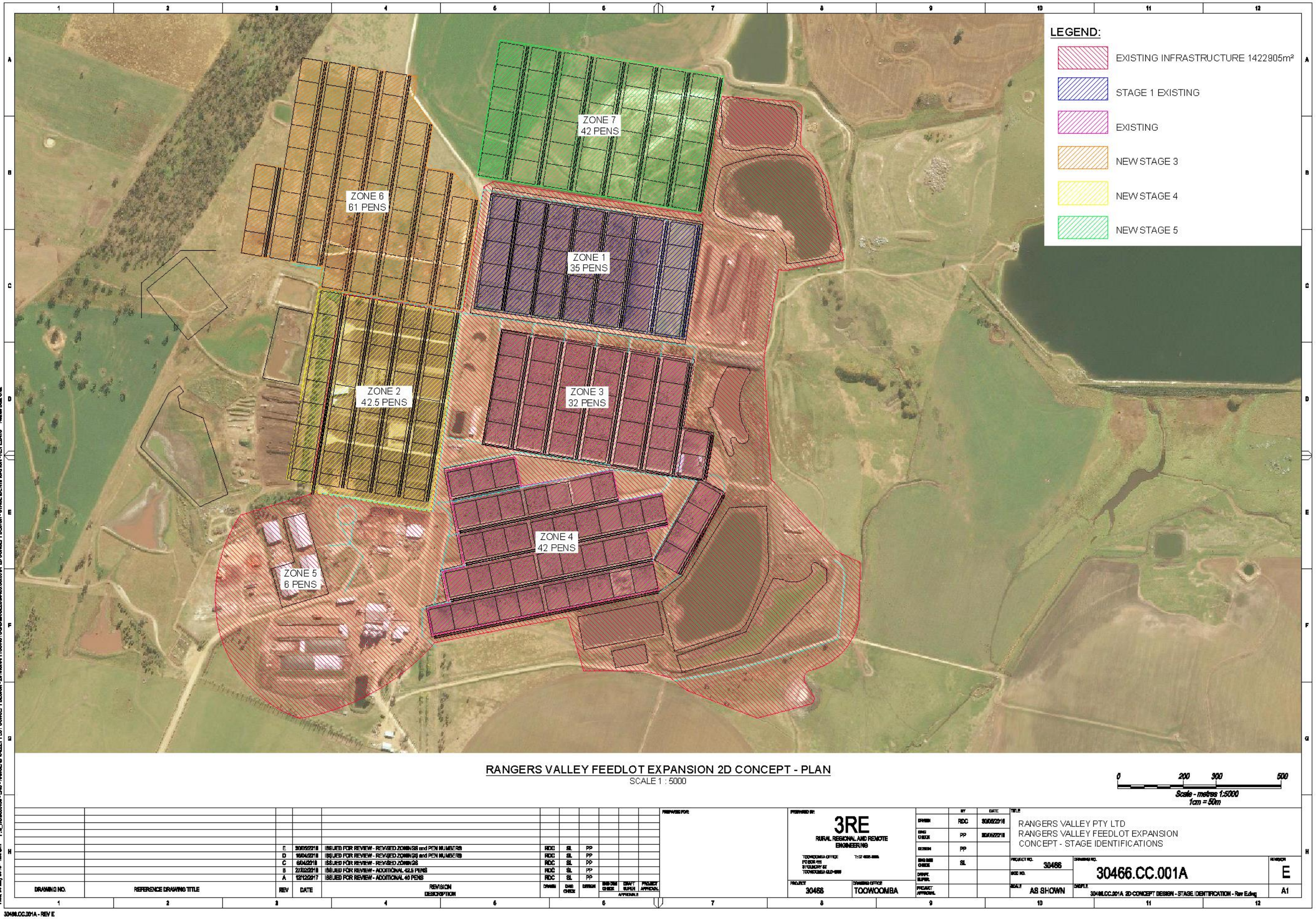

Figure 3 Rangers Valley – Proposed (2017) Development Design (50,000SCU)

Figure 4 **Current operational layout of Rangers Valley Feedlot (as at Stage 2 of 7 of the Approved Development Application - 30,000 head)**

4.3 Site Characteristics

Site characteristics remain largely unchanged from the original EIS (2002).

As the proposed modifications are not changing the overall capacity of feedlot (50,000SCU), or the stocking density of 16.5m^2, there is no real change in water usage, electricity consumption, operating hours or employee numbers.

However, the modifications to the development application are seeking to apply updated technology in hydrological modelling, which support best management practices for waste management and animal welfare in Class 1 feedlots in climates such as those found in Rangers Valley.

To support this, an up-to-date climate dataset has been used, incorporating the 14 years of data since submission of the 2002 EIS. This dataset has been used in the Specialist Hydrology Assessment (Report number 24072.87581).

4.4 Environmental Performance

In the 14 years since the completion of the original development application Rangers Valley have maintained a commitment to ensuring that their facility is constructed and operated within the conditions of the application, as well as with best management practices as required by the National Feedlot Accreditation Scheme. In addition, they have maintained all monitoring and reporting requirements in maintenance of their EPL licence (Number 3864).

5. Modification to Development

The main changes in this Statement of Environmental Effects in comparison to the EIS and the approved DA are:

- Layout and Staging;
- Hydrology; and,
- Waste Management

Odour was not considered as a factor that is changing as part of this modification, the odour foot print will in fact be the same for the pen areas and reduced with regard to the total surface area of sediment basins and holding ponds. These are reduced with the consolidation of the western catchments.

5.1 Changes to Layout

While the development modification seeks to make changes to the feedlot layout, the majority of the site will remain unchanged from the original application. This includes a maintaining of the stocking density of 16.5m^2.

Specifically, the development modification application is seeking to:

- Make minor configuration changes to the layout and staging of the pens proposed for the remaining, forward stages;
- Add a manure wet weather storage area (within the existing footprint);
- Add paddocks to the manure utilisation operations;
- Modify the environmental monitoring to deliver better alignment with feedlot and farm operations and environmental management.

5.1.1 Site Layout

The proposed changes to the site layout are as follows:

- Relocation of the proposed northern most pens to the north-western side of the feedlot to allow the existing centre pivot irrigation area located immediately to the north of the existing pens to be maintained;
- Pens on the south west quadrant of the feedlot that currently run east-west are to be upgraded to run north-south to improve drainage;
- Removal of the proposed sediment basin and holding pond in the NW and consolidation of the NW and SW catchments and use of one set of basins and holding ponds for the revised "western catchment"; and,
- Minor repositioning of some of the proposed pens in other areas to allow for sedimentation and wastewater ponds to remain undisturbed.

The reconfigured layout will result in a significant reduction in the footprint of the site, including:

- a net reduction in the overall feedlot footprint of approximately 315,058 m^2;
- a reduction in pen area of approximately 26,172 m^2.

5.1.2 Site staging

The original EIS had allowed 7 stages up to a capacity of 50,000 (see Table 6). This staging involved stepped construction of pens and infrastructure across the site and the reconfiguration of the existing southwestern pens as the final stage.

The proposed modification would see a reduction in the number of total stages from 7 to 5 (See Table 7). Stage 3 would see the construction of new pens (Zone 6 & 7) in the northwest of the site (see Figure 3). This would then allow for the relocation of stock in Zone 2 so that it can be reconfigured during Stage 4.

Stage 4 required the pens in Zone 2 to be demolished and rebuild. The reconfiguration of the pens will allow the existing irrigation infrastructure to remain, and enable site hydrology to be managed in accordance with best practice. At the end of this stage the feedlot will have a capacity of approximately 45,000.

Construction of the pens in Stage 5 will be the mostly costly for the business. For this reason, they have been left till the final stage. Completion of this stage would bring the feedlot capacity to 50,000.

Figure 2 (original design) and Figure 3 (proposed design) show how the proposed modification will change the layout of the feedlot's facilities, while Figure 4 shows the current layout of the feedlot.

5.1.3 Wet Weather Manure Storage

Rangers Valley is proposing to install three (3) emergency wet weather storage pits (see Figure 5) for liquid manure (sludge). These pits will be utilised sporadically to store wet manure from pens during periods of wet weather. The pits are required to reduce animal welfare issues and stress associated with foot complaints from consistently wet conditions.

A frontend loader or long arm excavator will be used to remove the wet manure from the pens for temporary storage in sludge pits until conditions are favourable for spreading on manure application areas.

The pits will be designed with an impermeable liner consistent with the design of the ponds, drains and basins on the site. Excess liquid from these pits will flow into the existing wastewater capture and treatment system.

Table 6 Staging – Original EIS 2002

Stage	0	1	2	3	4	5	6	7
Projected Feedlot Capacity	24,000	30,000	30,000	35,000	40,000	45,000	50,000	
Pen Construction Details		51-80	No pen construction	81-100 plus 6 pens in the south east	21-50	01-20 plus 3 additional pens in east of existing feedlot	20 new pens in southwest (involves reconfiguring of small existing pens)	Reconfigure all remaining southwest pens
Pen Increase		30	0	26	30	23	20	24
Pen Area Increase (m^2)		112,500	0	97,500	112,500	86,250	59,700	2,500
TOTAL Pen Area (m^2)	**349,400**	**461,900**	**461,900**	**559,400**	**671,900**	**758,150**	**817,850**	**820,350**
Average stocking density (m^2/head)	14.55	16.39	16.39	16.76	16.95	16.90	16.81	16.50
TOTAL Feedlot Capacity	**24,012**	**28,189**	**28,189**	**33,384**	**39,631**	**44,858**	**48,639**	**49,718**

Table 7 Staging - Current and Proposed

Stage	0	1	2	3	4	5
Projected Feedlot Capacity	24,000	30,000	30,000	40,000	45,000	50,000
Year	Pre 2000	Current	Current	Future	Future	Future
Revised Pen Construction Details		Pens 112 - 146 (Zone 1)	No new pen construction (rebuild Zone 2)	Build 61 pens in Nth West (Zone 6)	Reconfigure Old Pens (Zone 2)	42 Additional pens (if required)
Pen Increase		35	0	61	0	42
Pen Area Increase (m^2)		121,400	0	165,996.7	85,772	138,602.9
TOTAL Pen Area (m^2)	**349,400**	**470,800**	**470,800**	**636,796.7**	**722,568.7**	**861,117**
Average stocking density (m^2/head)	14.55	16.5	16.5	16.5	16.5	17.65*
Capacity	24,014	28,533	28,533	38,594	43,792	48,816
Shedded Holding Area		1,500	1,500	1,500	1,200	1,200
TOTAL Feedlot Capacity	**24,014**	**30,033**	**30,033**	**40,094**	**44,992**	**50,016**

***** Potential for reduction in stocking density if all additional 42 pens are constructed.

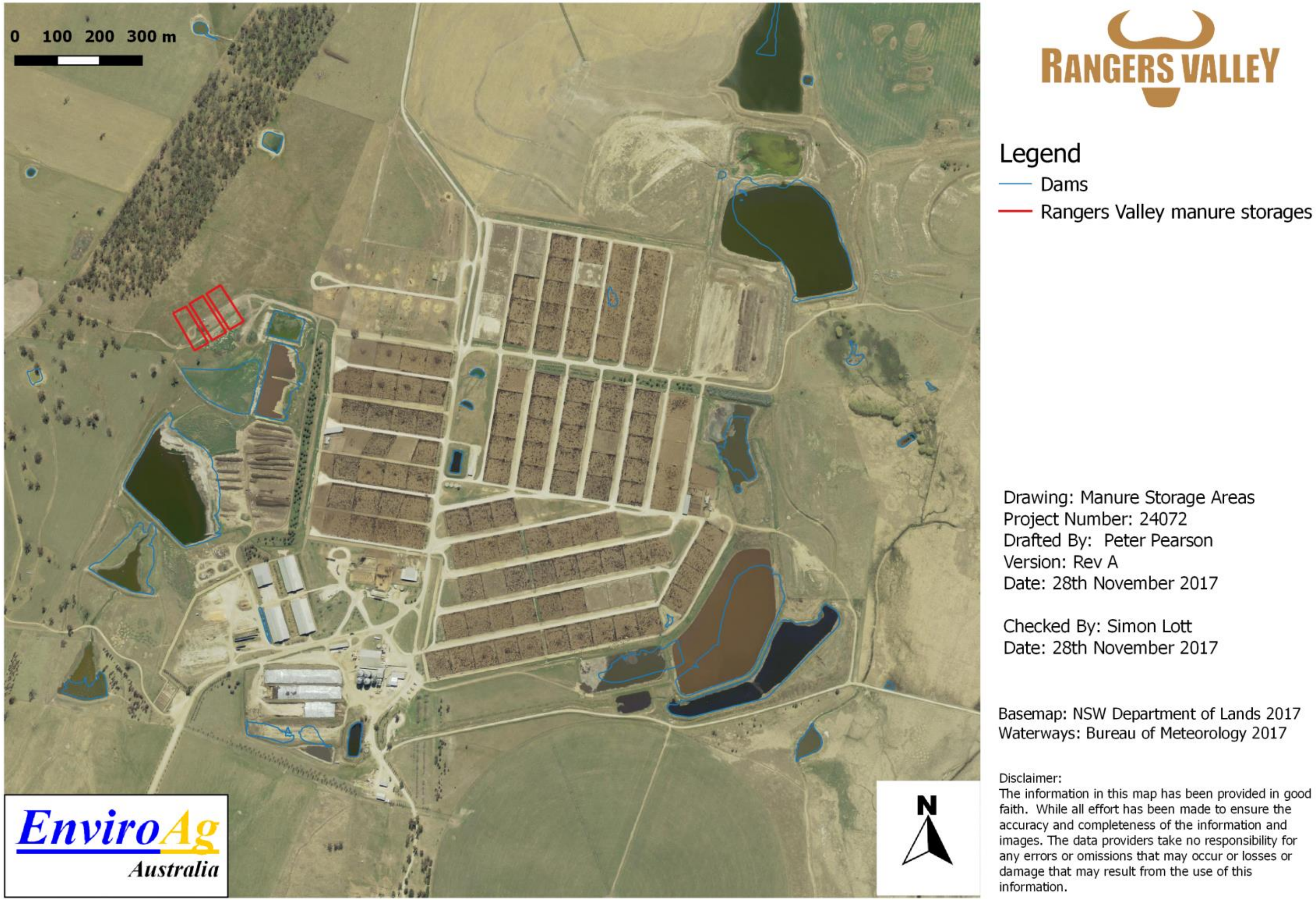

Figure 5 Manure Pads – Temporary Wet Weather Storage

5.2 Hydrological Assessment

5.2.1 Climate Data Input

An up-to-date climate dataset has been used. The new dataset incorporates a decrease of rainfall by 10 mm per year and an increase in evaporation of 174 mm, as well as 14 years of additional data since submission of the 2002 EIS. This dataset, which now comprises 127 years of data (1889 to 2016), has been used in the specialist Hydrology Assessment (Report number 24072.87581).

5.2.2 Design and Management Data Input

The input data to the FSIM model have also been updated. In particular, the manure management practices have been altered to acknowledge the increased cleaning frequency used in feedlots in 2017.

5.2.3 Modelling

Using an iterative approach, modelling was run for the new and expanded, Western Catchment (NW &SW) as well as for the existing North-eastern (NE) and South-eastern (SE) Catchments. The later were remodelled in light of the updated climatic data and changes in cleaning practices.

Numerous runs of the model were performed to derive an optimum design capacity for the holding ponds able to satisfy the design criteria of overflowing or “spilling” at a frequency less than once every 10 years.

5.2.4 Results

Numerous iterations were run using FSIM for each of the three catchment areas. The optimal size and related “spilling” frequency for each of catchment are presented in Table 8.

Table 8 Optimal FSIM modelling results for the proposed catchments

Catchment	Optimal Holding Capacity (ML)	“Spill” Frequency (127yr runtime)
Western (NW & SW)	140	11
North-eastern (NE)	76.5	8
South-eastern (SE)	120	10

Figure 6 shows the modelled “spill” frequency for the proposed Western Catchment.

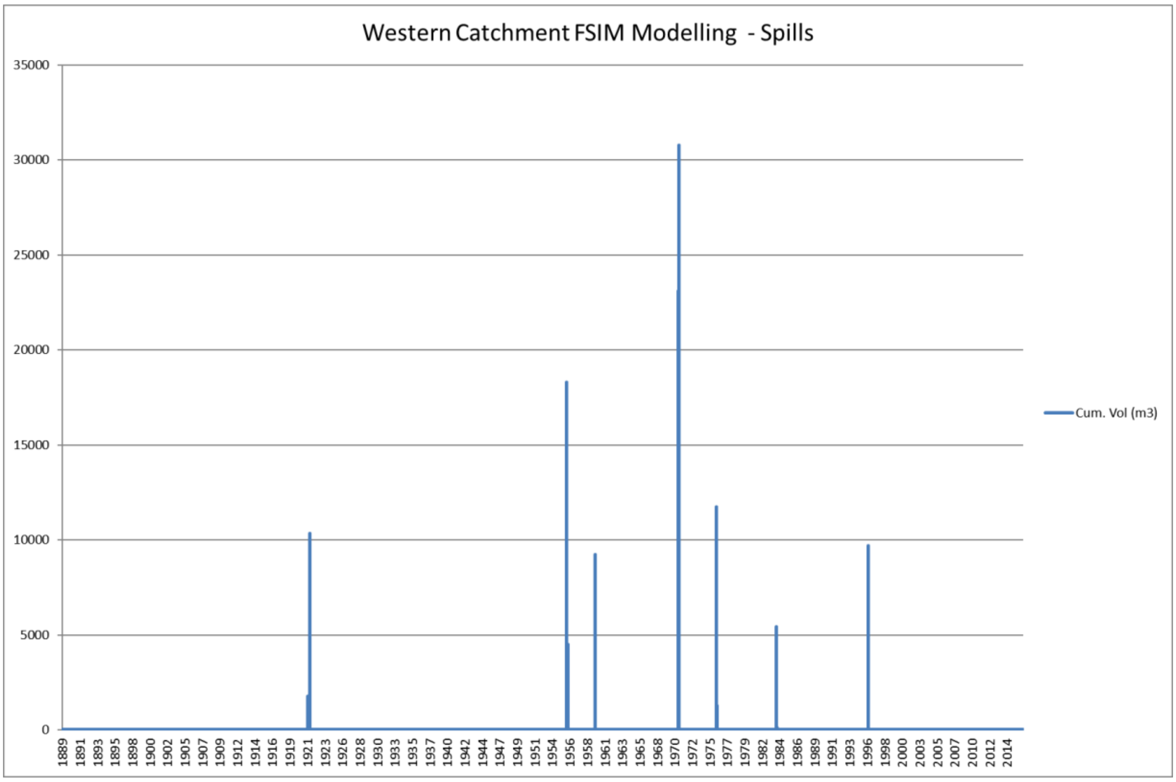

Figure 6 FSIM Modelling: Western Catchment Spills

5.2.5 Discussion

Remodelling of the NE and SE catchments in light of the updated climate data has allowed for a decrease in pond holding capacity for both of these catchments. This is most likely due to the reduced number of pens that now feed into these holding ponds, but the decrease in average rainfall and the associated increase in average evaporation would also be a factor.

While the new holding pond for the amalgamated NW &SW catchments is larger (140ML) than combined capacity of the previously approved ponds (20.7ML and 44ML), it is more than capable of handling the waste from the pens in the new catchment. There were 11 spills for this new catchment predicted by the model over the 127year runtime, which is well below the recommended rate of 1 spill event in 10yrs.

5.2.6 Summary

The modelling has shown that the revised pen layout and the consolidation of the western catchments can be achieved within the footprint. The reduction in overall footprint provides an improvement in hydrological performance with the optimal pond capacity and "spill" frequencies for each catchment being:

- NW & SW catchment, 140 ML capacity and 11 spills;
- NE catchment, 76.5 ML capacity and 8 spills;
- SE catchment, 120 ML capacity and 10 spills.

The recommended rate of spills is less than 1 in 10 years, so all catchments are well below the required rate, which would equate to approximately 12 spills over the 127 years of climate data.

5.3 Traffic Movements

The current consent condition for traffic movement states;

"The Applicant shall ensure that heavy vehicles associated with the operation of the cattle feedlot expansion shall not enter or exit the site between the hours of 10:00pm and 7:00am on any day, except during any emergency and heavy vehicles associated with the delivery of livestock to the site."

Rangers Valley seek to revise the traffic movement exclusion hours to between 10:00pm and 5:00am. This modification is sought based on the reasoning that Rangers Valley Feedlot is in a remote location and therefore:

- arranging logistics to the site within the current window can be problematic; and,
- the time change would allow for the better management of truck turnaround, and consequently driver fatigue and safety.

5.4 Waste Utilisation

Both manure and effluent water are used on site, and manure is also sold off site. Rangers Valley wish to modify the areas used for both manure utilisation effluent irrigation. The revised utilisation areas are shown in Figure 7 and Figure 8.

The revised areas provide an increase in the net area available for waste utilisation. Thus, there is a net improvement in the nutrient balances at the site. Where nutrients become excessive, applications are reduced.

5.4.1 Manure Application Areas

Manure generated at the Rangers Valley Feedlot is currently applied to irrigation and cropping areas within the property. The current (approved) manure application areas are shown in green in Figure 7. The additional manure application areas to be included as part of the modification are those shown in blue in Figure 7. The manure is only to be applied to the improved pasture and cropping areas shaded in blue. Manure is not to be applied to the timbered areas.

5.4.2 Effluent Application Area

Effluent water from the feedlot is currently utilised within the property. The current (approved) effluent irrigation areas are shown in teal in Figure 8. The additional effluent irrigation areas to be included as part of the modification are those shown in purple in Figure 8. The effluent water is only to be applied to the approved area. It is not to be applied to the any other areas.

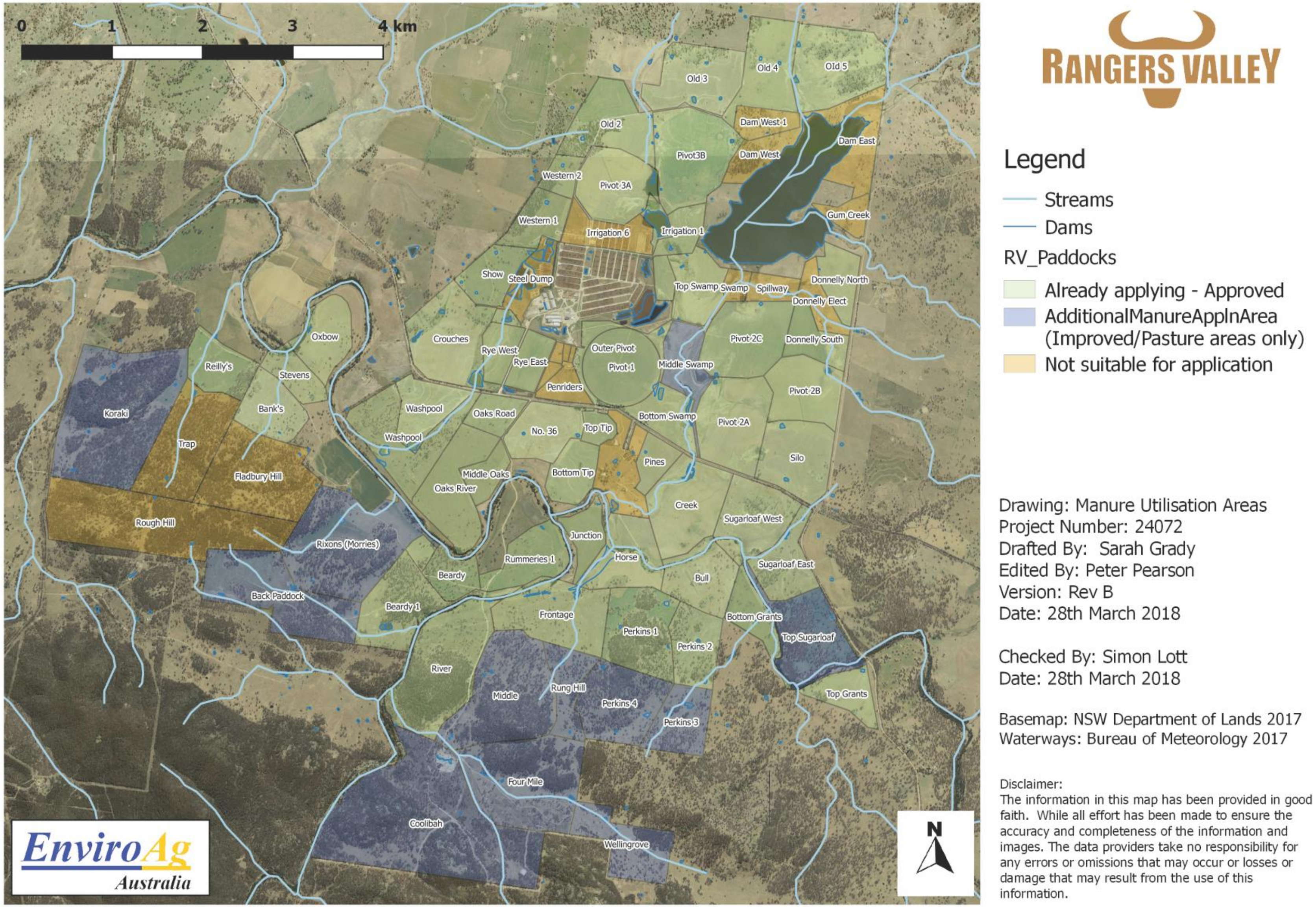

Figure 7 Manure Application Areas

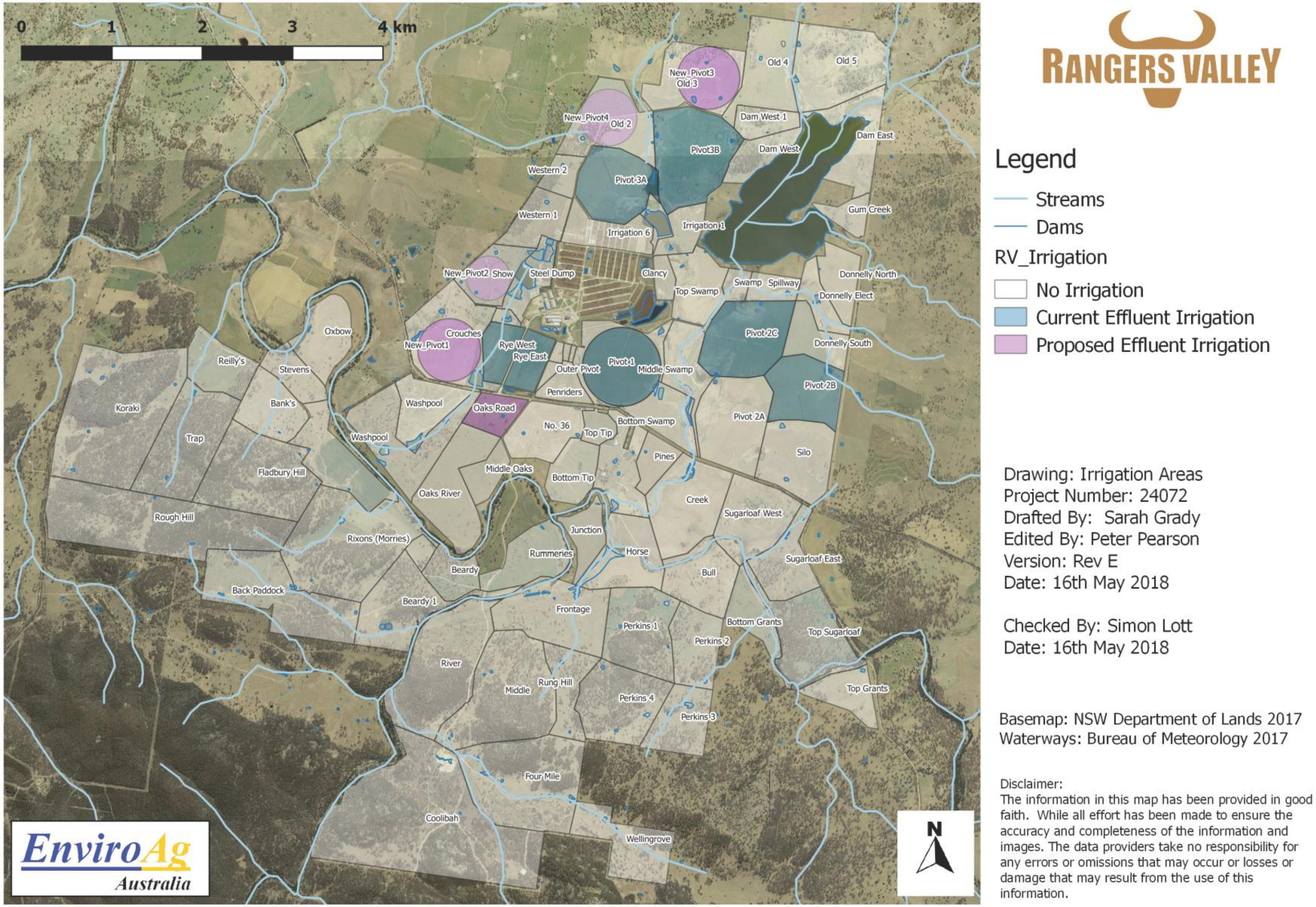

Figure 8 Wastewater irrigation areas

5.5 Environmental Monitoring and Management

Rangers Valley has been proactive in environmental monitoring and management, including submission of an Annual Environmental Management Report (AMER) since 2000. While there were some non-compliances in the earlier years, they have not had a non-compliance since 2007.

Analysis of total phosphorus levels at various monitoring points from the last four (4) years are shown in Figure 9. It can be seen from this data that there is no obvious increase in the total amount of phosphorus present in water at any of the monitoring points.

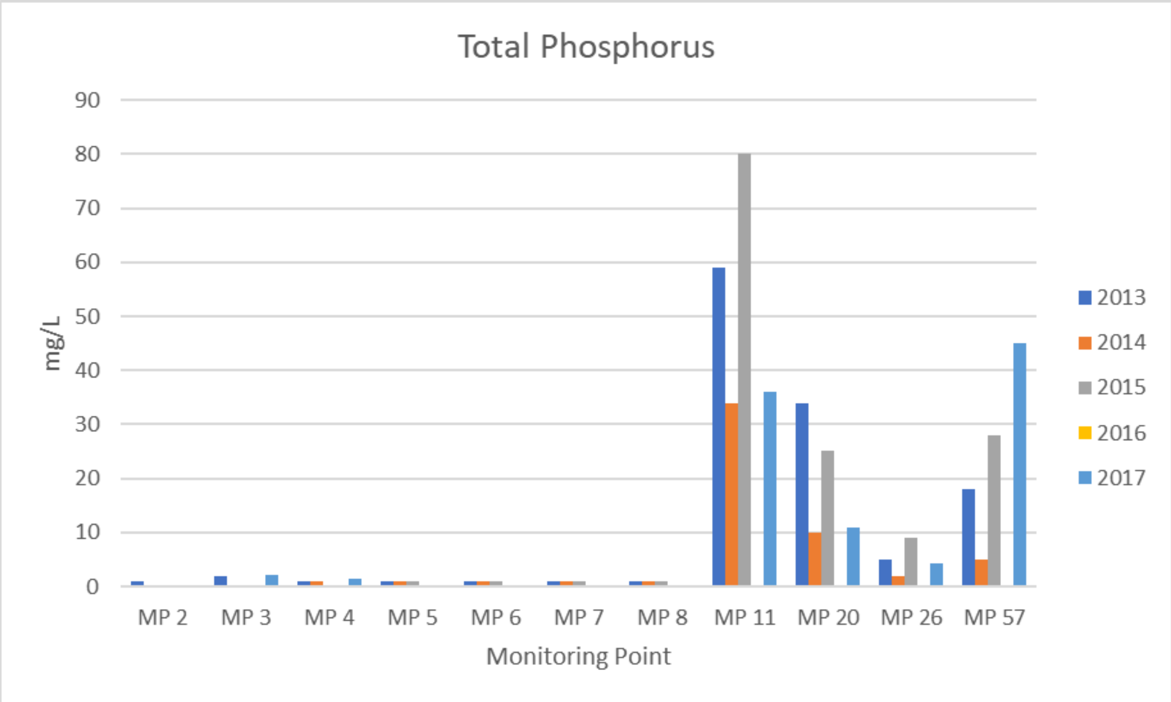

Figure 9 Total Phosphorus readings from Monitoring Points (2013-2017)

5.5.1 Waste Management

Waste Management practices at Rangers Valley consist of application of manure to cropping and pastures. Manure is cleared from the pens and stored on the manure pad prior to application to field.

Rangers Valley identified a potential efficiency to improve animal welfare within their pens. Specifically, they identified a need to remove wet manure from the pens into a sludge storage area liquid can drain freely and solid material can dry out for compost and field application. Further details on storage of manure during wet weather are detailed in 5.1.3. of this report.

6. Environmental Management Plan

6.1 Environmental Protection Licence

The existing EPL is current for the modifications and requires that the quality of waters from the piezometers be sampled as per Table 9.

Table 9 Groundwater monitoring parameters

Parameter	Units of Measure	Frequency
Standing water level	m	3 months
pH	pH	6 months
conductivity	µS/cm	6 months
Total nitrogen	mg/L	6 months
Nitrate	mg/L	6 months
Ammonium	mg/L	6 months
Total phosphorus	mg/L	6 months
Total suspended solids	mg/L	6 months
Filtered P	mg/L	6 months

The EPL states the onsite and offsite surface water monitoring needs to occur at the locations listed in Table 10, and whose locations can be seen in Figure 10. The parameters tested at these monitoring points are outlined in Table 11:

Table 10 Surface Water Monitoring Points

Type	Monitoring Point	Description
Surface Water	MP2, MP3, MP4, MP5, MP6, MP7 & MP8	• Rangers Valley Dam • Reticulation Dam
Effluent Water	MP11, MP 13, MP20, MP 22, MP26 & MP57	• Effluent Ponds • Holding Dam 1 for Feedlot Area Runoff • Holding Dam 2 for Feedlot Runoff
Terminal Ponds	MP10, MP14, MP48, MP49, MP50	• Terminal pond for runoff from the effluent utilisation area.

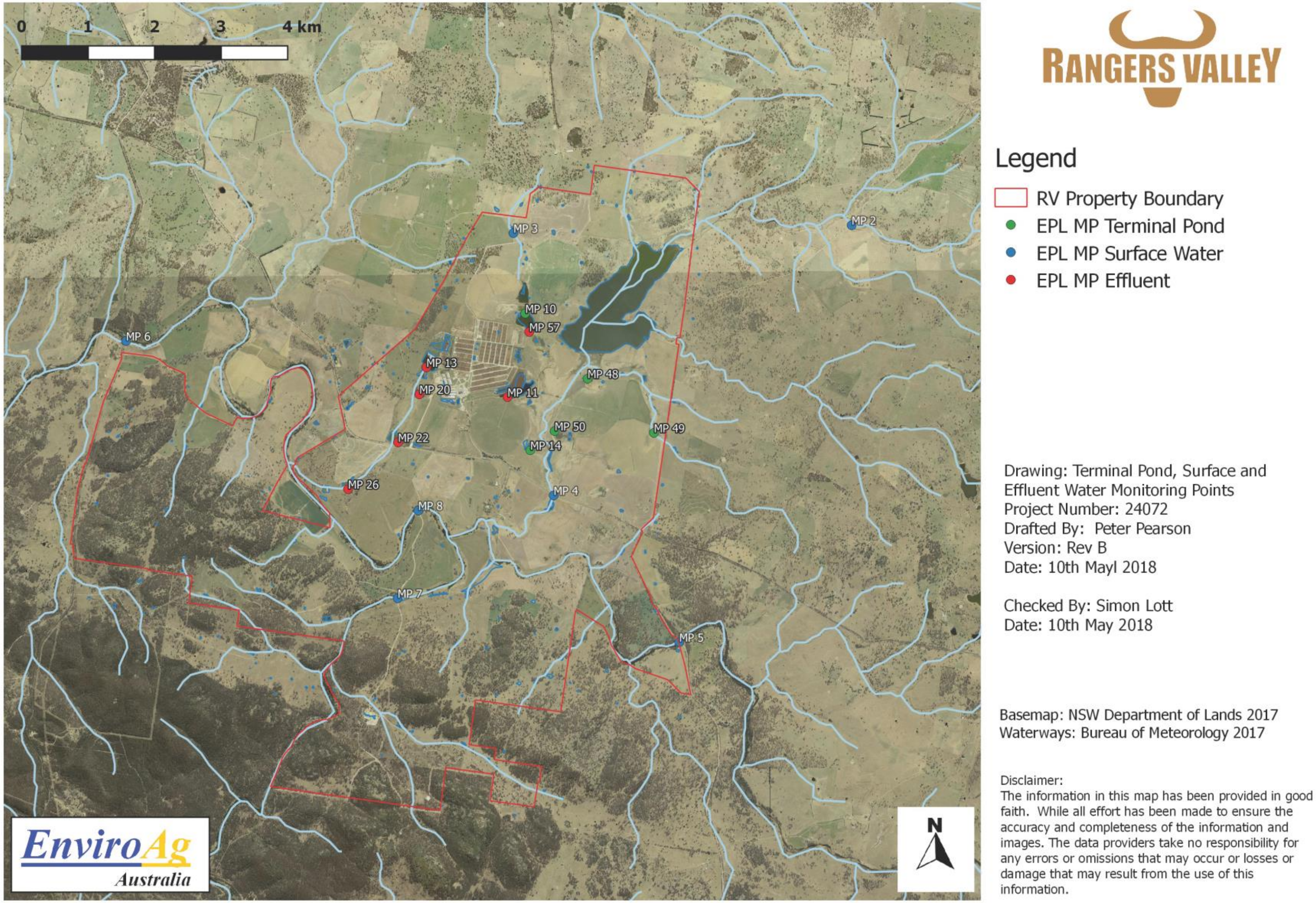

Figure 10 Terminal Pond, Surface and Effluent Water Monitoring Points

Table 11 The parameters for surface water monitoring

Parameters	Units
pH	pH
Conductivity	µS/cm
Ammonia	mg/L
Nitrate	mg/L
Total Kjeldahl Nitrogen	mg/L
Total phosphorus	mg/L
Soluble phosphorus	mg/L
Total suspended solids	mg/L
Bio-assessment	mg/L

This monitoring has occurred since the original EIS was written in 2002, so this would give a good background database to monitor any change that occurs within the area as a result of the modifications.

6.2 Waste Management

During excessively wet periods, Rangers Valley must continue to clean pens to minimise odour and maintain quality pen conditions for animal health and welfare. The wet manure is difficult to store. Rangers Valley have included emergency sludge storage areas for the temporary storage of wet pen manures / sludge. These areas are bunded thus allowing the material to be retained for drying and processing. They will allow an improvement in waste management at the site.

It is proposed that land areas added to the development for reuse of manure and waste water will be monitored in accordance with the revised EPL (see Section 6.1 and 6.3).

Waste water will be applied by low pressure irrigation consistent with the existing operations and the existing approvals for the development. It will be applied at rates that align with agronomic advices and generally in a manner that allows the development to meet or better the nutrient budget.

Manure will be applied to land areas so that riparian zones are avoided and when the land and its cover minimises potential for any runoff. Dry dust composted manures will not be applied in windy conditions.

6.3 Environmental Monitoring Requirements

Currently Rangers Valley Cattle Station conduct environmental monitoring in accordance with EPA licence number 3864. Rangers Valley are seeking to update the consent conditions. In particular they are seeking three areas of change:

- alignment between the environmental monitoring conditions for the Development Application and the EPA licence (number 3864), as the Development Application conditions have been surpassed by the EPA licence conditions;
- a reduction in Surface Water monitoring frequency; and,
- a change to the trigger point for the implementation of third party auditing.

6.3.1 EPL Alignment

Table 12 summaries the conditions which Rangers Valley are seeking to amend or remove due to repetition in the EPA Licence number 3864.

Table 12 Proposed amendments to the Rangers Valley Development Application (DA-261-8-2002-i) Conditions

DA Condition	EPA Licence Condition	Proposed Changes
Meteorological Monitoring 4.2	M4 Weather Monitoring	Remove the requirement to undertake sigma theta and air temperature monitoring at 10m as this is no longer required for modelling purposes. • NSW EPA guidelines state that air temperature measurements (AM-4) are to be conducted per the USEPA methods documented in EPA-454/R-99-005 (NSW DEC, 2007 and USEPA, 2000). • USEPA states “ambient temperature and humidity should be measure at 2m, consistent with the World Meteorological Organization (WMO) standards for ambient measurements”. Rangers Valley presently adhere to this, measuring humidity and air temperature data at 2m for the purposes of air quality modelling. • USEPA recommend use of a Gaussian plume model which is the preferred method for air quality modelling applications. The Gaussian plume model does not require the measurement of air temperature difference between 2m and 10m. • Should Rangers Valley require air quality modelling, they currently collect all relevant meteorological information for an accurate result; making the requirement to measure 10m air temperature contradictory to the requirement of the USEPA and NSW EPA standards. • Rangers Valley will continue monitoring and reporting the ambient temperature at 2m. Remove the requirement for all meteorological monitoring as this is repeated in NSW EPA Licence No. 3864. • The EPA Licence conditions M4 Weather monitoring are in place, annual reporting of meteorological observations to the NSW EPA are also required under condition R1 (see Appendix C).
Surface Water 4.3, Ponds 4.4 and 4.5	M2 Requirement to monitor concentration of pollutants discharged. R1 Annual return documents	Removal of the requirement in the Development Application to undertake surface water and pond monitoring. • Surface water and pond monitoring is repeated in the NSW EPA licence number 3864. • EPA licence condition M2 requires the monitoring of concentrations of pollutants of surface water and in ponds. • Condition R1 of EPA licence 3864 requires annual reporting of pollutant concentrations in both surface water and ponds to the NSW EPA (see Appendix C).

Groundwater 4.6	M2 Requirement to monitor concentration of pollutants discharged. R1 Annual return documents.	Removal of the requirement in the Development Application to undertake groundwater monitoring. Groundwater monitoring is repeated in the EPA licence number 3864. • EPA licence condition M2 requires the monitoring of groundwater pollutants at multiple locations throughout Rangers Valley. • Condition R1 requires annual reporting of the groundwater pollutants to the NSW EPA (see Appendix C).
Solid waste (Manure) 4.7 and Soil Quality Monitoring 4.8	M2 Requirement to monitor concentration of pollutants discharged. R1 Annual return documents.	Removal of the requirement in the development application to monitor solid wastes (manure) and soil quality. • Solid wastes (manure) and soil quality monitoring are repeated in EPA licence number 3864. • Condition M2 of the EPA licence requires that solid waste (manure) and soil quality is monitored on an annual basis. • Condition R1 requires that the solid waste (manure) and soil quality data be reported yearly to the NSW EPA (see Appendix C).

6.3.2 Reduction of Surface Water Monitoring Frequency

Rangers Valley seek to reduce the frequency of monitoring of surface water from three (3) monthly to six (6) monthly.

Currently EPL 3864 states;

> "*after every overflow event from the holding pond(s), wet weather pond(s) and/or terminal pond(s) and at least every three (3) months"*.

Rangers Valley have a history of environmental monitoring and submission of Annual Environmental Monitoring Reports (AEMRs). In addition to this there is a low risk of surface water contamination from the development. As such, Rangers Valley believes that they are justified in seeking this reduction in monitoring frequency.

6.3.3 Change of Trigger Point for Third Party Environmental Auditing

The current consent condition stated that "when the stocking rate of the development reaches 40,000 head of cattle at any one time, and at a period of every three years thereafter or otherwise required by the Director-General, the Applicant shall commission an independent person or team to undertake an Environmental Audit of the development".

Independent auditing is a substantial cost. Rangers Valley believe it is proportionate to the size of the facility. As such they believe that independent environmental auditing should be commence when they reach 45,000 head of cattle, and prior to the step to 50,000 head.

7. Social and Economic Impacts

The reconfiguration of the pen layout as part of this amendment allows the existing Pivot 3A to remain. Under the original plan this area was allocated for pen area. This means less expenditure on relocating and developing new irrigation infrastructure and reduced earthworks costs for pen development.

There are no expected changes to regional and continuing employment as part of this amendment.

8. Ecologically Sustainable Development

The principles of ESD that were discussed in Section 11 of the Original EIS have not changed as a result of the proposed amendments. The amendments allow Rangers valley to improve their environmental management practices.

9. Conclusions and Recommendations

The proposed feedlot modification aims to reconfigure the pens to match the layout in the current approval and improve the hydrological conditions onsite, without increasing the footprint or stocking density of 16.5m^2 outlined in the existing 2002 EIS. The only environmentally assessable factors which require updated data for this modification are hydrology (includes climatic data) and waste management. This is due to the reconfiguration of the old pen area in the south-west sector from an east-west direction to a north-south direction to improve drainage. The Hydrology Assessment has been completed as a separate report (Report number 24072.87581).

9.1 Layout

The revised design layout will result in a significant reduction in the footprint of the site, including:

- a net reduction in the controlled drainage area (CDA) by 315,058 m^2;
- a net increase in pen area of approximately 26,172 m^2;
- aggregation of the NW and SW catchments.

The layout allows Rangers Valley to realise technological improvements in design and improvements in operations through efficiencies with the revised design layout.

The revised layout delivers a smaller footprint for the development and a net positive environmental benefit, construction, operational and economic benefits.

9.2 Site Hydrology

The improvements in operation and management processes in facilities such as Rangers Valley over the last 10 years have net positive environmental outcomes. In addition, the following can be concluded as a result of the revised Hydrological Assessment:

- The active areas of the Rangers Valley Feedlot are above any historical flood level;
- The existing and proposed sedimentation systems and holding ponds are adequately sized such that will result in less than 1 spill per 20 years;
- Drain structures and terminal pond have been appropriately sized;
- The waste utilisation areas have adequate capacity for sustainable waste disposal.

9.3 Waste Management

Waste management practices on the feedlot will improve with the implementation of the wet weather manure sludge storage. This also has a welfare benefit with the removal of moisture from the pen surface.

Added areas for waste water and manure reuse improve the land management of the property and sustainable management of liquid and solid wastes.

9.4 Environmental Monitoring

The modification includes consolidating the Environmental Protection Licence conditions with the DA Approval. The current Environmental Protection Licence is attached in Appendix C.

10. References

E.A. Systems Pty Limited, 2001, *Environmental Impact Statement – Rangers Valley Feedlot Expansion* (Volume 1)

NSW DEC 2007, *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales*, NSW Environmental Protection Authority, Sydney, NSW.

MLA 2012, *National Guidelines for Beef Cattle Feedlots*, 3rd edn, MLA, Sydney.

USEPA 2000, *Meteorological Monitoring Guidance for Regulatory Modeling Application*, (EPA-454/R-99-005), United States Environmental Protection Agency, Research Triangle Park, NC.

11. Appendices

Appendix A. Risk Assessment

Risk Assessment

Rangers Valley Feedlot DA Modification

Report Number 24072.88061

Prepared for

RANGERS VALLEY

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This document provides information to address the intent of Project Number 24072 as agreed to by Rangers Valley Cattle Station Pty Ltd.

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1. Risk Assessment Methodology

A Risk Assessment of the proposed modifications to the Rangers Valley Feedlot Site has been undertaken. The Assessment was completed in line with ISO 31000:2009 Risk Management – Principles and Guidelines.

1.1 Risk Management Framework

The framework outlined in ISO 31000 was used in the assessment process for this development.

1. Establishment of context
2. Risk identification
3. Risk analysis
4. Risk evaluation
5. Risk treatment
6. Monitoring and review
7. Communication and consultation.

1.2 Context

The Rangers Valley Feedlot is considered under relevant State legislation and planning regulations as intensive livestock agriculture which is permissible with consent in RU 1 Primary Production Zoning. This development has a current consent (DA-261-8-2002 (Severn Shire Council)) to expand to 50,000 head over several stages.

Since the construction and operation of the first two stages, Rangers Valley have considered the latest technology available, new research outcomes and changes to the National Guidelines for Beef Cattle Feedlots in Australia 3rd Edition and the National Beef Cattle Feedlot Environmental Code of Practice 2nd Edition developed by Meat and Livestock Australia (2012). Rangers Valley has subsequently reassessed the optimal layout of the remaining stages to improve operational efficiencies and enhance the overall feedlot environment. Rangers Valley operates their facility in accordance with best management practice to ensure high levels of animal welfare and compliance with industry standards and the development consent.

The objective of this Risk Assessment is to ensure significant environmental risks are identified and evaluated such that appropriate risk treatment can be implemented to mitigate these risks.

1.3 Risk Identification

Risk Identification involves identifying sources of risk, areas of impact, events and their causes and their potential consequences. The following provides a summary of the risks identified in the assessment of the design modifications.

- Odour generation and nuisance;
- Site Hydrology;
- Traffic;
- Flora and Fauna;
- Soil contamination;
- Soil erosion;
- Contamination of Surface and Ground Water;
- Noise;
- Amenity;
- Dust generation and nuisance;
- Increase in pest, weeds and insects.

Table 3 lists out in more detail the events, the impacts and the management measures to be implemented to mitigate these risks.

1.4 Risk Analysis

The model used assumes the risk of an impact to be a function of two factors – the likelihood of occurrence and severity of the consequence. These are assessed on a rating scale of 1 – 5. Table 1 explains each of these ratings and Table 2 shows the Risk Matrix.

Table 1 Explanation of risk assessment ratings

Likelihood		Consequence	
5 Very likely (almost certain)	Event is expected to occur in most circumstances	1 Negligible	• Minor injury. No medical treatment required. E.g. cuts and bruises. • Low pollution. No observable effects on plants, animals or waterbodies. No requirements to inform authorities.
4 Likely	Event will probably occur in most circumstances	2 Minor	• Significant injury. Medical treatment required, but recovery is likely. E.g. burns, broken bones, severe bruises, cuts. • Minor pollution. Minor effects on plants and animals. Visible discharge observed offsite. Required to inform authorities. May involve a clean-up.
3 Possible	Event should occur at some time	3 Moderate	• Serious injury. Moderate permanent effects from injury or exposure. E.g.: serious burns, serious internal and/or head injuries. • Moderate pollution. Moderate effects on plants and animals. Measurable change in condition of environment. Physical impact on the public. Required to report to authorities. Extensive clean-up may be required
2 Unlikely	Event could occur at some stage	4 Significant	• Single fatality. Severe permanent injury, paralysis, brain damage, life threatening exposure to a health risk. • Major release. Major effects on plants and animals. Substantial clean-up costs. Personal and business prosecution possible.
1 Very unlikely	Event may only occur in exceptional circumstances	5 Severe	• A multiple fatality. Significant irreversible exposure to a health risk that affects greater than 10 people. • Extreme event. Permanent effects on the environment. Significant ongoing community complaint. Potential loss of licence to operate. Prosecution of company and directors possible

1.5 Risk Evaluation

The use of the Likelihood and Consequence table above allows the risk rating to be calculated to determine those risks of highest priority or concern and allows treatment and mitigation measures to be implemented.

The risk rating is calculated by multiplying the likelihood against the consequences as shown in the Risk Matrix below. High risk equals 16 to 25. High Risks activities should cease immediately until further control measures to mitigate the risk are introduced.

Medium risk equals 9 to 15. Medium Risks should only be tolerated for the short-term and then only whilst further control measures to mitigate the risk are being planned and introduced, within a defined timeframe.

Note: Medium risks can be an organisations greatest risk, due to the fact that they can be tolerated in the short-term.

Low risk equals 1 to 8. Low Risks are largely acceptable, subject to reviews periodically, or after significant change.

Table 2 Risk matrix

		Consequence				
		1	2	3	4	5
	Likelihood	Negligible	Minor	Moderate	Significant	Severe
5	Very likely	**Low**	**Medium**	**Medium**	**High**	**High**
4	Likely	**Low**	**Low**	**Medium**	**High**	**High**
3	Possible	**Low**	**Low**	**Medium**	**Medium**	**Medium**
2	Unlikely	**Low**	**Low**	**Low**	**Low**	**Medium**
1	Very unlikely	**Low**	**Low**	**Low**	**Low**	**Low**

1.6 Treatment and Mitigation Measures

The treatment and application of mitigation measures involves assessing the risk treatment, deciding whether the residual risk levels are tolerable; if not tolerable, generating a new risk treatment; and assessing the effectiveness of that treatment.

The following options were considered when assessing the risks:

a) Avoidance of the risk (not undertaking the activity that gives rise to the risk);
b) Taking or increasing the risk to pursue the opportunity;
c) Removing the risk source;
d) Changing the likelihood;
e) Changing the consequence;
f) Sharing the risk with another party or parties; and,
g) Retaining the risk by informed decision.

In undertaking the assessment of the risk associated with this development, Rangers Valley have:

- redesigned the original proposal to reduce, remove and avoid some of the higher risk activities;
- reduced or removed the risk source; and consequently,
- changed the likelihood and consequences of some of the activities occurring.

1.7 Management

The management of risks for this site will be undertaken at the following levels:

- the design level;
- the operational level; and,
- the management level.

The design level incorporates best management and design practices in line with industry standards and guidelines.

The operation level incorporates the running of the facility in accordance with the industry guidelines and standards and ensuring all staff are trained in the proper operation procedures and have a clear understanding to the management plans that are in place for each of the risks.

The management level is the use of management plans to ensure that the tasks and activities are undertaken in a particular way to minimise the risk associated with that activity. The management level also incorporated the responsibility of those managing the risk and ensuring that all personnel undertaking a task are aware to the measure that are required to be implemented to reduce the risk.

1.8 Monitoring and Review

In order to ensure a risk is being suitably treated or mitigated, monitoring and review is required this may be periodic or *ad hoc*. The key risks will have monitoring requirements within the management plans. Each of the procedures will have a review process under taken as part of the monitoring to determine if the level of risk is still significant or if there need to be a change in the way the risk is managed. The monitoring requirements for each of the risks identified in Table 3 are detailed in the Environmental Management Plan.

1.9 Definitions

Risk management definitions as defined by standard ISO 31000:2009 Risk Management – Principles and Guidelines.

Risk Source (Hazard) – An element which alone or in combination has the intrinsic potential to give rise to risk

Risk – Effect of uncertainty on objectives. Risk is often characterized by reference to potential events and consequences, or a combination of these

Consequence – Outcome of an event affecting objectives.

Impact - a marked effect or influence

Regulatory boundary (permitted operations) – The extant of the Rangers Valley Feedlot operations as permitted under the Development Application DA-261-8-2002 (Severn Shire Council)

3. Risk Assessments

Based on the initial literature, site visit and current and concept design of the feedlot, a risk assessment for the site has been undertaken as per the methodology explained above.

Table 3 Risk assessment of the Rangers Valley Feedlot

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Construction									
Vegetation clearance causing damage to Heritage, Fauna deaths.	Financial impacts to Rangers Valley through fines, legal costs, etc. Damage to Rangers Valley company profile and social licence. Loss of cultural values, knowledge and history.	1	2	LOW	No known cultural or European heritage sites have been found on government databases.	1	2	LOW	17
Vegetation clearing causing fauna deaths.	Financial impacts to Rangers Valley through fines legal costs, etc. Damage to Rangers Valley company profile and social licence. Loss of biodiversity value, species, etc.	3	2	LOW	Fauna spotter catchers will be onsite to relocate wildlife.	3	2	LOW	13
Vegetation clearing causing nuisance noise.	Public nuisance, complaints. And hold ups. Negative impacts to fauna roosting, feeding, sleeping etc.	1	2	LOW	Construction will only be carried out between 6am-6pm Monday to Saturday and between 9am-6pm on Sunday/public holiday. Residents will be notified of the construction timetable. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions.	1	2	LOW	6
Earthworks and construction of infrastructure causing sediment runoff and erosion and degradation of water quality downstream of site.	Sedimentation in streams, loss of stream habitats, damage to vegetation and fauna habitat due to erosion and siltation. Damage to neighbouring properties and fauna deaths from poor quality water.	4	3	MED	Erosion and Sediment Control Plan will be enacted. *Modification results in reduced construction footprint.*	2	3	LOW	8

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Earthworks and construction of infrastructure causing the spread of weeds.	Loss of native species, loss of habitat damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	4	3	MED	Vehicles and machinery will be cleaned prior to entering the site and before entering their next site.	2	3	LOW	10
Earthworks and construction of infrastructure nuisance noise.	Public nuisance, complaints and hold ups. Negative impacts to fauna roosting, feeding, sleeping etc.	4	2	LOW	Construction will only be carried out between 6am-6pm Monday to Saturday and between 9am-6pm on Sunday/public holiday. Residents will be notified of the construction timetable. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions.	4	2	LOW	6
Earthworks and construction of infrastructure causing dust.	Public nuisance, complaints and hold ups.	3	3	MED	Water will be applied to the ground prior to clearance.	2	3	LOW	4
Traffic management									
Transporting livestock and commodities to site increasing odour.	Public nuisance and complaints.	4	1	LOW	All vehicles will be maintained to reduce secondary issues such as noise, smoke and vibration.	4	1	LOW	5
Transporting Manure from site increasing odour.	Public nuisance and complaints.	4	1	LOW	All compost loads will be covered to reduce spills.	3	1	LOW	5
Transporting livestock, manure and commodities to site increasing traffic on local roads.	Public nuisance, complaints. And hold ups.	5	2	MED	Traffic will access the site via the Rangers Valley Road off the New England Highway at Dundee. All loads hauled on the public road network will be made to comply with road regulations. *Longer Feed times for specialist breeds such as Wagyu results in fewer truck movements*	4	2	LOW	12
Transporting livestock, manure and commodities to and from site increasing dust.	Public nuisance and complaints.	5	3	MED	The only unsealed road to be used is the internal property road. Watering unsealed internal property roads as required during dry spells.	4	2	LOW	4

Activity/Aspect/Hazard	Potential impacts	Before Management Measures (L = Likelihood; C = Consequence) L	C	Risk	Management measures	After Management Measures Residual L	Residual C	Residual risk	Issue No. (Table 4)
Transporting livestock, manure and commodities to site increasing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	5	2	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions. *Longer Feed times for specialist breeds such as Wagyu results in fewer truck movements*	5	1	LOW	6
Transporting livestock, manure and commodities to and from site spreading pests, weeds and vermin.	Loss of native species, loss of habitat damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	4	2	LOW	Pest and Weed Management Plans will be implemented to reduce spread of these organisms.	3	2	LOW	9
Transporting livestock, manure and commodities to site increasing greenhouse gas emissions.	Emissions impacting on flora and fauna. Meteorological impacts. Financial impacts to Rangers Valley. Damage to company profile.	5	1	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be maintained to reduce emissions. *Longer Feed times for specialist breeds such as Wagyu results in fewer truck movements*	5	1	LOW	4
Feedlot management									
Keeping livestock onsite causing loss of amenity.	Public complaints. Damage to company profile.	5	1	LOW	Ensuring cattle numbers do not exceed licence conditions and proper management and regular maintenance of pens.	4	1	LOW	15
Keeping livestock onsite causing odour.	Public nuisance and complaints.	5	2	MED	Weather, including wind speed and direction, will be monitored. Proper management and regular maintenance of pens.	4	2	LOW	5
Keeping livestock onsite causing dust.	Public nuisance and complaints. Negative impacts to vegetation.	5	2	MED	Maintain current pen stocking densities so that pens are not too wet, nor dry. Watering of pen surfaces during extensive dry periods.	4	2	LOW	4
Keeping livestock onsite causing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	4	1	LOW	Trucks will not be left idling when not in use. All equipment will be maintained to reduce noise emissions.	4	1	LOW	6

Activity/Aspect/Hazard	Potential impacts	Before Management Measures (L = Likelihood; C = Consequence) L	C	Risk	Management measures	After Management Measures Residual L	Residual C	Residual risk	Issue No. (Table 4)
Keeping livestock onsite spreading pests, weeds and vermin.	Loss of native species, loss of habitat damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	4	2	LOW	Enact Pest and Weed Management Plans. Livestock are back lined on receival to site	3	2	LOW	9
Keeping livestock onsite increasing Greenhouse gas emissions.	Emissions impacting on flora and fauna. Meteorological impacts. Financial impacts to Rangers Valley. Damage to company profile.	5	1	LOW	Reporting to GHG through the National Pollution Inventory.	5	1	LOW	4
Keeping livestock onsite creating biohazardous waste.	Health issues with employees, public, visitors, wildlife and surrounding livestock.	3	4	MED	Clinical and biohazardous waste to be contained and removed from site by certified agent. Maintain pen hygiene and isolate ill animals. Follow waste management plan and Pollution Incident Response Management Plan. Staff vaccinations for Q Fever	2	4	LOW	2
Improper/irregular pen cleaning causing an increase in weeds, pests and vermin.	Spread of pests, spread of disease, loss of native species, loss of habitat/damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	5	2	MED	Enact weed and pest management plans. Staff trained on proper cleaning practices. Pen maintenance routines and registers kept. Effluent waste captured in sediment drains and treatment ponds. Monitoring program as per EPL 3864	2	2	LOW	9
Improper/irregular pen cleaning causing disease/ health issues.	Health issues with employees, public, visitors, flora and fauna and surrounding livestock	5	3	MED	Staff trained on proper cleaning practices. Pen maintenance routines and registers kept. Livestock isolation and hospital pens for disease. Enact Pest and Weed Management Plans. Enact Waste Management Plan.	2	3	LOW	2
Improper/irregular pen cleaning causing odour.	Public nuisance and complaints.	5	2	MED	Pens are maintained at a (dry) manure depth of 50mm or less and cleaned at minimum every 13 weeks. Enact Odour Management Plan.	3	2	LOW	5

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Individual livestock death	Public nuisance and complaints. Spread of pests, spread of disease, loss of native species, health issues with employees, public, visitors, flora and fauna and surrounding livestock. Increase in odour	4	2	LOW	Isolate sick animals and Enact Emergency Management Plan Death events to be documented as per EPL3468	4	2	LOW	5, 9
Mass death event.	Public nuisance and complaints. Spread of pests, spread of disease, loss of native species, health issues with employees, public, visitors, flora and fauna and surrounding livestock. Increase in odour	2	3	MED	Isolate sick animals and Enact Emergency Management Plan Report Mass Death event to relevant authorities as per EPL3468. All carcases will be taken to the carcass composting site or disposed of as soon as possible (depends on cause of death). Carcases to be composted will be covered with composting bedding materials/ composted manure. Burial pit to be monitored for pests and vermin daily. Pest Management Plan to be enacted.	2	3	LOW	2, 5, 9, 16
Surface runoff/spills of effluent to surface water causing contamination.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	4	LOW	Bunding of chemical, compost manure pad and pens will prevent nutrient runoff. Monitoring of surface water as required by EPL 3864 *Redesign and upgrade of old pens moving towards "Class 1" improves the drainage of pens in Controlled drainage area and improves drainage to holding ponds.*	1	4	LOW	1, 3

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Leaching of effluent to groundwater causing contamination.	Contamination of ground water, surrounding landholders lose water supply, negative impacts on groundwater dependent ecosystems.	3	4	MED	Pens, compost manure pad, wastewater ponds and drainage areas are lined with compacted clay to reduce leaching into the groundwater system. The irrigation block will be closely monitored to ensure it is not irrigated while saturated. Irrigation block will be planted with species that have high nutrient uptake rates. Monitoring of groundwater will be undertaken in accordance with EPL 3864. *Redesign and upgrade of old pens moving towards "Class 1" improves the drainage of pens in Controlled drainage area and improves drainage to holding ponds.*	2	4	LOW	1, 3
Solid waste management									
Collecting and stockpiling manure for compost causing odour and dust.	Public nuisance and complaints.	4	1	MED	Compost pile must be turned regularly. Compost manure pad will be monitored for fires, pests and vermin. Wind conditions will be monitored prior to compost turning and pen cleaning to reduce offsite impacts. Compost, pens and internal roads will be watered to reduce dust *Improved waste management practices as per the National Feedlot Guidelines 2012.* *Monitoring as per EPL 3864*	3	1	LOW	2, 4, 5
Collecting and stockpiling manure for compost increasing pest and vermin populations.	Spread of pests, spread of disease, loss of native species, loss of habitat damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	4	2	MED	Compost manure pad will be monitored for pests and vermin.	3	2	LOW	9

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Collecting and stockpiling manure for compost causing spontaneous combustion and fire.	Damage to infrastructure, increase in greenhouse gas emissions. Public nuisance and complaints.	2	4	LOW	Monitoring of compost moisture and temperature levels to reduce odour and dust. Application of water to compost heap if moisture levels are low. Compost manure pad will be monitored for fires, pests and vermin. *Separation of composted Manure from hay sheds and other infrastructure.* *Slashed fire break around manure composting pad.*	1	4	LOW	2
Turning compost causing odour and dust.	Public nuisance and complaints. Negative impacts to vegetation.	4	2	LOW	Compost moisture and temperature levels are monitored and kept at optimal levels to reduce dust and odour. Compost manure pad will be watered when moisture levels are low to reduce dust and maintain optimal composting conditions. Wind conditions will be monitored and turning will not be carried out when windy	4	2	LOW	2, 5
Application of compost to irrigation area causing dust.	Public nuisance and complaints. Negative impacts to vegetation.	4	2	LOW	Compost moisture and temperature levels are monitored and kept at optimal levels to reduce dust and odour. Buffer zone and tree line will protect nearest sensitive receptor from noise. Wind conditions will be monitored and compost will not be moved when windy.	4	2	LOW	5
Application of compost to irrigation area causing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	4	2	LOW	All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions. Trucks and machinery will not be left idling when not in use. Consistent with farming operations in the area.	3	2	LOW	2, 6

Activity/Aspect/Hazard	Potential impacts	Before Management Measures (L = Likelihood; C = Consequence) L	C	Risk	Management measures	After Management Measures Residual L	Residual C	Residual risk	Issue No. (Table 4)
Application of compost to irrigation area causing soil and water contamination.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	3	LOW	Soil and water monitoring and testing will be carried out under the Environmental Protection Licence 3468 to ensure that pasture is removing nutrients from soil and nutrients are no leaching onto waterways. Application rates of manure and fertiliser based on sample results and nutrient budgets	1	3	LOW	2, 3, 8
Wastewater management									
Collecting wastewater in the wastewater pond causing odour.	Public nuisance and complaints.	3	2	LOW	Wastewater pond has pump infrastructure that is able to transfer water to secondary ponds or irrigation areas if odours are produced and the pond needs to be cleaned. Lime can be added to wastewater to reduce odours and make it inhabitable for mosquito breeding.	3	2	LOW	1
Surface runoff/spills of effluent to surface water causing contamination.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	5	MED	Wastewater holding ponds are adequate in size and are able to be dewatered quickly to irrigation area should they become too full. Facilities are located above the 1 in 100 year flooding levels. Controlled drainage areas designed to capture contaminated runoff for treatment prior to use onsite. Surface Water monitoring will be undertaken in accordance with EPL 3864.	1	5	LOW	1, 3
Leaching of effluent to groundwater causing contamination.	Contamination of ground water, surrounding landholders lose water supply, negative impacts on groundwater dependent ecosystems.	2	5	MED	Dams are lined with compacted clay or HDPE and then covered with sand. The irrigation areas will be closely monitored to ensure it is not irrigated while saturated. Irrigation areas will be planted with species that have high nutrient uptake rates. Groundwater monitoring will be undertaken in accordance with EPL 3864.	1	5	LOW	1, 3

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Diesel spill contaminating surface water.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	3	LOW	The container to be double-bunded. Loading of container will be undertaken by experienced individuals. Spill kits will be available within easy access of all diesel storage areas. PIRMP to be enacted in the event of a spill	1	3	LOW	3, 14
Diesel spill contaminating ground water.	Contamination of ground water, surrounding landholders lose water supply, negative impacts on groundwater dependent ecosystems.	1	4	LOW	The container to be double-bunded. Loading of container will be undertaken by experienced individuals. Spill kits will be available within easy access of all diesel storage areas. PIRMP to be enacted in the event of a spill	1	4	LOW	3, 14
Diesel spill contaminating soil.	Loss of vegetation, fauna deaths, Financial impacts to remediate.	3	3	MED	The container to be double-bunded. Loading of container will be undertaken by experienced individuals. Spill kits will be available within easy access of all diesel storage areas. PIRMP to be enacted in the event of a spill	2	3	LOW	14

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Applying effluent to pasture areas causing : • Odour; • Accumulation of nutrients in soils; • Salinity; • Soil erosion; • Soil waterlogging; • Surface runoff; and, • Groundwater contamination.	Public nuisance and complaints; Loss of vegetation, fauna deaths, Financial impacts to remediate; Sedimentation and contamination in streams, loss of stream habitats, damage to vegetation and fauna habitat due to erosion and contamination. Damage to neighbouring properties. Contamination of groundwater, surrounding landholders lose water supply, negative impacts on groundwater dependant ecosystems.	3	2	LOW	Suitable crop selection and crop rotation. Effluent application at sustainable nutrient loading rates. Effluent application will be based upon appropriate hydraulic loading rates. Irrigation rates and timing will need to be managed to ensure that runoff during irrigation does not occur. Effluent will be applied using a low pressure spray method (lateral moving/centre pivot irrigator), so that no runoff or waterlogging should occur. Annual monitoring of nutrients status of effluent and solids reuse areas in accordance with EPL 3864. Monitor irrigation application especially periodically check direction of irrigator. Stubble retention and suitable tillage practices for erosion control. *Application rates and runoff to be calculated in the Revised Hydrology report*	2	2	LOW	1, 3, 5
Pasture and feedmill management									
Harvesting pasture by baling causing dust.	Public nuisance and complaints. Negative impacts to vegetation.	3	2	LOW	Hay baling activities will be consistent with industry practice as occurs in all rural zones undertaking this type of activity	3	2	LOW	4
Harvesting pasture by baling causing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	3	1	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions. Noise emissions are consistent with agricultural use in the area	3	1	LOW	6

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Harvesting pasture by baling causing fire.	Damage to infrastructure, loss of habitat. Public nuisance and complaints.	3	4	LOW	The hay sheds have a separation distance to prevent spread and additional damage from fires. Harvesting not to be undertake during wet weather Machinery available to create a fire break, to slow/stop the spread of fire is available onsite. In addition, if there are nearby bushfires or planned burn offs fuel load on the property can be reduced.	2	4	LOW	4, 15
Processing feed causing dust.	Public nuisance and complaints. Negative impacts to vegetation.	3	1	LOW	Separation zone will protect nearest sensitive receptors. *Upgrade of feedmill undertaken under stage 2 reduces dust emissions.*	2	1	LOW	4
Processing feed causing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	4	1	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions.	4	1	LOW	6
Feed wastage/spoilage increasing pests and vermin.	Spread of pests, spread of disease, loss of native species, loss of habitat damage to waterways, spread of nationally significant weeds, damage to surrounding agriculture.	3	2	LOW	Good hygiene practices – regular cleaning around feedmill and feed bunks. Ensure that conveyors, silos and bins are sealed.	2	2	LOW	9
Feed wastage/spoilage increasing odour.	Public nuisance and complaints.	2	1	LOW	Good hygiene practices – regular cleaning around feedmill and feed bunks. Ensure that conveyors, silos and bins are sealed.	1	1	LOW	5
Vehicle movements (feed truck running feed up and down lanes) causing dust.	Public nuisance and complaints. Negative impacts to vegetation.	4	2	LOW	Watering unsealed on-farm roads as required during dry spells All vehicles will be maintained to reduce secondary issues such as noise, smoke and vibration. Buffer zone will protect nearest sensitive receptors.	4	1	LOW	4

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Vehicle movements (feed truck running feed up and down lanes) causing noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	4	2	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions.	4	1	LOW	6
Vehicle movements (feed truck running feed up and down lanes) causing greenhouse gas emissions.	Emissions impacting on flora and fauna. Meteorological impacts. Financial impacts to Rangers Valley. Damage to company profile.	5	1	LOW	Trucks and machinery will not be left idling when not in use. All equipment will be maintained to reduce emissions.	5	1	LOW	4
Weed and pest management									
Preparing herbicide (e.g. mixing herbicide and water/surfactants) contaminating surface water and/or soil.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality. Loss of vegetation, fauna deaths, Financial impacts to remediate.	3	3	MED	Herbicide preparation will take place in a concreted area with bunding to ensure that spills do not contaminate porous and sensitive areas. Only staff trained on chemical handling or accredited contractors will carry this out. Chemicals stored away in a bunded lockable storage area. Spill kits will be available onsite.	1	3	LOW	10
Applying herbicide to weeds causing contaminated surface water.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	2	LOW	Use of a buffer zone alongside crops Use of herbicide application nozzles with larger droplet sizes should reduce off target damage/contamination. Weather conditions also need to be taken into account when spraying – herbicide will not be applied on windy or rainy days. Restricted to staff trained in herbicide application or accredited contractors. Herbicide will be applied as described on the label. Spill kits will be available onsite.	1	2	LOW	3, 10

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Applying herbicide to weeds causing damage to off target plants.	Loss of vegetation, fauna deaths.	2	3	LOW	Use of a buffer zone alongside crops Use of herbicide application nozzles with larger droplet sizes should reduce off target damage/contamination. Weather conditions also need to be taken into account when spraying – herbicide will not be applied on windy or rainy days. Restricted to staff trained in herbicide application or accredited contractors.	1	3	LOW	10

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Emergency management									
Livestock disease resulting livestock deaths.	Damage to waterways through waste moving off site, decrease in aesthetic values and public complaints. Financial impacts to Rangers Valley through fines, legal costs, etc. Damage to Rangers Valley company profile and social licence. Increase in landfill space required, indirect impacts due to larger landfill. Health issues with employees, public, visitors, wildlife and surrounding livestock.	2	3	LOW	Regular pen cleaning. All cattle transported to the site are back-lined with an insecticide for flies and mosquitoes. Ill livestock are kept in isolation pens to reduce spread of disease or transmissible infections. Follow Disease/Quarantine Guidelines under emergency Management Plan.	1	3	LOW	Emergency Management
Fire and/or Flooding resulting in livestock deaths.	Damage to waterways through waste moving off site, decrease in aesthetic values and public complaints. Financial impacts to Rangers Valley through fines, legal costs, etc. Damage to Rangers Valley company profile and social licence. Increase in landfill space required, indirect impacts due to larger landfill. Health issues with employees, public, visitors, wildlife and surrounding livestock.	3	3	MED	For flooding: All storage and drainage facilities are built to withstand a 1 in 100 year flood event. Drainage lines will be cleaned regularly. A check of weather warnings from the Bureau of Meteorology should be carried out every morning. There should be enough food supplies for the duration of the flood. For fire: The hay sheds have a separation distance to prevent spread and additional damage from fires. Emergency water supply is available for firefighting purposes. Machinery available to create a fire break, to slow/stop the spread of fire is available onsite. In addition, if there are nearby bushfires or planned burn offs fuel load on the property can be reduced.	2	3	LOW	Emergency Management

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Fire and or flooding resulting in loss of infrastructure.	Damage to waterways through waste moving off site, decrease in aesthetic values and public complaints. Financial impacts to Rangers Valley. Damage to Rangers Valley company profile and social licence. Increase in landfill space required, indirect impacts due to larger landfill. Health issues with employees, public, visitors, wildlife and surrounding livestock.	3	3	MED	For flooding: All storage and drainage facilities are built to withstand a 1 in 100 year flood event. Drainage lines will be cleaned regularly. A check of weather warnings from the Bureau of Meteorology should be carried out every morning. There should be enough food supplies for the duration of the flood. For fire: The hay sheds have a separation distance to prevent spread and additional damage from fires. Emergency water supply is available for firefighting purposes. Machinery available to create a fire break, to slow/stop the spread of fire is available onsite. In addition, if there are nearby bushfires or planned burn offs fuel load on the property can be reduced.	2	3	LOW	Emergency Management

		Before Management Measures (L = Likelihood; C = Consequence)				After Management Measures			
Activity/Aspect/Hazard	**Potential impacts**	**L**	**C**	**Risk**	**Management measures**	**Residual L**	**Residual C**	**Residual risk**	**Issue No. (Table 4)**
Fire and or flooding resulting in loss of life.	Damage to Rangers Valley company profile and social licence. Financial impacts to Rangers Valley.	2	5	MED	For flooding: All storage and drainage facilities are built to withstand a 1 in 100 year flood event. Drainage lines will be cleaned regularly. A check of weather warnings from the Bureau of Meteorology should be carried out every morning. There should be enough food supplies for the duration of the flood. For fire: The hay sheds have a separation distance to prevent spread and additional damage from fires. Emergency water supply is available for firefighting purposes. Machinery available to create a fire break, to slow/stop the spread of fire is available onsite. In addition, if there are nearby bushfires or planned burn offs fuel load on the property can be reduced.	1	5	LOW	Emergency Management
Social and economic effects									
Loss of amenity due to odour.	Public nuisance and complaints.	3	3	MED	Separation distance between feed lot and nearest receptor is 2km Enact Liquid and Solid Waste Management Plan.	3	2	LOW	7
Loss of amenity due to dust.	Public nuisance and complaints. Negative impacts to vegetation.	4	3	MED	Watering unsealed on-farm roads as required during dry spells Enact Waste Management Plan to reduce compost dust. Management of pen stocking densities so that pens are not too wet, nor dry.	3	2	LOW	7

Activity/Aspect/Hazard	Potential impacts	Before Management Measures (L = Likelihood; C = Consequence) L	C	Risk	Management measures	After Management Measures Residual L	Residual C	Residual risk	Issue No. (Table 4)
Loss of amenity due to noise.	Public nuisance and complaints. Negative impacts to fauna roosting, feeding, sleeping etc.	3	3	MED	Trucks and machinery will not be left idling when not in use. All equipment will be fitted with efficient silencers, in accordance to the NSW legislation. All equipment will be maintained to reduce noise emissions.	3	3	MED	7
Cumulative effects									
Vegetation clearance impacting on flora and fauna communities.	Cumulative fauna/flora population decline.	4	1	LOW	Fauna spotter catchers will be present onsite to relocate fauna. Minimal clearing is requires as most construction works are to be undertaken in areas used for cultivation or that have been previously cleared.	3	1	LOW	11
Groundwater water use.	Surrounding landholders lose water supply, negative impacts on groundwater dependent ecosystems.	2	5	MED	Bore water usage will be monitored via a meter, and recorded. Water quality and standing water levels will be monitored as per EPL 3864	1	5	LOW	11
Wastewater treatment and application.	Contamination of surface water, loss of stream habitats, damage to vegetation and fauna habitat. Fauna kills due to poor water quality.	2	5	MED	Enact Water Quality Monitoring Program and Pollution Incident Response Management Plan.	1	5	LOW	11

4. Risk Summary

Table 4 summarises the risk assessment based on the highest, most conservative, risk rating (before management measures) for each issue in Table 3 and the revised risk score once mitigation measures are implemented.

Table 4 Summary of assessment

Issue No.	Issue	Risk / Prioritisation Score	Revised risk score after management
1	Liquid waste management	**12**	**8**
2	Solid waste management	**15**	**8**
3	Water quality & catchment protection	**12**	**8**
4	Air Quality (including dust)	**15**	**8**
5	Odour	**10**	**8**
6	Noise	**10**	**8**
7	Economic and social effects	**12**	**9**
8	Land capability and soil resources	**12**	**6**
9	Pest & insect control	**10**	**8**
10	Weed management	**12**	**6**
11	Cumulative impacts	**10**	**5**
12	Traffic & road impacts	**10**	**8**
13	Flora & fauna	**6**	**6**
14	Hazardous chemicals	**9**	**6**
15	Community amenity	**12**	**8**
16	Animal welfare	**6**	**6**
17	Heritage	**2**	**2**

Key: (Red = High; Yellow = Medium; Green = Low)

Based on Table 4 above the key risk items are:

- Solid waste management and air quality with a risk score of 15 (Medium);
- Liquid waste management, water quality & catchment protection, land capability and soil resources, weed management and community amenity with a risk score of 12 (Medium); and,
- Odour, noise, pest & insect control, cumulative impacts, and traffic & roads impacts with a risk score of 10 (Medium);
- (Economic and social effects are considered as a consequential impact associated with the management of primary risk factors such as odour etc.)

Provided adequate mitigation measures as described in Table 3 are implemented the risk score can be reduced to Low.

5. Conclusion

The modification will upgrade the quality of operations and drainage at the site leading to better environmental and social outcomes which in turn leads to better economic outcomes. For some of these moderate and low risk items the risk level will not change as a result of our proposal eg traffic, flora & fauna and weed & pest management.

We conclude that the environmental assessment should provide a detailed assessment of the key risk items identified in this assessment. That is, the modification of the facility in respect to hydrology.

Appendix B. Hydrology Assessment

Hydrological Assessment

Rangers Valley Feedlot Expansion Modification of Development Approval

Report Number 24072.87581

Prepared for

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Signatures		[signature]	[signature]	[signature]	[signature]

Notes:

Rev 3: Final Report

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Company	EnviroAg Australia	1

This document provides information to address the intent of Project Number 24072 as agreed to by Rangers Valley Cattle Station Pty Ltd.

Executive Summary

Rangers Valley obtained approval for the development of a 50,000 SCU feedlot in 2004. The development provided a forecast of the expansion in stages. Seven stages were envisaged.

Over time the business needs have changed. Technological improvements have occurred in the industry. Design improvements can be envisaged. Rangers Valley wish to modify the footprint of the feedlot and staging. These changes do not change any of the basic outcomes of the past environmental assessment and subsequent approval. The changes deliver net environmental improvements and simply allow the feedlot to modify the development to better align with its forward needs.

Uncontrolled runoff from a feedlot complex may be contaminated and may cause serious environmental harm to surface and groundwaters should it enter them. Consequently, it is necessary to establish the feedlot complex within a controlled drainage area (or CDA), where runoff from the feedlot complex can be safely intercepted and stored in the first case. Waste waters should then be re-used beneficially.

Stormwater and other runoff from the feedlot site will be contained within a controlled drainage area. This controlled drainage area is intended to divert 'clean' runoff water around the proposed feedlot. Catch drains will be located on the downslope sides (including behind each row of pens), which are intended to catch potentially contaminated runoff water from the site, and deliver it to a sedimentation basin and then a holding pond located at the lowest part of the controlled drainage area.

The FSIM model (Lott, 1998) was used to simulate the hydrological performance of the (revised) Rangers Valley feedlot catchment including the holding pond and effluent utilisation area. The FSIM model (Lott, 1995 and Lott, 1998) simulates the hydrological and mass balance of open cattle pens in a feedlot complex with particular emphasis on the water balance of the pen surface. The model uses physically based and distributed parameters to describe the various aspects of the hydrological balance and has been developed to incorporate variables for factors such as land use and feedlot management practices. The model has been calibrated and validated. It has been used to develop State and National Feedlot Guidelines in Australia.

The data from the FSIM modelling has also been utilised to determine design details for the runoff control structures including the catch drains, sediment ponds and holding ponds as well as the wastewater irrigation area. These are key outcomes not validated by FSIM.

Four catchments were previously modelled. The NW and SW catchments have been amalgamated with the following outcomes:

- This assessment ran three models for the three catchments within the controlled drainage area;
- The north-western and south-western catchments;
- The south-eastern catchment; and,
- The north-eastern catchment;
- The average climate data has changed since the initial modelling was undertaken with a decrease of rainfall by 10 mm per year and an increase in evaporation of 174 mm;
- The controlled drainage area (CDA) has been reduced by 315,058 m^{2};
- There is a net reduction in land use areas and footprint.

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1. Introduction

This report presents (revised) modelling of the feedlot hydrology for the Rangers Valley feedlot expansion that was previously approved in 2002. The 2002 approval was for staged construction from 24,000 head to 50,000 head. Since the approval was issued there have been changes to technologies in environmental management that allow improved design and environmental management practices to be implemented at Rangers Valley. An application to amend the approval is being prepared and this revised hydrology assessment forms part of the amendment application.

Uncontrolled runoff from a feedlot complex may be contaminated and may cause serious environmental harm to surface and groundwaters should it enter them. Consequently, it is necessary to establish the feedlot complex within a controlled drainage area (or CDA), where runoff from the feedlot complex can be safely intercepted and stored in the first case. Wastewaters should then be re-used beneficially.

Notwithstanding the need to protect the environment from contaminated runoff, it is also necessary for the good of the environment that the controlled drainage area does not intercept any more water than that necessary to adequately protect the environment. To this end any uncontaminated stormwater runoff must be diverted away from the controlled drainage area. Consequently, the physical extents of the controlled drainage area should be the practicable minimum that satisfies the design criteria set out in the *National Guidelines for Beef Cattle Feedlots in Australia* (MLA 2012).

The design principles of runoff control structures in open yard areas such as those in the feedlot are discussed in detail in Lott (1994), Lott & Skerman (1995), ICIAI (1997), SCARM (1997), Skerman (2000) and MLA (2012).

2. Rangers Valley Feedlot Layout

Stormwater and other runoff from the feedlot site will be contained within a controlled drainage area (CDA). This controlled drainage area will be defined by the ridgeline on the upslope side and catch drains on the downslope sides (including behind each row of pens), which are intended to catch potentially contaminated runoff water from the site, and deliver it to a holding pond located at the lowest part of the controlled drainage area. Figure 1 shows the site layout and staging plan, while Figure 2 shows the sources of wastewater in the CDA.

The existing feed preparation area will be used to service the new feedlot and is not part of the feedlot controlled drainage area. Table 1 shows the area (m^2) of each land use in the proposed layout.

Table 1 Total Land use by area (Current Approval vs Proposed)

Controlled Drainage Area				
Land Use	**Current Approval Area (m^2)**	**Proposed Area (m^2)**	**Net Change in Area**	
			m^2	**(ha)**
Pens	823,500	849,672	26,172	2.62
Roads	166,000	190,274	24,274	2.43
Drains	149,800	85,061	-64,739	-6.47
Grass	595,600	412,755	-182,845	-18.28
Sediment Basin	108,000	63,118	-44,882	-4.49
Holding Ponds	311,100	121,792	-189,308	-18.93
Manure Storage and Processing area	25,200	141,470	116,270	11.63
Hay Storage Area	18,600	18,600	0	0.0
Other hard stand areas (incl. Buildings)	17,300	17,300	0	0.0
Total	2,215,100	1,900,042	-315,058	-31.49
Irrigation Areas	**Area (ha)**	**Area (ha)**		
Irrigated cropping area (Pivot/Lateral)	490	454.7		-35.3
Total	490	454.7		-35.3

There is a reduction in the total area from the area currently approved and the proposed area in the modification. The surface area of the holding ponds has reduced as the north-western holding pond will not be constructed and instead the new north-western pens will drain into the south-western sediment basin and holding pond. The natural slope of the land allows for this. Table 1 shows difference between the current approved land uses and the proposed land uses.

2.1 Drains

Runoff from the feedlot pen areas is to be collected in catch drains situated directly below each pen. The pens are arranged in "back-to-back" rows (refer Figure 1). The configuration of the rows and the cross-slope gradient in the pens are designed to minimise the volume of runoff draining through adjoining pens. The below pen drains, main wastewater drains, tail-water catch drains and clean water diversion drains will be sized to carry flows at low velocities and will have low flow concrete drains where velocities are erosive. They are typically sized using the 1 in 20 year design storm. The cross section of the pen drain and road configuration used by Rangers Valley will be based on current industry standards. This drain will have a slope of 0.5-1% and lined with road base. The flat nature of the drain results in a broad, shallow flow at a low velocity, which is non-erosive.

The individual catch drains behind each row of pens are to discharge into main collection drains that will in turn discharge into a sedimentation system and ultimately the holding pond.

2.2 Sedimentation Basins

The aim of the sedimentation system design is to provide flow velocities in the system low enough to allow for the settling of a minimum of 50% of the solids entrained in the CDA runoff in a design storm also having an ARI of 20 years (ICIAI, 1997 and SCARM, 1997). This level of sedimentation typically occurs when flow velocities are less than 0.005 m/s (Lott & Skerman, 1995).

A performance standard requiring the settling of more than 50% of the entrained solids would require an exponential increase in detention time within the sedimentation system (as well as a correspondingly lower flow velocity) and therefore is generally impracticable and inefficient. The feedlot has been designed with five sedimentation basins in order to control flows and to ensure solids are retained.

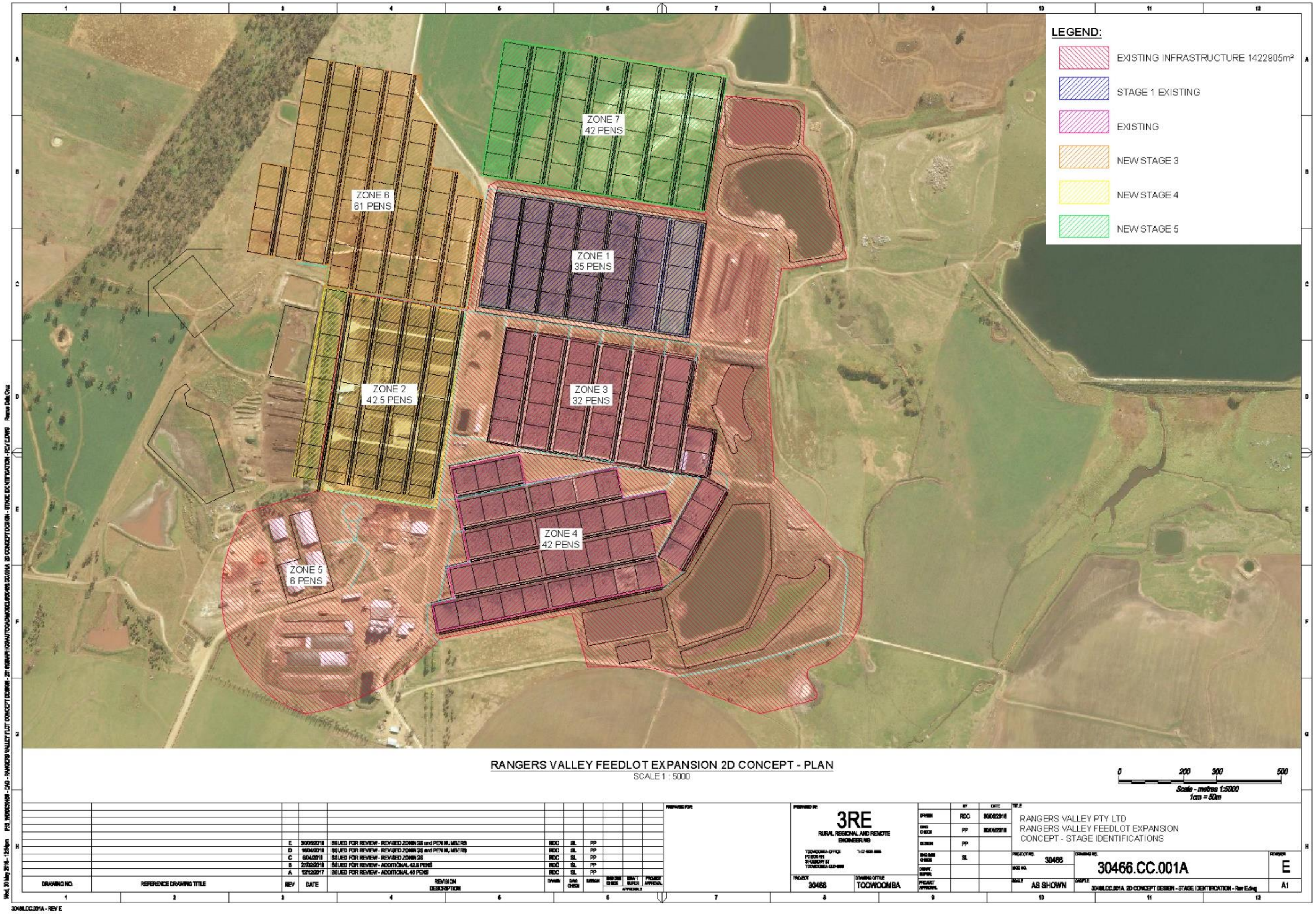


Figure 1 Site layout and stage plan

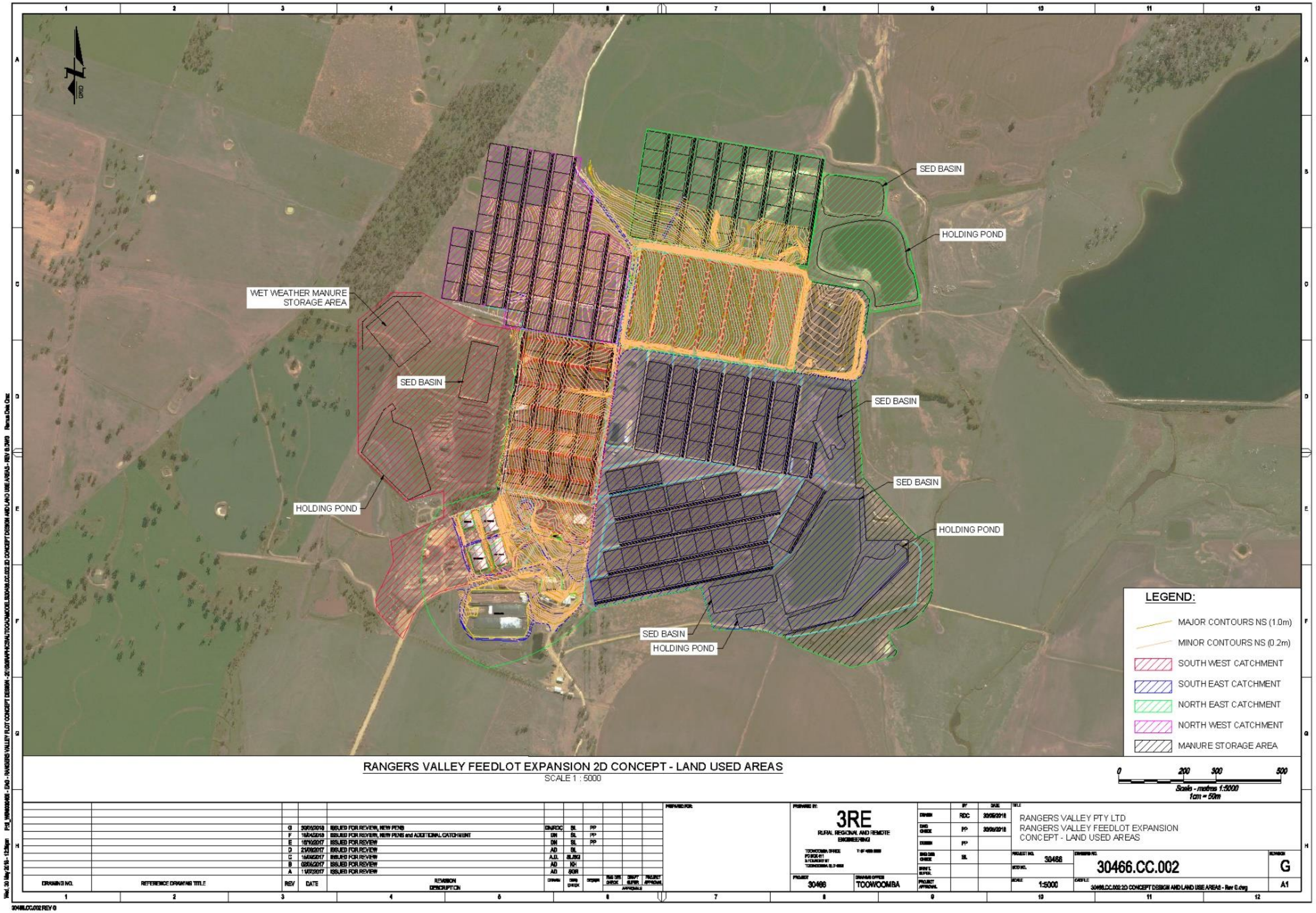


Figure 2 **Site layout and drainage**

3. Water Balance Modelling

The drainage system of a feedlot can be divided into the feedlot catchment and the liquid waste utilisation system. At the top of the feedlot catchment are the pens, and at the bottom is the holding pond. Runoff is collected from the feedlot complex and directed to the holding pond where it is stored. Water is pumped from the pond to the utilisation area. Runoff from the utilisation area is collected in the terminal pond and returned to the irrigation area or the holding pond.

A feedlot should have a well-defined catchment that does not allow the entry of external, uncontaminated runoff. The runoff from within the catchment is controlled, directed, and stored for later irrigation. Stored effluent must be irrigated onto the utilisation area. Excess irrigation or rainfall-induced runoff from this area must be temporarily held by a terminal pond, which removes excess nutrient entrained in this water.

Clean runoff water from areas upslope of the feedlot should be prevented from entering the feedlot facility or its associated land uses where waste may be collected, stored or treated. This runoff is excluded from these “controlled areas” by a clean water diversion bank. The controlled drainage area (CDA) is described as the area in which all wastewaters are controlled captured and stored. Therefore it is defined as the area from below the clean water diversion bank to the drains that pass wastewaters to the holding ponds.

In a feedlot CDA the majority of the land is used for pen area. Other land uses include, roads, drains, manure stockpiles, hard stands (truck parking, commodity dump areas etc), feedmill and sheds.

The FSIM model (Lott, 1995 and Lott, 1998) simulates the hydrological and mass balance of open cattle in a feedlot complex with particular emphasis on the water balance of the pen surface. The model uses physically based and distributed parameters to describe the various aspects of the hydrological balance and has been developed to incorporate variables for factors such as land use and feedlot management practices. The model has been calibrated and validated. It has been used to develop State and National Feedlot Guidelines in Australia.

Long-term daily climate data (precipitation and evaporation) for the site or a site representative station is a basic requirement. Output is in various forms and can be tailored to investigate the specific factors influencing the hydrology of the feedlot catchment. The model was developed using hydrological data collected in commercial feedlots. The FSIM model has been subsequently calibrated and the accuracy of its predictions of catchment conditions and rainfall runoff in feedlot catchments has been verified and tested (Lott, 1998). The search data and model was used to derive the co-efficient used in the current State and National feedlot guidelines (MLA, 2012).

The FSIM model was used to simulate the hydrological performance of the Rangers Valley feedlot catchment including the holding pond and effluent utilisation area. The modelling was undertaken for the full development.

This section of report discusses the principles underlying the FSIM model, the input data used in the model and presents the output predictions, comparing and contrasting them with those provided in the previous sections of the report.

3.1 Climatic Data

3.1.1 Data Requirements

The climate data required for a FSIM simulation are precipitation, temperature, humidity, radiation, and potential evaporation.

3.1.2 Evaporation Data

Evaporation can be demonstrated to be the most important climatic variable influencing the hydrological performance of the feedlot catchment, holding pond and wastewater utilisation area. To reliably model the hydrology of a feedlot, it is necessary to estimate, on a daily basis, the direct evaporation from the surface of the feedlot pen and the holding pond as well as the evapotranspiration from the wastewater utilisation area (Lott, 1998).

Lott & Skerman (1995) found hydrological balances based on daily variable evaporation estimates varied significantly from those based on monthly mean data with the two estimates of net annual evaporation varying by up to 30%. This has significant implications when issues such as the frequency of spill or overflow events are considered. Consequently, daily variable data is the preferred input for the FSIM model and should be used in preference to monthly mean data where available.

3.1.3 Climate Datasets

The climate of Rangers Valley is 'atypical' of most Australian lot feeding regions. The area is considered to be a generally temperate climate whereas most Australian feedlots are located in drier, hotter areas with sub-tropical or Mediterranean climates. The wetter and cooler character of the temperate climate can cause some difficulties with the utilisation of wastewaters due to extended wet periods that prevent irrigation. This can be accommodated through an increase in holding pond capacities that allow for longer-term storage of effluent.

The Rangers Valley feedlot is in a temperate area that has moderate rainfall and evaporation. This area is located in the north of a transitional zone separating the summer dominant rainfall belt of northern Australia and the winter dominant rainfall belt of southern Australia. The distance from the sea, its elevated position and its consequent lack of protection from southerly air streams gives its climate a "continental" type influence. It has warm to hot summers and cold to cool winters. In summer maximum daily temperatures typically range from 20°C to 30°C. During winter, minimum temperatures are usually 0°C to 5°C. Frosts are possible from April to mid-October inclusive but are most common during June, July and August.

The site is located approximately 10 kilometres south west of Deepwater, 16 kilometres east of Emmaville and 28 kilometres north of Glen Innes, New South Wales. The latitude is 29°30'S and longitude 151°45E.

The nearest Bureau of Meteorology (BoM) climate station recording detailed data (rainfall, wind, evaporation, etc.) is at Glen Innes NSW Agriculture Research Station (station number: 56013). The station is location approximately 26 kilometres south of the feedlot site. Two other BOM stations (recording daily rainfall, wind and temperature only) are also located in Glen Innes. These stations are the Emmaville Post Office (station number: 56011) and the Airport (station number: 56243). The nearest BoM weather station with a similar climate to Rangers Valley is a Pindari Dam some 50 kilometres west of Rangers Valley.

The precipitation datasets for the other stations generally cover 100 years or more and are of reasonable quality (>99% original data & <1% patched data for missing values).

Given the intrinsic variability associated with climatic data, the length of the historical record used in the modelling of feedlot hydrology is an important consideration in determining the confidence that can be placed in modelled outcomes. This is particularly the case in determining the size of a holding pond and predicting the frequency of "spill" or overflow events.

Data records longer than 30 years are generally required to model spill events where the design criteria is a spill frequency less than one of 1 in 10 years. Ideally, more than 50 years of historical climate data should be used if available. To provide an acceptable level of accuracy and precision as well as conservative modelled outcomes representative of the development site, a composite meteorological dataset using precipitation data for 1889 through to 2016 was compiled for use in the FSIM modelling.

The 127 year dataset was obtained from the Silo enhanced climate database hosted by the Science Delivery Division of the Department of Science, Information Technology and Innovation (DSITI), July 2016). Of all the sites considered it provides the longest, most robust and conservative data set.

The average climate data has changed since the initial modelling was undertaken (in 2001) with a decrease of rainfall by 10mm per year and an increase in 174mm of evaporation. The Bureau of Meteorology site used for current and previous modelling is the same site.

Table 2 Glen Innes (Station number 056012) monthly average rainfall and daily evaporation depths

Month	Monthly Rainfall (Ave mm)	Daily Evaporation (Ave mm)
January	105.6	5.4
February	92.9	4.8
March	69.5	4.1
April	41.5	3.1
May	48.5	2.0
June	53.1	1.5
July	55.5	1.7
August	49	2.5
September	54.9	3.6
October	75.4	4.5
November	91.1	5.0
December	110.1	5.5
Total	**847.1**	**43.7**

3.1.4 Runoff and Water Balance of a Manure Covered Pen

The accumulated manure (faeces and urine) on the surface of the feedlot pens acts as a significant store of water in the water balance a pen area catchment. The characteristics of the manure also influence the volume of runoff from rainfall events, the amount of nutrients and organic matter entrained on the runoff and the amount of odour generated.

The mass of faeces voided each day by cattle (with a full gut) is typically equivalent to between 5 and 6% of the body weight of the animals and has a wet basis moisture content greater than 80%. Voided urine typically constitutes around 30% of the manure produced each day. In contrast manure can be air dried to a wet basis moisture content of around 6% (Watts *et al*., 1994 and Sweeten & Lott, 1994). Given an average bulk density of 750 kg/m^3, the above range of potential moisture contents equates to a capacity for 100 mm of dry, compacted manure to store up to 280 mm of water. Storage of this amount of water would be associated with substantial expansion of particulate matter in the manure and water filling all the voids between the manure particles such that 100 mm of dry manure would become 300 mm of wet manure.

Due primarily to compaction resulting from cattle trampling the manure pad on the surface of the pen, the manure develops a stratified profile that is generally found to consist of up to three layers.

Immediately above the soil surface in the pen, an interface layer 25 to 50mm deep develops. This layer consists of organic matter from the manure mixed with the soil fabric. The trampling of cattle facilitates the mixing and compacts the manure and soil particles in this layer, so increasing the bulk density and reducing the hydraulic conductivity. Significantly, the manure is also a significant source of the monovalent cation forms of sodium and potassium. Overrepresentation of these cations on colloidal matter in this interface layer causes dispersion of the colloidal material. This exacerbates the compaction caused by the cattle trampling the manure, further increasing bulk density and reducing hydraulic conductivity. In addition, microbial decomposition of the organic matter releases complex carbohydrates and organic molecules that fill the voids between particulate matter and occlude pores increasing bulk density and further reducing hydraulic conductivity. The net result of these influences is that this interface layer usually has a bulk density of between 1,000 and 1,700 kg/m^3. By comparison, the manure above this layer typically has a bulk density of between 750 and 930 kg/m^3 while the underlying soil may have a bulk density of 1,400 to 1,600 kg/m^3 (Lott, 1998).

The hydraulic conductivity of the interface layer has been found to be in the range of 5 x 10^{-13} m/s and 3 x 10^{-12} m/s (Walker *et al*., 1979 and Southcott & Lott, 1997). Consistent with this Mazurak (1976), in a study undertaken in a Nebraska feedlot, found the hydraulic conductivity of the interface layer to be less than 4% that of the soil 100 mm deeper. These characteristics mean that the interface layer can be considered to effectively provide a barrier to water in the manure pad infiltrating into the underlying soil profile. Similarly, the interface barrier also prevents water borne pollutants directly entering the soil profile from the manure pad (Lott, 1998).

The condition of the manure above the interface layer varies with time and is dependent on factors such as rainfall, evaporation, stocking density, cattle trampling (which has different effects depending on the moisture content) and the manure management practices of feedlot pens. Lott (1994 & 1998) found that the condition of this manure could be reliably classified using one of the following descriptions:

(1) Powdery-smooth-dry;

(2) Smooth-compact-moist;

(3) Rough-wet ("puggy"); and,

(4) Smooth-saturated.

Each condition depends on manure moisture content and mechanical disturbance of the surface manure by cattle movement. Importantly:

- Maximum runoff occurs in conditions 2 and 4;
- Maximum sediment erosion occurs in conditions 1 and 4;
- Maximum odour nuisance and least runoff occurs in condition 3; and,
- Minimum odour and maximum runoff occurs in condition 2.

The rainfall-runoff relationship of surface of a manure covered pen is discussed in detail in Lott (1998). Figure 3 shows the conceptual water balance of a pen. It accounts for the gains and losses of moisture by the pen surface. The manure on the pen surface represents a store of water and its characteristics (slope and roughness) may influence its water balance and the rainfall-runoff process from the pen surface. The parameters of interest, when understanding the water balance of the manure are:

- Stored water;
- Infiltration;
- Depression storage;
- Temporary storage);
- Evaporation; and,
- Surface runoff.

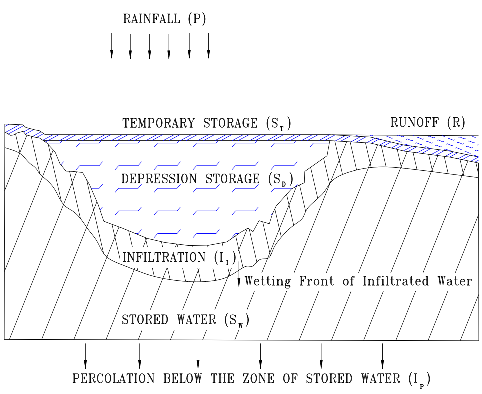


Figure 3 Conceptual model of the water balance of the cattle pen surface

The volume of runoff from a pen can be quantified by the following relationship (Lott, 1998):

Equation 1 Volume of Runoff

$$R = P - S_T - S_D - I - S_W - I_P$$

where R = runoff;
P = precipitation;
S_T = temporary storage;
S_D = depression storage;
I = infiltration;
S_W = stored water; and,
I_P = percolation below the zone of stored water.

The FSIM model uses the four pen conditions (1 – 4) described above to characterise pen surface storage (S) and infiltration (I) in the above relationship.

A factor significantly impacting on the above relationship is the amount of water added to manure by the cattle (Watts, 1994). Cattle excrete faeces and urine that, when combined, have a mass equivalent to 5-6 % of the animal's body weight. It is anticipated that the mean live weight of cattle in the proposed feedlot will be about 350-450kg.

A 450kg animal of this size can be estimated to produce about 25kg of manure (faeces and urine) per day. Of this, 21 kg is water and 4kg is dry matter. As a consequence, the amount of manure-derived water deposited on the pen surface can be seen to be dependent on the stocking density and the live-weight of the stock (refer Figure 4). The maximum stocking density in the proposed feedlot is 16.5 m^2 per SCU. FSIM incorporates these additions when undertaking its daily step estimate of the pen surface water balance.

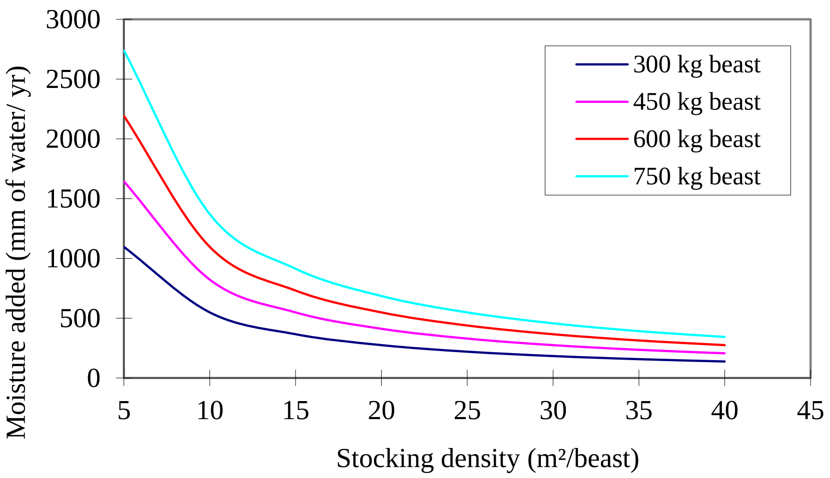


Figure 4 Moisture added to manure pad at various stocking densities of cattle of various live-weights (Sweeten & Lott, 1994)

The capacity of the pen surface to absorb water can vary with manure depth, manure condition and the gradient of the manure pad.

Empirically derived data on the rate of manure accumulation (Watts et al., 1994) is shown in Figure 5. At the proposed stocking density of 20 m² per SCU, the estimated rate of manure accumulation using this relationship is 83 mm/yr or 0.23mm/day (dry compact manure in pen condition 2). The amount of water able to be stored in the manure pad (Sw) increases with the mass of manure present on the pad. FSIM takes the accumulated depth of manure and its condition into consideration in undertaking the calculations for the pen surface water balance.

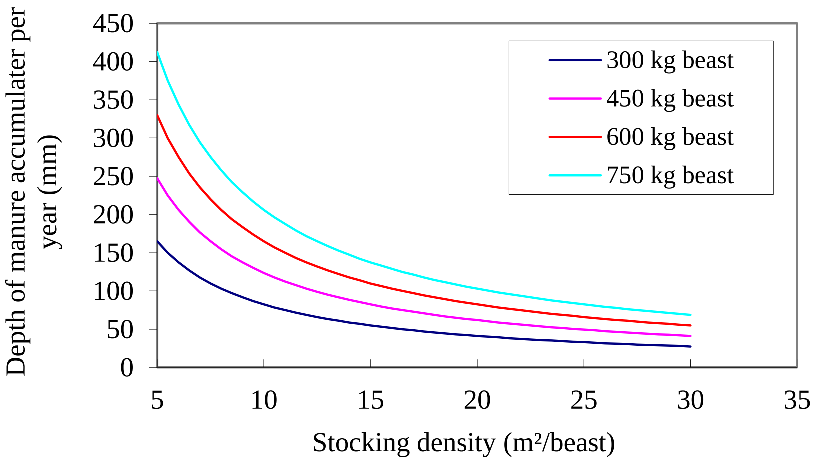


Figure 5 Depth of manure accumulated annually at various stocking densities of cattle of various live-weights (Watts et al., 1994)

Based on the above, at any given stocking density the amount of manure in the pens will be a function of the time since cleaning and the frequency of cleaning. This has implications for the condition of the manure in the pens. Lott (1998) found that compared to the regular intermittent cleaning of all of the pens, the continuous sequential cleaning of the pens reduces the incidence, extent and duration of pen condition 3 in the pen areas and the catchment that contributes to runoff to the waste water systems.

The depth of the manure and the moisture influences the amount of rainfall retained on the surface (ST) and in depressions (SD) in manure surface (Lott, 1994). This effect is not consistent across all pen conditions with manure depth being a significant influence on surface detention with pen condition 3 but not 1, 2 and 4. Condition 3 is typified by "puggy" conditions where indentations made by the hooves of the cattle are more likely to form and persist on the surface of manure. Surface detention is also influenced by the gradient of the pen slope (Lott, 1994). However, this effect is least for pen condition 2 and 4.

Considering the above, it is evident that runoff from pens is determined by a multifarious relationship between factors as diverse as the live-weight of the cattle, climate, stocking density, the pen cleaning frequency and pen slope. A model such a FSIM allows all these factors to be integrated into the estimates of runoff from the cattle holding pens, so enhancing the precision and accuracy of the modelled outcomes.

It is important to note that most animals will be "empty" when they arrive and as such they are likely to void substantially less manure than shown in Figures 3 and 4. Consequently the FSIM model undertaken will be very conservative with regard to manure accumulations and characteristics.

3.2 Runoff from Other Land-Uses in the Feedlot

While the feedlots open cattle holding pens have the most variable runoff yield and comprise the largest land-use in the feedlot controlled drainage area, other portions of the catchment can contribute significant amounts of runoff and have a significant effect on the hydrology of the catchment, the wastewater holding ponds and the irrigation areas.

Roadways, laneways and other hard stands generate significant runoff. After an initial abstraction of around 5mm, the remainder of a rainfall event can be considered to contribute directly to runoff from these areas. Similarly, an initial abstraction of around 7 mm can be expected for the drainage system within the controlled drainage area (Lott, 1998).

Harvested manure in stockpiled areas has the capacity to store a substantial amount of rainfall. Lott (1998) found that an initial abstraction of around 25 mm was a reasonable approximation for windrowed manure. Hardstand areas with a compacted cover between the windrows can be expected to provide an initial abstraction of around 7 mm.

The runoff from the grassed ("soft") areas and vegetated waterways within the catchment are able to be reliably determined using the approach used in USSCS model (USDA, 1971). This model assigns "k" values based on catchment condition and antecedent rainfall to the various areas within the catchment. These k values are then used to estimate runoff based on daily precipitation data.

3.3 Empirical Design of Holding Ponds

The design principles of feedlot holding ponds (referred to as the Primary Wastewater Pond) are discussed in detail in Lott (1994), ICIAI (1997), SCARM (1997), Lott (1998) and Skerman (2000).

The principal design function of holding ponds is to store feedlot runoff until such time as the pond effluent can be safely used for irrigating the wastewater utilisation area. Depending on the time for which the runoff is stored in the holding pond, microbial degradation (principally anaerobic) of the entrained organic matter may occur, a portion of any mineralised nitrogen may be lost to volatilisation and denitrification processes and a proportion of the water will be lost to evaporation (Lott, 1994 and ICIAI, 1997). Some sludge build-up may also occur through settlement of the entrained solids (Lott, 1994).

3.3.1 Single Storm Sizing Method

Until comparatively recent times, a commonly utilised approach to holding pond design was to treat the holding ponds as short-term retention systems. The applicable design criteria were for the pond to be capable of retaining the runoff from a major storm event (1 in 20 year 24 hour storm). Typically, runoff coefficients of 0.8 were used for feedlot pens, laneways and hardstand areas and 0.4 for grassed areas (ICIAI, 1997; SCARM, 1997; MLA, 2012). The required storage volume using the "major storm" concept can be determined using the following relationship:

Equation 2 **Holding pond formula**

$$V = [(A_h \times C_h) + (A_s \times C_s)] \times {}^{y}I_t / 100$$

where V = required storage volume (ML);

${}^{y}I_t$ = rainfall intensity (mm/24hr) of design storm having duration t_c;
A_h = area of "hard" catchment (ha);
C_h = a hard catchment runoff coefficient;
A_s = area of "soft" catchment (ha); and,
C_s = a soft catchment runoff coefficient.

An estimate of the required storage volume in the holding pond as determined using the "major storm" approach is shown in Equation 7.

Table 3 Design details of holding pond (major storm event approach)

Parameter		Value
Holding pond formula		
1 in 20 yr 24 hour storm	${}^{y}I_t$	127.20 mm/24hr (5.30mm/hr)
"Hard" catchment area	A_h	126.4 ha
Runoff coefficient	C_h	0.8
"Soft" catchment	A_s	56 ha
Runoff coefficient	C_s	0.4
Storage volume	V	157.12

The "major storm" design concept used above is based on the premise that holding ponds are only used for the short-term storage of runoff and that the pond contents can be fully utilised in the wastewater utilisation area between significant rainfall events. Unfortunately, major rainfall events are often associated with episodic periods of wetter than normal weather and seasonal and climatic factors may necessitate the long-term storage of runoff until such time as it can be safely assimilated in the wastewater utilisation area. Further, sludge build-up may also reduce the effective storage volume. Consequently, holding ponds designed on the above basis have often been found to have an unacceptably high frequency of “spill” or overflow events (more than an average of once every 10 years) due to the effective storage capacity being insufficient to accommodate the accumulated runoff in a 90 percentile wet year (Lott, 1998).

Thus, the storage capacity defined by Table 3 is determined to be inadequate; substantially undersized.

A more robust alternative to the major storm event approach is that carried out by undertaking a water balance for the entire feedlot catchment (controlled drainage area and wastewater utilisation area). This water balance needs to be modelled on at least a monthly step basis using site representative metrological data. Using this approach, the required storage volume is that capable of preventing the holding pond from overflowing in a 90 percentile wet year (ICIAI, 1997 and SCARM, 1997). In determining this capacity consideration also needs to be given for the storage of accumulated solids.

The FSIM model (Lott, 1998) is a daily step model developed specifically for open cattle pens such as those used in the feedlot catchments. The FSIM model simulates the material balance of both water and nutrients within a feedlot catchment using distributed parameters to describe the relevant system processes.

Catchment hydrology is modelled using separate algorithms for pen areas, “hard” surfaces such as roadways and “soft”, largely vegetated surfaces. The algorithms have been validated against standard methodologies used for catchment hydrology calculations (USDA, 1971 and Pilgrim, 2001). Model output has been verified by comparison with comprehensive hydrological measurements made in four catchments within three feedlots in southern Queensland. The design capacity of the holding ponds as determined using the FSIM model is detailed in 3.4 of this report.

3.3.2 Catchment Areas versus Holding Pond Size

Table 4 and Table 5 below show the land use areas by catchments. The difference in total catchment areas is shown in Table 1 and discussed in Section 2.

As a result of the reduced catchment area the required holding pond capacities for the combined catchment is also reduced. The holding pond and sediment basin that was proposed to be constructed in the north-west pen area is not required and the runoff from these new pens will be directed to the south western ponds.

The changes in holding pond capacities are show in Table 6, along with a comparison of catchment area to pond holding capacity. The proposed changes will result in a reduction in the following changes:

- a reduction in catchment area of 296,458 m^2; and,
- a decrease in holding pond capacity of 24.2 ML.

Table 4 Current Land Use Areas by catchment (Approved 2004)

LAND USE	Northwest (m^2)	Northeast (m^2)	Southwest (m^2)	Southeast (m^2)	Manure Storage (m^2)	Total Land use Area (m^2)
Pens	180,000	187,500	168,000	288,000	0	823,500
Roads	40,100	29,900	27,000	69,000	0	166,000
Drains	38,400	37,400	24,000	50,000	0	149,800
Grass	48,100	91,800	288,800	113,000	53,900	595,600
Area of Sedimentation basins	19,000	29,000	26,000	34,000	0	108,000
Area of Holding Ponds	43,000	44,000	58,100	96,000	70,000	311,100
Manure storage and Processing area	0	0	0	0	25,200	25,200
Hay storage area	0	0	18,600	0	0	18,600
Other hard standing areas (including buildings)	0	0	17,000	300	0	17,300
Total Catchment Areas (m^2)	**368,600**	**419,600**	**627,500**	**650,300**	**149,100**	**2,215,100**

Table 5 Proposed Land Use Areas by catchment (Revised 2017))

LAND USE	Northwest (m^2)	Southwest (m^2)	Northeast (m^2)	Southeast (m^2)	Manure Storage (m^2)	Total Land use Area (m^2)
Pens	184,140	127,600	269,192	268,740	0	849,672
Roads	47,311	29,560	47,260	61,191	4,952	190,274
Drains	20,279	14,850	25,452	24,480	0	85,061
Grass	0	0	53,856	149,328	0	203,184
Area of Sedimentation basins	0	23,656	11,392	28,070	0	63,118
Area of Holding Ponds	0	53,548	21,879	46,365	0	121,792
Manure storage and Processing area		0	0	0	141,470	141,470
Hay storage area	0	18,600	18,600	0	0	37,200
Other hard standing areas (including buildings)	0	17,000	0	300	0	17,300
Total Catchment Areas (m^2)		**284,814**	**447,631**	**578,474**	**146,422**	**1,709,071**

Table 6 Summary of holding pond capacities and catchment to holding pond ratios

Holding Pond	Current		Proposed		Net Change	
	Pond Surface (m^2)	Pond Volume (ML)	Pond Surface (m^2)	Pond Volume (ML)	Pond Surface (m^2)	Pond Volume (ML)
Northwest	43,000	20.7				
Northeast	44,000	68.0	21,879	76.5	-22,121	8.5
Southwest	44,000	44.0	53,548	140	9,548	96.0
Southeast	96,000	248.7	46,365	120	-49,635	-128.7
Final Irrigation Pond/Wet Weather Storage	70,000	250.0	70,000	250	0	0.0
Total	297,000	631.4	191,792	586.5	-62,208	-24.2
Total Catchment Area (m^2)	2,215,100		1,918,642		-296,458	

3.4 FSIM Modelling

3.4.1 Input data

The values used for the major input variables in the FSIM model are provided in Table 7. The data for the parameters were either design values discussed elsewhere in the Environmental Impact Statement or derived from comparable production data for feedlots elsewhere. Catchment areas were estimated by measurements from the engineering drawing provided in Figure 1.

Table 7 Values for major input variables in the FSIM feedlot hydrology model (Full development)

Parameter		**Values**	
Rangers Valley Feedlot	**NW & SW Catchment**	**NE Catchment**	**SE Catchment**
Feedlot capacity	18,893	16,315	16,287
Mortality rate	0.3%	0.3%	0.3%
Market type	Feedlot	Feedlot	Feedlot
Entry live weight	350 kg	350 kg	350 kg
Exit live weight	750 kg	750 kg	750 kg
Pen capacity	218 head	218 head	218 head
Stocking density	16.5 m²/head	16.5 m²/head	16.5 m²/head
Pen width	60 m	60 m	60 m
Pen depth	60 m	60 m	60 m
Pen slope	0.03 m/m	0.03 m/m	0.03 m/m
Feedlot class	1	1	1
Maximum manure depth	50 mm	50 mm	50 mm
Cleaning frequency	6 times/year*	6 times/year*	6 times/year*
Catchment characteristics			
Area Feedlot drains	35,129 m²	25,452 m²	24,480 m²
Initial loss drains	7 mm	7 mm	7 mm
Area roadways	76,871 m²	47,260 m²	61,191 m²
Initial loss roadways	5 mm	5 mm	5 mm
Internal CDA waterways	0 m²	0 m²	0 m²
Grassed waterway K1 K2 K3 values	35, 45, 55	35, 45, 55	35, 45, 55
Area grass	209,571	53,856	149,328
Grass K1 K2 K3 values	35, 45, 65	35, 45, 65	35, 45, 65
Manure stockpile area	59,417 m²	26,879 m²	55,174 m²
Manure bulk density	900 kg/m³	900 kg/m³	900 kg/m³
Maximum stockpile height	10 m	10 m	10 m
Initial loss stockpile	25%	25%	25%
Initial loss pavement	7%	7%	7%
Primary wastewater holding pond max surface area	53,548 m²	21,879 m²	46,365 m²
Primary wastewater holding pond max depth	4 m	4 m	4 m

* Pen cleaning 6 times per year is equivalent to approximately every 60 days.

3.4.2 Feedlot Runoff and Holding Pond Capacity

The design of the feedlot includes a series of holding ponds. Using an iterative approach, numerous runs of the model were performed to derive an optimum design capacity for the holding ponds able to satisfy the design criteria of overflowing or "spilling" at a frequency less than once every 10 years.

Iterations using the 127 year composite dataset found that the optimum capacities and "spilling" frequencies for the 3 FSIM models were as follows:

- NW & SW catchment, 140 ML capacity and 11 spills;
- NE catchment, 76.5 ML capacity and 8 spills;
- SE catchment, 120 ML capacity and 10 spills.

The volume of wastewater stored in the holding pond each day over a 127 year runtime from 1889 to 2016 of the simulation is shown for the NW/SW catchment (Figure 6), SE catchment (Figure 7) and NE catchment (Figure 8) together with the spill events.

Transfer of wastewaters between the holding ponds and the wet weather storage will be via a "ring" pipeline and high volume transfer pumps and in the case of the NE and SE holding ponds by gravity flow through spillways.

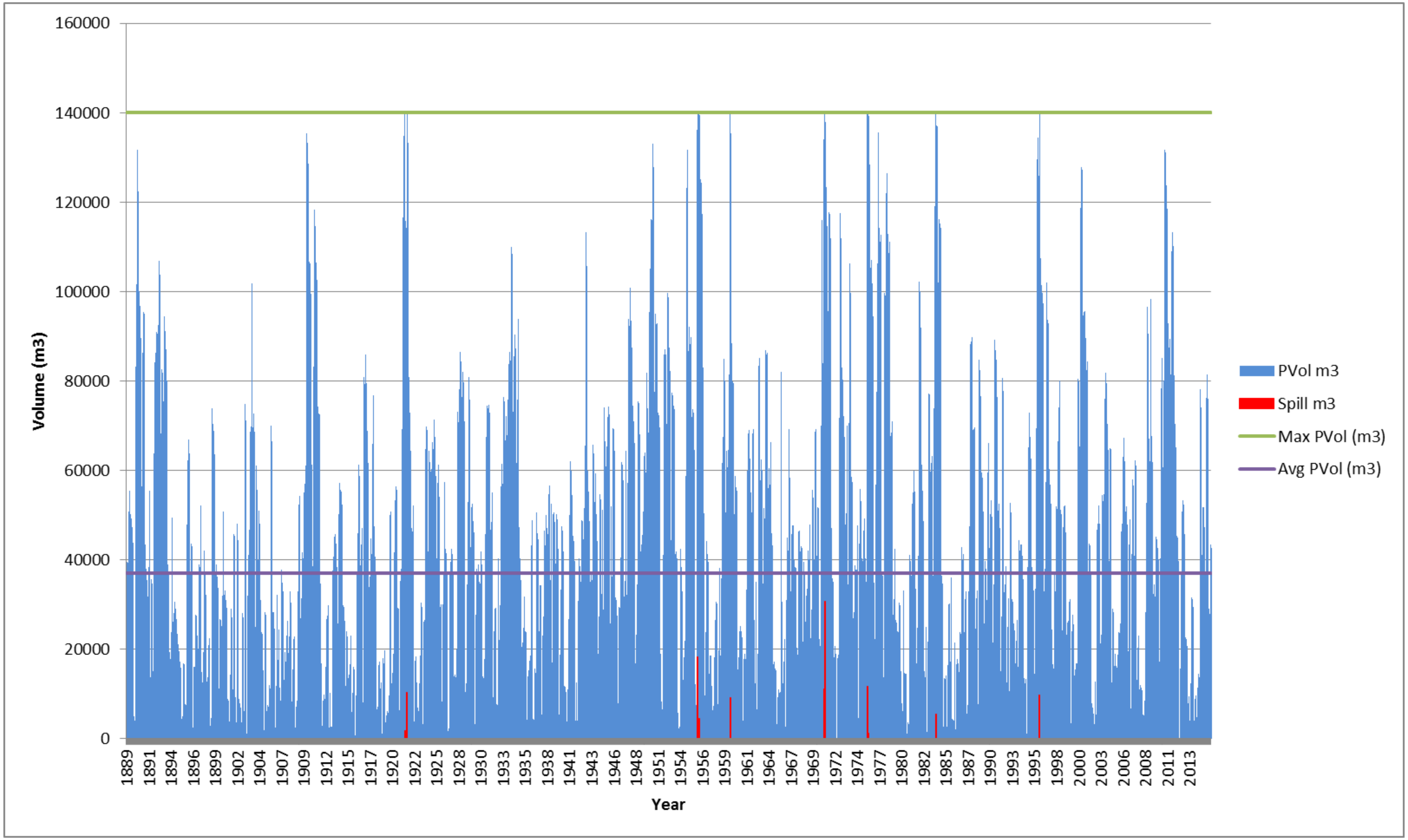


Figure 6 **Volume of wastewater stored NW/SW holding pond (Total Capacity) from 1889 to 2016**

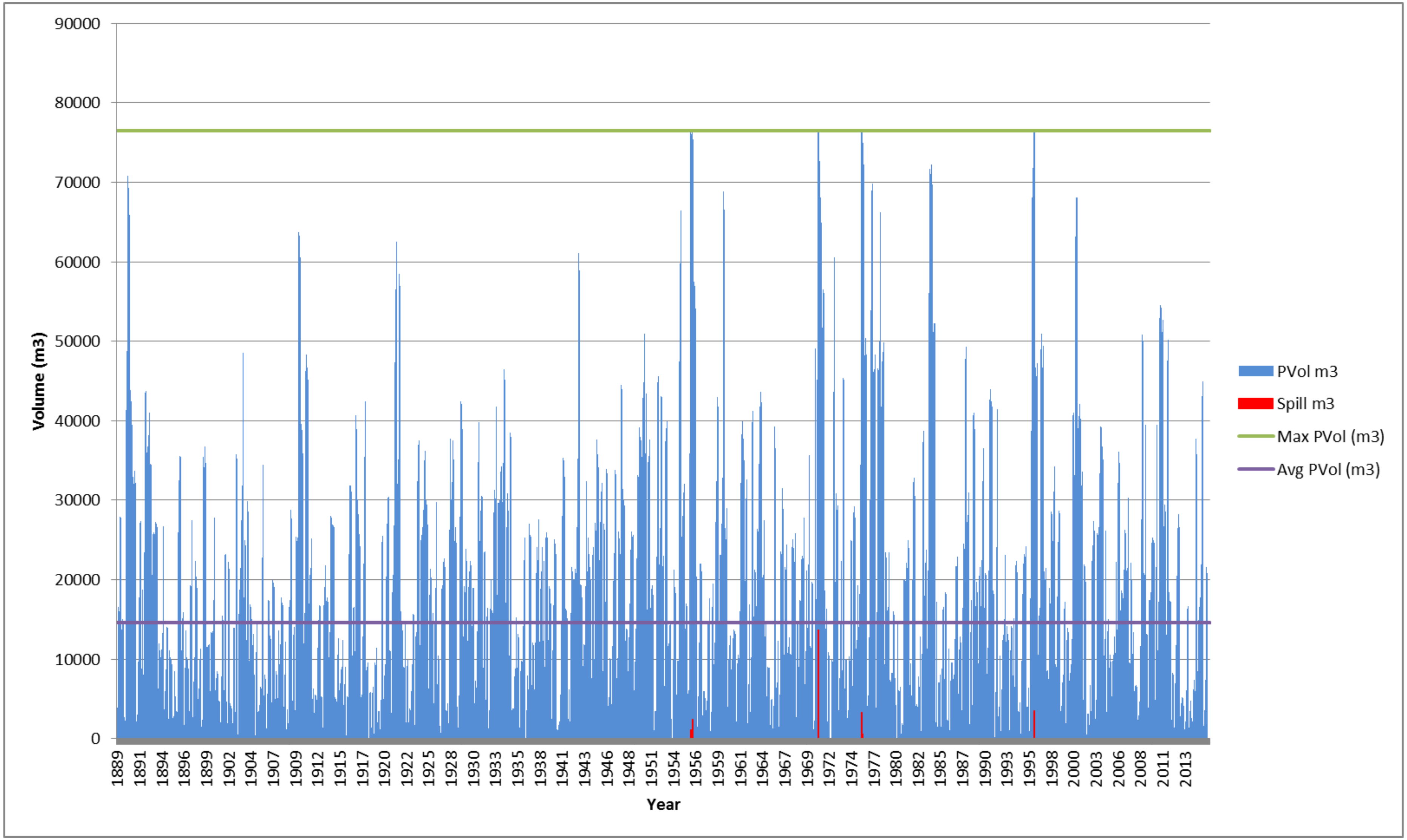


Figure 7 Volume of wastewater stored NE holding pond (Total Capacity) from 1889 to 2016

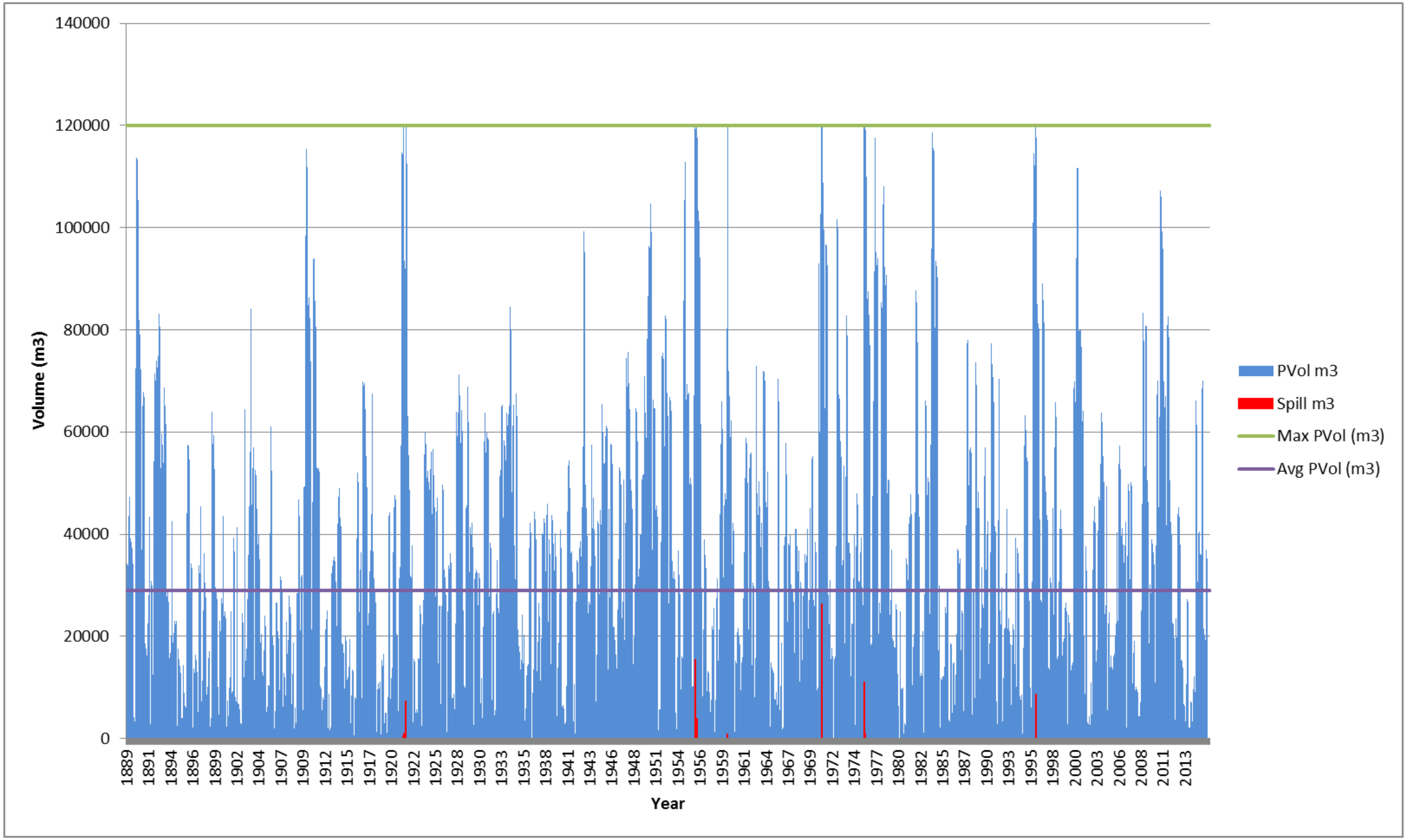


Figure 8 **Volume of wastewater stored SE holding pond (Total Capacity) from 1889 to 2016**

4. Design of Runoff Control Structures

The design principles of runoff control structures in open yard areas such as those in the feedlot are discussed in detail in Lott (1994), Lott & Skerman (1995), ICIAI (1997), SCARM (1997), Skerman (2000) and MLA (2012).

4.1 Drains

Runoff from the feedlot pen areas is to be collected in catch drains situated directly behind each pen. The pens are arranged in "back-to-back" rows (refer Figure 1). The configuration of the rows and the cross-slope gradient in the pens are designed to minimise the volume of runoff draining through adjoining pens.

The individual catch drains behind each row of pens are to discharge into main collection drains that will in turn discharge into a sedimentation system and ultimately the holding pond.

The catch drains and main drains need to be designed to both contain the flow volume and provide flow velocities that do not threaten channel stability at a peak flow rate equivalent to that from a design storm having an average recurrence interval (ARI) of 20 years (ICIAI, 1997, SCARM, 1997 and MLA, 2012). The maximum allowable flow velocity in channels is dependent on the characteristics of the material lining of the channel. High design velocities (>3 m/s) generally necessitate a concrete or masonry liner being applied. Where it is desirable to minimise any sedimentation of the entrained solids in the drains, minimum flow velocities (>0.3 – 0.5 m/s) may apply.

4.2 Sedimentation Basins

The aim of sedimentation system design is to provide flow velocities in the system low enough to allow for the settling of a minimum of 50% of the solids entrained in the CDA runoff in a design storm also having an ARI of 20 years (ICIAI, 1997 and SCARM, 1997). This level of sedimentation typically occurs when flow velocities are less than 0.005 m/s (Lott & Skerman, 1995). A performance standard requiring the settling of more than 50% of the entrained solids would require an exponential increase in detention time within the sedimentation system (as well as a correspondingly lower flow velocity) and therefore is generally impracticable and inefficient.

4.3 Peak Flow Velocities

To estimate the peak flow velocity in the catch drains, main drains and sedimentation systems it is necessary to determine the peak discharge of their respective catchments. The preferred method (ICIAI, 1997 and SCARM, 1997) for calculating the peak discharge of these catchments is the Rational Method as detailed by Pilgrim (2001). This methodology requires the prior estimation of the time of concentration of the catchments and the average rainfall intensity in the corresponding design storm.

Due to their relatively small size and the inability to derive observational data prior to construction, the Bransby Williams formula (Pilgrim, 2001) is often used to determine the time of concentration of feedlot catchments. This formula is given by:

Equation 3 **Bransby Williams formula**

$$t_c = \frac{58L}{A^{0.1} S_e^{0.2}}$$

where t_c = time of concentration (min);
L = mainstream length (km);
A = area of catchment (km²);
S_e = equal area slope (m/km).

4.4 Rainfall Intensity and Design

Having determined the time of concentration, the rainfall intensity of a design storm with an average recurrence interval of 20 years having a duration equal to the time of concentration can be derived for a location 29.50S 151.725E, using methodologies compatible with Canterford *et al*. (2001). The derived average rainfall intensity can then be applied to determine the peak volumetric flow using the formula for the Rational Method (Pilgrim, 2001) given by:

Equation 4 **Rational method formula**

$$Q_y = 0.278 C\ {}^{y}I_t\ A$$

Where Q_y = peak volumetric flow (m³/s) having an ARI of y years;
C = runoff coefficient (typically 0.8);
${}^{y}I_t$ = rainfall intensity (mm/h) of design storm having duration tc, and,
A = catchment area (km²).

Intensity-Frequency-Duration Table

Location: 29.500S 151.725E NEAR.. Rangers Valley Issued: 22/3/2017

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

	Average Recurrence Interval						
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	69.2	90.6	119	138	163	198	226
6Mins	64.5	84.4	111	128	152	184	211
10Mins	52.7	68.8	89.8	103	122	147	168
20Mins	38.5	50.0	64.5	73.7	86.2	103	117
30Mins	31.2	40.4	51.7	58.9	68.6	82.1	92.8
1Hr	20.9	27.0	34.2	38.7	44.9	53.4	60.2
2Hrs	13.6	17.5	21.9	24.7	28.5	33.7	37.9
3Hrs	10.5	13.4	16.8	18.8	21.7	25.6	28.7
6Hrs	6.68	8.54	10.6	11.8	13.6	15.9	17.8
12Hrs	4.20	5.36	6.63	7.41	8.49	10.0	11.1
24Hrs	2.56	3.28	4.09	4.60	5.30	6.24	7.00
48Hrs	1.48	1.91	2.43	2.76	3.21	3.82	4.31
72Hrs	1.04	1.35	1.74	1.99	2.32	2.78	3.15

(Raw data: 27.7, 5.5, 1.38, 50.49, 9.45, 2.62, skew=0.31, F2=4.35, F50=16.43) © Australian Government, Bureau of Meteorology

Figure 9 Intensity Frequency Duration Table (BOM:2017)

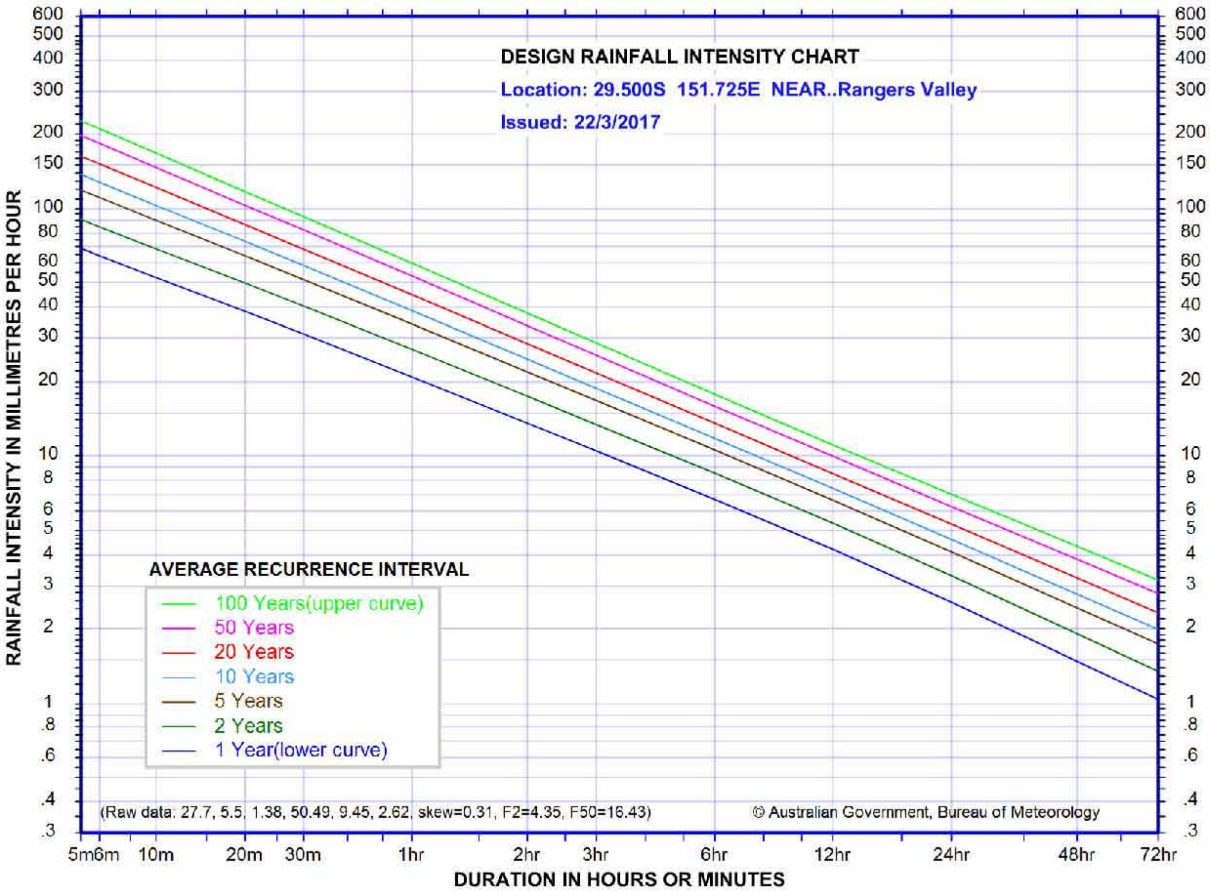


Figure 10 Design Rainfall Intensity Chart (BOM:2017)

The channels formed by the main drains are to be trapezoidal in cross-section. The bed width of the channel is usually determined by factors such as the operating width of the machinery cleaning and maintaining the drain. Using the peak volumetric flow rate determined above, the design dimensions of catch drains and main drains can be determined by solving for drain flow depth (*d*) the following equation (Skerman, 2000) derived from Manning's formula:

Equation 5 **Manning's formula**

$$Q_y = \frac{\left[W \times d + \frac{d^2 \times (z_1 + z_2)}{2}\right]^{5/3} \times S^{1/2}}{\left[W + d \times \left(\sqrt{1+z_1^2} + \sqrt{1+z_2^2}\right)\right]^{2/3} \times n}$$

where Qy = volumetric peak flow (m³/s) having an ARI of y years;
W = drain bed width (m);
d = drain flow depth (m);
z1 and z2 are the batter grades (1: z horizontal) of the channel sides;
S = gradient of the channel bed slope (m/m); and,
N = a Manning's roughness coefficient.

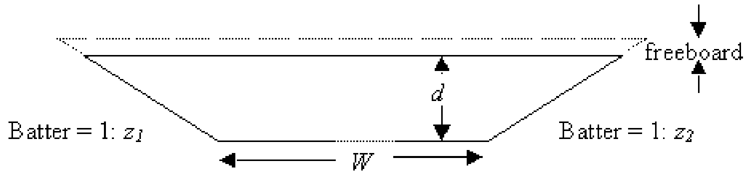
In the proposed development the drains will be lined with compacted gravel type material to provide a suitably durable surface for the dual purposes. Despite this form of lining, a conservative value for the Manning's roughness coefficient of 0.04 (Shaw, 1994; Skerman, 2000 & Loughlin & Robinson, 2001) should be applied to cater for any vegetative growth that might occur between cleaning operations in the drains.

Having established the drain flow depth it is then necessary to determine the flow velocity (*V*) in the channel using the following equation (Skerman, 2000) again derived from Manning's formula:

Equation 6 **Manning's formula**

$$V = \left[\frac{W \times d + \dfrac{d^2 \times (z_1 + z_2)}{2}}{W + d \times \left(\sqrt{1 + z_1^2} + \sqrt{1 + z_2^2} \right)} \right]^{2/3} \times \frac{S^{1/2}}{n}$$

The resultant design velocity should then be compared against tabulated maximum permissible flow velocities (Schwab *et al*., 1971 and Skerman, 2000) for similarly lined channels of various bed slopes. For channels lined with compacted gravel and having a bed slope gradient of 1 – 2%, a suitable maximum design velocity is 0.6 m/s. If the estimated design velocity exceeds the allowable maximum further iterations of the above calculations (Equations 3 and 4) can be undertaken using successively larger design widths for the drain bed until such time as the above design criteria are satisfied.



Freeboard

Where embankments are necessary to form the drains (eg irrigation tailwater drains), they need to be constructed to provide allowances for freeboard, settlement and minor undulations in addition to the calculated maximum drain flow depth. The degree of settlement will depend on soil type and the degree of compaction provided by construction equipment but can represent up to 20 to 25% reduction in finished embankment height (Skerman, 2000). An allowance of 0.15 m will normally account for undulations in most soils types (Skerman, 2000).

A suitable freeboard for feedlot drains is 0.5 metres (ICIAI, 1997). Side batter grades should less than 1:3 (ICIAI, 1997). Energy dissipaters may need to be placed where a catch drains terminate in the sediment basins and or main drain, so reducing the exit velocity from the channel (Lott, 1994). Design details for the catch and main drain are provided in Table 8.

Table 8 Design details of the pen catchments and main drain for each Sediment Basin catchment

Parameter	Symbol	Units	North East Catchment	North Western & South Western Catchment	South Eastern Catchment
Mainstream length	L	km	1.05	0.76	1.38
Catchment area	A	km^2	0.456	0.806	0.634
Equal area slope	S_e	m/km	12.9	2.68	23.12
Time of concentration	t_c	**min**	**39.5**	**37.0**	**44.7**
Rational method formula					
Runoff coefficient	C		0.80	0.80	0.80
Rainfall intensity (20 yr ARI)	${}^{y}I_t$	mm/hr	58.3	60.6	54.0
Peak volumetric flow	Q_y	m^3/s	**5.91**	**10.87**	**7.62**
Manning’s formula					
Lining	*Material*		Grass	Grass	Grass
Channel bed width	W	m	3	3	3
Upslope batter grade	z_1		2.5	2.5	2.5
Downslope batter grade	z_2		2.5	2.5	2.5
Channel bed gradient	S	m/m	0.05	0.05	0.05
Manning’s roughness coefficient	n		0.035	0.035	0.035
Channel flow depth	d	**m**	**0.3 m**	**0.3 m**	**0.3 m**
Channel flow velocity	v	**m/s**	**0.79 m/s**	**0.79 m/s**	**0.79 m/s**
Embankment height	$d + 0.5$	**m**	**0.80 m**	**0.80 m**	**0.80 m**

* Benching to be constructed in drainage channel to reduce channel flow velocity.

Sedimentation System Capacities

Sedimentation systems may be designed in the form of terraces, basins or ponds. These system types differ in respect to their aspect ratios and depth. Sedimentation terraces are shallow, relatively elongated structures with aspect ratios (*L*/*W*) of between 8:1 and 10:1. Sedimentation basins and ponds typically have similar aspect ratios (*L*/*W*) of between 2:1 and 3:1 but basins shallower (<1.5 m in depth) than ponds (>1.5 m in depth).

Sedimentation basins are designed to drain freely after each runoff event so allowing the collected solids to be dried and removed at frequent intervals. Sedimentation ponds are designed to allow solids from a series of runoff events to accumulate with decanting of the captured solids typically occurring at intervals of one to five years. A scaling factor (λ) is applied to the design volume to account for the storage capacity required to store the solids captured in the various types of sedimentation system between decanting or cleaning operations. The required volume of sedimentation systems can be estimated using the formula provided by SCARM (1997) given by:

Equation 7 **Required volume of sedimentation systems**

$$V = Q_y \frac{L}{W} . \frac{\lambda}{v}$$

where V = sedimentation system volume (m^3);
Qy = volumetric peak flow (m^3/s) having an ARI of y years;
L/W = aspect ratio of the system;
Λ = a scaling factor; and,
V = maximum design flow velocity (0.005 m/s).

Table 9 Design details of the Rangers Valley CDA sedimentation system structures

Parameter	**Symbol**	**Units**	**North East Catchment**	**North Western & South Western Catchment**	**South Eastern Catchment**
Mainstream length	*L*	km	1.05	0.76	1.38
Area of catchment	*A*	km²	0.456	0.806	0.634
Equal area slope	*Se*	m/km	12.9	2.68	23.12
Time of concentration	t_C	**min**	**39.5**	**37.0**	**44.7**
Runoff coefficient	*C*		0.80	0.80	0.80
Rainfall intensity	*I*	mm/hr	58.3	60.6	54.0
Peak flow rate	Q_p	**m³/s**	**5.91**	**10.87**	**7.62**
Aspect ratio	*L/W*		3	3	3
Scaling factor	*λ*		5	5	5
Design flow velocity	*v*	m/s	1.27	1.27	1.27
Required volume	***Vp***	**m³**	17,730	32,610	22,856
Design capacity		**m³**	46,475	58,620	91,468
Surface area		**m²**	11,392	23,656	28,070

Table 10 Original Design details of the Rangers Valley CDA sedimentation system structures

Parameter	**Symbol**	**Units**	**North East Catchment**	**North West Catchment**	**South Western Catchment**	**South Eastern Catchment**
Mainstream length	L	km	0.808	0.704	0.960	0.900
Area of catchment	A	km^2	0.4196	0.3686	0.453	0.649
Equal area slope	Se	m/km	21.818	21.591	27.801	21.053
Time of concentration	t_C	**min**	**27.590**	**24.410**	**29.060**	**31.610**
Runoff coefficient	C		0.80	0.80	0.80	0.80
Rainfall intensity	I	mm/hr	24.6	23.6	25.7	25.1
Peak flow rate	Q_p	**m^3/s**	**2.3**	**1.93**	**2.53**	**3.71**
Aspect ratio	L/W		3	3	3	3
Scaling factor	λ		5	5	5	5
Design flow velocity	v	m/s	1.27	1.27	1.27	1.27
Volume of Sediment Basin	Vp	**m^3**	6,900	5,790	7,590	11,130
Proposed Required volume	Vp	**m^3**	29,047	10,742	54,267	57,168

4.5 Wastewater System Design

4.5.1 Holding Pond Design

Batters

The internal batters of the pond design are for a 1V:5H slope from the inside crest to the floor. The upper part of the embankment will be protected from erosion through the use of topsoil and establishment of vegetation, and the use of the sacrificial layer beneath this.

The minimum external batters of the embankment are proposed to be 1V:3H. This batter will allow machinery to work a batter to allow maintenance and control of erosion. This is a safety requirement.

Crest and Freeboard

Embankments have a 6m design crest width (*nominal*) with a 1.5% slope (grading back towards the dam). The crest will be capped with a 150mm thick gravel aggregate to increase traffic ability and protection of embankment zones. The ponds are design with a 1 metre freeboard above the top water level.

4.5.2 Holding Pond Spillway

Irrespective of the design concept used, any holding pond is likely to spill or overflow following extraordinary rainfall events. Current guidelines (ICIAI, 1997 and SCARM, 1997) stipulate that the holding pond spillways be designed to handle a 1 in 50 year design storm. The volumetric peak flow resulting from a 50 year ARI design storm can be calculated using Equations 1 and 2. The design values determined using these equations are provided in Equation 8.

Equation 8 **Determination of Dimensions of a Weir for Peak volumetric flow – 50 year ARI storm**

$$Q_y = C_d . bH^{3/2}$$

where Qy = volumetric peak flow (m^3/s) having an ARI of y years;
Cd = a discharge coefficient;
b = weir crest length (m); and,
H = hydraulic head of the approach flow (m).

A broad crested weir discharge coefficient (C_d) of 1.7, obtained from published values (Isrealsen & Hansen, 1962; Shaw, 1994 and Jenkins, 2001), can be considered suitable for preliminary design work such as this. The design dimensions for the weir are provided in Table 12.

Table 11 Peak volumetric peak flow (Q_p) from a 1 in 50 year design storm

Parameter		Value
Bransby Williams formula (F.1)		
Mainstream length	L	1.38 km
Catchment area	A	0.659 km^2
Equal area slope	Se	23.12 m/km
Time of concentration	tc	44.5 min
Rational method formula (F.2)		
Runoff coefficient	C	0.8
Rainfall intensity (50 yr ARI)	^yI_t	65.3 mm/h
Peak volumetric flow	Q_y	9.56 m^3/s

The overflow from the primary holding pond needs to be released in a controlled manner by way of a weir. The required dimensions of a weir able to accommodate the peak volumetric flow from a 50 year ARI design storm (ICIAI, 1997) can be estimated by solving iteratively for weir crest length (*b*) and hydraulic head (*H*) the weir formula given in Equation 6. The resultant design details are provided in Table 12.

Constraints exist in terms of avoiding submergence of the weir due to subcritical flows at the peak design discharge apply. The extent of the spillway channel likely to be subjected to supercritical flows will need to be lined with a concrete or masonry liner. Again, more detailed engineering design for the weir and spillway structures will be undertaken as part of the detailed design work to be carried out prior to expansion of the feedlot.

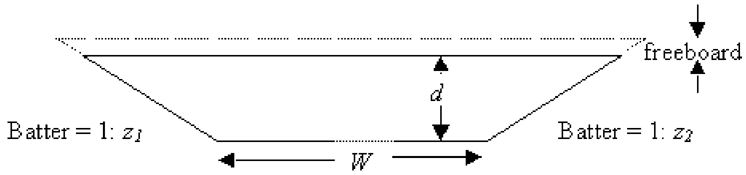
Table 12 Design Details for Primary Holding Pond Overflow Weir

Parameter		**Value**
Weir formula (F.7)		
Peak volumetric flow	Q_y	9.56 m^3
Discharge coefficient	C_d	1.7
Weir crest length	b	10 m
Head of approach flow	H	0.7 m
Mean flow velocity	v	1.27 m/s

The required dimensions of a trapezoidal spillway channel to carry the 50 year ARI peak flow can be determined iteratively by solving for various channel bed width and depth the Manning's formula equations (3 & 4). The holding pond spillway channel below the weir is to be trapezoidal in cross section and vegetated (mown grass). A Manning's roughness coefficient of 0.04 (Shaw, 1994 and Loughlin & Robinson, 2001) and maximum permissible flow velocity of 1.5 m/s (ICIAI, 1997 and Skerman, 2001) are applicable in this instance. The requirement for the spillway channel allowing critical or supercritical flow over the weir under normal flow conditions is an additional design criteria. The resultant design dimensions and design flow velocity of the spillway channel are provided in Table 13.

Table 13 Design details for holding pond spillway channel

Peak volumetric flow	**Qy**	**Y m^3/s**
Manning's formula (F.3 & F.4)		
Channel bed width	W	10m
Batter grade (1)	z_1	2.0
Batter grade (2)	z_2	2.0
Channel bed gradient	S	0.005 m/m
Manning's roughness coefficient	n	0.04
Channel flow depth	d	0.7 m
Mean flow velocity	v	1.27 m/s



4.6 Tail-water Systems

The runoff from a feedlot's controlled drainage area captured in the holding pond is to be irrigated on land adjacent to the feedlot complex where the nutrients and water can be utilised in plant production. The soil in the wastewater utilisation area provides a "sink" for the assimilation of applied nutrients.

The environmentally sustainable use of the wastewater utilisation area is directly related to the amount of nutrient applied to such areas, the amount of nutrient recovered in produce harvested or removed from the area and the amount of nutrient able to be safely stored in the soil. Some loss of nutrient (and salts) from the system will occur by way of leachate moving below the root zone of the crops and through processes such as erosive soil loss. It is also necessary for increased amounts of salt to be drained from the soil in the wastewater utilisation area by this means if salinization of the soil profile is to be avoided. This loss of nutrients and salts will not impact on the environmental value of any associated surface or groundwater resources.

Generally, one of the plant macronutrients (nitrogen, phosphorus or potassium), rather than either the hydraulic or the organic matter loading rate, is the limiting factor in determining the net annual application volume of wastewater in the utilisation area and, conversely, the required size of the utilisation area. The use of a source of "fresh" or "clean" irrigation water to supplement the applied wastewater will generally be necessary to help maximise crop yields and so maximise nutrient removal from the utilisation area. In the long term, rainfall, wastewater or irrigation water applications in excess of that utilised directly by the crops will be necessary to leach salts from the soil profile.

The amount and timing of both wastewater and fresh water applications will be largely determined by the irrigation requirement of the crops. In abnormally wet years or seasons, hydraulic loading may in the short term become the limiting factor on wastewater applications. Current guidelines (MLA, 2012) attempt to address this by stipulating that the wastewater utilisation area must be of sufficient size to allow wastewater irrigation in a 90 percentile wet year. Consistent with this, the FSIM model determines both the optimum size of the wastewater utilisation area and the optimum size of the holding pond necessary to provide sufficient storage capacity to safely store the wastewater in a 90 percentile wet year.

Under this proposal, irrigation of the wastewater utilisation area will be undertaken using a large lateral move and centre pivot irrigators, and areas of drip. When properly designed and managed such irrigators generate a minimum of irrigation tail-water. Nevertheless, the potential does exist where a significant storm event occurs during or immediately after a wastewater irrigation application for stormwater runoff from the wastewater utilisation area to transport unacceptable amounts of nutrient and other potential contaminants off-site. Consequently, it is necessary to employ a terminal or tail-water system to capture and recycle stormwater runoff from the wastewater utilisation area.

Current guidelines (ICIAI, 1997 and SCARM, 1997) stipulate that the terminal system must be capable of capturing and storing the runoff equivalent to a minimum of 12 mm over the entire wastewater utilisation area.

The required capacity of the terminal system can determined using the following equation (ICIAI, 1997; SCARM, 1997; MLA, 2012 and Skerman, 2001):

Equation 9 **Terminal system formula**

$$V = a + b$$

where V = volume of terminal system (m^3);
a = irrigation tailwater (m^3;, and,
b = stormwater runoff from the irrigation area (m^3).

The design capacity of the terminal system determined using this approach is shown in Equation 9.

Table 14 Design details for terminal system

Parameter		Min Value (32 approx..)
Terminal system formula		
Irrigation tailwater	a	0 mm
Rainfall runoff	b	12mm
Area (ha)	A	600ha
Terminal system capacity	V	54,000m³

The total 54ML design capacity of the terminal system would be provided by a tail water drain to the south of the flood irrigation area. Runoff collected in the tail-water system would be recycled through the irrigation system. The FSIM model is able to accommodate this recycling in its water balance calculations.

The tail-water pond will overflow with excess clean water inflows. Accordingly, the pond spillway should be designed to accommodate the runoff from at least a 1 in 20 year design storm for the wastewater utilisation area catchments (ICIAI, 1997 and SCARM, 1997).

The terminal pond will be largely cut below the natural surface. This will eliminate any prospect of catastrophic embankment failure. The by-wash and weir must be capable of handling a 1 in 50 year design storm. The by-wash is 25m and is cut on the lowest point on the terminal pond so water discharged to the natural flow line.

5. Design and Management of the Irrigation Areas

The runoff from the controlled drainage area captured in the holding pond is to be irrigated on land adjacent to the feedlot, where the nutrients and water can be utilised in plant production. Irrigation areas are shown in Table 15 and Figure 11.

The sustainable use of the wastewater utilisation areas directly relates to the amount of nutrients applied, the amount of nutrients recovered in harvested or removed produce from the area and the amount of nutrients able to be safely stored in the soil. Some loss of nutrients (and salts) from the system will occur by way of leachate moving below the root zone of the crops and through processes such as erosive soil loss. However, such losses of nutrients and salts should not impact on the environmental value of any associated surface or groundwater resources.

The use of a source of “fresh” or “clean” irrigation water to supplement the applied wastewater will be necessary to help maximise crop yields and to maximise nutrient removal from the utilisation area. The amount and timing of both wastewater and fresh water applications will be largely determined by the irrigation requirement of the crops. The water use for a perennial pasture has been calculated at 6.5 ML/ha. EnviroAg have used the FSIM modelling to calculate the annual effluent production to be about 340 ML.

Table 15 Rangers Valley Wastewater Irrigation Areas

Irrigation/Paddock name	Area (ha)	Summer crop	Winter crop
Pivot 1	50	Corn Silage	Rye grass, barley
Pivot 2B	46	Corn Silage	Rye grass, barley
Pivot 2C	51	Corn Silage	Rye grass, barley
Pivot 3A	42	Soybean	Rye grass, barley
Pivot 3B	49	Corn Silage	Rye grass, barley
Rye East	22	Improved pasture	Improved pasture
Rye West	21	Improved pasture	Improved pasture
Total (current)	**281**		
Crouches	35	TBD	TBD
Oaks Road	40	TBD	TBD
Old 2	36	TBD	TBD
Old 3	41.2	TBD	TBD
Show	21.5	TBD	TBD
Total (Proposed)	**173.7**		
Total	**454.7**		

Table 16 Rangers Valley Irrigation Usage

		Effluent Application		Fresh Application	
Paddock	**Area (ha)**	**Total (ML/yr)**	**ML/ha**	**Total (ML/yr)**	**ML/ha**
Pivot 1	50	40.0	0.8	285.0	5.7
Pivot 2B	46	36.8	0.8	262.2	5.7
Pivot 2C	51	40.8	0.8	290.7	5.7
Pivot 3A	42	33.6	0.8	239.4	5.7
Pivot 3B	49	39.2	0.8	279.3	5.7
Rye East	22	17.6	0.8	125.4	5.7
Rye West	21	16.8	0.8	119.7	5.7
Total (current)	**281**	**224.8**		**1601.7**	
Crouches	35	28.0	0.8	199.5	5.7
Oaks Road	40	32.0	0.8	228.0	5.7
Old 2	36	28.8	0.8	205.2	5.7
Old 3	41.2	33.0	0.8	234.8	5.7
Show	21.5	17.2	0.8	122.6	5.7
Total (Proposed)	**173.7**	**139.0**		**990.1**	
Total	**454.7**	**363.8**		**2,591.8**	

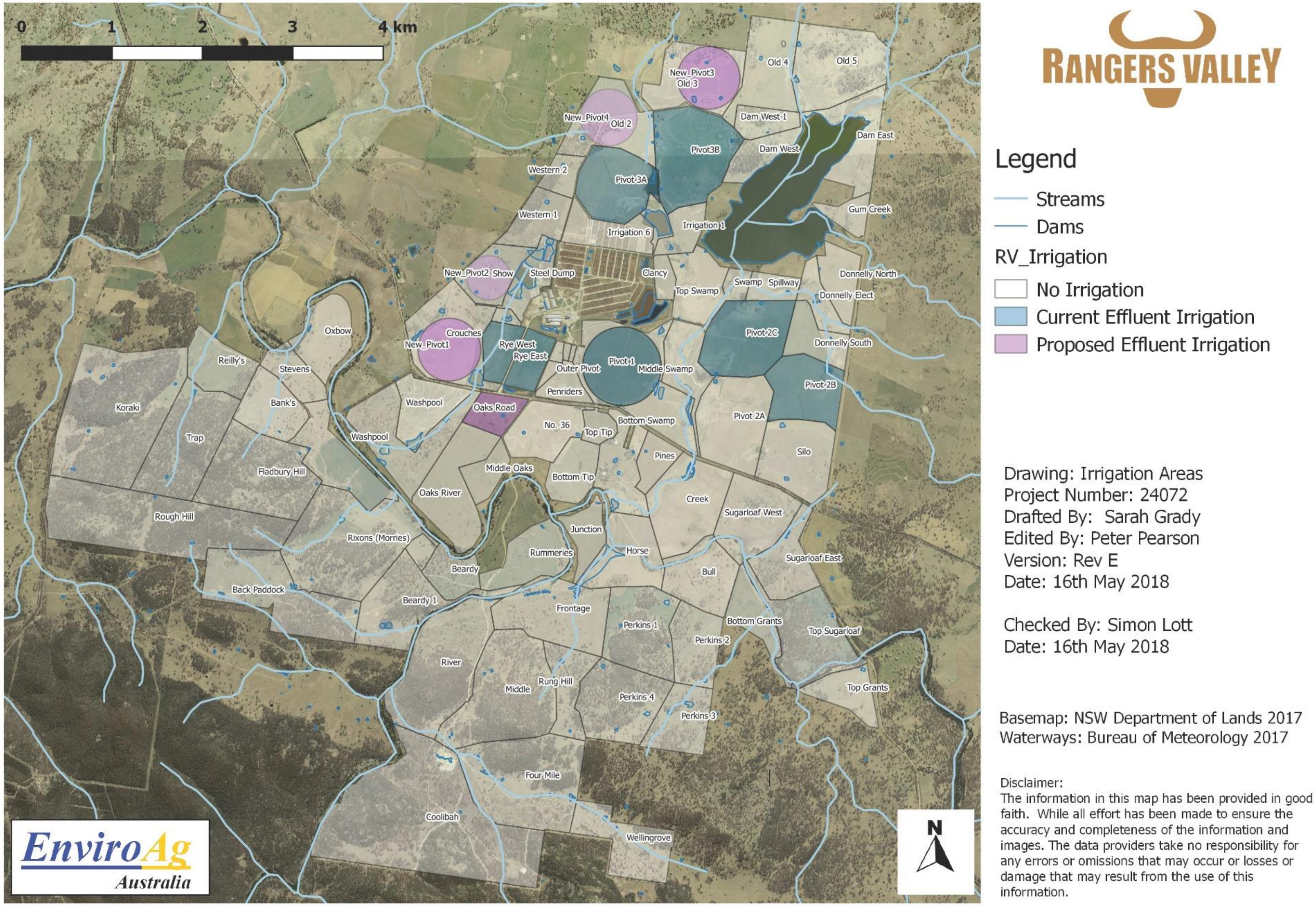


Figure 11 Wastewater irrigation areas

5.1 Wastewater Quality

Analyses of holding pond wastewater (Table 17) and manure (Table 18) have been undertaken as part of the existing operations.

The wastewater has been compared to average wastewater analyses undertaken by Skerman (2000). This shows that the wastewater varies mainly in regard to it being both less potassic and less sodic than the averages provided by Skerman (2000).

Table 17 Holding pond wastewater lab analysis

Analyte	Unit	MP11 Effluent Holding Pond	MP20 Effluent Holding Pond	MP26 Effluent Holding Pond	MP57 Effluent Holding Pond	Average RV	Average (Skerman 2000)
pH		7.5	7.6	7.6	7.7	7.6	7.6
Electrical conductivity	dS/m	1.1	0.95	0.36	2.0	1.1	
Sodium	mg/L	51	47	18	84	50	-
Potassium	mg/L	130	140	50	300	155	2053
Magnesium	mg/L	125	18	8.5	40	47.88	-
Calcium	mg/L	42	27	9.6	42	30.15	-
Total Phosphorus	mg/L	14	13	4.0	32	15.75	81
Total Nitrogen	mg/L	53	14	5.3	50	30.58	764
Nitrate Nitrogen	mg/L	<0.05	<0.05	<0.05	<0.05	0.05	0
Ammonia Nitrogen	mg/L	19	3.2	0.53	29	12.93	
Total Suspended Solids	mg/L	400	57	30	270	189.25	
TS (%) calculation using EC to calculate TDS							
Electrical conductivity	(µS/cm)	1100	950	360	2000		
Suspended Solids	(mg/L)	400	57	30	270		
TDS = EC x 0.65	(mg/L)	715	617.5	234	1300		
TS = TDS + SS	(mg/L)	1115	674.5	264	1570		
Total Solids	(%)	0.11	0.07	0.03	0.16	0.09	

Manure analyses found similar manure nutrient composition to Skerman's (2000) averages. However, the pH was more alkaline and electrical conductivity very low. Nitrogen and potassium are in line with the average stated by Skerman (2000).

Table 18 Manure lab analysis

Analyte	Unit	Manure screened 2016	Manure unscreened 2016	Average (Skerman 2000)
pH – water		8.52	8.40	6.85
Electrical conductivity	dS/m	7.76	4.13	12.39
Nitrate nitrogen	mg/kg	<200	230	-
Chloride	mg/kg	12000	5400	-
Moisture	%	38.5	40.4	-
Nitrogen	%	2.27	2.01	2.18
Calcium	mg/kg	26000	18000	-
Magnesium	mg/kg	9100	6500	-
Phosphorus	%	0.11	0.62	0.8
Potassium	%	2.3	1.4	2.32
Sodium	%	0.43	0.21	0.61
Sulphur	%	0.62	0.38	-
Zinc	mg/kg	280	200	-
Organic matter – ignition	%	28.4	24.8	-
Sodium absorption ratio		6	3	

5.2 Nutrient Budget – Waste Water Irrigable Area

5.2.1 Land Capability

Chemical and agronomic soil testing is undertaken regularly to determine the land capability of irrigation areas. Table 19 provides examples of the most recent results for some of the paddocks intended for irrigation with the treated wastewater. In summary it is noted that:

- The soil pH is neutral to slightly acidic throughout the profile.
- The cation exchange capacity of this soil is high in surface and subsurface soils. It should be able to hold plant nutrients well.
- Organic carbon levels are good in surface and subsoils.
- Exchangeable sodium is high in subsoils. This indicates that the soil is sodic.

Table 19 Example results of soil testing from planned irrigation areas.

Analyte	Unit	Crouches 0-30	Crouches 60-90	Show (Oats) 0-30	Show (Oats) 60-90
pH – water	pH units	6.38	6.7	5.31	6.53
Nitrogen (Total)	mg/kg	712	-	893	-
Nitrogen (Nitrate)	mg/kg	16	22	3	<1
Phosphorus - Colwell	mg/kg	248	3	125	5
Organic Matter	%	0.8	0.5	1.9	0.3
Electrical Conductivity	dS/m	0.08	0.1	0.03	0.02
Chloride	mg/kg	2	10	4	2
Cation Exchange	meq/100g	8.34	17.5	3.97	12.2
Exchangeable Sodium	meq/100g	0.06	0.42	0.04	0.1
Exchangeable Potassium	meq/100g	0.49	0.26	0.52	0.36
Exchangeable Calcium	meq/100g	5.95	11.4	2.69	8.59
Exchangeable Magnesium	meq/100g	1.84	5.47	0.72	3.12
Exchangeable Sodium percent	%	0.7	2.4	0.9	0.8
P sorption index		<1	69	28	54
Emerson Aggregate test		2(1)	3(2)	4	3(4)

5.2.2 Nutrient Budget – Waste Water Irrigation Area

The modelling undertaken in the hydrological assessment shows that the annual average yield of wastewater from the facility is expected to be approximately 340.4 ML/year. The yield in the wettest year in 10 years is expected to be in the order of 180ML/year. Thus, the irrigation application rate is estimated to be approximately 0.8 ML/ha/year. This is less than the expected crop water requirement of 4-8ML/ha/year. Some clean water will be available but will be limited.

The total proposed irrigable area 454.7 ha. The expected average nutrient content of the treated wastewater is shown in Table 20 and Table 21 below.

Table 20 Expected average nutrient content of treated wastewater using Rangers Valley effluent results

Attribute	pH	EC (dS/m)	TS (%)	TN (mg/L)	TP (mg/L)	K (mg/L)	Na (mg/L)
Effluent parameters (RV Ave from Table 17)	7.6	1.1	0.09	30.58	15.75	155	50
Average Annual WW Generation (ML).				340.4 ML			
Mass (kg/ha)	NA	NA	NA	-91.5	34.7	98.5	NA
Losses in Wastewater (Wet Weather Storage) (kg/ha)	NA	NA	50%:	40-70% (50%)^:	10-40 (25%)#:	10%:	NA
Irrigation Application (kg/ha)*	NA	NA	NA	22.3	49.8	725.8	NA

^ Volatilization (denitrification and evaporation)
# Chemical precipitation and deposition in algae detritus (sludges)
* Average values were used where no data present

Table 21 Expected average nutrient content of treated wastewater

Attribute	pH	EC (dS/m)	TS (%)	TN (mg/L)	TP (mg/L)	K (mg/L)	Na (mg/L)
Rangers Valley	7.6	1.1	0.09	30.6	15.8	155	NA
Average Annual WW Generation (ML).				340.4 ML			
Mass (kg/ha)	NA	NA	NA	8.0	8.2	80.6	NA
Losses in Wastewater (Wet Weather Storage) (kg/ha)	NA	NA	50%:	40-70% (50%)^:	10-40 (25%)#:	10%:	-
Irrigation Application (kg/ha)*	7.6	1.1	0.09	2.4	2.5	24.6	NA

^ Volatilization (denitrification and evaporation)

Chemical precipitation and deposition in algae detritus (sludges)

* Average values were used where no data present

Section 6.5.2 of the Original EIS details the soils on Rangers Valley and their management, Appendix C of the Original EIS was a detailed investigation into the soils on the property. The property has a varying landscape and a range of soil types ranging from light sandy loam soils derived from granite type rocks, through to heavy cracking clays which have been formed by alluvial deposition.

The soils in the irrigation areas have been described as podosols. The predominant soil type is a duplex soil which has a sandy loam clay surface horizon, a bleached sub-surface horizon and a sandy clay subsoil of variable nature (specifically clay content and colour). These soils comprise 70% of the soils found on the property. Soils on the remaining areas have been described as sodosols. They deliver a useful soil to sustain irrigated agriculture. The wet season delivers a moisture surplus. This significant episodic event provides a leaching fraction.

The SaLF (Salt and Leaching Faction) program (Department of Natural Resources, 1998) was used to assess the leaching fraction of the soil profile in the proposed irrigation area. Parameters were consistent with the soil profile as it is being used. Based on the model, the leaching fraction is estimated to be approximately 30mm/year (average). The model shows that it will take considerable time for the sodium to be removed from the profile due to the high clay content and low rainfall. Salinity may pose an issue if the irrigation of waste water is not managed correctly. Freshwater will be required to flush the soil profile in order to manage the sodic soils and potential salinity issues.

Given the leaching fraction; ongoing careful management of potential loss of nitrogen and phosphorus is important. This is best achieved by:

- Frequent moderate applications of irrigation;
- Maintaining an active plant growth;
- Maximising organic matter content to maximise nutrient holding capacity;
- Management of soil meta-metal balances by application of gypsum/lime; and,
- Maximising nutrient recovery by crop harvest.

5.2.3 Crops and Dry Matter Production

The irrigable areas currently grow corn silage (maize), oats, rye grass (improved pasture) (target of 5t/ha). The dry matter production from the irrigable areas is anticipated to be 10t DM/ha/year. Both grain and straw (baled hay) will be harvested from the areas. With a total annual DM harvest of 10t/ha, production will use about:

- 250 kg/ha of Nitrogen (N);
- 30 kg/ha of phosphorus (P); and,
- 275 kg/ha of potassium (K) each year.

The annual average rainfall for Glen Innes is 847 mm, whilst the annual average evaporation is 1,435 mm. Thus the average moisture deficit is in excess of 588mm/year. This is equivalent to an annual average water deficit of 5.88 ML/ha/year.

Crop water use is proportionate to the evaporation and consequent transpiration of the environment. A Crop Factor is applied to the evaporation to determine a transpiration rate. The Crop Factor considers soil and climatic factors to accurately determine the transpiration rates in different conditions.

Given the soil type, selected cropping regime, and considering the climatic data, a crop factor of 0.5 has been applied for all months. Given crop factors for improved pasture, the expected irrigation demand is in the order of 5-10 ML/ha/ year.

The 340 ML/year of available treated wastewater when applied across 454.7 ha with an efficiency of 90 % will supply only 0.8 ML of wastewater per ha per year. This is not sufficient to meet the irrigation demand for a fully irrigated improved pasture.

A nutrient budget using site data is provided in Table 22. It shows the input and outputs for the proposed irrigation area, given the proposed wastewater application rate and the crop production from the area.

Expected wastewater constituents are expressed in Table 22 (per the Hydrological calculations). It is from this data that application rates can be calculated.

With the P sorption, evapotranspiration rates and the removal of nutrients through harvesting crops, removal rates can be determined.

Table 22 Nutrient Budget for Rangers Valley Wastewater (kg/ha/year)

	N kg/ha	P kg/ha	K kg/ha
Inputs			
Fertiliser	162.6		
Wastewater	30.6	15.8	155
Outputs			
Evapotranspiration	0	0	0
Volatilisation	7.98	0	0
Runoff[(a)]	1.35	0.03	1.6
LF[(b)] (allowable)	5	0.1	10
Harvest	255	33.4	230.7
Phosphorus Sorption	-	156.7[c]	-
Change (Rangers Valley Effluent)	-76.13	-174.43	-87.3

(a) Annual average runoff will be ~40mm/ha or 0.4ML/ha. Runoff will carry some organics containing some nutrient, and, will preferentially dissolve and carry dissolvable ions especially potassium and sodium (that dissolve readily). CAR dams this water.

(b) LF = Leaching Fraction. Quantities based on concentrations in ANZECC guideline values for waters.

(c) Life of irrigable area 50years

The following assumptions were made in the preparation of Table 22:

- Composted manure is applied based on agronomic advices and if only a nutrient deficit exists;
- Harvest of pasture crops removes 10,000kg of dry matter per ha per year; and,
- The design life is 50 years (for exhaustion of P sorption in soils).

From Table 22, it is concluded that:

- Greater uptake of P and K is expected due to be compensated by plant luxuriant uptake;
- The health of the soil will be directly related to management of organic matter (to prevent a decline) and the use of lime and gypsum to manage the cation exchange balance (K and Na); and,
- Analysis of soils in the irrigation areas has observed N and P deficient soils;
- Nitrogen will need to be added as inorganic fertiliser to sustain the DM production rates.

Annual soil monitoring will continue to be undertaken to check nutrient levels in the soil. The crop type and application rates can be adjusted accordingly.

5.3 Manure Application

The nutrient budget for the manure application rate is set out below. A 20T single application every 2-4 years is undertaken to reduce soil damage by compaction.

Table 23 Nutrient Budget (kg/ha/yr)

	N kg/ha	P kg/ha	K kg/ha
Inputs (Rangers Valley Manure)	2.01%	0.62%	1.4%
Inputs (Skerman 2000)	2.18%	0.8%	2.32%
Fertiliser		0	0
Manure (Rangers Valley)	351.7	213.7	542.6
Effluent (Rangers Valley)	20.6	46.0	669.9
Outputs			
Volatilisation	290	0	0
Runoff[(a)]	40	4	400
LF[(b)] (allowable)	5	0.1	10
Harvest	225.8	28.9	196.4
Phosphorus Sorption	-	48[©]	-
Change (Rangers Valley)	-405	35.9	-420

The manure application rate of 20T/ha every 2-4 years shows that inadequate nutrients are applied with each application with the exception of Phosphorus. It is for this reason that manures will be applied and monitored until sufficient nutrients are available. Phosphorus content in soil will be monitored as a sentinel variable.

Given the loss of nutrients through the harvesting of crops, it is expected that manure and effluent will need to applied regularly and monitored carefully to ensure adequate nutrients are available for plant uptake. It is likely that effluent will be used to irrigate the area to the south of the feedlot until there are adequate or an excess of nutrients. At this stage effluent will be irrigated on approximately 454.7 ha with centre pivot. It is expected that the site specific effluent and manure analytical results will vary depending on the seasonal conditions.

The paddocks have deficits of nitrogen and potassium and a surplus of phosphorus. The nitrogen deficit will be offset by nitrogenous fertilisers in cropped land or legume sin pasture (for hay and grazing). The P surplus will be taken up by soil sorbtion to a point where the soil complex becomes saturated. Available P should be monitored annually and the sorbtion capacity will need to be monitored tri-annually.

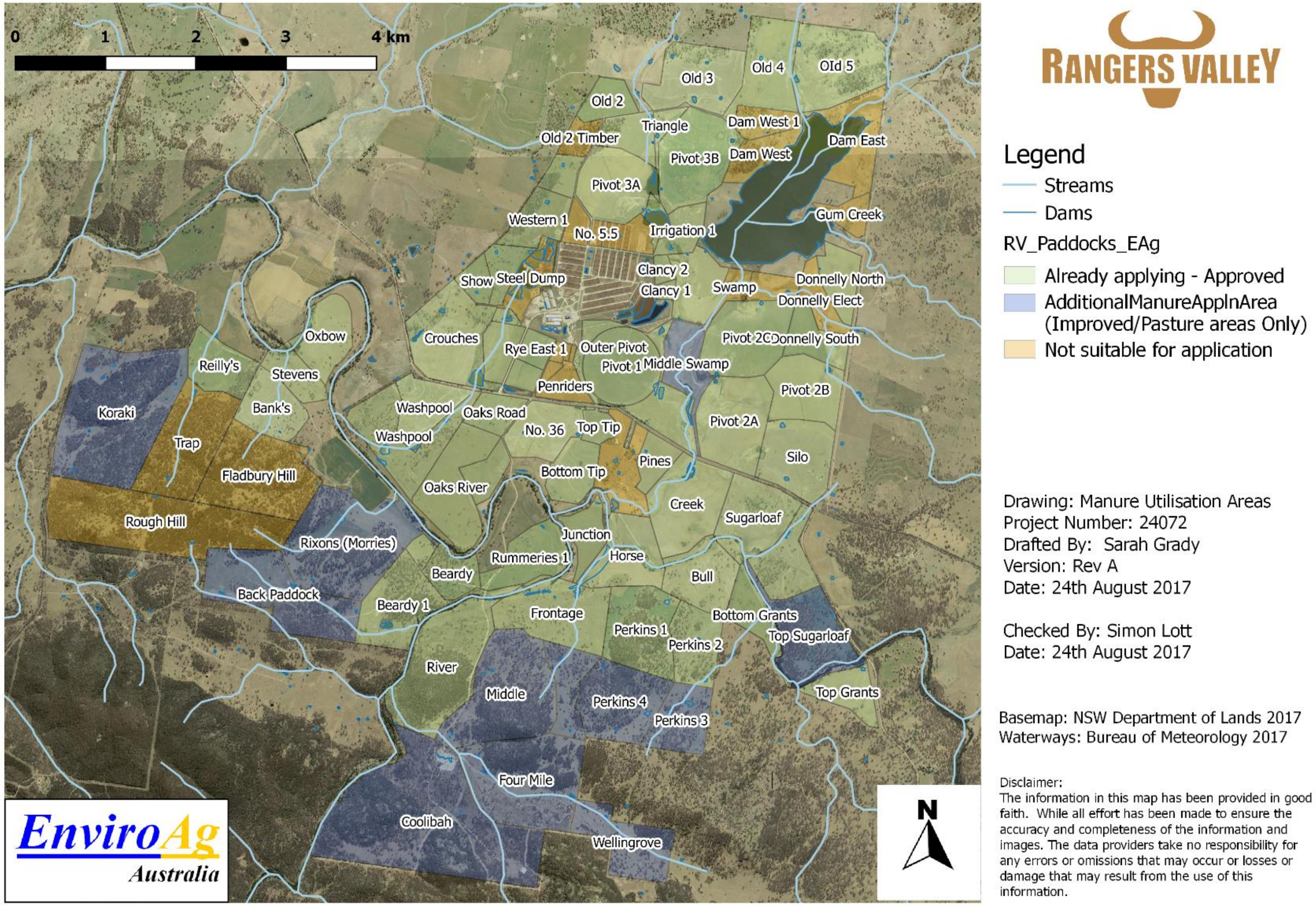


Figure 12 Manure Application Areas

6. Conclusion

It is concluded that:

- The active areas of the Rangers Valley Feedlot are above any historical flood level.
- The existing and proposed sedimentation systems and holding ponds are adequately sized such that will result in less than 1 spill per 20 years.
- Drain structures and terminal pond have been appropriately sized.
- The waste utilisation areas have adequate capacity for sustainable waste disposal.

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Appendix C. Current Environmental Projection Licence

Environment Protection Licence

Licence Details	
Number:	3864
Anniversary Date:	01-September

Licensee
RANGERS VALLEY CATTLE STATION PTY LTD
PO BOX 63
GLEN INNES NSW 2370

Premises
RANGERS VALLEY CATTLE STATION
1304 RANGERS VALLEY ROAD
GLEN INNES NSW 2370

Scheduled Activity
Crushing, grinding or separating
Extractive activities
Livestock intensive activities

Fee Based Activity	**Scale**
Cattle, sheep or horse accommodation	> 2500 T accommodation capacity
Crushing, grinding or separating	> 30000-100000 T annual processing capacity
Land-based extractive activity	> 30000-50000 T annual capacity to extract, process or store

Region
North - Armidale
Ground Floor, NSW Govt Offices, 85 Faulkner Street ARMIDALE NSW 2350
Phone: (02) 6773 7000
Fax: (02) 6772 2336
PO Box 494 ARMIDALE NSW 2350

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

RANGERS VALLEY CATTLE STATION PTY LTD
PO BOX 63
GLEN INNES NSW 2370

subject to the conditions which follow.

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Livestock intensive activities	Cattle, sheep or horse accommodation	> 2500 T accommodation capacity
Crushing, grinding or separating	Crushing, grinding or separating	> 30000 - 100000 T annual processing capacity
Extractive activities	Land-based extractive activity	> 30000 - 50000 T annual capacity to extract, process or store

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
RANGERS VALLEY CATTLE STATION
1304 RANGERS VALLEY ROAD
GLEN INNES
NSW 2370
RANGERS VALLEY, DUNDEE - EMMAVILLE ROAD, 14 KM FROM DUNDEE. FOR LOT AND DP DESCRIPTION REFER TO CONDITION A2.2.1

A2.2 **Premises details**

This licence refers to the premises of Rangers Valley. The full description of Rangers Valley is as follows:

Parish of Fladbury County of Gough
Lots 14, 15, 21, 24, 26, 27, 28, 30, 88, 89 of DP 753278
Lot 2 of DP 859230
Lot 25 of DP 659977

Parish of Rangers Valley County of Gough
Lots A, B, C, D, E of DP 1870
Lot H of DP 32737
Lot I of DP 215201

Lots 3, 17, 18, 20, 21, 22, 23, 24, 25, 31, 43, 44, 47, 48, 50, 53, 73, 74, 83, 84 of DP 753303
Pt Lots 1, 2, 7, 8, 9, 10, 14, 15, 16, 19, 32, 42, 45, 49, 52, 72, 75, 85, 86, 99, 126 of DP 753303

Parish of Wellington Vale County of Gough
Lots 221, 222, 223, 224 of DP 753323

Parish of Louis County of Gough
Lots 6, 7, 8, 9, 19, 21, 22, 23, 24, 25, 26, 32, 40, 67,120, 131 of DP 753291
Pt Lot 45 of DP 753291

A2.3 In relation to A2.1 the premises also includes the utilisation areas labelled as EPA Points 27 - 31 and management units 1 - 8 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03.

A3 Other activities

A3.1 This licence applies to all other activities carried on at the premises, including:

Ancillary Activity
Agricultural Produce Industries
Extractive Industries

A4 Information supplied to the EPA

A4.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.2 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identi-fication no.	Type of Monitoring Point	Type of Discharge Point	Location Description
2	Surface water quality monitoring		Surface water monitoring point (S2) at Cam Creek causeway on Deepwater Road at "Nant Park" labelled as EPA Point 2 on map titled Environmental Monitoring Points -Location of Surface Water Monitoring points dated 1st May 2007. See Fig 1 - 250832A1/10
3	Surface water quality monitoring		Surface water monitoring point (S3) at grassed waterway in Old 2 paddock labelled as EPA Point 3 on map titled Environmental Monitoring Points -Location of Surface Water MP dated 1st May 2007. See Fig 1 - 250832A1/10
4	Surface water quality monitoring		Surface water monitoring point (S4) at Cam Creek bridge on Rangers Valley Road labelled as EPA Point 4 on map titled Environmental Monitoring Points -Location of Surface Water MP dated 1st May 2007. See Fig 1 - 250832A1/10
5	Surface water quality monitoring		Surface water monitoring point (S5) at Severn River Bridge on the Yarraford Road labelled as EPA Point 5 on map titled Environmental Monitoring Points -Location of Surface Water MP dated 1st May 2007. See Fig 1 - 250832A1/10
6	Surface water quality monitoring		Surface water monitoring point (S6) at Severn River Bridge on the Emmaville Road labelled as EPA Point 6 on map titled Environmental Monitoring Points -Location of Surface Water MP dated 1st May 2007. See Fig 1 - 250832A1/10
7	Surface water quality monitoring		Surface water monitoring point (S7) at Beardy Waters causeway on the Haul Rd (2nd causeway) - upstream of confluence with Severn River, labelled as EPA Point 7 on map titled Env MP -Location of Surface Water MP dated 1st May 2007. (Fig 1)

8	Surface water quality monitoring		Surface water monitoring point (S8) at Severn River causeway on the Haul Road (first causeway) labelled as EPA Point 8 on map titled Environmental Monitoring Points -Location of Surface Water MP dated 1st May 2007. See Fig 1 - 250832A1/10
10	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Terminal pond and spillway servicing Pivot 3A and 3B including pump labelled as EPA Point 10 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
11	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Final effluent holding pond (on eastern side of the feedlot, known as E2) including spillway and irrigation pumps labelled as EPA Point 11 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2. 250832A1/10
13	Wet weather discharge Discharge quality monitoring	Wet weather discharge Discharge quality monitoring	Spillway for effluent holding pond known as W2 (on western side of feedlot) labelled as EPA Point 13 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
14	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Terminal pond and spillway servicing Pivot 1 and located in the paddock Bottom Swamp including pump labelled as EPA Point 14 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
20	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent holding pond (on western side of feedlot, known as W4) including spillway and irrigation pump labelled as EPA Point 20 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
22	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Effluent quality and volume monitoring Wet weather discharge Discharge quality monitoring Discharge to utilisation area	Terminal pond and spillway servicing Rye East and Rye West known as W5 including pump labelled as EPA Point 22 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10

24	Manure quality monitoring Mass monitoring	Manure stockpile and composting area containing screened and unscreened manure and labelled as EPA Point 24 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
26	Discharge quality monitoring	Dam located in the bottom corner of "Washpool Road" (13) paddock labelled as EPA Point 26 on map titled Env MPs-Location of Effluent MP dated 1st May 2007. see Fig 2 250832A1/10
27	Soil quality monitoring Mass monitoring	Effluent utilisation area known as Pivot 1 labelled as EPA Point 27 on map titled "Rangers valley cattle station Site Plan" dated 30.07.03.
28	Soil quality monitoring Mass monitoring	Effluent utilisation area known as Pivot 3A labelled as EPA Point 28 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03.
29	Soil quality monitoring Mass monitoring	Effluent utilisation area known as Pivot 3B labelled as EPA Point 29 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03.
30	Soil quality monitoring Mass monitoring	Effluent utilisation area known as Rye East labelled as EPA Point 30 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03.
31	Soil quality monitoring Mass monitoring	Effluent utilisation area known as Rye West labelled as EPA Point 31 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03.
34	Groundwater quality monitoring	Groundwater monitoring bore (34 located in corner paddock) labelled as EPA Point 34 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
35	Groundwater quality monitoring	Groundwater monitoring bore (35 located in the laneway north of Rye East paddock) labelled as EPA Point 35 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
36	Groundwater quality monitoring	Groundwater monitoring bore (36 located between ponds W3 and W4) labelled as EPA Point 36 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3

38	Groundwater quality monitoring	Groundwater monitoring bore (38 located on eastern point of effluent pond E2) labelled as EPA Point 38 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
40	Groundwater quality monitoring	Groundwater monitoring bore (40 located on adjoining fence line between Pivot 3A/3B) on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
41	Groundwater quality monitoring	Groundwater monitoring bore (41 below EPA point 14 in paddock Bottom Swamp) labelled as EPA Point 41 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
42	Groundwater quality monitoring	Groundwater monitoring bore (42 located in laneway between Pivot 1 and effluent pond E2) labelled as EPA Point 42 on map titled Env MP-Location of piezometer MP dated 1st May 2007. see Fig 3
43	Soil quality monitoring Mass monitoring	Utilisation area identified as the 'solid utilisation areas as identified on drawing No 19045-05 as quoted in the consent conditions' on map titled "Map 1 - Rangers Valley Cattle Station" submitted with a letter to the EPA on 25 October 2006.
44	Groundwater quality monitoring	Groundwater monitoring bore (44 located in the north eastern grassed area of the paddock known as Old 2) labelled as EPA point 44 on map titled Env MP-Location of Peizometer MP dated 1st May 2007. see Fig 3. 250832A1/10
45	Groundwater quality monitoring	Groundwater monitoring bore (45 located on eastern boundary of the paddock known as "Donnellys Elect" labelled as EPA point 45 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3
46	Groundwater quality monitoring	Groundwater monitoring bore (46 located in paddock known as "Oaks Road") labelled as EPA point 46 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3

47	Groundwater quality monitoring		Groundwater monitoring bore (47 located in paddock known as "Horse" labelled as EPA point 47 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3
48	Effluent quality and volume monitoring wet weather discharge. Discharge quality monitoring. Discharge to utilisation area	Effluent quality and volume monitoring wet weather discharge. Discharge quality monitoring. Discharge to utilisation area	Terminal Pond One and spillway servicing Pivot 2c located in the paddock known as Spillway including pump labelled as EPA Point 48 on map Titled Environmental Monitoring Points-location of Effluent MP dated 1st May 2007. see Fig 2
49	Effluent quality and volume monitoring. Wet weather discharge. Discharge quality monitoring. Discharge to utilisation area.	Effluent quality and volume monitoring. Wet weather discharge. Discharge quality monitoring. Discharge to utilisation area.	Terminal Pond Two and spillway servicing Pivot 2B and located in paddock known as Pivot 2B including pump labelled as EPA Point 49 on map Titled Env MP-location of Effluent MP dated 1st May 2007. see Fig 2
50	Effluent quality and volume monitoring wet weather discharge. Discharge quality monitoring. Discharge to utilisation area	Effluent quality and volume monitoring wet weather discharge. Discharge quality monitoring. Discharge to utilisation area	Terminal Pond 3 and spillway servicing Pivot 2B and 2C located in the paddock known as "wally's" including pump labelled as EPA Point 50 on map Titled Env MP-location of Effluent MP dated 1st May 2007. Fig 2
51	Soil quality monitoring. Mass monitoring		Effluent utilisation area known as Pivot 2B labelled as EPA Pont 51 on map titled "Rangers Valley Cattle Station" Site Plan date 30.07.03
52	Soil quality monitoring. Mass monitoring		Effluent utilisation known as Pivot 2C labelled as EPA Point 52 on map titled "Rangers Valley Cattle Station Site Plan date 30.07.03
53	Groundwater Quality Monitoring		Groundwater monitoring bore (53 located west of Terminal Pond 1 in the paddock known as spillway) labelled as EPA point 53 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3
54	Groundwater Quality Monitoring		Groundwater monitoring bore (54 located north of Terminal Pond Two in the paddock known as Pivot 2b) labelled as EPA point 54 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3

55	Groundwater Quality Monitoring	Groundwater monitoring bore (55 located south of Terminal Pond Three in the paddock known as Wallys) labelled as EPA point 55 on map Titled Env MP-location of Piezometer MP dated 1st May 2007. see Fig 3
56	Groundwater Quality Monitoring	Groundwater monitoring bore (56 located south of the northern holding pond N1 in the paddock known as Irrigation 1) labelled as EPA point 56 on map titled Env MP dated 1st May 2007. see Fig 3. 250832A1/10
57	Effluent Quality and Volume monitoring. Discharge to utilisation area.	Effluent holding pond (known as N1) irrigation pump labelled as EPA point 57 on map titled Env MP- Location of Effluent MP dated 1st May 2007. see Fig 2. 250832A1/10

P1.3 **Weather monitoring**

The following point(s) in the table are identified in this licence for the purpose of the monitoring of weather parameters at the point.

EPA identification number	Type of Monitoring Point	Description of Location
W1	Weather analysis	2 metre weather monitoring station located near the centre of the fed lot pens, and near row of only three pens numbered 95,96 and 97 at 29o-30'-24'S and 151o-44'18"E

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Volume and mass limits

L2.1 For the points identified below, no discharge to waters is permitted unless the specified volume of runoff is exceeded.

Point	Specified volume of runoff

11, 13	The runoff volume from the controlled drainage area draining to the effluent holding pond from a 1:20 year, 24 hour storm event, using volumetric runoff coefficients of 0.8 for the feedlot pens, roadways and other hard stand areas and 0.4 for grassed areas within the controlled drainage area;
14	The runoff volume from 12mm runoff generated from the drainage catchment for each point.

L2.2 For the purposes of this licence:

(a) Australian Rainfall and Runoff Data and rainfall data from the Australian Bureau of Meteorology for the premises is to be used to calculate the volume of runoff from a 1 in 20 year, 24 hour storm event.

(b) The *controlled drainage area* for EPA Point 11 consists of the *Eastern Catchment* defined on map titled "Rangers Valley Cattle Station Controlled Drainage Areas" dated 21.07.03. The *controlled drainage area* for EPA Point 13 consists of the *Western Catchment* defined on map titled "Rangers Valley Cattle Station Controlled Drainage Areas" dated 21.07.03; and

(c) The *drainage catchment* consists of the catchment areas identified in figure "Tailwater Dams – Catchment Plan & Details, Nov 2005" provided with the licence variation application dated 10 January 2006. In particular

Point 14 – 75 Ha catchment of tailwater dam labelled TW Dam 1

L3 Waste

L3.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L3.2 This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.

L4 Noise limits

L4.1 The continuous noise ($L_{Aeq\ 15\ min}$) emitted from the feedlot and associated facilities, when measured within 10 metres of any residence, outside of the property on which the project is constructed, must not exceed 45 dB(A) between the hours of 7.00am and 7.00pm, must not exceed 40dB(A) between the hours of 7.00pm and 10.00pm, and must not exceed 35dB(A) between the hours of 10.00pm and midnight and midnight and 7.00am on any day.

L4.2 Trucks must not enter or leave the premises between the hours of 10.00pm and midnight, and midnight and 7.00am on any day unless such truck movements are necessitated by the welfare of any animals on such trucks or circumstances beyond reasonable control of the licensee.

L4.3 The hours of operation specified in condition L4.2 may be varied with written consent if the EPA is satisfied that the amentity of the residents in the locality will not be adversely affected.

L5 Potentially offensive odour

L5.1 No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

L6 Other limit conditions

L6.1 The total number of cattle accommodated within the feedlot pens on the premises, at any one time, must not exceed 40 000.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O4 Effluent application to land

O4.1 Effluent application must not occur in a manner that causes surface runoff.

O4.2 Spray from effluent application must not drift beyond the boundary of the premises.

O4.3 Livestock access to any effluent application area must be denied during irrigation and until the applied effluent has dried.

O4.4 The licensee must retain the utilisation area.

O4.5 At least 14 days prior to a utilisation area being rendered unavailable for use, the EPA must be advised in writing of this intention.

O4.6 The quantity of effluent/solids applied to the utilisation area must not exceed the capacity of the area to effectively utilise the effluent/solids.

For the purposes of this condition, 'effectively utilise' includes the use of the effluent/solids for pasture or crop production, as well as the ability of the soil to absorb the nutrient, salt, hydraulic load and organic material.

O4.7 Irrigation of effluent must not be applied within,
(a) 100 metres of any watercourse or
(b) 50 metres of any public road.

O5 Processes and management

O5.1 The holding ponds must be maintained to ensure that sedimentation does not reduce their capacity by more than 20% of the design capacity.

O5.2 The feedlot pen surface must be maintained to prevent infiltration.

O5.3 Solids must be stored on an impermeable pad within the controlled drainage area.

O6 Waste management

O6.1 If solids are removed from the premises, the licensee must record:
a) the date of removing the solids;
b) the estimated weight of the solids removed; and
c) the identity of the person removing the solids.

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:

a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Water and/ or Land Monitoring Requirements

POINT 2,3,4,5,6,7,8

Pollutant	Units of measure	Frequency	Sampling Method
Calcium	milligrams per litre	Special Frequency 1	Representative sample
Chloride	milligrams per litre	Special Frequency 1	Representative sample
Conductivity	microsiemens per centimetre	Special Frequency 1	Representative sample
Magnesium	milligrams per litre	Special Frequency 1	Representative sample
Nitrate	milligrams per litre	Special Frequency 1	Representative sample
Nitrogen (ammonia)	milligrams per litre	Special Frequency 1	Representative sample
pH	pH	Special Frequency 1	Representative sample
Phosphorus (total)	milligrams per litre	Special Frequency 1	Representative sample
Potassium	milligrams per litre	Special Frequency 1	Representative sample
Reactive Phosphorus	milligrams per litre	Special Frequency 1	Representative sample
Sodium	milligrams per litre	Special Frequency 1	Representative sample
Sodium Adsorption Ratio	sodium adsorption ratio	Special Frequency 1	Representative sample
Total Kjeldahl Nitrogen	milligrams per litre	Special Frequency 1	Representative sample
Total suspended solids	milligrams per litre	Special Frequency 1	Representative sample

POINT 10,14,22,48,49,50

Pollutant	Units of measure	Frequency	Sampling Method
Calcium	milligrams per litre	Each overflow event	Representative sample

Chloride	milligrams per litre	Each overflow event	Representative sample
Conductivity	microsiemens per centimetre	Each overflow event	Representative sample
Magnesium	milligrams per litre	Each overflow event	Representative sample
Nitrate	milligrams per litre	Each overflow event	Representative sample
Nitrogen (ammonia)	milligrams per litre	Each overflow event	Representative sample
pH	pH	Each overflow event	Representative sample
Phosphorus (total)	milligrams per litre	Each overflow event	Representative sample
Potassium	milligrams per litre	Each overflow event	Representative sample
Reactive Phosphorus	milligrams per litre	Each overflow event	Representative sample
Sodium	milligrams per litre	Each overflow event	Representative sample
Sodium Adsorption Ratio	sodium adsorption ratio	Each overflow event	Representative sample
Total Kjeldahl Nitrogen	milligrams per litre	Each overflow event	Representative sample
Total suspended solids	milligrams per litre	Each overflow event	Representative sample

POINT 11,20

Pollutant	Units of measure	Frequency	Sampling Method
Calcium	milligrams per litre	Quarterly	Representative sample
Chloride	milligrams per litre	Quarterly	Representative sample
Conductivity	microsiemens per centimetre	Special Frequency 4	Representative sample
Magnesium	milligrams per litre	Quarterly	Representative sample
Nitrate	milligrams per litre	Special Frequency 4	Representative sample
Nitrogen (ammonia)	milligrams per litre	Special Frequency 4	Representative sample
pH	pH	Special Frequency 4	Representative sample
Phosphorus (total)	milligrams per litre	Special Frequency 4	Representative sample
Potassium	milligrams per litre	Quarterly	Representative sample
Reactive Phosphorus	milligrams per litre	Special Frequency 4	Representative sample
Sodium	milligrams per litre	Quarterly	Representative sample
Sodium Adsorption Ratio	sodium adsorption ratio	Quarterly	Representative sample
Total Kjeldahl Nitrogen	milligrams per litre	Quarterly	Representative sample
Total suspended solids	milligrams per litre	Each overflow event	Representative sample

POINT 13

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Each overflow event	Representative sample
Nitrate	milligrams per litre	Each overflow event	Representative sample
Nitrogen (ammonia)	milligrams per litre	Each overflow event	Representative sample

Nitrogen (total)	milligrams per litre	Each overflow event	Representative sample
pH	pH	Each overflow event	Representative sample
Phosphorus (total)	milligrams per litre	Each overflow event	Representative sample
Reactive Phosphorus	milligrams per litre	Each overflow event	Representative sample
Total suspended solids	milligrams per litre	Each overflow event	Representative sample

POINT 24

Pollutant	Units of measure	Frequency	Sampling Method
Calcium	milligrams per kilogram	Every 6 months	Representative sample
Chloride	milligrams per kilogram	Every 6 months	Representative sample
Conductivity	microsiemens per centimetre	Every 6 months	Representative sample
Magnesium	milligrams per kilogram	Every 6 months	Representative sample
Moisture content	percent	Every 6 months	Representative sample
Nitrate	milligrams per kilogram	Every 6 months	Representative sample
Nitrogen (total)	milligrams per kilogram	Every 6 months	Representative sample
Organic carbon	percent	Every 6 months	Representative sample
pH	pH	Every 6 months	Representative sample
Phosphorus (total)	milligrams per kilogram	Every 6 months	Representative sample
Potassium	milligrams per kilogram	Every 6 months	Representative sample
Sodium	milligrams per kilogram	Every 6 months	Representative sample
Sulfur	milligrams per kilogram	Every 6 months	Representative sample

POINT 26

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Every 6 months	Representative sample
Nitrate	milligrams per litre	Every 6 months	Representative sample
Nitrogen (ammonia)	milligrams per litre	Every 6 months	Representative sample
Nitrogen (total)	milligrams per litre	Every 6 months	Representative sample
pH	pH	Every 6 months	Representative sample
Phosphorus (total)	milligrams per litre	Every 6 months	Representative sample
Reactive Phosphorus	milligrams per litre	Every 6 months	Representative sample
Total suspended solids	milligrams per litre	Every 6 months	Representative sample

POINT 27,28,29,30,31,51,52

Pollutant	Units of measure	Frequency	Sampling Method
Aggregate stability	As approp.	3 years	Special Method 1
Available phosphorus	milligrams per kilogram	Yearly	Special Method 1

Cation Exchange Capacity	centimoles of positive charge per kilogram of soil	Yearly	Special Method 1
Chloride	milligrams per kilogram	Yearly	Special Method 1
Conductivity	microsiemens per centimetre	Yearly	Special Method 1
Exchangeable calcium	centimoles of positive charge per kilogram of soil	Yearly	Special Method 1
Exchangeable magnesium	centimoles of positive charge per kilogram of soil	Yearly	Special Method 1
Exchangeable potassium	centimoles of positive charge per kilogram of soil	Yearly	Special Method 1
Exchangeable sodium	centimoles of positive charge per kilogram of soil	Yearly	Special Method 1
Exchangeable sodium percentage	percent	Yearly	Special Method 1
Nitrate	milligrams per kilogram	Yearly	Special Method 1
Nitrogen (total)	milligrams per kilogram	Yearly	Special Method 2
Organic carbon	percent	Yearly	Special Method 2
pH	pH	Yearly	Special Method 1
Phosphorus Sorption Capacity	phosphorus sorption capacity of soil	3 years	Special Method 1

POINT 34,35,36,38,40,41,42

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Every 6 months	Representative sample
Nitrate	milligrams per litre	Every 6 months	Representative sample
Nitrogen (ammonia)	milligrams per litre	Every 6 months	Representative sample
Nitrogen (total)	milligrams per litre	Every 6 months	Representative sample
pH	pH	Every 6 months	Representative sample
Phosphorus (total)	milligrams per litre	Every 6 months	Representative sample
Reactive Phosphorus	milligrams per litre	Every 6 months	Representative sample
Standing Water Level	metres	Every 6 months	In situ
Total suspended solids	milligrams per litre	Every 6 months	Representative sample

POINT 43

Pollutant	Units of measure	Frequency	Sampling Method
Aggregate stability	As approp.	Special Frequency 7	Special Method 1
Available phosphorus	milligrams per kilogram	Special Frequency 7	Special Method 1
Cation Exchange Capacity	centimoles of positive charge per kilogram of soil	Special Frequency 7	Special Method 1
Chloride	milligrams per kilogram	Special Frequency 7	Special Method 1
Conductivity	microsiemens per centimetre	Special Frequency 7	Special Method 1

Exchangeable calcium	centimoles of positive charge per kilogram of soil	Special Frequency 7	Special Method 1
Exchangeable magnesium	centimoles of positive charge per kilogram of soil	Special Frequency 7	Special Method 1
Exchangeable potassium	centimoles of positive charge per kilogram of soil	Special Frequency 7	Special Method 1
Exchangeable sodium	centimoles of positive charge per kilogram of soil	Special Frequency 7	Special Method 1
Exchangeable sodium percentage	percent	Special Frequency 7	Special Method 1
Nitrate	milligrams per kilogram	Special Frequency 7	Special Method 1
Nitrogen (total)	milligrams per kilogram	Special Frequency 7	Special Method 2
Organic carbon	percent	Special Frequency 7	Special Method 2
pH	pH	Special Frequency 7	Special Method 1
Phosphorus Sorption Capacity	phosphorus sorption capacity of soil	Special Frequency 7	Special Method 1

POINT 44,45,46,47,53,54,55,56

Pollutant	Units of measure	Frequency	Sampling Method
Conductivity	microsiemens per centimetre	Every 6 months	Representative sample
Nitrate	milligrams per litre	Every 6 months	Representative sample
Nitrogen (ammonia)	milligrams per litre	Every 6 months	Representative sample
Nitrogen (total)	milligrams per litre	Every 6 months	Representative sample
pH	pH	Every 6 months	Representative sample
Phosphorus (total)	milligrams per litre	Every 6 months	Representative sample
Reactive Phosphorus	milligrams per litre	Every 6 months	Representative sample
Standing Water Level	metres	Every 6 months	In situ
Total suspended solids	milligrams per litre	Every 6 months	Representative sample

POINT 57

Pollutant	Units of measure	Frequency	Sampling Method
Calcium	milligrams per litre	Quarterly	Representative sample
Chloride	milligrams per litre	Quarterly	Representative sample
Conductivity	microsiemens per centimetre	Quarterly	Representative sample
Magnesium	milligrams per litre	Quarterly	Representative sample
Nitrate	milligrams per litre	Quarterly	Representative sample
Nitrogen (ammonia)	milligrams per litre	Quarterly	Representative sample
pH	pH	Quarterly	Representative sample
Phosphorus (total)	milligrams per litre	Quarterly	Representative sample
Potassium	milligrams per litre	Quarterly	Representative sample
Reactive Phosphorus	milligrams per litre	Quarterly	Representative sample
Sodium	milligrams per litre	Quarterly	Representative sample

Sodium Adsorption Ratio	sodium adsorption ratio	Quarterly	Representative sample
Total Kjeldahl Nitrogen	milligrams per litre	Quarterly	Representative sample

M2.3 For the purposes of the table(s) above Special Frequency 1 means the collection of samples shall occur after every overflow event from the holding pond(s), wet weather pond(s) and/or terminal pond(s) and at least every three (3) months. However, monitoring is not required in the three month period at monitoring points 2, 3, 4, 5, 6, 7 and 8 if the monitoring site is dry or inadequate water is available to collect a sample.

M2.4 For the purposes of the table(s) above Special Frequency 4 means the collection of samples shall occur: (a) at every overflow event; and (b) every three (3) months.

M2.5 For the purposes of the table(s) above Special Frequency 7 means the collection of samples shall occur prior to manure application and at least once every three (3) years.

M2.6 For the purposes of the table(s) above Special Method 1 means that, for each paddock (within the EUA or MUA), representative composite samples must be taken of the: (a) top soils; and (b) sub soils.

M2.7 For the purposes of the table(s) above Special Method 2 means that, for each paddock (with the EUA or MUA), representative composite samples must be taken of the top soils.

M2.8 For the purposes of the table(s) above, monitoring at points 10, 14, 22, 48, 49, and 50 is not required if the monitoring site is dry or inadequate water is available to collect a sample

M2.9 For the purposes of the table(s) above, monitoring at points 34, 35, 36, 38, 40, 41, 42, 44, 45, 46, 47, 53, 54, 55 and 56 is not required when the bore is dry or inadequate water is available to collect a sample.

M3 Testing methods - concentration limits

M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Weather monitoring

M4.1 For each monitoring point specified in the table below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Point W1

Parameter	Units of Measurement	Frequency	Averaging Period	Sampling Method
Air temperature	ºC	Continuous	1 hour	AM-4
Wind direction	º	Continuous	15 minute	AM-2 & AM-4
Wind speed	m/s	Continuous	15 minute	AM-2 & AM-4
Sigma theta	º	Continuous	15 minute	AM-2 & AM-4
Rainfall	mm	Continuous	24 hour	AM-4

M5 Recording of pollution complaints

M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M5.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M7 Requirement to monitor volume or mass

M7.1 For each discharge point or utilisation area specified below, the licensee must monitor:
a) the volume of liquids discharged to water or applied to the area;
b) the mass of solids applied to the area;
c) the mass of pollutants emitted to the air;

at the frequency and using the method and units of measure, specified below.

POINT 10

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 11

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 14

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 20

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 22

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 24

Frequency	Unit of Measure	Sampling Method
Yearly	tonnes	Special Method 5

POINT 27

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 28

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 29

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 30

Frequency	Unit of Measure	Sampling Method

Yearly	kilograms per hectare	Special Method 6

POINT 31

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 43

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 4

POINT 48

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 49

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 50

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

POINT 51

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 52

Frequency	Unit of Measure	Sampling Method
Yearly	kilograms per hectare	Special Method 6

POINT 57

Frequency	Unit of Measure	Sampling Method
Continuous during discharge	megalitres per year	Special Method 3

M7.2 For the purposes of the table(s) above Special Method 3 means that sampling shall occur by calculation (volume flow rate or pump capacity multiplied by operating time) and that volume data is to be provided for each effluent utilisation area.

For the purposes of the table(s) above Special Method 4 means that the mass of:
1. manure (dry matter) and nutrient (Total Phosphorus, Total Nitrogen and Potassium) applied to each management unit of the Manure Utilisation Area; and

2. crop yield (dry matter) and nutrients removed (Total Phosphorus, Total Nitrogen and Potassium) for

each management unit of the Manure Utilisation Area;

are to be monitored.

For the purposes of the table(s) above Special Method 5 means that the amount of solids taken from the manure stockpile (labelled as EPA Point 24 on map titled "Rangers Valley Cattle Station Site Plan" dated 30.07.03) shall be recorded.

For the purposes of the table(s) above Special Method 6 means that the mass of:
3. nutrients (Total Phosphorus, Total Nitrogen and Potassium) applied to the Effluent Utilisation Areas; and
4. crop yield (dry matter) and nutrients removed (Total Phosphorus, Total Nitrogen and Potassium) from the Effluent Utilisation Areas;

are to be monitored.

M8 Other monitoring and recording conditions

M8.1 **Testing methods – monitoring concentration of pollutants discharged**
Monitoring of solids and soils for concentration of pollutants must be done in accordance with methods that have been approved by the EPA in writing before any tests are conducted. Methods must be approved for:

(a) the sampling technique; and
(b) the analytical technique.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:
1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of

the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R1.8 **Monitoring report**

The licensee must supply with the Annual Return a report, which provides:
a) an analysis and interpretation of monitoring results; and
b) actions to correct identified adverse trends.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G2 Contact number for incidents and responsible employees

G2.1 The licensee must operate one 24-hour telephone contact line for the purpose of enabling the EPA:
a) to contact the licensee or a representative of the licensee who can respond at all times to incidents relating to individual premises, and
b) to contact the licensee's senior employees or agents authorised at all times to:
i) speak on behalf of the licensee, and

ii) provide any information or document required under licence.

G2.2 The licensee is to inform the EPA of the contact number within 3 months of this condition taking effect.

G3 Signage

G3.1 Each monitoring and discharge point must be clearly marked by a sign that indicates the EPA point identification number.

Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same me aning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Mr David Dutaillis

Environment Protection Authority

(By Delegation)

Date of this edition: 31-August-2001

End Notes

1	Licence varied by notice 1027134, issued on 27-Oct-2003, which came into effect on 21-Nov-2003.
2	Licence varied by notice 1035431, issued on 18-Mar-2004, which came into effect on 19-Mar-2004.
3	Licence varied by change to record due to LGA amalgamation, issued on 27-Oct-2004, which came into effect on 27-Oct-2004.
4	Licence varied by notice 1056214, issued on 28-Dec-2006, which came into effect on 28-Dec-2006.
5	Licence varied by notice 1071584, issued on 23-Aug-2007, which came into effect on 23-Aug-2007.
6	Licence varied by notice 1078921, issued on 06-Nov-2007, which came into effect on 06-Nov-2007.
7	Licence varied by notice 1082561, issued on 07-Feb-2008, which came into effect on 07-Feb-2008.
8	Condition A1.3 Not applicable varied by notice issued on <issue date> which came into effect on <effective date>
9	Licence varied by correction to Scheduled Activity name, issued on 28-Feb-2011, which came into effect on 28-Feb-2011.
10	Licence varied by notice 1503436 issued on 27-Jan-2012
11	Licence varied by notice 1515048 issued on 28-Jun-2013
12	Licence varied by notice 1546705 issued on 25-Jan-2017

Appendix D. Amendment Process Correspondence

OUT16/49698

16/12/2016

Sarah Grady
EnviroAg Australia Pty Ltd
Unit 1, 3 Foundary St
PO Box 411
Toowoomba QLD 4350
sarah.grady@enviroag.net.au

Dear Sarah

Re- Your reference 24072 - Modification of the Rangers Valley Feedlot DA-261-0-2001-I

Thank you for the opportunity to provide advice and comment on the modification for the above proposal as per your e-mail correspondence dated 2nd December 2016.

The NSW Department of Primary Industries (NSW DPI) Agriculture provides advice about the protection, growth and development of agricultural industries and the resources upon which these industries depend to provide economic growth.

DPI Agriculture is not aware of any complaints from the current Development and can see the environmental and animal welfare benefits of improved pen drainage and business benefits from the modification should they work as well in practice as they do in theory.

An assessment of Heat Load in cattle is the only risk that DPI Agriculture has been able to identify that the modification missed on picking up. This is not an issue as it is considered low in the Glenn Innes area. For further information the generic consent conditions that DPI Agriculture has been advising councils to adopt in relation to Heat Load is attached in Appendix 1.

Yours sincerely

Andrew Scott
Resource Management Officer
Northwest (Barwon) Region
NSW DPI Agriculture Landuse Planning

Attachment 1.

Issue	Detail
Compliance with Guidelines	National Guidelines for Beef Cattle Feedlots in Australia SCARM report 47 Model Codes of Practice for the Welfare of Animals: Cattle Model Code of Practice for the Welfare of Animals: Land Transport of Cattle Model Code of Practice for the Welfare of Animals: Animals at Saleyards National Guidelines for Beef Cattle Feedlots in Australia.
Heat load in feedlots:	Where the feedlot is considered to be in a zone where heat load may need to be managed. DPI recommends the following actions to manage heat loads in feedlots. **All feedlots;** • Must provide approved type of shade for sick animals in hospital pen(s) • Must conduct a risk analysis using ALFA Risk Assessment Program for the feedlot site using the standard "fat black steer" as a model - **1.** If the calculated ***"Over -all Risk"*** for the ***"extreme risk probability"*** of heat stress due to an ***"event duration"*** of ***3 or more days***, is ***"less than 1/decade"***: ▪ No further requirement; ▪ Recommend following the principles outlined in MLA, NSW and National guidelines for managing animals during summer ▪ Recommend membership of National Feedlot Accreditation Scheme (NFAS) to encourage best practice **2.** If the calculated ***"Over -all Risk"*** for the ***"extreme risk probability"*** of heat stress due to an ***"event duration"*** of ***3 or more days***, is ***"1/decade"*** or greater feedlots must have a "Summer Action Plan (SAP)" in place: ▪ Must follow NFAS standards and become a member of NFAS ▪ Non-member of NFAS required to meet conditions during Dec-Feb to keep probability less than once/decade Either through: o Approved "Summer Action Plan (SAP)" developed using the ALFA/MLA RAP software to design suitable mitigations measures (breed, water, shade, pen cleaning etc) for implementation. Or o Approved shade required in all pens **Notes:** • RAP software available at http://chlt.katestone.com.au/rap-calculator/ • Use climatic data from nearest appropriate center

	• "Fat black steer" is Black, British breed (Bos Taurus), condition score 4, no access to shade, healthy and in a class 3 feedlot. • "Approved shade" to be a minimum of **<u>3</u>** sq meters per head, design and aspect to conform to recommendations published by MLA • Limit of acceptable risk based on probability of an extreme event of 3 days, less than once per decade